

# Derech HaTeva

A JOURNAL OF TORAH AND SCIENCE

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# Derech HaTeva

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A JOURNAL OF TORAH AND SCIENCE

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derech hateva

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# DEDICATION

This volume of  
Derech HaTeva is  
dedicated in

memory of all the victims of terror and those who have suffered tragic losses during the recent events in Israel, the United States, and the rest of the world. We pray for this time of hardship to end and yearn for the return of peace for all of *Klal Yisrael*.



# THANK YOU

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Derech HaTeva.

# Derech HaTeva

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## A JOURNAL OF TORAH AND SCIENCE

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"Mah rabu ma'asecha Hashem,  
kulam bi'chachma asita,  
malah ha'aretz kinyanecha."  
(Tehillim 104,24)

How abundant are your works,  
Hashem, with wisdom You made  
them all, the earth is full of  
Your possessions."

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# Embryonic Stem Cells in Halachah

As always, new advances bring new opportunities but also new ethical and moral dilemmas. Scientists, government officials, and clerics are divided over maximizing the potential of the early steps in stem cell research and the issue of using human embryos. As always, our contemporary rabbinic leaders strive to reach some consensus on the Jewish

halachic view through an understanding of the science involved, the precedents in halachic interpretations of related issues (in this case, abortion), and the possible applications and beneficial ramifications for society.

The start of human development occurs when a sperm fertilizes an egg and creates a single totipotent cell, with the capacity to develop into an entire organism. Following several cycles of cell division, the totipotent cell forms a multicellular blastocyst consisting of an outer layer of cells in the shape of a hollow sphere, with an inner cell mass comprised of a cluster of cells. The cells of the inner cell mass are pluripotent. They can form virtually every type of cell found in the

human body, but unlike totipotent cells, the pluripotent cells cannot form the cells of the placenta and supporting tissues necessary for development in the uterus. Subsequently, these pluripotent stem cells divide and differentiate into multipotent stem cells, that give rise to cells with a particular function.<sup>1</sup>

Multipotent adult stem cells, such as blood stem cells, are found in the bone marrow of every human, and can even be located circulating in the blood stream. Blood stem cells continually differentiate into red blood cells, white blood cells, and platelets, as their normal supply wears out. Skin stem cells also continually replenish the different types of dermal cells. However, multipotent stem cells have not yet been

found for all types of adult tissue, their numbers may decrease with age, are often found in only minute quantities, and are difficult to obtain and purify. Furthermore, there is also no evidence that adult stem cells have the potential of pluripotent embryonic stem cells.<sup>1</sup>

Pluripotent cell lines, the tools for scientific research, can be obtained in different ways. The first method involves isolating pluripotent embryonic stem cells directly from the inner cell mass of human embryos at the blastocyst stage, growing them in culture, and thereby creating a cell line of indefinitely replenishing stem cells. Excess embryos in in vitro fertilization (IVF) clinics, initially were produced for reproduction not research are the source of these stem cells. The excess embryos are either frozen, discarded, or donated to other people, depending on the decision of the parents. The second method involves isolating pluripotent stem cells from fetal tissue obtained from aborted fetuses and thereby creating a cell line.<sup>1</sup> Embryos used for embryonic

stem cell research can also be obtained from embryos created exclusively for stem cell research as well as from cloned embryos.

There are several important applications of stem cell research with pluripotent human stem cells. On the basic level, this research could shed light on the many factors involved in the cellular decision-making process that occurs during human development. Human pluripotent stem cell research could also be used to develop and test drugs for their safety to different cell lines before subsequent testing on laboratory animals and human subjects. Yet, the greatest potential application lies in "cell therapies." Pluripotent stem cells can replace damaged or malfunctioning cells and tissues and thus can potentially be used to treat various diseases and dis-

stem cells into an environment with the proper hormonal stimulation, the stem cells differentiate into any of the almost 220 different tissue types in the body. These cells would be almost genetically identical to the initial nuclear DNA's somatic cells. If needed, the cells can be transplanted into the individual, and, as the risk of rejection is obviated there is no need for immune-suppressing drugs. This technology offers endless possibilities including: creating pancreatic islet cells to restore function to a type I diabetic, nerve cells to replace neuronal tissue damaged by strokes, spinal-cord injuries, and Alzheimer's and Parkinson's diseases, skin tissue for burn victims, and cardiac tissue for damaged arteries and heart muscle.<sup>1</sup>

What is the halachic perspective on

both Jews and non-Jews. When they exited the ark, G-d commanded seven laws for Noah and his family to keep, which apply to all humanity. One of these laws is: "Whoever sheds the blood of man, by man shall his blood be shed" (Bereishit 9:6). The Talmud (Sanhedrin 67b) changes the punctuation and translates this commandment as: "Whoever sheds the blood of man, within man, his blood shall be shed." The Talmud continues to explain that "man within man" refers to a fetus in its mother's womb. Therefore, for both Jews and non-Jews, there is a prohibition of abortion, although how strictly this is interpreted differs according to technical reasons.<sup>6</sup>

How is this prohibition of abortion classified? There are four basic opinions as to the nature of this prohibition.

Some derive the prohibition of abortion from the Torah prohibition of hashchatat zera, "wasting seed." The prohibition forbids the destruction or useless emission of sperm that could create life. If there is a prohibition against wasting sperm, certainly there is a prohibition against destroying an embryo which is a created life.<sup>7</sup> Rabbi Yakov Emden argues with this opinion and explains that hashchatat zera does not apply once fertilization has occurred.<sup>8</sup>

Some derive the prohibition of abortion from the Torah prohibition of chavalah – causing injury to others. By performing an abortion, the chavalah can either apply to injuring the fetus or the mother, because by wounding the fetus one is wounding the mother.<sup>9</sup>

The third category for abortion may be retzicha, murder. The Mishna states that if a woman is in labor and her life is at stake, one is permitted to abort the fetus to save the life of the mother. The Rambam explains that abortion is permitted in this case because the fetus is con-

The question remains: does a five-day old blastocyst, consisting of approximately 100 cells, attain the status of human life?

abilities such as Parkinson's and Alzheimer's diseases, heart disease, type I diabetes, and arthritis.<sup>1</sup>

The most promising application of stem cell research would be to combine it with somatic cell nuclear transfer (SCNT), commonly called cloning. By taking almost any somatic cell from a person's body, removing the nucleus and placing it into an enucleated recipient egg cell, researchers can create a copy of that person's cell, which develops into a blastocyst. Then, the inner cell mass can be removed and used to create a culture of pluripotent cells that would be immunologically compatible with the initial DNA of the nucleus. By placing the pluripotent

such research? The debate centers around the permissibility of using the excess embryos from IVF to obtain stem cells, since in the process of obtaining the stem cells, the blastocyst is destroyed. The question remains: does a five-day old blastocyst, consisting of approximately 100 cells, attain the status of human life? Furthermore, does the destruction of such a blastocyst, which was conceived in vitro, constitute an abortion? First, one must understand the Torah view on abortion, and with these parameters, one can understand the possible issues concerning stem cell research.

Abortion is a complex issue, but the Torah is clear that a prohibition exists for

sidered a rodef, a pursuer after the mother with the intent to kill her, and it is a mitzvah to kill a rodef to save the nirdaf, the pursued – in this case, the mother. Most commentaries on the Rambam<sup>10</sup> explain that since the only reason the Rambam permitted abortion is because of the rodef status of the fetus, it is implicit that Rambam maintains that the fetus has acquired the status of a nefesh, human life, and therefore the prohibition of retzicha would apply. However, the Rambam adds that once the fetus is partially born, one cannot sacrifice the fetus to save the life of the mother, because at that point the new life is not considered a fetus but rather an independent human being. The commentaries deal with the seeming contradiction within the Rambam – of why the rodef status only applies while the fetus is still in the mother's womb, but the solutions are beyond the scope of this article. Regardless, the Rambam clearly maintains that abortion falls under the category of retzicha, and is only permitted when the fetus is considered a rodef – if the mother's life is in danger.

The fourth possible category for the prohibition of abortion stems from the converse of two positive commandments in the Torah. The Torah states that one should "not stand idly by as your neighbor's blood is being shed" (Vayikra 19:16), and regarding lost objects, "...and you should surely restore it to him" (Devarim 22:1-2). The Talmud (Sanhedrin 73a) on the first verse explains that one must go out of his way to protect an endangered person. From the second commandment of restoring lost property, the Rambam<sup>11</sup> derives the obligation to heal because if one has an obligation to restore property, surely one has an obligation to restore a person's health. According to these verses then, it

is a positive commandment to save a person's life. Based on these commandments, some poskim<sup>12</sup> argue that one is required to desecrate shabbat to save the life of a fetus because they are of the opinion that it is a mitzvah to save the life of a fetus. It follows, then, that it must be prohibited to abort a fetus since it is a mitzvah to save the life of a fetus.

What are some of the practical ramifications and what is the consensus of opinions? Although there are a number of possible ways to derive the prohibition of abortion, there are two basic approaches to the practical halachah.

Most major poskim follow the Rambam who states that the prohibition of abortion stems from retzicha.<sup>13</sup> Based on the perspective of the fetus as a rodef, an abortion can only be performed if it will save the life of the mother.

Rabbi Eliezer Waldenberg argues that the prohibition for abortion is not based on retzicha, but on one of the less severe prohibitions.<sup>14</sup> Therefore, under certain circumstances, if there is a tzorech gadol (a great need), one may perform an abortion. He allows first trimester abortions of a fetus which would be born with a deformity that would cause it to suffer, and up to the end of the second trimester for a fetus with a lethal fetal defect, such as Tay Sachs, which would also cause great suffering for the parents.

The above discussion pertains to abortions after forty days. What is the Torah view towards abortion before forty days? The Talmud (Yevamot 69b) says that until the fortieth day, the fetus has the status of "mayim b'alma (mere water)." The Mishnah (Nidda 30a) also states that there is no status of tumat leida, ritual impurity after the birth of a baby, for the mother if she miscarries prior to forty days.

Does this mean that there is no pro-

hibition of abortion before forty days? Again, the poskim disagree depending on their source for the prohibition of abortion. The Beit Shlomo maintains that there is no prohibition of abortion before forty days because the fetus is considered mayim ba'alma.<sup>15</sup>

Rabbi Chaim Ozer Grodzensky<sup>16</sup> and the Torat Chesed<sup>17</sup> (look up name) contend that for non-Jews there is no prohibition of abortion before forty days, but for Jews there is a rabbinic prohibition. Rabbi Yechiel Yakov Weinberg allowed a woman who contracted German measles in her first month of pregnancy to abort the fetus because the baby might be born with deformities. He permitted this abortion since there was a tzorech gadol and the prohibition for abortion before forty days is only rabbinic in nature.<sup>18</sup> It would seem, therefore, that all of the poskim who maintain that the prohibition of abortion before forty days is rabbinic, would also agree that one is permitted to perform an abortion if a tzorech gadol would arise.<sup>19</sup>

Rabbi Unterman,<sup>20</sup> the former Ashkenazi chief Rabbi of Israel, and Rabbi Moshe Feinstein<sup>21</sup> made the case that even though the fetus is considered mayim ba'alma before forty days, and is not considered a nefesh, for Jews one must look at the potential for life and therefore an abortion would be prohibited. Their ruling was based on the principle that one is allowed to desecrate the shabbat to save a life because of the potential for that person to keep many more shabbatot and mitzvot in general (Yoma 85b). So even though prior to forty days the fetus has not attained the status of a nefesh, the Baal Halachot Gedolot rules that one is obligated to desecrate the shabbat to save the life of the fetus because it possesses the potential to develop into a nefesh.<sup>6</sup>



## “Is there a prohibition of destroying these

The poskim arrived at their positions based on their classification of the prohibition of abortion. Those who argue that abortion falls under the category of retzicha maintain that this prohibition no longer applies within forty days because there is no nefesh, a qualification for the status of retzicha (it must be considered a life before it can be considered murdered). The status of nefesh is a prerequisite for the prohibition of chavalah as well, and therefore those who place the prohibition under chavalah of the fetus would have to argue that the prohibition does not apply prior to forty days (because there is no limb to injure before the formation of a recognizable fetus). Those who posit that the prohibition is based upon the prohibition of chavalah for the mother do not mention the forty day distinction, because chavalah of the mother would apply whenever the abortion takes place. Those who assert that the prohibition is hashchatat zera, make no distinction before forty days because the prohibition takes effect even before conception. Finally, if the reason for the prohibition is because of the positive commandment of hashavat aveidah, restoring lost objects (which includes saving lives), the prohibition of abortion may still apply prior to forty days because of the potential to develop into a human being. Although there is still dispute among poskim, most opinions argue that for Jews there is a prohibition of abortion even within the first forty days, although the minority view maintains that there is no prohibition before the fortieth day.

The discussion this paper has outlined pertains only to Jews who are bound by Torah law. For non-Jews, the prohibition of abortion is derived from the Noachide laws and is limited to murder and “shedding blood of man within

man.” However, these commandments include only actual lives, not potential lives. Therefore, before the fortieth day, there is no prohibition of abortion for a non-Jew, nor for a Jew to aid in such an abortion.

Once the prohibition of abortion has been broken down, we can analyze the destruction of surplus embryos from IVF clinics and which were never in utero. Is there a prohibition of destroying these pre-embryos (embryos which are still in vitro), even within the forty days? Again, there are a few different opinions.

According to Rabbi Mordechai Eliyahu<sup>23</sup> and Rabbi Moshe Sterbauch,<sup>24</sup> the surplus embryos from IVF clinics have no potential for life because another action must be done in order for them to develop into human beings (they need to be implanted), whereas a pre-embryo left in its Petri dish will die. Rabbi Shmuel Vozner of Bnei Brak was asked whether or not one may desecrate the shabbat to save pre-embryos, in the case of, for example, the freezer breaking down. He, like Rabbi Eliyahu and Rabbi Sternbauch, asserted that the embryos in the Petri dish have no potential for life, but he presented a different reason. He explained that currently, the success rate of IVF is not over rov (majority), and therefore even if the pre-embryos would be implanted, most of them would not develop into fetuses.<sup>25</sup> According to the latest statistics, the success rate of IVF is 22.8% live births per egg retrieval, which is clearly under rov (50%).<sup>26</sup> So, according to Rabbi Vozner, one may not desecrate the shabbat in order to save a pre-embryo. Should the success rate of IVF increase, then according to Rabbi Vozner, the halachah would change and it would become permitted to desecrate the shabbat to save the pre-embryos, and it would likewise become

prohibited to destroy or discard the pre-embryos.

Therefore, according to the reasoning of Rabbi Eliyahu, Rabbi Sternbauch, and Rabbi Vozner, there is no potential for life for pre-embryos outside the womb. Additionally, retzicha would not apply since there is no nefesh. Chavalah of the mother would not apply since the embryo was never a part of the mother, and chavalah of the embryo would not be an issue since there is no prohibition of chavalah without a nefesh.

The only remaining prohibition is that of hashchatat zera, which would not be rescinded if the embryo is outside the womb. However, many authorities claim that the prohibition of hashchatat zera only applies to wasted sperm and not to the destroyed embryo. Since there is only one opinion who maintains that hashchatat zera is a problem in respect to abortion, it is a stringency to worry about the prohibition. Even if one wants to be stringent and take this opinion into account, if one utilizes the sperm for stem cell research, it is no longer hashchatat (wasting)!<sup>27</sup> Furthermore, the prohibition certainly applies only to Jews. When the issue is raised about destroying the pre-embryos of non-Jews, who are a majority of society, then there is no effective prohibition of hashchatat zera. To summarize – there would be no problem pursuing stem cell research in the United States of America where the majority of the population is not Jewish.

pre-embryos (embryos which are still in vitro), even within the forty days?

A second approach to the issue of stem cell research was presented by Rabbi Bleich, who refers to the stipulation of Rabbi Yechiel Yakov Weinberg of abortions within forty days. Although there was no definitive rabbinic ruling regarding abortion within forty days, Rabbi Weinberg had permitted abortions until the fortieth day only if there was a "tzorech gadol." Since Rabbi Bleich is not sure whether research constitutes a tzorech gadol, he maintains that perhaps stem cell research is problematic. If stem cell research can save lives, then the destruction of pre-embryos would be permitted for research because with the exception of murder, adultery, and idol worship, Judaism requires one to transgress all of the laws in the Torah for pikuach nefesh, saving a life. Rabbi Yechezkel Landau established certain conditions for employing the waiver of pikuach nefesh, including a present recipient, and immediate benefit to this recipient. Currently, as stem cell research has not progressed to the stage in which there are recipients (all of the research is still only potentially life-saving), one could argue that pikuach nefesh does not apply, but because the prohibition that is being circumvented is only a stringency, one is entitled to extend the limits of pikuach nefesh and forego the conditions which were established by Rabbi Landau.<sup>22</sup>

Additionally, Rabbi Bleich adds that if the pre-embryo is microscopic, then research would be permitted because in halachah, microscopic organisms have no status. For instance, the Talmud explains that although we ingest thousands of tiny worms every time we eat, they have no standing in halachah and therefore are permissible. Although the pre-embryo is not microscopic (it is just within the range of the resolution of the human eye, 0.1-0.2mm), it is so tiny that

the argument of microscopy might still apply. However, the real fallacy in this argument is that one cannot argue that the pre-embryo has no halachic status because in a number of cases, it does! For instance, although it cannot be included within the scope of this article, there is much halachic discussion concerning the ownership of this pre-embryo. Clearly, the halacha does recognize the status of this pre-embryo, regardless of its nearly microscopic size.<sup>22</sup>

A third opinion, held by Rabbi Yosef Shalom Eliyashuv, possibly the most highly regarded posek in Israel today, addresses the problem of discarding the surplus pre-embryos from IVF. He stated that the pre-embryos of Jews may not

what if this has already been done and established stem cell lines are available? Once stem cell lines are established, and there is an unlimited supply of proliferating stem cells, there is no prohibition in deriving benefit from them. Even if the act of destroying the embryo was prohibited, this does not necessarily result in a prohibition to use the product of that act.<sup>31</sup> For instance, the Torah prohibits cross-breeding two species of animal. Yet, according to the Rambam (K'layim 9:3), the mule which is the product of a horse and donkey, may be used even though a Torah prohibition was transgressed.

However, the specific creation of embryos by IVF for the purpose of stem cell research is not permitted lichatchila (a

Additionally, Rabbi Bleich adds that if the pre-embryo is microscopic, then research would be permitted because in halachah, microscopic organisms have no status.

actively be destroyed, yet if frozen, they can be left out of the freezer to thaw and, thereby, be indirectly destroyed. This reasoning, based on the prohibition of hashchatat zera, is not applicable to non-Jews. According to the reasoning of Rabbi Eliyashuv, apparently, stem cell research on Jewish pre-embryos might be prohibited because the research actively destroys the embryo, which violates the prohibition of hashchatat zera. Although since hashchatat zera is a minority opinion, it is not such a serious issue. Yet for non-Jews this prohibition does not apply and stem cell research would therefore be permitted.<sup>30</sup>

Even if destroying the pre-embryo to obtain stem cells would be prohibited,

priori), since there are poskim who forbid abortion even before the fortieth day.<sup>2</sup> Currently, there are approximately 100,000 surplus pre-embryos from IVF which bedieved (ex post facto) may be used for research since they are available. Additionally, the process of IVF can be difficult and expensive for the donor couple, which will make the commercialization of IVF for the purpose of stem cells quite unlikely.

Another concern resulting from stem cell research is the controversy of the proverbial "slippery slope." In today's society, the prospect of advances in scientific research from stem cells may lead to the cheapening of fetal human life, resulting in relaxed standards regarding abor-



tions, as couples vacillating may be encouraged to donate their abortuses towards stem cell research. Others argue that stem cell research facilitates human cloning, but this argument is far-fetched given that cloning of humans is not even a distant goal of this research, and assuming that the researchers realize that cell therapy is a far greater contribution to

society through the replacement of damaged cells and organs than cloning.<sup>33</sup>

Thus, the research in new medical frontiers continues, and the search for halachic and ethical guidelines for these frontiers follow at the heels. The joy for us is not only in benefiting from the consequences of this research, but also in witnessing today's gedolim apply our

centuries-old halachot and precedents to these new opportunities. It is no wonder that at this moment the excitement of discovery and application is so high in both the science world and the Torah world.

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# Weighing the Sources:

## *Eating Habits and Eating Disorders in the Torah*

In recent years there has been an increased emphasis on the effect of diet and eating habits on one's overall health. This heightened awareness of food choices and eating habits corresponds to an increased prevalence of weight problems and eating disorders among the American people. Torah sources centuries old offered advice and information about eating habits

and eating disorders that concur with some of today's popular opinion.

In several passages, the Gemara echoes the advice of the 21st century dietician on healthy eating habits. Brachos (62b) states the number one rule in any dieting book: Eat only when you are hungry. A passage in Shabbos (152a) advises one to eat slowly and chew the food well, which is not unlike diet advice to "Eat slowly and savor each mouthful" to prevent overeating.<sup>1</sup> Rabbi Meir's comment that is unacceptable for a sage to eat in the street<sup>2</sup> can be seen not only as an admonishment to a sage for belying his dignity, but also advice to "Eat sitting down in one designated place."<sup>3</sup> In Gittin (70a), we are

advised to enjoy meals, but not to indulge excessively, as we should eat one-third, drink one-third, and leave one-third of the stomach empty.

The Gemara offers several insights and advice about health that are universally recognized today as valid. It is difficult to open any health, diet, or woman's magazine today without finding an article about the importance of drinking water. However, the Gemara recognized the importance of constant hydration long before Lady's Home Journal. Shabbos (41a) warns that eating without drinking destroys one's vitality. Nedarim (37b) addresses a phenomenon that most of us experience on a weekly basis. There, Shmuel describes the slug-

gishness that many people experience on Shabbos after eating a large meal, (naturally followed by an afternoon shluft!), concluding that a change in one's regular diet is the beginning of digestive trouble. Did Rashi know about the colloquial beer belly? In one brief comment on Mo'ed Katan (9b), Rashi explains that beer produces obesity and growth of hair.

The Gemara's advice on eating is meant to promote good health and prevent obesity and its consequences. Today, approximately 1 in 8 Americans are obese, defined as 20 percent over their ideal weight, with approximately 280,000 adult deaths each year in the United States attributed to obesity. The Gemara does not discuss how many people were afflicted with obesity in its time nor does it cite obesity as a cause of death, but it does mention that, in general, more people die from overeating than from under-eating.<sup>3</sup>

Rabbi Yishmael ben Yose, who lived in the 2nd century, and his contemporary, Rabbi Eleazar ben Shimon, are described as so over-

weight that when they stood facing each other, a pair of oxen could pass under their bellies without touching them.<sup>4</sup> Bava Metzia (83b), discusses a procedure that the obese Rabbi Eleazar ben Shimon underwent to remove several "baskets of fat."

Although Rabbi Eleazar ben Shimon is usually presumed to be the son of Rabbi Shimon bar Yochai, who lived with his father in a cave for 13 years eating only dates and carob, Dr. Samuel Kottek<sup>5</sup> suggests that Rabbi Eleazar was not Rabbi Shimon bar Yochai's son, as such a diet would preclude obesity. Dr. Kottek suggests that Rabbi Eleazar was the son of Rabbi Shimon ben Chalafta, who is described as being very overweight and, like Rabbi Eleazar, lived near Sepphoris in the Galilee.

Rabbi Shimon ben Chalafta also seems to have suffered from respiratory problems due to his corpulence, as Bava Metzia (86a) describes his climb to the top of a hill on a warm day when "a welcome wind brought him relief."<sup>5</sup> It is not surprising that an obese man would suffer from respiratory problems. Modern studies show an increase in mortality rate associated with obesity compared to normal-weight individuals, and most of the increased risk is due to cardiovascular diseases and type 2 diabetes. By establishing a father-son relationship between the overweight Rabbi Shimon ben Chalafta and the obese Rabbi Eleazar ben Shimon, Dr. Kottek attempts to prove that the Talmudic literature supports a genetic predisposition for obesity. Today's literature on obesity rejects the simplistic view of obesity as a result of overeating because of self-indulgence and lack of self-control, encouraging us to focus on the metabolic and genetic factors contributing to the disease. Scientists have discovered that

several genes, each that may have relatively small effects, interact with environmental factors, such as diet, physical activity, and smoking to cause obesity.

Although Dr. Kottek proves that there were genetic factors influencing Rabbi Eleazar's obesity, the Gemara also associates his obesity with self-indulgence. In another context, the Gemara presents Rabbi Eleazar as a man with a voracious appetite who ate three figs simultaneously, while holding three in his right hand and three in his left hand, indicating that his eating habits may have been a factor in his obesity.<sup>6</sup>

The limited discussion of obesity in the Gemara may indicate that it was not a widespread problem at the time. There were greater problems of starvation due to persecutions and famines than indulgence due to a surplus of food.

For the same reason, anorexia nervosa, an eating disorder that afflicts approximately one percent of young women in the United States, was presumably not a problem in Talmudic times. The self-induced starvation characteristic of anorexia is rarely found in societies where food is scarce. Choosing not to eat is a phenomenon that occurs almost exclusively in countries of affluence. Additionally, many researchers agree that the prevalence of the disease in today's society and its predominance in women, is due to the emphasis on thinness and body size in Western culture as a measure of attractiveness, an issue that the women who lived in Talmudic times did not face. The super-thin models and celebrities seen in the media and magazines today reinforce the connection between body size and beauty. In fact, approximately 5 to 10 percent of all young women in the United States, have a distorted body

image and a preoccupation with becoming thin, though they do not fit all the criteria for a clinical diagnosis of anorexia nervosa.

The criteria for anorexia nervosa include an extreme preoccupation with weight and feeling fat, despite continual weight loss. Anorexics will undertake strict diets, severely limiting their food consumption, leading to a drop of 20 percent below their ideal weight. The medical symptoms of anorexia include fatigue and muscle weakness, dry, yellowish skin, brittle hair, and sometimes, hair loss. Many anorexics suffer from a slow heartbeat, heart palpitations, and low blood pressure, and approximately 5 to 20 percent of anorexics die from medical complications due to their disease.

Although the Gemara discusses fasting in several passages, nowhere does it discuss a disease, like anorexia nervosa, which is associated with fasting, nor does it cite psychological reasons for self-prescribed fasts. Dr. Isaac Schiff and Dr. Morty Schiff suggest that Nevi'im contains a reference to anorexia nervosa, contending that Chana, the mother of Shmuel HaNavi, suffered from anorexia nervosa.<sup>7</sup> They bring proof from Shmuel I (1:7-8), where the Passuk says that Penina's torments caused Chana to stop eating, and consequently, Chana's husband, Elkanah, asks her, "Why do you weep? Why don't you eat? Why are you so unhappy?" Drs. Schiff contend that Chana's anorexia was caused by depression due to her inability to conceive, while Elkanah's other wife, Penina, had several children. "Poor Hannah thus was caught in a downwardly spiraling syndrome-depression due to not conceiving, leading to anorexia, leading to assured infertility!" The depressed Chana went to the Temple

at Shiloh to pray, and after receiving a blessing from the Kohen Gadol, Eli, she was happy, and she sat down to eat. Soon afterward, she conceived.

Although the Schiffs' contention that Chana was anorexic is possible, there is little evidence in the text to support their theory. Because anorexia is predominantly found in women, (over 90 percent of its sufferers are women), and depression is one of its most common causes, Drs. Schiff deem Chana a perfect candidate for the disease. Her inability to conceive, they posit, was a result of amenorrhea, the absence of at least three consecutive menstrual cycles, triggered by her anorexia. The Schiffs' theory, crediting natural causes for Chana's infertility, is not inconsistent with the view that G-d's will enables (or prevents) a woman from becoming pregnant, as G-d works through nature. However, the tenuous connection to the text of Shmuel weakens the argument for Chana's anorexia.

About 30 percent of people with anorexia nervosa also develop bulimia nervosa, an eating disorder characterized by recurring episodes of binge eating followed by compensatory behaviors, such as induced vomiting, to prevent weight gain. Because of the connection between the two diseases, the American Psychiatric Association did not classify bulimia and anorexia as separate diseases until 1989.

There are several discussions in the Gemara about a disease called bulmus, which is triggered by extreme hunger. In an article in the American Journal of Psychiatry, Dr. Allan Kaplan and Dr. Paul Garfinkel suggest that bulmus in the Gemara is the "forme furste," or the predecessor, of what is called bulimia today.<sup>8</sup>

Bulmus in the Gemara is an extreme

hunger that compels its sufferers to eat immediately. It causes the eyes to dim and can lead to blindness and eventually death, if not treated. Bulimia is derived from the Greek, meaning "ox-like hunger," but it is not caused by physical hunger. Like anorexia, bulimia is caused by a distorted body image and/or low self-esteem, and it is characterized by a preoccupation with weight.

The eating habits of the bulmus sufferer may resemble the bingeing of the bulimic, as both may eat with a sense of urgency and compulsiveness. However, unlike the bulmus sufferer, the bulimic's compulsive eating is mostly psychological, not physical, and the bulimic will purge the food when he finished eating to prevent weight gain. Although there are some similarities between the Gemara's bulmus and today's bulimia, the 21st century disease bulimia is not synonymous with the Gemara's bulmus, and it is doubtful that bulimia existed in Talmudic times.

The passage in the Gemara that most closely resembles today's bulimia is not included in its discussion of bulmus. In Shabbos (17b) there is a discussion of the sages' prohibiting gluttons from inducing vomiting after a big meal to be able to eat more. Bulimics can consume as much as 20,000 calories in one binge,<sup>9</sup> but when the binge is over, they purge the food to prevent weight gain. Unlike the bulimic, however, the glutton purges so he can eat more, while the bulimic purges to prevent weight gain. The Talmudic descriptions of bulmus define it as a possibly fatal disease that results from extreme hunger. However, unlike bulimia, which results in few immediate deaths, none of the sources indicate that the hunger is self-induced, has psychological causes, or that the

eating involves any compensatory measures.

There is one Midrashic source<sup>10</sup> that uses bulmus metaphorically, associating it with lack of self-control. The Midrash warns that "he who yields to the bulmus of immorality will eventually still the hunger of his own flesh..."<sup>11</sup> However, the discussions of the actual disease bulmus do not make any associations between the person and the disease. In fact, we are told of many rabbis who suffered from bulmus, indicating that the disease is probably not a reflection on the person. Yoma (83b) describes two rabbis who suffered from bulmus. Rabbi Yehuda, when he was suffering from bulmus, stole a piece of bread from a shepherd. When Rabbi Yose entered a city while he was suffering from bulmus, people rushed to greet him with all kinds of food.

The treatment that the Gemara diagnoses for bulmus is as different as the treatment for bulimia, as are the different symptoms of the two diseases. A person who is gripped by bulmus, or ravenous hunger on Yom Kippur is permitted to eat, until his vision becomes clear, and he may even eat non-kosher food if no kosher food is available. Yoma (83b) prescribes sweet foods, like honey and figs, for the bulmus sufferer. When he was afflicted with bulmus, Rabbi Yochanon plucked a fig from the eastern side of fig tree, where the figs are the sweetest. The use



of figs or honey to treat bulmus may serve as a sugar source for the famished individual. Perhaps figs are specified because they were easy to attain in Talmudic times, as Peah (8:5) recounts that dried figs were distributed to the poor, especially during times of famine.<sup>12</sup> Unlike the treatment for bulmus, the treatment for bulimia, which is generally considered to be a psychological-rooted eating disorder, includes a regimented diet plan, and extensive therapy to fix the attitudes toward food and body image, which are largely responsible for the disease.

Bulmus is not only discussed anecdotally in the Gemara, but it is mentioned in halachic works as well. Rav Moshe Feinstein, a 20th century Posek, derived a halachic ruling from the bulmus sufferer.<sup>13</sup> Citing the Gemara's ruling that allows the bulmus sufferer to eat forbidden foods and to even eat on Yom Kippur, Rav Moshe characterizes certain individuals as bulmus sufferers and permits them to eat on fast days. Their

inability to fast is indicated by a change in their complexion, similar to the dimming of the eyes of the bulmus sufferer in the Gemara. Rav Moshe's ruling distinguishes between individuals who get weak from fasting, which is normal, and those who have bulmus, where fasting can be life-threatening. Rav Moshe does not make any associations between bulimia and bulmus or equate the Gemara's bulmus with any other modern day disease.

As the number of people suffering from eating disorders today reaches epidemic proportions, Torah sources discussed healthy eating habits and obesity that are still relevant today. However, they never mentioned the most common eating disorders today, anorexia and bulimia, probably because they did not exist during Talmudic times.

The Rambam, medieval doctor and Halachist,<sup>14</sup> quotes a Passuk in Mishlei (13:25) that captures the correct approach to eating: "The righteous eat to satisfy his soul whereas the wicked's

belly shall feel want." A chacham or scholar can be recognized through his eating habits; he eats only once or twice a day and eats only what is healthful. The Rambam was definitely an advocate of a healthy lifestyle, complete with healthy eating habits. Although it's hard to say what he would say about the Atkins diet, the Rambam would undoubtedly contend that it is imperative upon someone suffering from an eating disorder, like anorexia or bulimia, to get help to solve his problem, not only from a health perspective, but from a halachic perspective as well. He might even suggest that it is a mitzvah to join Weight Watchers! And who said counting points is ridiculous...?

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# A Prayer a Day Keeps the Doctor Away

**B**nei Brak, a city in Israel on the outskirts of Tel Aviv, claims the highest average life expectancy in the country. To anyone who has ever visited this city, this finding seems surprising, as Bnei Brak is also one of the poorest residential areas in Israel.<sup>1</sup> These two pieces of information seem to confound the expected correlation between wealth and health, and

lead one to wonder what else is known about this city that would perhaps explain this phenomenon. To scientists and researchers, the answer to this puzzle is one that is not hard to find. Bnei Brak is also known as one of the most religious cities in Israel, and recent findings about the connection between faith and health are proving that religiosity does indeed have the power and ability to affect one's health.

The idea that faith acts as an imperative component in the healing process is one that is deeply rooted in Jewish ideology. One such example is found in the book of Exodus 21:18-19, where it states that if one man hurts another, he is responsible to heal him, i.e. to pay for his doctor's bills and such. However, the

specific terminology used leads us to understand that there is a far deeper lesson to be learned. The word "heal" is written not once, but twice. On a simple level, this suggests that the one at fault must ensure that the other is completely healed. However, this repetition can also be interpreted to explain that there are two factors involved in the healing process: the physician and G-d. While the medical personnel are there to create the conditions that can allow for the healing process to occur, it is ultimately G-d who does the healing.<sup>2</sup> Although this may seem to be a mere religious theory, worldwide scientific studies have continuously proven the validity of faith's ability to both heal and cure.

A nationwide study of 21,000

people from 1987 to 1995 found that those who never attended a religious service had almost twice the risk of an earlier death compared with those who attended more than once a week. Overall, this translated into a seven-year difference in life expectancy between those who never attended and those who attended a religious ceremony of some sort more than once a week!<sup>3</sup> Another report demonstrated that a high level of religious coping was correlated with low levels of depression in hospitalized elderly patients who were medically ill.<sup>4</sup> In a 1997 study conducted in India, subjects who prayed regularly were 70% less likely to have coronary heart disease and in a 1989 study of 400 Caucasian men, a significant protective effect against high blood pressure was noted among those who considered religion very important and who attended religious services regularly. A Dartmouth medical study found that patients comforted by their faith had three times the chance of being alive six months after open-heart surgery than patients who found no comfort

in religion. Another study showed that older adults who considered themselves religious had fewer health problems and functioned better than the non-religious.<sup>5</sup>

These findings show clearly that faith is indeed a powerful medicine. To the doubtful, however, they leave room for questioning. Why does religious belief possess such seemingly strong powers? Why should the act of attending a religious service decrease one's chance of developing depression, stress, anxiety, coronary disease, and high blood pressure? Can having faith really provide Prozac-like results? Karl Marx claimed, "religion is the opium of the people." While this statement has a negative connotation, it does seem to

were compared. The kibbutzim served as excellent sources of information because they are, on the whole, marked by a strong stable community and an unusually low death rate in comparison with the rest of the population. In addition, each pair was matched as closely as possible according to characteristics such as geographical location, year of establishment, educational level of the population, and use of the same regional hospital. This helped to eliminate outside factors that could otherwise have the potential to influence or bias the study. The findings from the study showed a distinctive lower mortality rate in the religious kibbutzim, allowing the researchers to make the claim that reli-

Researchers at Columbia University have reported that **women at an in vitro fertilization clinic had a higher pregnancy rate** when, unknown to the patients, **total strangers were asked to pray for their success.**

indicate that religious practice has marked positive mental effects.

According to the National Institute of Healthcare Research in America, the health benefits of being religious may be partly due to the social support derived from frequent attendance at religious services.<sup>6</sup> A second opinion is that the religious perhaps suffer from less anxiety about death than the non-religious, thanks to a comforting belief in the after-life, and this in itself could explain their lower mortality.<sup>7</sup> These explanations are strengthened by the results of a cross-sectional study conducted in Israel. The mortality rates of 11 paired religious and secular kibbutzim across the country

gion has a direct effect on health. The explanation offered by the researchers for this discrepancy is that religious life is less stressful than secular life, and this contributes to lower rates of mortality. The reasons for these low stress levels can be attributed to an enhanced development of certain protective personality characteristics that shield its believers with psychological resources for coping with life stressors. These characteristics include a strong sense of belonging, collective solidarity provided by frequent prayers, belief in God, ritualistic actions that give structure to daily life, and the general sense of well being resulting from living in a cohesive religious community.<sup>8</sup>

An intriguing study from Yale University displayed similar findings when it was discovered that the religious are much less likely to die in the month before their religious holidays. Whereas holy days ascribe meaning to the passage of time, rites, festivals and ceremonies enhance social integration, support, and a sense of belonging.<sup>9</sup> Consequently, participation in a collective action, which characterizes religious holy days, augments internal coping resources and leads to a postponement in mortality. Religion appears to bestow on believers a sense of contentment and resilience in the face of misfortune and tragedy, with which modern medicine and psychotherapy can still, even after thousands of years, simply not compete.

A different opinion on why the religious are healthier is that there is a definite link between religious practice and physical health, and it is these religious acts that enable the religious to live a healthier life. This was clearly proven by the Jewish community during the era of the Black Plague. While the entire rest of the population was horribly affected by the devastation of the epidemic, the Jews were less affected. A possible explanation is that Jewish law requires regimented hand washing, ritual bathing, care of the sick, and immediate burial of the dead, thus assuring that the Jews were not exposed to the germs and lack of hygiene that caused the rest of the population to contract and spread the disease.

Another perspective on the underlying cause of religiosity's ability to prevent illness is demonstrated by a study of postpartum depression among women. Religious individuals might not actually be less prone to manifest depression. Rather, they may tend to perceive their difficulties in more fatalistic or accepting

terms and therefore be less likely to report sadness or discontent when questioned.<sup>10</sup> A circumstance that is described as misfortune by a non-religious individual might be expressed as the will of G-d by an orthodox one. Faith also enables the individual to gain a sense of the meaning of life and human existence, which can then decrease the chance of falling into the grasp of depression and vulnerability to illness. Religiosity also provides a sense of purpose and allows the person to believe in the importance of what and who he/she is. Thus, the religious personality is far better equipped to deal with various stressors and their negative

effects on health.

There are, however, aspects of faith that possess proven healing abilities yet lack any medical or scientific explanation. Researchers at Columbia University have reported that women at an in vitro fertilization clinic had a higher pregnancy rate when, unknown to the patients, total strangers were asked to pray for their success. In fact, the women who were prayed for became pregnant twice as often as those who did not have people praying for them!<sup>11</sup> This study indicated that while religiosity has many apparent and explained health benefits and cures, there are incidents where a logical explanation is hard to deduce.

In summary, the link between religious practice and good health is well established. Some of these links are tangible and explanatory; they include social support, more positive attitude in regard to death and misfortune, religious actions and rituals, lower stress levels, and a stronger sense of purpose in life. However, there are elements that lack a definite explanation and serve to demonstrate that faith is also a mysterious medicine-prescribed by G-d to assist those who believe in its power.

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# The Rimon:

## *A Biblical and Medicinal Source for Longevity*

**T**he rimon, one of the shivas haminim of Eretz Yisrael, is an extremely prominent fruit in Tanach, as well as in Torah sheBaal Pe. Pomegranates not only adorned the robes of the kohen gadol (Shemos 39:28), they were also used as ornaments in the structure of the bais hamikdash itself (Melachim 1:7:18 and Yirmiyahu 52:22-3). Rimonim

were also extremely significant to the dor hamidbar. The meraglim returning from Eretz Yisrael brought back pomegranates (Shlach 13:23). Also, when BnaiYisrael complained by mai meriva about the midbar, they declared that it was "not a place of pomegranates" (Chukas 20:5) thereby indicating its inferior status. The mishna, as well as the gemara, also makes many references to the rimon. The Rama when discussing the simanim of Rosh Hashana adds rimonim to the list, symbolizing that our mitzvos should multiply like the seeds in a rimon.

There are numerous allegorical references to the rimon, such as in Shir Hashirim. The Sforno on Shir Hashirim 4:3, states that the rimon refers to the students who are full of

the knowledge of Hashem. The Metzudas David on that posuk elaborates that the rimon is representative of the sanhedrin, who were full of knowledge, like a pomegranate is full of seeds. Yet the rabbis of the sanhedrin were humble and hid their knowledge, like the seeds of the pomegranate are concealed by its exterior cuticle. The Midrash Rabba on Shir Hashirim 6:17 states that the rimonim of this posuk refer to the young children who study Torah while sitting in rows, like the rows of seeds in a pomegranate. Rashi on Shir Hashirim 7:13 contends that rimonim do not symbolize young children studying Torah, but rather symbolize the talmidei chachamim, proficient in gemara and worthy of teaching others. Rashi on Shir

Hashirim 7:11 explains that rimonim refer to those who keep Hashem's mitzvos and are full of zechuyos, like the pomegranates are full of seeds. The Meam Loez on Shir Hashirim 6:7 reconciles these two interpretations of Rashi and quotes Chazal who explain that envisioning a rimon in a dream is indicative that the person's positive actions will multiply like a rimon. Chazal then amplify this thought to explain that if this individual is a talmid chacham, his Torah knowledge will multiply; however, if he is an am haaretz, his mitzvos will multiply. The gemara in Brachos 57a alludes to this and states that even the empty headed ones of Klal Yisrael are full of good deeds, as a pomegranate is full of seeds. The Meam Loez also notes that Shir Hashirim uses the image of a half of a pomegranate to illustrate that just like one half of a pomegranate needs its corresponding half in order to achieve completion, so to the Jewish people yearn to learn Torah from chachamim in order to achieve their state of completion. In all of the above stated references, the rimon portrays either the study of

## ● “Perhaps, by linking the rimon to spiritual reward

Torah or the fulfillment of Hashem's mitzvos.

Torah is also symbolically represented by the eitz hachaim, the tree of eternal life. When Hashem first brought Adam harishon to gan eden, the Torah says in Beraishais 2:15, “V'vinichaihu b'gan eden l'avda v'l'shamra,” that Adam's goal in gan eden is to work it and to guard it. Many commentators attempt to understand why such strange terminology is used in connection to a garden. The Midrash Rabba on Vayikra 9:3, as well as the Tanchuma Beraishis 25, explains that this posuk is referring to the eitz hachaim. Hashem commanded Adam to keep and safeguard the ways of the eitz hachaim, which is representative of the Torah. Hashem's purpose in placing Adam in gan eden was so that he would toil in the study of Torah, symbolized by the eating from the eitz hachaim. The Pirkei d'Rabi Eliezer notes that the scriptural usage of “l'avda v'l'shamra” is in connection to the study of Torah and the keeping of its mitzvos. He explains that the eitz hachaim is the Torah, as described in “eitz chaim hi l'machazikim ba.”

The sefer, Derech Hachaim, analyzes why eating from the eitz hachaim is compared to the study of Torah. When one eats, that food becomes part of one's very essence. By the eitz hachaim, when one ate from it, the food became an integral part of the person, to the extent that it nourished the person completely and allowed for potential immortality. When one learns Torah, the Torah becomes a part of the person's very essence, and he is sustained by it. The Torah is compared to the tree of life, just as the tree is strongly rooted into the ground, winds are not able to uproot it, the Torah is strongly implanted in the

world and can never be uprooted, for its source is Hashem. In his introduction to the Mishna Berura, the Chafetz Chaim states that the Torah is compared to the eitz hachaim. For, just as whoever ate from the fruits of the eitz hachaim in gan eden would gain eternal life, the Torah gives eternal life to the physical body and the soul of a person. As stated in gemara Kesubos 111b, “the light of Torah gives life to people forever.”

Since the rimonim are compared to the Torah and its mitzvos, and the Torah is compared to eternal life, rimonim must also have an element of eternal life. One may even venture to suggest that the fruit of the eitz hachaim was a rimon. If the eitz hachaim represented the Torah, what better fruit than the rimon, which also symbolizes Torah would grow from it? To further this idea, the Piskasa Rabasi 3:1 states that the tzadikim who are constantly studying Torah are rewarded in the hereafter with great honor, as they sit under the eitz hachaim in gan eden. The Meam Loetz in Shir Hashirim 8:2 states that when mashiach comes, he will be brought to the bais hamikdash, in which he will teach the Jewish people to fear Hashem and to follow in His ways. There, he will drink wine made from grapes from the time of creation and will eat the seudas halivyason and pomegranates kept for tzadikim in gan eden. One may postulate that the eitz hachaim of gan eden, which is a reward for tzadikim, may have been the pomegranate tree, whose fruit is exclusive for tzadikim, and that eternal life is thus linked to pomegranates.

Perhaps, by linking the rimon to spiritual reward and eternal life, the Torah was subtly guiding us to evaluate the rimon as a dietary supplement that,

in actuality, does exert positive health effects. Scientists have recently demonstrated that pomegranates, which are rich in antioxidants, play a key role in prolonging life, and in fighting the aging process. Chemical oxidation reactions occurring within the human body, use molecular oxygen to produce cellular energy. These reactions, however, also generate potentially dangerous free radicals, which are molecules that contain one or more unpaired electrons, in the outer shell. The electron transport chain of aerobic cellular respiration of glucose and other organics is a metabolic process that generates free radicals as intermediary end products. During these reactions hydrogen ions and electrons are added to molecular oxygen, to yield water. However, there are numerous intermediary steps. In the final stages of the electron transport system, prior to the formation of water, numerous free radicals are formed, including the very reactive hydroxyl radical. Free radicals, in their search of an electron to match their unpaired electron, obtain electrons from other molecules, thereby transforming these molecules into free radicals, thus initiating a continuous chain of free radicals. Antioxidants stop this chain reaction, by donating one of their electrons to the free radical.

Free radicals have deleterious effects on human beings. Free radicals attack the RNA

... the Torah was subtly guiding us [that] the rimon ... does exert positive health effects..”

and DNA, cause many diseases, and damage cell membranes and thereby accelerate aging. Medicinally, antioxidants transform these potentially dangerous free radicals into stable molecules, such as water and carbon dioxide, which are then excreted from the body. Antioxidants decrease skeletal muscle oxidation, the primary cause of aging, and prevent cancers and cardiovascular disease. Naturally occurring antioxidants include, vitamins A, C, and E, zinc, and selenium. Green tea, the skin of grapes, carrots, green leafy vegetables such as spinach, tomatoes, oranges, sweet potatoes, cabbage, broccoli, watermelon, bean sprouts, and cauliflower are all good sources of

ing that liver cells of older rats did not fight free radicals as efficiently as those in younger rats. The researchers observed that after being fed foods rich in antioxidants, the liver cells of the older rats were able to combat free radicals more effectively. Interestingly, the older rats were now experiencing a more energized state of life.<sup>1</sup>

A report in Reuters Health stated that mice that lacked a specific antioxidant lived shorter lives. The scientists deduced, that this antioxidant, when present may be responsible for prolonging life. Apparently, the absence of antioxidants can cause early death. Other research focused on an antioxidant protein, MsrA. In vitro studies with

Other studies in Israel have corroborated that **pomegranates are high in antioxidants** and thus may **prevent heart disease, cancers, and extend life.**

dietary antioxidants.

An interesting experiment performed at the University of Guelph in Ontario, demonstrated that antioxidants fight free radical induced aging. The investigators found that fruit flies exposed to the antioxidant, superoxide dismutase (SOD1), lived forty percent longer than the controls. During the period of extended longevity, the flies did not portray signs of old age. In fact, they continued to live in a state of youth.

In an experiment performed at Oregon State University, aging rats were fed foods rich in antioxidants. The hypothesis of the experiment was predicated upon previous results demonstrat-

ing that liver cells of older rats did not fight free radicals as efficiently as those in younger rats. The researchers observed that after being fed foods rich in antioxidants, the liver cells of the older rats were able to combat free radicals more effectively. Interestingly, the older rats were now experiencing a more energized state of life.<sup>1</sup>

human immune cells showed that they were protected from free radical damage by MsrA resulting in a higher survival rate. Similarly, an experiment at Tufts University revealed that rats that were fed extracts from spinach, blueberries, or strawberries, suffered less oxidative stress in their brain cells and their memory and coordination had improved, as compared to controls. These experiments proved that the aging process is not inevitable, but rather, it may be controlled.<sup>2</sup>

A study at the University of California indicated that pomegranate juice contains antioxidants that are three times more effective relative to antioxi-

dants in red wine and green tea, both known to contain high concentrations of antioxidants.<sup>3</sup> Research in Israel have confirmed that fermented pomegranate juice, pomegranate seed preparations, and pomegranate seed oil contain high levels of antioxidants.<sup>4</sup> Based upon these observations, it was suggested that the dietary intake of pomegranates would be clinically effective in promoting human health. Recent investigations showed that extracts from the hulls of the fruit had anti microbial properties effective against the bacteria, Salmonella and Vibrio cholerae, and the parasite ameba, Giardia, and antiviral properties towards Herpes simplex, poliomyelitis virus, and human immunodeficiency virus (HIV). The clinical applications of pomegranates are numerous. The seed oil may be used by menopausal women as phytoestrogen, replacing or serving as a supplement to the usual hormone replacement therapy.<sup>5</sup> Pomegranate oil and juice may be an important chemopreventative agent towards cancer. Research at the Technion showed, albeit in in vitro studies, that oil from pomegranates may act as a useful agent in fighting breast cancer.<sup>6</sup> Other studies in Israel have corroborated that pomegranates are high in antioxidants and thus may prevent heart disease, cancers, and extend life.

Leukotrienes and prostaglandins, produced by activated mast cells, are mediators of the inflammatory response. Leukotrienes are sulfur-containing lipids that produce smooth muscle contraction, increased vascular permeability, and increased neutrophil and eosinophil chemotaxis. Prostaglandins are long-chain, unsaturated fatty acids that cause increased vascular permeability, increased neutrophil chemotaxis, and induce pain. Pomegranate oil, shown to

inhibit the enzymes, cyclooxygenase and lipoxygenase, which are responsible for the production of leukotrienes and prostaglandins, may be useful as an anti-inflammatory agent to relieve pain.<sup>4</sup>

Cardiovascular disease may occur by blockage of the arteries by fatty deposits containing saturated fatty acids and cholesterol. The specific pathology is termed atherosclerosis and the blockages, termed plaques, may lead to high blood pressure or, hypertension. Cholesterol is carried in the blood by two types of lipoproteins, referred to as

low-density lipoproteins (LDL) and high-density lipoproteins (HDL). The LDLs are considered the "bad lipoproteins" as, when in excess, they contribute to the buildup of plaque. Oxidative modification of the LDLs and blood platelet aggregation, both of which play a role early in the development of atherosclerosis, are inhibited by pomegranate juice. Furthermore, pomegranate juice was shown to lower blood pressure in patients with blockage (stenosis) of their carotid arteries.<sup>7</sup>

With all the therapeutic advantages

of the pomegranate, it is no wonder that it is an extremely important fruit in the Torah. Based on this, prior to eating a rimon for the first time in a year, it is extremely appropriate to recite the bracha of "shehechyanu," which praises Hashem for keeping us alive. Pomegranates could play a key role in the process of sustaining life.

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# Good Sun, Bad Sun

In 1513, Nicolaus Copernicus proclaimed that the universe revolves around the sun.<sup>1</sup> His society mocked him for this radical idea, but we can now attest that he was correct. The universe not only revolves around the sun in terms of its solar orbits, but also in the sense that the sun governs many aspects of our daily lives. It holds a tremendous power to heal, as well as to

cause damage and destruction to the human body.

The use of the sun's rays to bring healing to one's injuries was first demonstrated thousands of years ago with our forefather Avraham. Three days after his circumcision, Avraham sat outside of his tent, waiting to receive visitors. As stated in Genesis 18:1, "G-d appeared to [Avraham] in the plains of Mamre while he was sitting at the entrance of the tent in the heat of the day." The Midrash explains that G-d intentionally made it hot on this third and most painful day because the sun helps to heal wounds (Bereishis Rabah 48:8).

A few chapters later, the sun is used again as a treatment for ailments. Yaakov, the third of the

forefathers, was involved in a physical quarrel with a heavenly angel and was injured in the area of his thighbone. Genesis 32:32 states that the following morning, "The sun rose for him (Yaakov) as he passed Peniel and he was limping on his hip." Rashi interprets the addition of the unnecessary phrase "for him" to mean that the sun rose specifically for Yaakov on that particular morning to heal his injured limb.

Modern medicine did not discover the healing powers of visible light until the late 19th century when Niels Ryberg Finsen, a Danish scientist and doctor, announced the successful use of phototherapy. Finsen experimented with different dosages of sunlight and showed that at certain dosages, the rays had a positive

effect in treating many skin diseases such as lupus vulgaris, a form of tuberculosis.<sup>2</sup> Over the last hundred years, this technique has been fine-tuned and many more diseases have been successfully treated with phototherapy. One of the more common uses of phototherapy is in the treatment of psoriasis, a disease in which the skin becomes inflamed and produces red, thickened lesions usually on the scalp, elbows, knees, and lower back. The cause of psoriasis is currently unknown, but it seems to be linked to the malfunctioning of white blood cells, which trigger inflammation and the rapid shedding of the skin. Although the biological mechanisms that govern phototherapy are uncertain, sunlight and ultraviolet (UV) light have been shown to slow the rapid growth of skin cells, thus reducing the inflammation and lesions caused by psoriasis.<sup>3</sup> Phototherapy has found numerous usages in the treatment of dermal pathologies. It is effective in the treatment of acutely exacerbated atopic dermatitis, localized scleroderma, urticaria pigmentosa and disseminated granuloma annu-

lare.<sup>4</sup> Another widespread use of phototherapy is for the treatment of hyperbilirubinemia, more commonly known as neonatal jaundice. Bilirubin, a metabolic waste product produced by liver cells in their degradation of the hemoglobin in old blood cells, is usually excreted by the body. However, when the newborn's liver is not yet fully developed enough to process the bilirubin, it builds up in the bloodstream and causes the skin to appear yellow. Jaundice is very common in newborns, especially those that are premature and have underdeveloped organs. These babies are treated with phototherapy by being placed under special lights or on light-producing blankets. The light helps to break down the excess bilirubin in the skin and restore the child's normal coloring.<sup>5</sup> A recent study showed that in the treatment of neonatal jaundice, natural sunlight was almost six times more effective than the usage of artificial phototherapy.<sup>6</sup> Undeniably, sunlight does have healing powers.

The prophet Malachi described the sun, “with healing in its wings” (Malachi 3:20). The sun is benevolent and its rays bring healing. However, as Malbim points out in his commentary to this verse, the sun has two opposing dimensions. Its heat can indeed heal, but it has the ability to burn and damage as well. Although phototherapy is a promising treatment for many dermal disorders, its long term effects are not yet known, and care must be taken to avoid the possible health risks that may result from chronic exposure to sunlight, such as eye damage, skin wrinkling, and skin cancer.<sup>3</sup>

Malignant melanoma is one of three types of skin cancer thought to be related to excessive exposure to sunlight and, in particular, to UV radiation.

Melanoma is one of the most common and deadly cancers in the United States, and the rate of its diagnosis has increased more rapidly than any other type of cancer.<sup>7</sup> A study compared the incidence of melanoma from 1970 to 1982 among Jews living in two closely situated neighborhoods in Israel, and found that melanoma in Givatayim, a primarily non-orthodox community, was significantly at a higher level than in Bnei Brak, an orthodox community. As orthodox Jews wear heavy clothing and are almost fully covered all year round in accordance with their religious laws, they were less frequently exposed to harmful UV radiation than those in Givatayim, and thus were less afflicted with melanoma.<sup>8</sup>

As seen, the sun can play a potentially deadly role in the lives of human beings. Whereas chronic exposure to the sun can lead to certain types of cancer, acute exposure can lead to heat exhaustion or to heat stroke, a fatal condition if left untreated. The human body must maintain its internal temperature within a specific range, despite the temperature of its surrounding environment. Thus, when the body is exposed to high temperatures, such as those caused by natural sunlight, it must actively respond by lowering its internal temperature to an acceptable level. Sensory thermoreceptors located in the skin send impulses to the brain's hypothalamus, when these neural cells sense a rise in body temperature. The hypothalamus responds in two ways, both which involve sending impulses through sympathetic cholinergic neurons. The first response promotes active vasodilation, the enlargement of blood vessels, near the skin's surface. Vessels that are closest to the surface lose their heat to the surrounding air, by a

process called radiation, as long as the surrounding air temperature is lower than the internal body temperature. By enlarging the vessels and pumping more blood through them, additional heat is lost from the body, thereby lowering the internal temperature. The second way that homeostasis is maintained after a rise in internal body temperature is through sweating. Human skin has between 2 and 3 million sweat glands, composed of a single layer of epithelial cells which secrete fluid onto the skin's surface. To evaporate this surface fluid, heat energy is drawn from the body, thus lowering its internal temperature.<sup>9</sup>

The mechanisms of vasodilation and sweating do not function properly in all circumstances. If the surrounding air temperature rises above 95°F, heat can no longer be lost through radiation. As the humidity rises, sweat evaporation becomes slower and less effective. However, as the body continues to sweat to cool itself, large amounts of fluid are lost, causing dehydration. Thermoregulatory mechanisms are forced to work exceedingly hard and the person may exhibit a condition known as heat exhaustion. Although the skin will usually be cool and moist from sweat, the person may experience nausea, fatigue and dizziness and may have a higher than normal body temperature, but it does not exceed 106°F.<sup>10</sup>

According to certain commentators, the prophet Yonah may have been afflicted with some form of heat exhaustion. Yonah, after refusing to comply with G-d's command that he tell the city of Nineveh a prophecy that they were to be destroyed, was thrown into the ocean and swallowed by a fish. After spending three days inside the fish, he agreed to proceed to Ninveh to fulfill G-d's wishes. Towards the end of the event it states, "Now G-d appointed a kikayon and it grew up over Yonah to be a shade over his head, to save him from discomfort" (Yonah 4:6). Rashi explains that this plant shielded Yonah from the heat of the sun. Protection was necessary, according to Rav Yosef Kara, because Yonah

sun-imposed illness, and it occurs when body temperature rises above 106°F. As fluid is lost through sweating, blood volume decreases, which cause blood pressure and blood flow to the brain to decrease as well. Unconsciousness and dysfunction of the central nervous system are likely to occur. Peripheral blood vessels constrict in an attempt to raise blood pressure to a normal level and restore blood flow to the brain, but when constricted they can no longer release excess heat. The body stops sweating to retain whatever water it has not yet excreted and to prevent further dehydration, but the internal body temperature continues to soar. The thermoregulatory mechanisms are overtaxed and cease to

him to his mother.' And he carried him and brought him to his mother, and he sat on her knees until noon, and he died" (Kings II 4:18-20). Rav Mana, one of the Talmudic sages uses these verses as a proof that, "People get sunstroke only at harvest time" (Yerushalmi Yevamos 15:2). The Pnei Moshe, a Talmudic commentary, explains that during harvest time the sun is extremely strong and causes people to get sick. Another commentary, Korban Ha'eydah, adds that people faint from the intensity of the sun's rays and therefore they die.<sup>9</sup>

A second case of sunstroke is recorded in the Apocrypha where we are told that Judith's husband Menashe was working in the field and "the scorching sun came upon his head...and [he] died" (Judith 8:3). Additionally, the Talmud in Sanhedrin 77a teaches the law that if one person binds another in the sun for a significant amount of time and the victim dies (from sunstroke), the perpetrator is considered a murderer.<sup>11</sup>

Many things in this world have the potential to be used for good or for bad. The Maharsha teaches that the sun's rays can be harmful or helpful depending on how they are utilized (Sotah 10a). Ideally, the sun should be used to bring healing and benefit to mankind, but we must protect ourselves as well from the harm that may result from extensive exposure.

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R' Kara says that when Yonah was cast into the sea, his hair fell out because of the salty water, and when subsequently cast upon dry land, he fainted under the heat of the sun

was unusually sensitive to the sun's heat. R' Kara says that when Yonah was cast into the sea, his hair fell out because of the salty water, and when subsequently cast upon dry land, he fainted under the heat of the sun as his body was not adequately covered. Ibn Ezra uses a slightly different interpretation. He suggests that Yonah's skin became tender from his stay inside the fish's acidic stomach, and, as he was unable to tolerate the sun's heat, G-d designated the kikayon to cover him. Both interpretations express that Yonah was ill due to exposure to the sun, but he was not harmed so severely as to bring about death.

Heat stroke is a more severe form of

function. If the body temperature is not lowered immediately, the person is likely to die.<sup>9</sup>

There is an interesting case discussed in the Kings II, which the Talmud Yerushalmi explains as heat stroke. The prophet Elisha, after being given hospitality by a barren woman from the town of Shuman, promised that the following year she would give birth to a son. She gave birth that year, but within the next few years the child was afflicted with a sudden fatal illness. "And the child grew up; and it was one day that he went out to his father, to the reapers. And he said to his father, 'My head, my head!' And [his father] said to the servant, 'Carry

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# The Father of Genetics

*Yaakov Avinu or Gregor Mendel?*

Ever wonder why some children are vertically challenged? Or why others have poor eyesight? Is it genetically determined or are other factors involved? Dating back to 1860, the Austrian monk, Gregor Mendel, developed the laws of heredity while experimenting with garden pea plants. Mendel, for example, performed a mating, or cross, between

plants that differed in the trait seed color, yellow or green. When yellow seed plants were crossed with green seed plants, the offspring always resembled the yellow seed parents. When these yellow seed plants were self-fertilized (the mating termed the monohybrid cross), a 3:1 ratio of yellow seed plants to green seed plants was noted in the offspring. For every three yellow seed plants there was one green seed plant. Mendel evaluated seven different traits and the 3:1 ratio was a constant. Through these observations, Mendel developed the concept that a specific trait is controlled by one gene that exists in two allelic forms, a dominant and a recessive allelic form. For the dominant trait to be apparent, the organism need pos-

sess only one dominant allele, as in the case of the monohybrid yellow seed plant. However, for the recessive trait to be apparent, the organism must possess a double dosage of the recessive allele.<sup>1</sup>

Is this the primary source for the concepts of inheritance or, perhaps, was there an earlier time in history when this logic was used for breeding? This article discusses the theory, developed by Dr. Yehudah Feliks of Bar-Ilan University, that Yaakov Avinu was the originator of the monohybrid cross.<sup>2</sup> However, first a brief discussion of some basic genetics in the Talmud is presented. Resh Lakish stated that "an abnormally tall man should not marry an abnormally tall woman, lest their offspring be like a mast... A man with an

abnormally white-complexion should not marry an equally white-complexioned woman, lest their offspring be excessively white complexioned..." (Bekoroth 45b). Thus, centuries prior to Gregor Mendel learning the wonders of genetics, this great Torah scholar advised his people in the ways of inheritance. Furthermore, the Talmud is credited as the first written source to recognize a genetically determined disease.<sup>3</sup> This disease, postulated to be hemophilia,<sup>4,5</sup> or bleeder's disease, occurs when there is a deficiency in specific blood plasma clotting factors. It is a potentially fatal disease, evident primarily in males and usually transmitted by asymptomatic females who are carriers of this X-linked recessive gene. The Talmudic citation for hemophilia is found in Yevamos 64b. Rabbi Yehuda Hanasi stated, "If she circumcised her first child and he died (as a result of bleeding from the operation), and a second one died (similarly), she must not circumcise her third child..." With modern technology, hemophilia, albeit a serious disease, need not be fatal. The development of clot-

ting factors and the use of blood transfusions have been most beneficial. But, what about circumcision; can a hemophiliac male infant have a bris milah? In Israel in 1998, Dr. Shlomo Wallfish performed laser surgery on a two-month old baby. The baby suffered from hemophilia and was therefore unable to undergo the ritual circumcision in the usual manner. To prevent potentially fatal bleeding, a laser, instead of a knife, was used. According to Talmudic law, if two brothers die after a circumcision (due to hemophilia), the next son is exempt from a bris milah. However, as noted by Wallfish, today any hemophiliac baby can receive the ritual by undergoing this new laser technique.<sup>6</sup>

Back to the theory of Dr. Feliks that Yaakov Avinu, not Gregor Mendel, is the father of modern genetics.<sup>2</sup> The theory centers around the agreement between Yaakov Avinu and his father-in-law, Lavan, regarding the breeding of sheep and goats (Bereshis 30:32-43). The agreement required Yaakov to tend and breed Lavan's sheep and for his wages Yaakov would keep some of the resultant offspring. To make this agreement more interesting, Lavan removed all the spotted sheep from the flock, leaving only white sheep. Any spotted sheep born subsequently from matings between the white sheep would belong to Yaakov, whereas any white offspring would belong to Lavan. Lavan expected the majority of the offspring to be white, with only a small probability of spotted offspring. Yaakov peeled white streaks on rods, placed them at the watering troughs in which the females drank opposite the males, and after their matings, many of these white sheep produced spotted progeny. Apparently, these rods "magically" created offspring

that were speckled and spotted. From this story Dr. Feliks suggests that Yaakov Avinu discovered the laws of genetics. How?

Dr. Feliks postulates the following. The trait for the color of sheep wool exists in two allelic forms, W which encodes for white wool and w which encodes for spotted wool; white is dominant over spotted. Thus, with sheep three genotypes are possible: WW and Ww, which encode for white wool and ww, which encodes for spotted wool. Lavan removed all the spotted (ww) sheep, leaving Yaakov only with white (WW and Ww) sheep. Lavan distanced these spotted sheep from Yaakov's white flock for fear that the two groups would interbreed. Yaakov's flock of white sheep included homozygote dominants (WW) and heterozygotes (Ww) and both appeared white to the same degree. In his matings of the sheep, Yaakov crossed heterozygote (Ww) males with heterozygote (Ww) females, thus yielding offspring in a 3:1 ratio of white to spotted. Yaakov kept the spotted (ww) sheep for himself, gave the homozygous white (WW) sheep to Lavan, and retained the hybrid (Ww) white sheep to continue performing the monohybrid cross. Matings between homozygotes (WW x WW) or between a homozygote and a heterozygote (WW x Ww) would yield only white offspring and would be detrimental to Yaakov's business. So, apparently, Yaakov was the initial scientist to perform the monohybrid cross.

The next obvious question is how did Yaakov distinguish between homozygous white (WW) and heterozygous white (Ww) sheep, as both appeared white to the same extent?

Yaakov observed the sheep and

noted differences in mating behavior; white sheep that carried the recessive gene for "spottedness" (i.e., the heterozygotes or hybrids) conceived earlier than the homozygous dominants. This phenomenon, termed "hybrid vigor," expresses the concept that the hybrid is more fit than either extreme (homozygous dominant or homozygous recessive). The sheep that showed hybrid vigor are called mekusharos (the stronger ones) and were the heterozygotes; the others are called atufim (the feeble ones) and were the homozygous dominants. Thus, by watching their mating behavior Yaakov was able to differentiate the white Ww sheep from the white WW sheep. Yaakov placed the peeled rods before the stronger sheep and, apparently, they conceived early. However, in reality, Yaakov understood the principles of genetics and the peeled rods that were placed before the conceiving sheep were only to mislead Lavan into believing that this was the usual procedure done by sheperds.

To more fully understand the concept of hybrid vigor, attention is focused on the illness, sickle cell disease. Anemia, a swollen spleen, joint pain, and infections manifest this disease, caused by an autosomal recessive gene. This condition is potentially fatal to the homozygous recessive. A healthy homozygous dominant, however, is hypersusceptible to malaria, a protozoan disease

that also may be fatal. When a mosquito carrying the malarial parasite bites a person, protozoa enter the person's red blood cells, which then travel to the liver, burst, and release parasites throughout the body. However, the hybrid individual, with sickle cell trait, is less susceptible to malaria than the homozygous dominant and does not exhibit the detrimental affects of sickle cell anemia as the homozygous recessive.<sup>7</sup> We can clearly see that carriers of sickle cell anemia are

the potential healthier individuals and will therefore live a normal life. Those with the sickle cell disease may perish even before being bitten by a malarial-contaminated mosquito; healthy humans without the genes for sickle cell, can G-d forbid, be infected with malaria. The same concept of hybrid vigor is shown in Yaakov Avinu's analysis of his sheep. Yaakov could only have accomplished this scientific feat with a precise knowledge of the laws of heredity. We,

thus, can conclude that Yaakov Avinu understood and utilized the laws of heredity long before Gregor Mendel performed studies with garden pea plants. Therefore, Yaakov Avinu is not only our Patriarch, but also our father of genetics.

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# Genetic Screening for the BRCA Genes:

## *Halachic Implications*

As stated in Yebamot (64b), "A man shall not marry a woman from a family of epileptics or from a family of lepers." Rashi commented that this precept is applicable to all hereditary diseases. When given some thought, the statement is actually scientifically sagacious. Many diseases are familial transmitted and if an individual marries into a family with

such a disease, the disease may be transmitted to the next generation.

Scientists have known for many years that some diseases are hereditary. Interestingly, however, the first recorded familial transmission of a disease is that of hemophilia, a sex-linked autosomal disease, mentioned in Yebamot (64b). Hereditary diseases result from mutation of the DNA, the genetic material of a person's chromosomes. With current biotechnological methodologies, specific disease-bearing genes can be pinpointed to a particular chromosome. Once the gene is located and the appropriate assay developed for its identification, screening for a particular deleterious trait is an option. Genetic screening is the systematic search

within a particular population for persons of certain genotypes.<sup>1</sup> Interestingly, genetic screening raises quite numerous halachic and ethical disputes, involving many factors.

Understandably, for some genetic diseases, screening is an enormous step in preventative medicine. For example, if a person has tested positive for a specific detrimental gene, perhaps changes in diet, exercise implementation, or other measures can be taken to prevent, or at least delay, the onset of the disease. However, for those genetic diseases for which neither a cure nor an ameliorating remedy is available, what is the purpose to know that one is genetically predisposed to possibly developing the

disease? Will this person now suffer psychological damage from knowledge that this disease may emerge? The rabbanim are concerned that the emotional burden of such knowledge may cause tiruf hadaas (insanity).<sup>2</sup> Perhaps this tiruf hadaas is an unnecessary burden, especially when testing positive for those genetic diseases with incomplete penetrance and variable expressivity. Another factor to consider is the stigmatization that may result from testing positive for a hereditary disease. Conversely, an individual who carries a deleterious gene that is life endangering, but was neither genetically tested nor had medical intervention, could possibly fall under the banner of sakanos nefashos.<sup>3</sup>

Recent attention, particularly in the Jewish community, has been directed to understanding mutations of the BRCA1 and BRCA2 genes, which increase susceptibility to breast cancer. Discovered in 1994, the BRCA1 gene, when functionally normally, suppresses cancerous mutations in breast and ovarian tissues. However, when mutated and defective, the occurrence of cancer



is enhanced. Two variants of the BRCA1 gene, the 185delAG mutation and the 5382insc mutation, are present in 1 and 0.1%, respectively, of Ashkenazi Jewish women. The 185delAG BRCA1 mutation also has been identified at an elevated incidence in non-Ashkenazic women, e.g., Iraqi and Moroccan, and is thought to have originated in the Jewish gene pool prior to the Jewish dispersion that occurred after the destruction of the second temple.<sup>4,5</sup> In 1996, a second gene, BRCA2, was identified as a cause of familial breast cancer. Whereas BRCA1 is located on chromosome 17, BRCA2 has been localized to chromosome 13.<sup>6</sup> The estimated carrier frequency of the BRCA1 and BRCA2

tions in a major predisposition gene interact with mutations in other modifier genes and with other environmental factors.<sup>7</sup>

It is interesting to compare the BRCA genes with the gene that causes Tay-Sachs disease, which also is at an elevated incidence in the Ashkenazi Jewish community. The BRCA genes are autosomal dominant genes and, thus, if a person merely is a heterozygote for the BRCA gene, she is at increased risk and potentially likely to develop the malignancy. This is in contrast to Tay-Sachs disease, which is an autosomal recessive disease and for the disease to emerge the individual must be a homozygote. Although dominant genes, the BRCA

ber of Jewish babies born with Tay-Sachs disease. A similar screening program in Israel has resulted in no Tay-Sachs children being born to newlywed couples in the ultra-Orthodox Jewish Ashkenazi community in over 10 years.<sup>1</sup> The primary prevention for a woman testing positive for the BRCA genes includes frequent mammograms, chemoprevention therapy involving the use of tamoxifen and raloxifene, and bilateral mastectomy. As noted by Rabbi Bleich, to state the extreme option of prophylactic bilateral mastectomy is not to state that it is either medically or halachically advisable.<sup>8</sup>

Are Jewish women with these BRCA genes destined to be gravely ill? Are Jews a nation of "mutated people?" One begins to contemplate, 'Is this possible?' 'Did Hashem not create the world for the sake of B'nei Yisroel?' B'nei Yisroel are the *am segulah* (Devarim 7:6). . . Are genetic diseases unique to the Jewish people? The answer is a resounding "No!" Genetic diseases are studied in Jews because B'nei Yisroel constitute an excellent population group for such studies. Much more than most other ethnic groups, Jews have preserved a homogenous genotype over a period of millennia and have preserved a unique genotype. As noted by Rabbi Bleich, the suitability for Jews for genetic studies "should be considered badge of pride."<sup>8</sup> Paradoxically, because Jews are particularly affected by the BRCA mutations, it has actually benefited the scientific world. Jewish support for genetic screening is essentially pushing research forward, thereby, positively affecting the greater population, beyond

**One begins to contemplate, 'Did Hashem not create the world for the sake of B'nei Yisroel?'**  
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mutations in Ashkenazi Jews is greater than 2%.<sup>7</sup> Interestingly, the mutated BRCA1 gene is not solely a female problem. Males with the mutated form of the BRCA1 gene have an elevated risk for prostate cancer and, in some families, breast cancer as well.<sup>6</sup>

Approximately 5 to 10% of all breast cancer are hereditary<sup>2</sup> and the BRCA genes are responsible for most inherited breast cancer, especially in women before the age of 40 years. The risk of getting breast cancer for Jewish women with an established family history of breast cancer is 85%.<sup>4</sup> Yet, expression of a cancer is dependent on an intricate series of events, where muta-

genes exhibit incomplete penetrance and about 15 to 45% of women who carry the gene will never develop breast cancer. Thus, the disease may never manifest or it may emerge at anytime during adult life. This is in contrast to Tay-Sachs disease, which is expressed during infancy and exhibits full penetrance. Lastly, there are practical differences between the genes. Although Tay-Sachs disease is incurable, selective mate-choosing in conjunction with a screening program, such as that sponsored by Dor Yeshorim, is successful in primary prevention of this disease. In the United States, the Dor Yeshorim program has significantly reduced the num-

the scope of the Jewish Ashkenazim.<sup>1</sup>

The Torah commanded us, "Rack, heshamer lecha, u'shmor nafshecha meod," (Devarim 4:9), which was interpreted by the Kli Yakar to mean that we are compelled to take care of our health. When needed, it is obligatory to seek medical advice. Additionally, doctors have a unique, divine license to heal, having been given this authorization by Hashem. In the daily Shmoneh Esrei we say, "Rifaeynu Hashem vi'nerafeh." "Heal us Hashem and then we will be healed." On that tefilla the Siach Yitzchak commented that sometimes human beings, and even angels, are HaShem's agents to heal illness.

The human genome project is thus not an infringement on HaShem's divine will; rather, on the contrary, it is HaShem's will. Most contemporary rabbanim regard the attainment of knowledge to find cures for human illnesses to be an enactment of HaShem's will. In Sefer Tehillim (115:16) it is stated, "Hashamayim, shamayim laHashem, ve'ha'aretz nassan libnei adam." "The heavens belong to HaShem, but the earth He has given to mankind." Evidently, human involvement is legitimate and encouraged.<sup>2</sup> Consequently, genetic screening, gene therapy, and other aspects of genetic engineering are acceptable within the halachic precepts.

With regards to Tay-Sachs disease, Rav Moshe Feinstein advised testing, but with specific reservations, such as not to do testing in mass groups and to do testing with complete confidentiality. The issue of confidentiality is actually one of great debate. Who has the right to this genetic information? According to the Chafetz Chaim, when a physician receives confidential medical information, if there is no benefit to the patient,

then the physician may not disclose the information to anyone, including the patient's family or his professional colleagues. However, if the physician's silence will serve as a detriment to the patient's health, then significant others may be informed. Furthermore, halacha mandates that one's prospective spouse be informed if there is a serious genetic disorder.<sup>2</sup>

The question still remains, how is someone carrying mutations for the BRCA gene categorized? Is that person considered to have a potentially lethal genetic disorder or, perhaps, not? Women carrying this mutation can take a number of preventative measures. The most common and widespread approaches are frequent mammograms and chemoprevention (e.g., with tamoxifen). Nevertheless, mammography may give unreliable data in young women and may have little benefit for premenopausal women. Additionally, the long-term effectiveness of chemoprevention is still unknown. Being that the benefits of screening for the BRCA are still not yet proven, is it worthwhile to test for the gene, bearing in mind the individual's psychological state?<sup>3</sup> Seemingly, although a woman can transmit this mutated gene, there are measures to delay and, possibly, to prevent the onset of this disease. There is also the prospect that the disease may never manifest itself, even without the preventative steps. A woman carrying this mutation may not be as great a threat to her family as is a woman heterozygous for the recessive gene for Tay-Sachs disease.

The foremost purposes of genetic screening still remain justifiable. Genetic screening potentially allots people a second chance at life, as it allows for

restoration and preservation of health, a possible cure of a genetic disease and, if nothing else, it could prolong one's life. Tampering with genes, otherwise known as gene therapy, may also preserve, restore and prolong one's life. For example, with Tay-Sachs disease, gene therapy could replace the missing enzyme. For the various reasons mentioned above, gene therapy would presumably fall under the 'halachically legitimate' category along side genetic screening.

Discovery of the BRCA genes and subsequent mass screenings that have ensued have raised many eyebrows, especially in the field of medical ethics. It is important to recognize that although genetic screening for the BRCA genes is available, no benefits, as yet, have been proven. Apparently, continued analysis and investigation are needed, in particular to delineate the appropriate age for screening and the degree of confidentiality required.

As stated in Bereishit (7:11), "In the sixth hundredth year of Noah's life...all the fountains of the great deep burst forth; and the windows of the heavens were opened." The Zohar HaKodesh commented that in the concluding part of the sixth millennium, the gates of wisdom will open on high and fountains of wisdom will open below. This sixth millennium is merely the grounding and preparation for the seventh millennium, which is clearly the

infringement on HaShem's divine will; rather, on the contrary, it is HaShem's will."

coming of the long awaited Moshiach. The human genome project involved the sequencing of the entire human genome with its roughly 50,000 genes; amongst many other advances in science and

technology, this represented a major achievement. Moreover, it is a highlight in the continuous exposures to the wisdoms of the universe and its mysteries. This advancement unquestionably marks

the launch of the messianic era.<sup>8</sup>

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# Human Cloning, a Jewish Perspective

Cloning is an issue many scientists, ethicists, theologians, and legislators have had to confront. Cloning employs the technique termed somatic cell nuclear transfer, in which the genetic material (nucleus) of the recipient cell, an unfertilized egg, is removed and replaced with a nucleus from a donor cell. Although there are various versions of this procedure,

in one technique the entire donor cell (i.e., cytoplasm + nucleus) is fused with the enucleated recipient egg, which is then given an electric shock to induce the process of cell division. If successful, the resulting mass of cells differentiate and develop into an embryo, which is implanted in the uterus of a surrogate mother for further development into a fetus. The baby that is born is the clone, as it is genetically 99% identical to the initial donor. The recipient enucleated egg, however, provided the remaining 1% of the clone's genetic constitution as it contributed DNA in its mitochondria. While this biotechnology can bring beneficial medical advances to human health, as well as to plant breeding and animal husbandry,

there are serious concerns and debates within religious communities regarding its use as applied to humans.

Basic understanding of cloning can provide medical benefits, without the actual need of cloning of a human. Some of the potential medical benefits from this biotechnology include the ability to replace dead or renew damaged cells. This could have a tremendous impact in the treatment of Parkinson's or Alzheimer's diseases, which result from damage to specialized brain cells.<sup>2</sup> In addition, research in cloning can provide a better understanding of carcinogenesis, providing information to halt the uncontrolled production of cancerous cells and, thereby, offering hope of a

cure for malignancies.<sup>2</sup>

Cloning can provide a novel mechanism for eliminating infertility, by allowing men without sperm or women without ova to produce offspring. Infertility physicians already are skilled in the micromanipulations needed to create embryos by in vitro fertilization and, thereafter, to implant them into a woman's uterus. Dr. George Annas, bioethicist and Chair of the Health Law Department at Boston University School of Public Health, sees the future of cloning in infertility clinics.<sup>3</sup> Cloning eliminates the problem faced by an infertile couple of the need to introduce the genes of a third party via sperm or egg donation. In general, Jewish law bears a negative attitude towards the use of a third party's donor egg or sperm.<sup>4</sup> Instead, via cloning, the genetic contribution to the child would be predominantly or solely from one parent. Furthermore, nuclear transfer or embryo splitting could be used to clone embryos, thus increasing the number of embryos available for implantation and improving the chances of successful conception. In



addition, cloning enables those couples, in which one party risks transmitting a serious, dominant hereditary disease or in which both parties are carriers for a recessive genetic disease, to reproduce without causing the birth of an affected child.<sup>2</sup> However, cloning for the sole purpose of creating an individual to be used as a source for transplants is highly immoral. Rabbi J. David Bleich notes that ultimately if cloning is viewed as immoral by Jewish teaching, it cannot be a permissible "cure" for infertility.<sup>5</sup>

Cloning will not produce "carbon copies" of people and the idea that this biotechnology could be used to duplicate exemplary personalities, such as Einstein or Mozart, is based on a mistaken assumption. The neural networks of the brain change with different experiences.<sup>6</sup> Thus, even if one were to clone Einstein, for example, the resulting person would be a unique individual rather than a replicate, though he would have mostly the same genotype and phenotype as his earlier twin. In addition, the clone, i.e., the "later twin," would be derived from an adult nucleus that itself may have acquired undesirable mutations, or changes in its genetic code, thereby distinguishing it, to some degree, from the "earlier twin," i.e., the source of the donor nucleus. The clone of an extraordinary individual would likely experience psychological distress due to great pressure to live up to a lofty ideal and may be limited in freedom to choose a career distinct from that of the donor nucleus. The first human to be cloned probably would be exposed to excessive, unwanted media attention, as occurred with the first child born of in vitro fertilization. This novelty, however, would eventually fade, as more clones are produced and would become integrated into the general society.

In addition to the ethical concerns of human cloning, there are great risks to the potential clone. Mammalian studies thus far have indicated a high mortality rate and risk of birth defects in clones. Of the very small percentage of animal clones that survived to birth, most exhibited various physical abnormalities, such as heart and circulatory problems.<sup>7</sup> The birth of the lamb, Dolly, the first mammal to be cloned from an adult cell (by Dr. Ian Wilmut and Dr. Keith Campbell at the Roslin Institute, Scotland, in February 1997)<sup>1</sup>, took place after 276 failed attempts. Even if preimplantation genetic diagnosis were to be performed, which would screen out embryos with genetic abnormalities due to cloning technique<sup>8</sup>, there is a risk that the embryo cloned and implanted, deemed healthy, may have an undetected abnormality. It is also unknown what mental impairments may be risked in cloning a human, since they may not be perceived in animals. Nevertheless, given the potential medical benefit from cloning, it may follow a path similar to that of in vitro fertilization, which scientists proceeded with in the early 1990s before its safety could be determined. Also, it is feared that eugenic concerns will direct the cloning of people with certain traits, such as heightened intellectual capacity, beauty, or strength.<sup>2</sup> If such cloning became widespread, a large population of genetically identical people could ensue. Such a lack of genetic variability would cause greater susceptibility to disease, which could eradicate a community of clones.<sup>2</sup>

Another major drawback to human cloning is the threat to the existing social order and the possible destruction of the nuclear family<sup>2</sup> and confused parental relationships. For example, a female clone may have one, two, or even three

mothers: the donor of the enucleated egg, the donor of the diploid nucleus, and the gestational surrogate mother<sup>9</sup>, all which may be different women, without a male father involved. According to Rabbi Michael J. Broyde, Jewish law is inclined to view the gestational mother as the mother.<sup>10</sup> The 1996 ruling on surrogacy in the State of Israel, in which the surrogate mother, rather than the genetic mother, was considered the mother,<sup>6</sup> concurs with this view. Similarly, a woman who had received ovarian transplant is considered the mother of a child she bears, although the eggs were from a foreign ovary.<sup>10</sup> The father is traditionally the contributor of the sperm. However, as no sperm is involved in cloning, there does not yet exist a halachic definition of fatherhood in which the genetic material contributed by the male is in the diploid nucleus of a mature somatic cell.

When the donor nucleus, enucleated egg, and carrier of the embryo are all the same woman, there is no question concerning the identity of the mother. Several possibilities, however, exist regarding the identity of the father. The simplest approach is that there is no father. Alternatively, the father could be the maternal grandfather of the embryo, although this male had nothing to do with the reproductive process. Another option would be that the woman herself is the father. This, however, has no precedent in religious literature. Though it is reasonable to assume a lack of fatherhood, the child thus produced would not halachically be considered a *shetuki*,<sup>9</sup> one whose father is unknown, and would therefore not be restricted in marriage within the Jewish population.

Whether or not a man fulfills the commandment of *peru urevu*, "be fruitful and multiply" (Genesis 1:28) via cloning

remains under dispute. Some halachic authorities maintain that this mitzvah is fulfilled through natural sexual intercourse, while others consider the resulting child to be the determining factor. In accordance with the former position, a nucleus donor is not considered the father of a cloned child. The child thus cannot be a mamzer (a child resulting from a forbidden union) and may eventually marry into the Jewish population. Rabbi J. D. Bleich's position is that semen must be contributed in order to fulfill the Biblical requirement of *peru urevu*. As such, cloning does not fulfill this commandment.<sup>9</sup>

As for the question of whether a clone is a golem (an anthropoid produced, according to legend, by mystical means), a human clone is clearly of human origin, born from a human mother. It would, thus, have intellect and the power of speech considered to be the sign of possessing a soul, contrary to a golem, which, according to tradition, cannot speak due to its lack of a soul.<sup>5</sup> Since clones would be fully human, they are to be treated as such, with dignity and respect.

As of now, the issue of human cloning is only a theoretical discussion. However, cloning technology, as applied to humans, may be forthcoming. The embryologist, Panayiotis Zavos, is currently setting up a human cloning project in the Mediterranean. His team, which includes Israeli Dr. Avi Ben-Abraham, is one of two groups of scientists who plan to proceed with human cloning in the next year or two.<sup>11</sup>

Motives for having children by sexual or asexual means (i.e., cloning) can be complex, and vary with each case. Public policymakers do not currently assess the reasons of prospective parents for procreating, which may not always be commendable or in the best interests of the child. Therefore, the authority of legislators to ban human cloning or cloning research may be called into question, as well. It may, however, be very desirable and possibly necessary for governmental measures to be taken for the regulation of this technology (and banning of human cloning). Cloning has already been prohibited in the United Kingdom, Denmark, Germany, Belgium, and the Netherlands. Many favor the adoption

of similar legislation in the United States of America. The current position of the Food and Drug Administration (FDA) regarding human cloning is that "there are major unresolved questions...which must be seriously considered and resolved before the Agency would permit such investigation to proceed."<sup>12</sup>

New scientific or medical knowledge generally brings with it a certain degree of uncertainty. Such research may be highly valuable, particularly in the medical field. However, restrictions on human cloning may be necessary, as it presents ethical, social, and even medical problems. As was stated by Rabbi J. D. Bleich on the golem topic, the "absence of a prohibition...does not mean that such endeavors were encouraged by rabbinic scholars."<sup>5</sup> Thus, cloning of a human being would, at the very least, not be encouraged by most authorities on Jewish law. While scientists can perfect the technology necessary for cloning, it does not seem right to practice on humans.

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# Be Fruitful and Multiply:

*Infertility in Tanach*

**B**e fruitful and multiply" (Genesis 1:28). This is G-d's commandment to Adam given in the Garden of Eden. While for most people reproduction is something that comes naturally and relatively easily, one of five couples today in the United States must seek extensive medical assistance in order to become pregnant. Definitively, infertility is the inability

Jewish life.

All four biblical matriarchs Sarah, Rebecca, Rachel, and Leah were barren at some point in their lives. Other biblical infertile women include the mother of Samuel, Hanna and the mother of Samson. It is important to note that these women eventually conceive and deliver children at some point. Not only do they have children, but they have some of the most important characters in the biblical history. These births are considered possible because of the direct intervention of G-d, yet it is still possible to look at them with a scientific viewpoint. The purpose of this article is not to claim a scientific explanation, but rather it is to simply shed some light on the phenomenon of infertility.

The biblical mothers suffered great anguish because they could not conceive. In the case of Sarah, the wife of Abraham, she "had borne him no children" (Genesis 16:1). In the case of Rebecca, "Isaac entreated Hashem opposite his wife [Rebecca] because she was barren" (Genesis 25:20). Hashem saw that Leah was unloved so He

of a sexually active couple, not using any form of contraception, to conceive during one year. This struggle to conceive leads to over two million office visits to health care providers each year in the United States alone. Notably, over half of all infertility is attributed to the female partner. Possible causes are numerous. Some women are unable to produce eggs, others can but do not ovulate. In some women the blockage of fallopian tubes, scarring of the uterus, or inadequate cervical mucous can be causes of infertility. Whatever the actual cause, these couples tend to endure years of struggle before finally conceiving a child. Even more unfortunate, some couples never conceive at all.

When one thinks about infertili

ty what usually comes to mind are the vast amounts of state of the art technology used for treatment. One can forget that this obstacle dates backs to biblical time and is a focus of a tremendous amount of Talmudic literature. "Infertility is a curse and fertility is a blessing" (Exodus 23:36). "A person without children is considered as if excommunicated by heaven." (Tosafot Pesachim 113b) "The key to childbirth is one of the keys that G-d Himself administers and does not entrust to an emissary" (Ta'anit 2a, Sanhedrin 113a).<sup>1</sup> These quotes do not even begin to scratch the surface on the amount of times that infertility becomes the focus in Jewish literature, but they do lead to a sense of just how valued procreation is in



opened her womb, but Rachel remained barren" (Genesis 29:31).<sup>1</sup> Rebecca was the only one who, with divine intervention, became pregnant apparently within a biologically reasonable span of time.<sup>2</sup> Interestingly, the other three completely despaired and resorted to adoption, offering their maidservants to their husbands and planning to adopt their husbands' offspring. Leah did this even after she had given birth to four children. When she had stopped conceiving "she took Zilpah her maidservant and gave her to Jacob as a wife" (Genesis 30:9). Leah goes on to have two more sons with Jacob, only after Zilpah gives birth to two sons. Although they were childless for many years, all these women did go on to eventually have children, which leads to the ultimate question: How?

According to folk wisdom, adoption may promote pregnancy in infertile women,<sup>2</sup> but this hypothesis clearly lacks scientific proof. Whether or not there is backing to such a theory, many women do adopt in hopes that it will increase their chances of conception. Perhaps this was thought as far back as biblical times and was a factor in the matriarchal decision to adopt the offspring conceived by their respective husbands and handmaids. According to Rashi, the women believed that perhaps as a divine reward for allowing their husbands to reproduce with others, they would later be granted their own biological children. Sara, the wife of Abraham, after realizing that she was indeed infertile gave her handmaiden to her husband. She did this in the hopes that the maid and Abraham would have a child whom Sara could then adopt. This took place well before angelic messengers informed her that she would, in fact conceive a child, leading to support

of Rashi's theory. Perhaps she thought performing this selfless act could lead to conception of her own child.

Rachel and Leah imitated Sara's behavior giving their handmaids to their husband Jacob. At the time, Rachel had no children, and Leah had stopped conceiving. Three biblical commentators, R. Levi b. Gershon (1288-1344), R. Nissim (1310-1375), and Sforno (1475-1550) suggest that these women, post adoption, underwent psychosomatic changes. They suggest, respectively, "changes in temperament, system, and a stirring up of her nature."<sup>2</sup> Even though many commentators disagree on this point, it is still a possible insight as to the mechanisms enabling fertility among the infertile matriarchs.

Besides examining the infertility of the matriarchs, there is another biblical character whose story stirs up both emotion and curiosity. This is the story of Hanna, the barren wife of Elkana. (Samuel 1) She was one of his two wives, but as it states she was more loved by him. Peninah, the other wife, bore children to Elkana but did not receive the special treatment enjoyed by Hannah. Hannah was therefore constantly tormented by her rival, Peninah. In verse 7 we are informed that because of this torment, Hannah had stopped eating. Her husband even asks in verse 8, "Why do you weep, why do you not eat?" The writer of the event has set a clear-cut observation of a possible cause of continued infertility, perhaps, elucidating how G-d directs human events through the laws of nature.<sup>3</sup> This could perhaps be considered the first biblically cited case of anorexia nervosa brought on by the depression of not being able to conceive. According to Schiff and Schiff<sup>3</sup> "the emphasis placed in

Hannah's story on her not eating makes the leap from biblical exegesis to medical diagnosis possible, if not fairly obvious." After Hannah returns from praying in Shiloh, and having received support from the high priest Eli, and whether or not she received divine spirit there, we see that she is reassured, begins eating and conceives soon thereafter. Whatever the initial cause of infertility, it can be seen that a physical change did take place in Hannah and she was then able to conceive. Apparently, through divine intervention, it can clearly be seen that observable physical phenomenon that took place played a central role in Hanna's ability to conceive. This idea provides some deeper explanation of the phenomenon that occurred.

Besides the historical ramifications of ancestral infertility, it is important to note some of the halachik implications as well. In today's world of modern technology there are many procedures utilized in helping couples become fertile, each of which must be examined for halachik acceptance. One such procedure called homologous artificial insemination (AIH), is nearly accepted unanimously in cases where the semen comes from the husband and there has been a significant waiting period for conception.<sup>4</sup> A similar procedure, involving sperm donation from an anonymous donor [artificial donor insemination] is not accepted by most Rabbinical

their husbands to reproduce with others, they would later bear their own children."

authorities. Interestingly, rabbis have been discussing such a concept for centuries. The discussion of procreation without intercourse appears in fifth century Talmudic passages detailing Ben-Sira's birth. The midrashic legend is of the prophet Jeremiah, who went to the bathhouse where his semen entered the water. Following this, his daughter entered the same bath water and became pregnant by her father's sperm, resulting in the birth of Ben Sira, who was considered a halakhically legitimate

child. While some authorities deny the legend of this conception, it has since been quoted many times in medical literature and Rabbinical responsa dealing with the issue of AID.<sup>4</sup> Despite this, all Jewish legal experts agree that it is forbidden to use a Jewish donor in AID, while it is the severity of the prohibition that is questionable.

Infertility is an ancient dilemma that has been recorded since biblical times. Medical literature is replete with causes, treatments, and ways of dealing with the

situation. Modern man and woman are not the first to deal with this trying experience; our matriarchs suffered, but persevered. No matter what the explanation for the cause of infertility or conception, the most fundamental idea to remember is that Hashem is always in control.

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# Bleeder's Diseases and Circumcision

Circumcision is one of the oldest surgical procedures performed by man. The Talmud in tractate Yevamoth 64b relates the view of Rebbe (Rabbi Judah the Prince) who ruled that if a woman circumcised her oldest son and he died as a result of bleeding from the procedure and her second son died similarly, then she must not circumcise her third son.

The Talmud further relates that Rabbi Simeon son of Gamliel ruled that she may circumcise her third son and not her fourth. The two Rabbi's differ only in the number of repetitive events required to establish a pattern and thus disallow circumcision of the subsequent child, not in the question of heredity transmission of the disease. The Talmud then continues in its discussion with a story about four sisters from Tzipori. The first three sisters each had a son who died from circumcision. The fourth then came before Rabbi Gamliel to ask if she needed to circumcise her son and he ruled that she should not circumcise him. By virtue of this ruling we can ascertain that the disease being discussed is maternally transmitted. Three sisters each with

a son having a bleeding disorder, gives credence to the defective gene being carried on the X chromosome. Thus, the disease alluded to in this section of the Talmud most probably is an inherited bleeding disorder this is transmitted maternally.

Rabbi Isaac Alfasi better known as the Rif, an eleventh century scholar who was the first codifier of Jewish law, ruled that the law follows the opinion of Rabbi Judah (Alfasi on tractate Yevamoth 64b). Moses Maimonides the famous twelfth century physician and scholar, better known as the Rambam, ruled that if a woman has two children who die as a result of a circumcision, even if they were from different fathers, she may not circumcise her third son. That he

specifically included the issue of different paternity for the two sons alludes to the fact that the Rambam believed the Talmud to be referring to a bleeding disorder that is maternally transmitted. Maimonides also discusses postponing the circumcision until the child is medically fit (Mishnah Torah, Sefer Ahava; Laws of Circumcision 1:18). This would seem to indicate that he thought this disease to be curable or at least controllable. Rabbi Joseph Karo of the sixteenth century stated in his commentary on Maimonides, called the Kesef Mishnah, quoting the above cited Talmud, that the disease referred to by the Rambam is loose or weak blood that is genetically transmitted (Kesef Mishnah on Mishnah Torah, Sefer Ahava; Laws of Circumcision 1:18).

Still other commentators described this disease as paternally transmitted. Several sources, including Rabbi Karo, Rabbi Hayim Joseph David Azulay (Chidah- eighteenth century), and Rabbi Jacob Reischer (eighteenth century), discuss the possible transmission through the father and ruled that if a

man has had two sons die, he should not circumcise the third son. Rosner has reviewed this in detail.<sup>1</sup>

The specific identity of the disease has not been positively identified. This paper will postulate that these cases refer not to one specific clinical entity, but rather to several different diseases each of which centers on a bleeding diathesis.

Upon the simple reading of the Talmud it appears that the disease is hemophilia. Hemophilia is a group of hereditary bleeding disorders. There are several proteins, called clotting factors, that play a role in blood clotting. Hemophilia is caused by an absolute or relative deficiency of one or more of

are passed maternally. Since the genes are recessive, most hemophiliacs are male. Females who receive a defective gene are merely carriers and exhibit no symptoms of the disease.<sup>2</sup> Rarely, preferential inactivation of one of the two X chromosomes in a female will lead to carriers having a low enough level of factor VIII or IX to experience abnormal bleeding. The severity of this disease differs case by case. Mild cases may go unnoticed until the patient undergoes surgery or trauma.<sup>3</sup>

While the Rambam clearly refers to a maternally inherited disease, he was of the opinion that the disease had the potential to be cured over time, to the extent that the child could safely under-

children, both females and males, and is often triggered by a viral infection. Approximately 85% of children recover completely within one year and the problem does not recur.<sup>4</sup> However, being exposed to a given virus does not guarantee that the child will develop ITP. There may be inherited or environmental factors that predispose a given child to develop ITP as a response to the viral infection. More than one child in a family can be exposed to a virus and members of the same family may share an inherited or environmentally mediated predisposition to develop ITP, as a result of the viral infection. However, ITP is not a classically inherited bleeding disorder and although possible, it would be unlikely that exposure to the same virus would occur years apart in the same family (as it would have to in order to affect different children in the same family at the age of infancy, unless they are twins, triplets, etc.).

Another possibility is Von Willenbrand's disease (VWD). VWD is both a maternally and paternally inherited bleeding disorder, caused by a deficiency of Von Willenbrand factor, which normally interacts with factor VIII and platelets in the clotting mechanism. The manifestations of VWD may be different even in siblings within the same family and may improve and deteriorate with time (related to other co-existent stresses). Therefore VWD may represent a bleeding disorder whose manifestations may at least temporarily improve. However VWD is autosomally inherited and is thus both paternally and maternally transmitted, while the Rambam clearly refers to a maternally inherited disease.<sup>3</sup>

Finally, although a problem for the Kesef Mishnah, the Rambam may not be referring to a bleeding disorder at all. In

**The Rambam, ruled that if a woman has two children who die as a result of a circumcision, even if they were from different fathers, she may not circumcise her third son.**

these clotting factors. There are two common forms of hemophilia, each one caused by a deficiency in a different clotting factor.<sup>2</sup> The most common form, hemophilia A, is caused by a lack of clotting factor VIII and affects about 80% of all hemophiliacs.<sup>3</sup> Hemophilia B is caused by a lack of clotting factor IX. Both forms cause prolonged bleeding. Minor injuries are not usually a problem. However internal bleeding, bleeding into joints, significant lacerations, and surgery can all be life threatening. Hemophilia A and B are inherited diseases, transmitted as recessive X-linked traits, meaning that the defective genes are located on the X chromosome and

go circumcision at a later time. Hemophilia does not usually improve with time. Based on this, we should consider the possibility that the Rambam is not referring to hemophilia, but rather some other disorder; which according to the Kesef Mishnah (Kesef Mishnah on Mishnah Torah, Sefer Ahava; Laws of Circumcision 1:18) would be some other bleeding disorder.

One possibility is immune thrombocytopenic purpura (ITP). ITP is another type of bleeding disorder characterized by a decrease in a patient's platelet number, resulting in internal bleeding. One form of ITP, acute thrombocytopenic purpura, is commonly seen in very young

fact the Rambam does not directly quote the Talmud where thinning of the blood is mentioned, rather he discusses a disease that causes "weakening of his strength" rather than thinning of his blood.

As mentioned previously, Rabbi Joseph Karo and the Chidah apply the rule of not circumcising the third son to the case a bleeding disorder that is paternally transmitted. Paternal transmission is not the mode of transmission for the two types of hemophilia discussed thus far. However, a third form of hemophilia, hemophilia C, has recently been identified. Hemophilia C is a characterized by a deficiency in clotting factor XI. It is very rare, as it only affects about 2-3% of all hemophiliacs, and most importantly it is transmitted as an autosomal recessive gene. This means that both the mother and the father transmit the gene. Another interesting fact is that hemophilia C has a higher rate of occurrence amongst Ashkenazic Jews, as compared to the general population.<sup>5</sup> There are two different mutations that cause factor XI deficiency, type II and type III. Type III is largely restricted to Ashkenazic Jews whereas type II is found both in Ashkenazic and Sephardic Jews (Iraqi). This indicates that at least the type II mutation appeared before the separation of these two communities.<sup>6</sup>

It is interesting to note that the rabbinic authorities that discuss paternal transmission are both Ashkenazic (Rabbi Jacob Reischer of Prague and Worms), and Sephardic (Rabbi Karo). Representatives of both Jewish communities seem to have had experience with something similar to, if not actually, hemophilia C.

One must keep in mind that these commentators probably were cognizant

only of the bleeding disorders that they themselves came into contact with in their own communities. Communication between various communities in the Diaspora was minimal. Even today, with modern diagnostic modalities, the incidence of these bleeding disorders is relatively low. Therefore, the different commentators may in fact have been referring to different diseases.

Modern technology has advanced to the point of perhaps allowing circumcision in hemophiliacs and others with bleeding disorders. ITP in young children usually improves with time. Platelet transfusion may also help control bleeding in ITP. The drug desmopressin acetate can help control bleeding in VWD.<sup>3</sup> The availability of fresh frozen plasma, cryoprecipitate, and now even recombinant factor VIII, should theoretically allow the hemophiliac child to undergo surgery without a significant bleeding risk. However infusing these factors may have to continue for several days after circumcision. Additionally, use of these factors is not without risk. Most of them are human blood products and, as such, can transmit viral diseases such as hepatitis, and AIDS. Giving these blood products to very young infants can adversely affect their cardiovascular and respiratory systems. While it is clear that it is permissible according to Jewish law to administer these potentially dangerous products to save life and limb, it is not as clear if one is permitted to perform circumcision on a hemophiliac with the up-front plan of using these products to stem bleeding.

Other more promising advances include the use of fibrin glue and the use of a laser knife. Fibrin glue is a solution of human fibrin that is activated by thrombin and calcium. It has been used successfully to stop bleeding in several

surgical settings, such as cardiac surgery where bleeding is frequently caused by various factor deficiencies. However, once again, fibrin glue is at least partially a human blood product and, as such, may transmit viral disease. There is available a viral-inactivated form but this is not yet approved by the U.S. Food and Drug Administration (FDA).<sup>7</sup>

Recently, the laser knife has been used successfully in Israel to perform circumcisions in hemophiliac patients. There are, however, several halachik issues involved. First, a laser knife is not a knife in the true sense of the word. Does circumcision require a true knife? Probably not. It is well known that Tzipporah, Moshe's wife, used a sharp stone to circumcise her son, as it says in Exodus 4:25, "So Tzipporah took a sharp stone and cut off the foreskin of her son..." The Rambam also rules that any sharp instrument is acceptable, so long as it does not damage the person being circumcised. Does this include a laser? Maybe. Another potential problem with the use of the laser is the lack of obtaining any blood. Ritual circumcision requires the drawing out of blood (metzitza). The laser, by its very nature cuts and coagulates simultaneously, thus leaving little, if any, blood. Nevertheless, it is possible to perhaps create a small cut without the laser and then perform the rest of the circumcision with the laser, this would significantly reduce bleeding problems.<sup>8</sup>

With the amazing strides that modern medicine has taken over the past several decades, some of the conditions once considered fatal or life threatening have changed to controllable or even curable. Many bleeding disorders fall under this category. With the help of

medical technology, most children born with clotting problems can lead normal, active lives. The advances made in performing surgical procedures on hemophiliac patients and those with related bleeding disorders could possibly be applied to a circumcision. With this in

mind, many would now like to take a fresh look at the law in the Talmud prohibiting the circumcision of such a boy.

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# The Bloodsuckers of Today

Leeches, members of the Class Hirudinea, are commonly identified as bloodsuckers, since *Hirudo medicinalis*, the most popular leech, was widely used for bloodletting in the 18th and 19th centuries.<sup>1</sup> The approximately 300 different species of leeches are mainly freshwater inhabitants. *H. medicinalis* was very plentiful, but now, it is becoming

endangered to the point of extinction due to the man-made changes in its habitat over the past century. The draining of the wetlands and the decline in the frog population, leech's alternative host, have been most detrimental to the propagation of the species.<sup>2</sup>

Jewish literature discusses leeches extensively. The Hebrew word for leech is *aluka*, derived from the root *alak*, meaning to cleave, or to adhere. The Hebrew word for leech reflects its mode of infectivity, as the leech attaches to the nostrils or mouth of people or animals who drink from leech-contaminated water.<sup>3</sup> The Book of Proverbs (30:15) notes that the leech has two daughters: "Give, give", referring to the two sucking discs on

its head, used to adhere to the prey and suck its blood.<sup>4</sup> Leeches appear in Talmudic literature as well. In the 13th century, the Talmudic commentators, Tosafot, describe leech as "a small aquatic worm. If it falls on flesh, it attaches itself thereto and sucks blood. If a person swallows a leech from a pond or river...it causes the abdomen to swell."<sup>5</sup> Metzudat Tzion, a 18th century Biblical commentator, also discusses leeches noting that they live in rivers and suck blood of their prey until the leech's entire body is filled with blood.<sup>5</sup> Rabbis, cognizant of the danger associated with swallowing a leech, formulated different prohibitions against drinking water directly from rivers and pools.<sup>6</sup> Such prohibitions are described by Rabbi Moses

Maimonides (the Rambam), a Talmudic scholar, in his *Mishneh Torah* (Code of Jewish Law). Rabbi Joseph Karo in his Code of Jewish Law states that if a person swallows a leech, it is considered as if he has an internal wound which could be very dangerous (Shulchan Aruch, Orach Chayim 328:6).

Conversely, the beneficial uses of leeches were known for a long time. An illustration of the medicinal usage of leeches was discovered in an Egyptian tomb dating back to 1500 B.C.E. 7 Books of the Renaissance period describe the medicinal use of leeches, especially for bloodletting. Leech therapy reached its peak in the 19th century, with millions of leeches used in Europe annually.<sup>2</sup> By the end of the 19th century medicinal usage of *H. medicinalis* dropped dramatically, as its medicinal efficacy in bloodletting was questioned.<sup>7</sup> Interestingly, in the late 1950's there was a renewed interest, due to a salivary anticoagulant, called *hirudin*, secreted by the leech. *Hirudin* is an antithrombotic substance that can possibly be used to treat or prevent thromboembolic



disease.<sup>5</sup> The saliva of leeches also contains the following pharmaceuticals: an unidentified anesthetic, which prepares the area for a bite; hyaluronidase, an enzyme which maximizes the spread of other salivary secretions; a histamine-like vasodilator, which increases regional blood flow; and hirudin, which prevents coagulation of the blood meal in leech's crop. These chemicals create a perfect environment for bleeding to continue up to 48 hours after the leech has detached.<sup>8</sup>

Bloodletting was a very popular methodology for treating different diseases, as well as a measure to preserve health. Talmudic sages encouraged and participated in this practice. The general

should be terminated immediately.<sup>9</sup> It is also important to examine the initial blood emitted from the patient during bloodletting, because certain illnesses can be detected in it (Niddah 20a). Talmudic Sages discuss numerous precautions that should be taken into account before and after the bloodletting procedure. Maimonides in his Laws of Moral Dispositions and Medical Aphorisms suggests that anyone under 14 or over 70 years of age, in general, should not have the procedure done, but it is not sufficient solely to rely on the patient's age and the physician should also consider the physical appearance of the patient.<sup>9</sup> One should not perform bloodletting if the patient has one of the

early "cauliflower ear", obesity, pericarditis, headache and many other diseases.<sup>2</sup> The Talmud states that one of the remedies for ailments of the spleen is to take seven water worms (leeches), dry them, and daily drink two to three of them in wine (Gittin 69b). Many cases have been documented of the beneficial use of leeches. Empress Josephine was treated with leeches after falling down a flight of stairs and Mary Lincoln (Abraham Lincoln's wife) used leech therapy as a treatment against migraines.<sup>8</sup> *H. medicinalis* has been used after microsurgical reattachment of totally amputated ears.<sup>8</sup> Cases of skin flaps with venous congestion were resolved after the application of leeches for the first two to four post-operative days.<sup>2</sup>

There are very few risks associated with leech therapy. The main concern is the infection from normal intestinal bacteria of the leech, primarily endosymbiotic bacterium, *Aeromonas hydrophila*. These bacteria can contaminate wounds with insufficient arterial blood flow.<sup>8</sup> Complications that occur usually are due to the use of an unknown leech type or to a patient's specific clinical problem. The Talmud talks about health dangers associated with swallowing a leech. It was considered so dangerous, that if one has swallowed a leech, the Sabbath can be violated and water can be heated for the patient. Until the water is hot, the patient should drink vinegar (Abodah Zarah 12b). One of the opinions in the Talmud is the use of a bug (pishpash) as a remedy against leeches (Jerusalem Berachoth 9; 13c). Apparently, the bug is roasted, releasing noxious fumes that irritate the leech and force it to come out of the body.<sup>10</sup>

The therapeutic use of leeches has increased in the past years. They are

**The Talmud states that one of the remedies for ailments of the spleen is to take seven water worms (leeches), dry them, and daily drink two to three of them in wine (Gittin 69b).**

view of the sages on bloodletting is that it can be dangerous if done excessively, but if it is done properly, it can be very helpful (Gittin 70a). Maimonides understood that venesection was necessary but dangerous, and therefore a patient should pray before and after the procedure. Mar Samuel, an earlier Talmudic sage, noted that if one performs bloodletting for therapeutic purposes, prior to the procedure, the person needs to fast, but if one does it to "ease" someone, then one does not need to fast (Shabbat 129b). During the bloodletting procedure it is very important to check the patient's pulse. If changes in strength or rhythm are apparent, the procedure

following symptoms: convulsive disorder, severe insomnia, anginal type pain, extreme obesity, inordinate anxiety, and diarrhea, and if the patient is too young, too old, or not accustomed to bloodletting.<sup>9</sup> After bloodletting, a person should not fast because: "he who fasts after bloodletting takes his own life in his hands" (Derech Eretz Rabbah 11). After bloodletting, the patients should not eat milk or cheese because they are too light, and not onions because they are irritating to an empty stomach (Nedarim 54b; Abodah Zarah 29a).

Leeches are used to treat various human diseases, including thrombophlebitis, periorbital hematomas,

widely used in plastic and microsurgery for free-flap skin grafts and re-attachments. Leeches are used for ear replants when there is no venous outflow, because they remove coagulated blood that might interfere with the healing process.<sup>5</sup> Complications and risks are very minimal, while the benefits can be tremendous. The best clinical cases to use leech therapy is when there is good arterial inflow, but the outflow is insuffi-

cient or absent. The fact that leeches do not attach to dead skin flaps is used to test skin flap viability. If the leech does not attach quickly to the replanted tissue, or does not suck enough blood, it is a bad prognosis of tissue survival.<sup>2</sup> To avoid any possible infections, leeches are used only once or on one patient only and antibiotics are given to the patient during leech therapy.

Leeches are very interesting ani-

mals. They can be harmful if swallowed or if used unnecessarily, but if handled properly, there are tremendous benefits that arise from their clinical application. Such cases are described in both secular and Talmudic literature.

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# Conic Tubes & Techum Shabbos

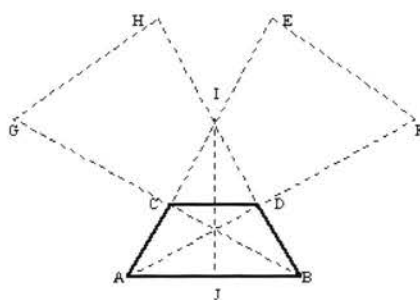
The halacha, techum shabbos, forbids walking two thousand amos, or approximately one thousand meters, outside of a city on shabbos. Since this halacha requires that one know the distance between two points, an accurate method of measurement is needed. Nowadays, devices such as satellites and radar can easily measure distance.

However, before these modern day tools were invented, how was distance measured accurately?

The Talmud in Eruvin 43b states that Rabban Gamaliel, who lived at the end of the first century A.D., constructed a hollow tube that allowed him to see a distance of two thousand amos on land or sea. The mefarshim explain how his conic tube worked.

The tube, ABCD, had a base, AB, through which the viewer looked. The top of the tube, CD, was calibrated for various distances by lengthening or shortening the distance between points C and D. Line AD is extended to F, line BC is extended to G, line AC is extended to E, and line BD is extended to H. Lines ACE and BDH cross at point I.

The viewer's right eye sees the area enclosed by triangle GBH, while the viewer's left eye sees the



area enclosed by triangle EAF. The area enclosed by triangle CID was seen by both eyes. Vertex I is the

farthest point that can be seen by both eyes.

Rabban Gamaliel calibrated his conic tube to measure a techum, or two thousand amos. When looking through his tube, point I was two thousand amos from the viewer. An imaginary line extended from point I to line AB creates the right triangles AJI and BJI and cuts line AB in half. The length of line CD is determined by the slopes (change in Y value divided by the change in X value) of lines BD and AC.

The slope can be calculated by the equation  $\tan$  of angle IAJ (IJ divided by AJ) equals one thousand meters divided by half of line AB.

Rabban Gamaliel's conic tube apparently was the first of its kind. It is unknown, though, whether he invented the tube based on his own calculations or on the calculation of others, such as the Greeks, who were advanced in mathematics. The Greek occupation of Israel would have provided the opportunity for such cultural diffusion to take place.

The Talmud relates that Rabban Gamaliel used his tube to determine whether his ship had entered within

two thousand amos of port before Friday eve (the shabbos) fell. According to Rabban Gamaliel, if the boat had entered within two thousand amos before nightfall, the halacha would con-

sider the boat within city limits. By accurately measuring distance, Rabban Gamaliel's conic tube enabled him to determine halacha.

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# Scriptural Shorties

Dwarfism is not a new phenomenon but has existed since biblical times. Throughout the Tanakh and Talmud there are numerous references describing this deformity, thus, testifying to its early origins. Even scientific principles, which were only discovered in recent times, are alluded to in the Talmud, which was written thousands of years ago.

There are currently over 100 types of dwarfism,<sup>1</sup> which affect about 1 in every 10,000 births.<sup>2</sup> Dwarfism, which is genetically determined, is the result of the disproportionate growth of the skeleton and is characterized by a height of 4'10" or shorter. While some syndromes are caused by new genetic mutations, others result from random combinations of gametes carrying two recessive genes, which, perhaps, were latent for generations.<sup>1</sup>

One such syndrome, known as pituitary dwarfism, is the result of a defect in hormone production by the anterior pituitary gland. The anterior pituitary is responsible for the production of somatotropin, or growth hormone, which acts on all body cells to regulate growth by

increasing protein synthesis, fat utilization, and storage of carbohydrates. During maturation, growth hormone has a stimulatory effect on bone growth, thereby influencing the ultimate size of the person. Variations in human height are primarily due to individual differences in the level of growth hormone.<sup>3</sup> In cases of hypopituitarism the anterior pituitary gland may secrete either too little growth hormone or none at all. A lack of secretion of growth hormone affects children, but generally has no negative effect in adults.<sup>4</sup> Typically, the afflicted child will cease growing in early childhood and may be sexually immature, but will retain normal body proportions and mental capacity. These individuals are usually well proportioned,

except for the head which may be relatively large compared to the body. This type of dwarf, who is completely normal except for size, is commonly termed a midget or a pituitary dwarf.<sup>5</sup>

Advances in recombinant DNA technology have enabled pituitary dwarfs to be clinically treated during their childhood by injections of synthetic growth hormone. Prior to this technology, growth hormone was collected from the anterior pituitary glands of cadavers, which posed the danger of transmitting serious viral infections to the central nervous system and which could only be obtained in limited amounts and at inflated costs. Through genetic engineering researchers have inserted the human gene for growth hormone into the bacterium, *Escherichia coli*, which serves as the biologic factory for synthetic growth hormone, called somatrem. As compared to obtaining growth hormone from human cadavers, this bacterial source yields hormone that is purer, more plentiful, and economically affordable and, thereby, enables more children to be treated.<sup>6</sup>



## ● “The Talmud states that two dwarfs should not marry

Another inherited form of dwarfism, known as cretinism, results from an inactive thyroid gland early in life. The thyroid gland is responsible for the secretion of thyroxine, a hormone that plays a crucial role in vertebrate metabolism, development, and maturation. Lack of this hormone in infancy leads to cretinism. A cretin dwarf is stunted in mental and physical growth, with a distorted face that is larger than normal and disproportionate to the remainder of his body. Immediate treatment with thyroxine or thyroid extract can correct this abnormality and will result in normal growth.<sup>7</sup>

In contrast to cretinism and pituitary dwarfism which are caused by a combination of heredity and endocrine malfunctions, achondroplastic dwarfism is the result of an autosomal dominant genetic trait with complete penetrance. This is the most frequent form of short-limb dwarfs and is characterized by a narrow trunk, large head, short extremities and normal intelligence. Such dwarfs will often suffer from orthopedic complications. Geneticists have recently discovered a mutation in the gene responsible for fibroblast growth factor receptor 3, a negative regulator of bone growth, as a cause of achondroplasia.<sup>8</sup>

As opposed to a midget, a pygmy is a word coined for a specific African tribe consisting of individuals who are short, despite their normal production of growth hormone. Their small stature results from the inability of the plasma membrane of their somatic cells to recognize and interact with growth hormone. Apparently, the surface receptor proteins responsible for interacting with growth hormone are lacking and their body therefore does not recognize the production of growth hormone by the

anterior pituitary gland.<sup>9</sup> Localization of this mutation in a specific, isolated population has been attributed to a founder's effect, which occurs when a small population selectively interbreeds and thereby increases in size and has a different genetic composition from that of the parent group. Similarly, a founder's effect is noted in the Old Order Amish of Lancaster, Pennsylvania, an isolated community that was founded some 200 years ago by only a few individuals. This community has a high background level of an unprecedented recessive allele that in the homozygous state results in a combination of dwarfism and polydactylism. Apparently, the large percentage of these abnormal traits in this localized group reflects that their marriages are limited to within their close-knit community.<sup>10</sup>

Although the Scriptures and Talmud make note of small-sized people, neither differentiates among the different types. “Any man from among the offspring of Aaron the priest who has a blemish shall not approach to offer the fire-offerings of HaShem; the bread of his G-d he shall not approach to offer” (Leviticus 21:21). This biblical verse is the basis for the disqualification of a person with any congenital anomaly from serving as a priest in the temple service.<sup>11</sup> One such anomaly is dwarfism, biblically referred to as a dak (Leviticus 21:20)<sup>12</sup> and talmudically as a nannas (Berachos 58b).

Written more than 3,000 years ago, the Talmud, in its infinite wisdom, provides some genetic counseling regarding marriages. The Talmud in Bechoros 45b states that two dwarfs should not marry each other “lest their offspring be a thimble.”<sup>11</sup> In reference to achondroplasia, which is caused by an autosomal dominant gene, this advice has prevailed to

the age-old test of time. Homozygous dominant infants are stillborn. Heterozygotes are able to reproduce, however, while they are young and their limb bones are forming, the cartilage components of these bones cannot form properly and at maturity the affected individuals have abnormally short arms and legs. In a mating between two such heterozygotes, there is only a 25% chance of producing a normal child, a 50% chance producing a child with achondroplasia, and a 25% chance of a stillborn (double-dominant syndrome).<sup>1</sup> Thus the sages were aware of genetic factors in reproduction. The isolation and inbreeding of pygmies and the Old Order Amish of Lancaster are examples of a founder's effect and of populations that testify to the warning in the Talmud.

It is important to stress that biblically a dwarf is deemed neither evil, worthless, nor ill. In contrast to the Greek's practice of disposing newborns with deformities, Jewish law is intolerant of such barbaric customs. In Judaism our prior generations were judged by their learning of Torah and the keeping of mitzvos, rather than by their outer appearances. The present-day organization, Little People of America (LPA), focuses on uniting and providing services to dwarfs.<sup>1, 2</sup> Disrespect towards dwarfs, in contrast to the love of a mother for her short child, is noted in the following: “A

each other “lest their offspring be a thimble.”<sup>11</sup>

woman whose son was a dwarf saw him in her imagination as "tall and swift" (Genesis Rabbah 65:11), but everyone else saw him only as a puny dwarf (Song of Songs Rabbah 2:15:12).<sup>12</sup> The respect that the LPA demands for dwarfs is one that is clearly supported by the Torah.

Proof of the esteem that the Torah extols towards all individuals, including those that appear different from the norm, is the special blessing, "mishaneh et habriot," recited upon seeing a dwarf (Berachos 58b). This blessing is an acknowledgment of G-d's unique ability to create and change people according to His will and with a distinct purpose. For example, Metzudas, in Ezekiel 27:11, translated gamadim as dwarfs and explained that in ancient times dwarfs, because of their small stature,

were strategically placed as guards in towers. These dwarfs had an advantage over average-sized people, because they were able to observe the nearby enemy camps without themselves being seen. Thus, the enemies being unable to see these guards would not shoot arrows at the apparently deserted towers. Thus these dwarfs were crucial to the war effort.

In biblical history the social equality of dwarfs is apparent through two powerful non-Jewish kings, both described as dwarfs. Pharaoh, the ruler of Egypt, was only one amah tall. Although many interpret this allegorically, still it is interesting to note that he is described as a midget, possibly to emphasize that G-d is the One who rules over the kingdoms of man and, at times, appoints the lowest of men as rulers (Moed Katan, 18A).

Additionally, Nebuchadnezzar, the powerful king of Babylon, is described as the smallest person ever appointed as a ruler over a kingdom; the Midrash suggests that he was a dwarf.<sup>13</sup>

Although written almost three millennia ago, it is fascinating to see how accurately the Bible describes the social aspects and genetics of dwarfs. These descriptions are remarkably similar to those made throughout scientific history and provide undisputable proof that there is a G-d orchestrating the world, because how else could such facts have stood the age-old test of time.

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# Tanach Tallies

When one thinks of the word "giant," an imaginary person of great size and power comes to mind. Giants are people whose body length is much greater than of normal sized individuals. They appear as characters in the folklore and legends of many cultures and can be traced back to Biblical and Talmudic times.

The first acknowledgement of their existence is in Genesis, where it mentions nephilim: "The nephilim were in those days and also after that... and they born children to them ....the same were the mighty men" (Genesis, 6:41). Rashi, the famous 11th century Bible commentator, interprets nephilim as giants. Also, later in the Bible giants are mentioned. Moses sends spies to explore the Promised Land. The spies report that they saw men of "great stature" (Numbers, 13:32). Rashi interprets "men of great stature" as very tall, huge men and compares them to Goliath, the great giant who was six cubits and a span. The spies claim that compared to these people, the nephilim, "we were like grasshoppers in our own eyes, and so we were in

their eyes." The Talmud explains that spies heard the giants say to each other, "There are ants in the vineyard resembling human beings" (Sotah 35a). The Bible also makes mention of another sect of giants known as the rephaim. Chief among them is Og, the king of Bashan, who was the last giant to live in Israel during Biblical times. Og's "bed was an iron bed... nine cubits in length and four cubits its width by the cubit of a man" (Deuteronomy, 3:11.). The Talmud further elaborates on the size of Og. The following incident occurred to either Rabbi Yochanon or Abba Saul while chasing a deer. The rabbi entered into the thighbone of a corpse and relates "and I never reached the deer nor the end of the thighbone" (Niddah 24b).

Apparently, the thighbone was so large, that it appeared never to end. The Talmud explains that this thighbone belonged to Og, the king of Bashan.

In Antiquities, Josephus and Plinius describe the bodies of giants living in the land of Chevron. "People of such dimensions are not known in later times. It is possible that just as the duration of life of human beings diminished already during the period of the description of Genesis, so too, the bodies of humans have decreased in size."<sup>1</sup> The Philistine, Goliath, one of the four giants born to Orpah, was the only remaining giant whose height is mentioned. His height was "six cubits and a span" (Samuel I 17:4), estimated as twelve to thirteen feet tall.

People of tall stature, but not necessarily giants, are mentioned in Leviticus, where it notes those abnormalities that disqualify a priest from serving in the temple. It states, "Any man in which there is a blemish shall not approach: a man who is blind, or lame, or one who has an enlargement" (Leviticus 21:18). The Hebrew word for enlargement, *sarua*, is inter-

preted in the Talmud as an excessive overgrowth of a limb that is larger than its fellow. Examples involve eye or leg deformities. A man by the name of Ben Batiach is mentioned in the Mishnah, tractate Keilim, as having a very large fist. The Talmud, in tractate Yoma, also mentions a man by the name of Rabbi Ishmael ben Kamchitch who was able to grab four kabs in one hand. Additionally, other terms that mean a giant or a very tall person are mentioned and include kippuach (Tosefta Berachoth 7:3; Yerushalmi Berachoth 9; 13b) and kipeach (Becoroth 7:6; Berachoth 58b), explained by Rabbi Gershom as "very tall and thin people whose faces appear to jump forward." Their height is out of proportion to their width and their bodily features sag.<sup>1</sup> Furthermore, the Talmud relates that throughout many of the generations, some of the leading rabbinic authorities were extremely tall men, to the extent that they were the tallest men in each of their respective generations (Niddah 24b).

What is gigantism? What is the scientific cause behind these unusually tall figures? Gigantism is a hereditary condition, caused by the overproduction and oversecretion of the pituitary growth hormone, GH. The pituitary gland is a small endocrine gland that produces and secretes into the blood stream several hormones that control several body functions, such as growth, development, reproduction and metabolism. The hypothalamus, which is located in the brain, releases growth hormone releasing-hormone (GHRH), which stimulates the anterior pituitary gland to make GH. Then somatostatin, another anterior pituitary hormone, signals or inhibits the release of GH. When GH has entered the bloodstream it stimulates the hormone, IGF-1, an insulin growth factor in the liver. This later hormone is the chemical agent that

causes bone growth. The interplay among these hormones is regulated by feedback stimulatory and inhibitory mechanisms. However, if the anterior pituitary gland becomes independent of the regulatory mechanism, it continues to make GH, but in excess. Prolonged exposure to excess GH hormone, before the epiphyses of the bones have closed, causes increased growth of the long bones and excessive overgrowth of all body tissues.<sup>2</sup> The result is a giant, that grows to an excessive height of 7 feet tall and tends to have long limbs that are disproportionate to the rest of his body. A giant's metabolic rate is usually 20% above normal, which may be caused either by excessive growth hormone alone or by the additional oversecretion of thyroxine by the thyroid gland.<sup>3</sup> In addition, a giant's pancreatic beta cells may be overactive and provide too much insulin, resulting in hyperglycemia. Ultimately, hyperglycemia may lead to degeneration of the pancreatic beta cells, resulting in diabetes. Because of these metabolic abnormalities, the lifespan of a giant tends to be relatively short. However, if over secretion of GH occurs after body growth is complete, which is marked by the closure of the epiphysis in the long bone, then the resultant condition is known as acromegaly, not gigantism. Acromegaly, an endocrine disorder that affects most middle-aged adults, is usually caused by a benign tumor of the anterior pituitary gland, termed an adenoma. Adenomas, as they increase in size, produce excessive GH. As the tumor expands, it may compress on certain areas on the brain and cause severe abnormalities. For example, compression on the optic nerves causes severe headaches and visual disorders. Compression around the normal pituitary tissue can also alter the production of

other hormones, leading to impotence in men and alterations in the menstrual cycle and in breast discharge in women.<sup>2</sup> Adenomas can grow either at a rapid or at a very slow rate. If the growth rate is slow, symptoms are not noticeable for several years. The most common symptoms are abnormal growth and swelling of the hands and feet, hence, the word acromegaly which is Greek for "enlargement" and "extremities."<sup>4</sup> Other symptoms include increasing of the skull, tongue and liver enlargement, thickened ribs, a protruding jaw, a deepening of the voice due to enlarged vocal cords, skin tags, enlargement of body organs, snoring, and excessive sweating. The serious health factors involved include diabetes mellitus, hyperhidrosis, hypertension, heart disease, carpal tunnel syndrome, and sleep apnea.<sup>5</sup>

Were any of the biblical giants acromegalics? If so, is there any biblical proof that supports that they could have possibly had this condition? "Whether or not any of these giants were acromegalics cannot be established with any degree of certainty."<sup>6</sup> However, much is written about Goliath, all suggesting that he was suffering from a hormonal disorder. Why Goliath and not the others? The simple answer is that many people are intrigued by the battle between David and Goliath. "The story became a symbol of the victory of the faith over brutal force, the mastery of good over evil."<sup>7</sup> How was it possible for a man of Goliath's size to lose in battle to David, a man of normal proportions? Many theories have been written about this unbelievable victory.

The battle between David and Goliath took place thousands of years ago in the valley of Ellah. Throughout many generations there was constant rivalry between the Philistines and the Israelites. The Philistines challenged the



Israelites to a battle, not between armies but between representative fighters from each group. The Philistines sent out their champion Goliath and David represented the Israelites. The young lad had faith that G-d would rescue him in the battle. David, the strong believer in G-d, was victorious.

In Samuel I, the slowness of Goliath is mentioned. "The Philistine walked, going closer and closer to David..." (Samuel I 17:41). Possibly, this was because of his enormous height and heavy weight. Perhaps, he suffered from acromegaly. His height was a "feature of a pituitary macroadenoma with hypersecretion of growth hormone"<sup>7</sup> In addition, his slowness may be attributed to his heavy dress in metal armor. "He had a copper helmet on his head, and was wearing armor of mail; the weight of the armor was five thousand shekels. He had a copper shield on his legs and a copper neck-guard between his shoulders" (Samuel I 17:5-6). On the other hand, David "hurried and ran to the line" (Samuel I 17:49). Goliath, surprised and unprepared, was unable to defend himself against the stone David slung into his forehead.

V.M. Berginer attributed Goliath's

defeat to a visual disorder and suggested that he had an enlarged pituitary tumor that pressed on his optic chiasm and caused bitemporal hemianopsia. There are many hints throughout the text that suggest that Goliath suffered from visual field restriction. For example, David took his one staff in his hand, yet Goliath saw that David had several sticks. Goliath says to David, "Am I a dog that you come to me with sticks?" (Samuel I 17:43). Additionally a shield bearer walked in front of him, suggesting that Goliath needed to be guided; furthermore, the staff bearer had to inform Goliath from which side David was coming.

What actually killed Goliath? Was it more than the stone that struck Goliath and "penetrated his forehead" (Samuel I 17:49)? Such a sudden, sharp injury could even kill a normal, healthy person. "How much more so in a case where the frontal sinuses become enlarged and the frontal bone consequently thinner," as noted in acromegalics, postulates Berginer.<sup>7</sup> The stone that penetrated into Goliath's pituitary gland may have caused severe hemorrhage resulting in transtentorial herniation and death.<sup>8</sup> Others postulate that it was more than just

that. D. Rabin and P. Rabin conclude that Goliath suffered from acromegaly and homonymous hemianopia, but also suggest that Goliath suffered from multiple endocrine neoplasia I (MENI), a rare disease that leads to hyperplasia (an abnormal increase of normal cells arranged in a tissue) and to the hyperfunction of two or more glands in the endocrine system.<sup>9</sup> Possibly, Goliath also suffered from a pancreatic tumor and on the morning of the day of battle he may also have been hypoglycemic. Hyperparathyroidism may have made Goliath more prone to a stone penetrating his skull, as this pathology causes extensive osteitis fibrosa and "a brown tumor on his forehead through which the stone pierced his brain."<sup>10</sup>

Gigantism has both its advantages and disadvantages. It helped Goliath land a spot in the history books and become a legendary biblical character studied by many. In the end though, was it really that advantageous?

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# The Compassionate Creator

In the past, the mentally ill were viewed as social rejects, treated with mockery and contempt. "Such a negativistic attitude is to be found in most Greek and Roman works, as well as in later English and French classics from drama to poetry."<sup>1</sup> Until the mid-20th century, all State mental facilities were built in the outskirts of main metropolitan areas.

Mentally ill children were called "attic children" because, not only were they never given health care but, they were hidden in attics, banned from society. America's history of dealing with the mentally ill is less than something to be proud of.

Unfortunately, maltreatment of the mentally ill is not a thing of the past. In the 1970's all mental institutions in the United States were overcrowded and subsequently unable to care for their residents. In 1972, the Rockland County State Hospital was so overcrowded that a basic head count was nearly impossible. At the time, the mayor of Rockland County, New York, Nelson Rockefeller, formulated a plan. Each mental facility was told to decide which patients could be moved to

"neighborhood assisted-living facilities," which would provide them with less intensive care. Theoretically, this could have been a fantastic solution to the problem. However, the one drawback at that time was that there were no neighborhood facilities. These people were thrown out of the facilities, with nowhere to go.

Now, thirty years later, there is a significant homeless population, mostly former residents of State institutions. Most of today's urban homeless people were, at one time, residents of such institutions and now find themselves sleeping in subway stations and on street corners. Little has been done to rectify this situation. Recently, a neighborhood in New York City planned to build a

facility for the mentally ill, but there were huge protests, as the residents were of the opinion that real estate costs would decrease and that it would be unsafe for the neighborhood children. This perspective is known as the "NIMBY" (not in my backyard) philosophy. The general population is more than happy to support the establishment of such facilities, as long as they are nowhere near residential areas.

The Torah views treatment of the mentally ill much differently.

The Almighty created every person in His image (Bereishis 2:27): "B'zelem Elokim bara es ha'adam." In this context Ha'adam includes every person in the history of mankind. The Torah was given to mankind as a guide to life. It is no wonder why the Torah's approach toward the less fortunate is one of care and compassion. Dovid Hamelech, the Psalmist King David, writes in sefer Tehillim (116:6) that "Shomer p'sa'im Hashem" (G-d protects the simple-minded).

The language of the Torah is halacha (the Jewish Code of Law). We can only achieve G-d's will by

properly following halacha. When King David wrote that, “G-d protects the simple-minded,” we must realize that this protection is done through the halachic definition of who the “pesi” is, and how we have to treat him as a member of our society.

“Pesi” is one of several words used throughout the Torah to describe someone whose mental faculties do function properly. Others include kesil, ba’ar, avil, meshuga, and shoteh.<sup>1</sup> Each of these words has a specific definition, which is often based on its context. The word for fool most commonly used in Rabbinic literature is “shoteh,” derived from the root, “sh’t,” connoting a state of foolishness, a deficiency in knowledge (da’as) and in comprehension, or mental retardation.<sup>1,2</sup>

In defining a shoteh, Chazal’s definition is primarily behavioral. The Talmud (Chagiga 3b) describes a shoteh as someone who exhibits three specific characteristics: ha’yotseh yechidi ba’layla (one who goes out alone at night), ha’lan be’veis ha’kevaros (one who spends the night in a cemetery), and ha’mekare’a es kesuso (one who tears his clothing). As each behavior if done individually can have a rationalization, Rav Huna states that a true shoteh does all three behaviors. However, Rashi adds that anyone who does at least one of these, b’derech shtus (in a pathological manner), can be identified as a shoteh.

The Yerushalmi (Terumos 1:3) describes the shoteh with the above three actions and added that the shoteh is me’abbed (destroys) all that is given to him. The definition of a shoteh is discussed elsewhere, e.g., the Rambam (Eidus 9:9), the Tur (Yoreh De’ah 1:1), and Bais Yosef (Yoreh De’ah 1:5).

Once a reliable halachic authority has determined that a person is a shoteh, what responsibilities do we, as a society, have toward him? A beautiful story is told of Rabbi Yeshaya Karelitz, also known as the Chazon Ish (died, 1954). The Chazon Ish walked out of his house in Bnei Brak, trailed by his students and followers. Suddenly a mentally retarded young man rushed forward and embraced the great scholar. The students rushed forward to chase the young man away. The Chazon Ish embraced the boy and told them to leave him alone, as “this young man will never commit a transgression, sin willingly, and should therefore be treated with compassion and love.” This is, of course, symptomatic of halacha’s approach to one whom is not responsible to keep the Torah obligations, but who is a human being, and therefore must be treated accordingly.

The halachic sources are replete with discussions regarding the protection of the shoteh, as well as the protection of the people with whom he deals. One major issue discussed is eidus (testimony). Regarding the shoteh, the Rambam (Hilchos Eidus 9:9) adds to the Talmud Chagiga by stating: “The shoteh is disqualified by Biblical Law from serving as a witness because he is not subject to the mitzvos (Torah obligations). A shoteh is not only one who walks around naked, who breaks things and throws stones, but anyone whose mind is confused (shenitrefah da’aso) and whose mind is invariably mixed up (da’aso meshubeshes). He is included among the shotim” because his mental faculties do not function to their full capacity.

The Rambam’s definition of the shoteh is behaviorally different than the Talmud Chagigah’s. The Kesef Mishna

(Hilchos Eidus 9:11) states that the Rambam is showing us that the behaviors listed in Talmud Chagigah are only presented as examples. Because the Rambam lists totally different behaviors, he shows us that it is not the actual behavior, rather it is the type of behavior that we are concerned with. All of the behaviors listed both in Chagigah 3b and the Rambam are idiosyncratic behaviors, which seems to indicate that if someone does them pathologically, without rationale, they probably have some sort of mental illness.

In his discussion of eidus, the Rambam compares the cheresh (deaf-mute) with the shoteh: “The status of the cheresh is that of the shoteh, because he is not of ‘sound mind’ and is not bound to observe the mitzvos. This applies also to the “speaking deaf” and the “hearing mute.” Halacha requires that a witness be able both to present oral testimony and to hear the judges (Hilchos Eidus 9:11). Although the cheresh cannot serve as an eid primarily because he cannot verbalize testimony, from a behavioral perspective, his inability to hear and talk deems him unfit to be an eid.

In a sense, the fact that neither a shoteh nor a cheresh can be a legal witness protects both themselves and those around them. From a social perspective, the halacha is over-protective of anyone involved in a court case. Because it is likely that neither

that “Shomer p’sa’im Hashem” (G-d protects the simple-minded). ”

the shoteh nor the cheresh has the mental capacity to remember facts correctly and/or accurately repeat them to a Bais Din (Jewish Court of Law), the potential for severe problems exists. Therefore, it is most prudent that they cannot serve as witnesses.

The Rambam (Hilchos Eidus 9:11) differentiates between the shoteh and the cheresh with regard to the laws of shechitah (ritual slaughtering). As noted, for someone to be a legal witness, he must possess all his mental faculties, to comprehend and recall past, present and future events. A shoteh is incapable of this. However, this is not the case with the cheresh. Under most circumstances, the cheresh's mental capacity is limited

and another pair came and declared that the sale was affected while he was in a state of sh'tus. And Rav Ashi said: Put two against two and let the land remain in the possession of the shoteh" (that is, status quo).

The above text alludes to a mental condition whereby the patient can either be in a "state of sh'tus" or in a sound "state of mind." It is evident from the text that the concern was that Bar Sh'tiya bought this piece of land while he was in a "state of sh'tu." However, because of his mental state, Rav Ashi said that his kinyan (sale) was not reliable, and the land remained in his possession.

Psychologists refer to a cyclical mental condition such as this one as manic-

of appetite feeling unworthy to receive food, is in a stupor, has a desire for self-punishment, and also may attempt suicide."<sup>1</sup> Psychologists often refer to the stages of a manic-depressive psychotic as hypomania, acute mania, and delirious mania.<sup>3</sup>

A person with the above condition is in great danger of making irrational decisions during the mania phase, and later suffering their consequences. It is quite common for a person in the mania stage to spend extreme amounts of money, which may have been the case with Bar Sh'tiya. Rav Ashi, in the Talmud (Yevamos, 31a) points out that when a person is in a state of "sh'tus," his sale is invalid because he is not thinking clearly, and is probably not consciously aware of his decisions.

Another realm of halacha that is intune with the rights of both the shoteh (male) and shotah (female) includes issues of kiddushin (marriage betrothal), gittin (divorce), and chalitza (levirate marriage). Before discussing the halachic ramifications of the marriage of a shoteh or shotah, a brief analysis is presented of the Torah's perspective on marriage. Upon completion of His creation of Chavah (Eve), G-d brought her to Adom (Adam). After calling her "isha" (woman), Adom states, "Therefore a man shall leave his father and his mother, and cleave to his wife, and they shall become one flesh" (Bereshis 2:24). The Sages explain that since the beginning of humanity, the Torah views marriage as a spiritual, sacred unity of two souls. Rabbi Dr. Menachem M. Brayerl notes how elegantly Chazal refer to marriage. "They always extolled the spirit of mutual love, the Divine gift given to humans, as being the core of marital relations. The Rabbis therefore call it 'kiddushin,'" which is

Because it is likely that neither the shoteh nor the cheresh has the **mental capacity to remember facts** correctly and/or accurately repeat them to a Bais Din, the potential for severe problems exists. Therefore, **it is most prudent that they cannot serve as witnesses.**

in that he cannot hear and/or speak, however his ability to think is not necessarily limited at all. Therefore, based on the Rambam in Hilchos Eidus, a cheresh is fit to be a shocheh (ritual slaughterer).

Another issue wherein the halachos protect the shoteh is in regard to his financial responsibility. The Talmud (Yevamos 31) describes a case where a person's mental state affects a financial matter: "A certain man named Bar Sh'tiya (called such because he suffered from temporary bouts of sh'tus) once sold some property while he was in an unhealthy state. A pair of witnesses came and declared that he had affected the sale while in a sound state of mind,

depressive psychosis. "It is described as a mental disorder characterized by marked emotional oscillation. In the mania phase, usually proceeded by a simple depression, the patient is flippant, spends his money extravagantly, disregards the truth, has wandering stream of thoughts, is argumentative, rapidly changes to irritability, has disturbances in the area of affectivity, ideation and psychomotor activity. During the depressive phase of such a person there is retardation of ideas and motility, anxiety or sadness, insecurity, fixed opinions and ways of action. Spontaneous speech is limited, he avoids social contacts, has feelings of unreality, has loss



derived from the word, *kadosh*, meaning holiness.

Obligations of marriage require full understanding and consent of both partners. The *kesubah* (marriage contract) was essentially devised as a protective legal instrument to safeguard the wife's rights when necessary, in terms of support, such as in a divorce.<sup>1</sup> The *kesubah* requires a husband to provide his wife with *she'er* (food), *kesus* (clothing), and *onah* (intimate pleasure). For a man and a woman to be betrothed the *kesubah* must be accepted and binding, and the bride and groom must both be in the mental condition to understand and accept the responsibilities. A *shoteh/shotah* is not in complete control of his/her mental faculties and thus is unable to fully comprehend the extent of these obligations and, hence, cannot get married (Tur, based on Yevamos 112b).

The question arises, however, when two sane people sign their *kesubah* and, subsequently, one loses sanity later in the marriage and the other wants a divorce. This is one of the most complicated areas of halacha. Just as it is necessary for full mental comprehension to be intact for both partners to marry, so is the case with a get (bill of divorce).

According to the Mishna (Gittin 2:5), anyone can write a get, even a *cheresh* (deaf-mute), *shoteh* (psychotic), and a *katan* (minor). These three are grouped together because they are not "*bnei da'as*" (capable of mature conceptual thought and expression). The Rambam adds to the Mishna (Gittin 2:5): "That which is said here, that a get is valid if written by one without understanding is conditional upon an adult standing over him, and that he write only the non-binding passages with an adult writing the binding passages." However, the Tur (Even Ha'Ezer 121),

and subsequently Bais Yosef (Even Ha'Ezer 121), states that for a husband to authorize a *sofer* (scribe) to write a get, the husband must be in full control of his mental faculties.

Because both partners must be in a state of full mental comprehension and have to be able to verbally give and/or accept a get, if the husband loses his sanity, he may not write a get for his sane wife and, therefore, he may not legally divorce her. As the Rambam states (Hilchos Gerusin 2:17): "Whoever married while sane and later on became a *cheresh*, and needless to say, a *shoteh*, he can never divorce (his wife) until he comes healthy again." The halachos are a bit different when it comes to a wife losing her sanity during the marriage (Tur, Even Ha'Ezer 121; Bais Yosef, Even Ha'Ezer 121).

The halachos of marriage and divorce are consistently overly sensitive to the rights and needs of the wife, as the main intent of the *kesubah* is to protect her rights. Concerning a wife who loses her sanity the Rambam states that: "If a (married) woman loses her sanity the husband cannot divorce her. This rabbinic edict (*takanas hachachamim*) was designed to protect her from abuse and prevent her exposure to depravity, since she is unable to guard herself. Therefore, the husband may leave her in status quo and is permitted to remarry. Although he is not obliged to offer her food, clothing, and marital intimacy (*she'er*, *kesus*, *v'onah*), because one possessing reason (*ben da'as*) does not have the emotional strength to live in a common house with *shotim*, he still must provide her food and drink from her own assets. He is also not requested to cure her or redeem her, and if he divorces her, the get is a valid one" (Rambam, Hilchos Gerushin 6:6; also

see Bais Yosef, Even Ha'Ezer 119:6, based on Yevamos 112b and the Rama). The Ravid added that a husband must provide his wife with medical care, as long as her condition is curable (Tur, Even Ha'Ezer, Gittin 119). The Rama and the Mabit mentioned that in such a case the husband should use his own assets to provide the wife with *she'er* (food) (Tur, Even Ha'Ezer, Gittin 119; Rama, Even Ha'Ezer 119:6; Mabit, II, 20).

Until the beginning of the second century, it was widely accepted for a man, even without a valid reason, to divorce his wife without her consent. In 1000 C.E., Rabbenu Gershom of Mainz promulgated a *cherem* (ban) that a man could no longer divorce his wife arbitrarily, without her consent. This became an accepted custom among Jews living in the Western Hemisphere. However, when a situation arose wherein the wife became insane, the Rabbis created an opportunity for the sane husband to obtain a divorce. The methodology involved obtaining permission from one hundred reliable Rabbis, "*heter me'ah rabbanim*," to abolish that part of Rabbenu Gershom's decree which banned bigamy. As his wife would not be in the position to accept a get, her husband, still maintaining his legal status of being her husband, was responsible for her financial support, although he could now theoretically remarry and begin a new life.

Regarding her mental status, the Rabbis did not rely solely upon the husband's diagnosis of her incurability, rather he had to wait twelve months before initiating the process of "*heter me'ah rabbanim*." However, according to Maharam Schick one could rely on the prognosis of a Gentile physician to determine whether this *shotah's* condi-

tion was curable. Today, psychological or psychiatric experts make such decisions. With the introduction of many medications, tranquilizers and the like, the final decision would include all factors.

Often people think that using medical and/or psychological data to help clarify and define halacha is wrong, however based on the Maharam Schick, as well as many other sources the opposite is the case. It is interesting to note that in his comprehensive article, "The Concept of Insanity in Rabbinic Law and Psychiatry," Rabbi Dr. Menachem M. Brayer mentions having been most fortu-

nate to have acquired a manuscript of the Rambam's medical work, *Fi-Bayan Al-Arad*, on mental depression. Rabbi Dr. Brayer also notes that the Rambam's "phenomenal medical insight was evident from his detailed diagnosis, therapy and prognosis," as well as that "much of the psychopathology of the manic states described by him concurs with the contemporary theories of mental illness."<sup>1</sup> As long as there is scientific data to support a theory, by definition, it cannot conflict with Torah, as Chazal teach us "Histakel b'Oraysa, u'bara alma."

Every case of mental illness is different and therefore must be handled by a reliable halachic expert. The interested reader is directed to other articles addressing this topic of the *shoteh* as viewed in halacha.<sup>4-8</sup> Upon examining and analyzing the halachos that protect the mentally ill, one comes to a recognition and appreciation of the care and compassion that G-d has for every one of His creations.

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#### ACKNOWLEDGEMENTS

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# Artificial Resuscitation or Spiritual Revival?

**T**he Talmud teaches that someone who saved the life of another, it is as if he has saved an entire world (Mishna Sanhedrin 4:5). Artificial respiration (AR) and cardiopulmonary resuscitation (CPR) are potentially life-saving techniques. Who is the individual to be lauded for having formulated such innovative and successful techniques?

Strange as it seems, a primitive version of these techniques may be rooted in the Tanach. This article will examine the biblical roots of AR and CPR based on analyses of the events in which Eliyahu and Elisha attempted unique forms of resuscitation. Before examining the techniques performed in Tanach, the physiological basis for AR and CPR are discussed.

AR is any measure that causes air to flow into and out of a person's lungs when natural breathing is inadequate or ceases, thereby simulating natural breathing. In emergency situations, AR is performed via mouth-to-mouth contact, known as mouth-to-mouth resuscitation. Once determined as unconscious and not breathing, the victim is placed on his back, with the head tilted backward

and chin pointing upwards so that the tongue will not block the throat. This position, known as head-tilt-chin-lift, prevents the tongue from blocking the throat. This is especially important, since the tongue is the most common cause of airway obstruction. The rescuer's mouth is then placed over the victim's mouth, forming as air-tight a seal as possible. For an infant or child, the rescuer's mouth covers both the nose and mouth. The rescuer breathes into the victim's mouth (and nose, in the case of a child and infant), with the victim's nostrils pinched close. Assuming the air passes, the rescuer breathes in a second time. Then, he checks for any signs that the victim is breathing independently, by listening as to whether any breathe

emanates from the victim's mouth, looking at whether his chest is rising and falling, and feeling whether any breath is being blown out. The rescuer can check for all these signs simultaneously, since his position is crouched over the victim, with his ear on top of the victim's mouth. If there are no signs that the victim is breathing, the rescuer gives the victim one breath every five seconds (for an adult) or every three seconds (for a child or infant). If the victim is an adult, a deep breath should be blown into his lungs, at the rate of 12 breaths per minute. If the victim is a child or infant, the breaths should be shallower, and should amount to 20 breaths per minute.<sup>1</sup> AR should be maintained until the victim begins to breathe on his own, or until professional help arrives. Air that enters the lungs contains about 21% oxygen, whereas exhaled air contains about 16% oxygen.<sup>2</sup> Therefore, the air breathed out has enough oxygen to keep a person who has stopped breathing from cardiac arrest or severe brain damage.

Since the heart often stops beating when breathing is interrupted,

most often, minutes after the cessation of breathing, the circulatory action of the heart is arrested. This is known as cardiac arrest: the cessation of the heart's pumping action, so that blood is no longer circulated to the brain.<sup>3</sup> A person who is in cardiac arrest is termed clinically dead, whereas someone who has only stopped breathing but whose heart is still functioning is termed biologically dead. Statistics compiled by the Heart and Stroke Foundation show that 4-6 minutes after the heart has stopped beating, brain damage may occur, and 10 minutes after cardiac arrest, irreversible brain damage sets in.<sup>1</sup> This background will help determine the physiological state of the child-who Eliyahu and Elisha revived.

The story of Eliyahu HaTishbi in Kings I, chapter 17, is a clear indication that resuscitation techniques existed in ancient times. Strange as it may seem, the prophet Eliyahu HaTishbi may have invented AR. Although the technique is not explained in depth, he definitely attempts some form of natural resuscitation on a lifeless boy. An analysis of Eliyahu's character may help clarify both the child's physiological state and the technique performed by Eliyahu. The resuscitation story parallels the growth and development of Eliyahu's personality.

In the book of Kings I Eliyahu appears to be a zealous man of G-d.<sup>4</sup> No introduction or bibliographical background information is provided. His first speech curses the wicked King Achav, invoking several years of drought with an oath in G-d's name. To placate Eliyahu's temper and reprimand him for his zealousness, G-d sends Eliyahu to live in the house of a widow, a poor woman with barely enough food to feed herself and her son. Upon arriving, Eliyahu sees the widow chopping lumber and asks for something to drink and eat. The widow,

desperate for her own sustenance, feeds Eliyahu, but immediately responds, "for the life of G-d," she has only but a little food, only enough to keep herself and her son alive (Kings I 17:12). The fervent Eliyahu is quick to reply that she should not worry for "G-d has stated" that as long as there is a drought He will continuously replenish her flour and oil jars (Kings I 17:14). Without this miracle, the widow, by her own admission, may have starved to death, which was not Eliyahu's intention when he cursed Achav. Furthermore, the daily miracle that created flour and oil *ex-nihilo* was also a daily reminder that a famine plagued the whole country as a result of Eliyahu cursing Achav. Eliyahu realizes that as a result of his over-zealousness, not only one individual, but an entire nation was starving.

Eliyahu's character is further developed in the next event in which he revives the same widow's son. The widow's son becomes very ill, "*ad asher lo notra bo nishama*" (Kings I 17:17), until devoid of all his breath. The widow, understandably grieved and infuriated, asks Eliyahu why he came to her if he intended all along to kill her son. Eliyahu in turn, asks G-d sarcastically, Is it right for G-d to do such evil to the widow with whom he is staying so as to kill her only son? (Kings I 17:20). But G-d does not respond and the boy remains lifeless. Is there a correlation between the lifeless state of the boy and the way in which Eliyahu approaches G-d? For Eliyahu's plea was not one of sincerity and hope, but one of cynicism and zealousness.<sup>5</sup>

Immediately upon recognizing that his pleas were ignored, Eliyahu tries to revive the boy naturally "*Va'yitmod al ha'yeled shalosh pa'amim*," He shakes or stretches himself over the child three times (Kings I 17:21). There is no response and he calls out to G-d a second time. But this

time, his language is in stark contrast to that of his first plea. He implores G-d, in a polite and genuine manner. "*Va'yikrah el Hashem va'yomar: Hashem Elokai, tashov na nefesh ha'yeled ha'zeh al kirbo.*" (Kings I 17:21) "*Na*" means "please". Clearly, Eliyahu's request is polite and respectful. In the next verse we are told that "G-d heard the voice of Eliyahu and the soul of the child returned to him again, and he revived" (Kings I 17:24).

Was the boy's revival a miracle or did Eliyahu really revive the child naturally? The text does not state explicitly the condition of the child, only that the child falls ill and his breath left him. His mother frantically accuses Eliyahu of having come to kill her son. "*Bata elay l'hazkir et onyi u'lhamit et bni?*" (Kings I 17:18). Whereas the mother's accusation may imply that her child was in cardiac arrest, the actual text's use of the phrase "there was no breath left in him" (*lo notra bo nishama*) implies that the child was in respiratory arrest and, as such, would only require AR to simulate his breathing. Given enough time, respiratory arrest may lead to cardiac arrest. However, no significant amount of time elapsed between the breath leaving the child, the widow's grievance that her son had "died," and Eliyahu's actions. Therefore, one cannot assume that the child's condition deteriorated and what initially was respiratory arrest developed into a case of cardiac arrest, which would justify the widow's choice of the word "*l'hamit*". Having looked at the biological basis of the miracle, the commentators' interpretations are now discussed.

The meaning of the sentence "*ad asher lo notra bo nishama*" is ambiguous. Radak (Kings I 17:17) explains that there are some who contend that the child did not die, but was rather very sick and no

sign of life or breathing could be discerned. Ralbag and Mitzudath David disagree with this view and state that the child actually died from his illness. But is this a clinical or a biological death? Was he in respiratory arrest or cardiac arrest? An analysis of the technique performed by Eliyahu may shed light on this question.

Eliyahu, upon hearing the woman's desperate accusation, picked up the child, took him to his room, laid him on his bed, and proceeded to invoke G-d, saying, "O Lord, my G-d, has Thou also brought evil upon the widow with whom I lodge, by slaying her son?" (Kings I 17:20). The text then states "vayitmoded al hayeled" (Kings I 17:21), which is often translated as Eliyahu stretched out upon the child three times. Eliyahu prays again to G-d, politely imploring G-d to please return the child's soul, and the child then revives.

There clearly is a miraculous element to the child's revival. The ambiguity, however, lies in the physiological role played by Eliyahu in his attempt to revive the child. "Vayitmoded" can be interpreted in several ways. Rashi, Radak and Ralbag interpret vayitmoded as some form of stretching out. They base this interpretation on the root word middah as in measurement, and maintain that by measuring himself over the child, Eliyahu stretched over him. Radak states that stretching over the child was Eliyahu's attempt to breath air into the boy, as well as to warm him with his own body heat, with the hope of reviving him. Ralbag agrees and points out that stretching over the boy was Eliyahu's attempt to transfer his ruach into the boy from limb to limb. He therefore lined up his eyes with those of the child, as did Elisha in the next instance analyzed. Although the commentators differ in their opinions as to exactly how Eliyahu breathed into the child, the consensus is

that Eliyahu attempted some sort of ventilation into the child, which today we recognize as a form of artificial respiration.

Another interpretation of vayitmoded is shaking the child (see Chabakuk 3:6).<sup>6</sup> Based on this interpretation, it could be that Eliyahu shook the lifeless child. If, the child was in fact clinically dead, the only way to physiologically reverse that state would be to compress and pump his heart, which is the basis for modern day CPR. However, CPR does not entail compressions alone. It requires both compressions and ventilations. For a child, one breath is administered for every five compressions. Interestingly, a recent study published in the New England

xyphoid process, a piece of cartilage at the tip of the sternum, as a landmark. The rate of compressions to respirations is intended to mimic the heart and breathing rates of the individual. On a child, the depth of compressions is 1 to 1.5 inches, performed at a rate of 100 compressions per minute.<sup>i</sup> The compressions simulate the contraction of the heart, whereas the release simulates the relaxation of the heart. Statistics have shown a survival rate of 16% for someone who has received CPR. Although this value may seem shockingly low, that statistic drops to 6% when CPR is not administered. When an individual lapses into cardiac arrest, the heart begins to quiver

The story of Eliyahu HaTishbi in Kings I, chapter 17, is a clear indication that **resuscitation techniques existed in ancient times.** Strange as it may seem, the prophet **Eliyahu HaTishbi may have invented AR.**

Journal of Medicine gives credence to the possibility that Eliyahu did administer some form of archaic CPR. This study concluded that chest compressions alone might be an effective form of CPR for people not properly trained in the lifesaving technique.<sup>7</sup> Is it possible that modern medicine is only discovering today what the prophets realized in ancient times?

CPR is performed by a series of compressions directly on the heart and respirations into the lungs. It is a highly specific technique and to be successful it must be performed accurately. In order to be effective, the compressions need be performed directly on top of the heart. To locate the heart, the rescuer uses the

instead of beat at its normal rhythm. This quivering is known as ventricular fibrillation; defibrillation is necessary within minutes to avoid sudden cardiac death. Contrary to popular belief, CPR does not restart the heart, rather it keeps the heart viable for defibrillation by circulating blood and oxygen around the heart. If defibrillation is administered, the victim's chances of survival jump to an encouraging 40%.<sup>3</sup> Furthermore, studies conducted by the American Heart Association concluded that only 15% of single-rescuers were able to simulate the proper ratio of compressions to breath on a mannequin.<sup>3</sup> These statistics remind us that although bestowed with good intentions, if Eliyahu



did actually attempt some sort of primitive CPR, it is unlikely that his technique alone would have restarted the child's failed heart. There is no conclusive answer as to whether the child was in respiratory or cardiac arrest. However, the interpretation of Eliyahu's techniques gives weight to either method, albeit with clear Divine intervention.

A somewhat similar event concerns Elisha, Eliyahu's disciple and student. A childless woman from the town of Shunam had hosted Elisha in her home. In gratitude, Elisha tells her that she will give birth the following year. A child is born and later in its life, this child goes to meet his father in the field. While there, the child cries out "my head, my head," collapses, and is carried back to his mother. He sits on her lap and dies at noon.

Unlike in the episode of Eliyahu, key information is provided about the events leading up to the death of the child. The text states that the father was harvesting grain, so the season was presumably early summer when the sun is very strong. As such, the child may have suffered heatstroke. In the tropics, heatstroke is a frequent occurrence and most often affects young people.<sup>8</sup> Heatstroke, which is a life-threatening disorder, is characterized by hot flushed skin, dizziness, headaches, and a rapid pulse. A key sign of heat stroke is cessation of perspiration, since the body has become largely dehydrated.<sup>9</sup> Unlike other forms of heat disorders, heat stroke may not necessarily be caused by exertion or exercise, but may be caused by high temperatures, as was likely the case in the field during the harvest season. In fact, the Talmud describes the child's collapse in the field as a classic case of heat stroke (Yerushalmi Yebamot 15:14d).

The mother brings the boy to his room, lays him on the bed, and asks her husband to send her a servant and a don-

key. Her husband questions this request. Instead of revealing to him what has happened, the woman maintains that everything is fine and sets out to Har Carmel to find the prophet Elisha. Upon seeing the woman approaching, Elisha sends his servant, Gehazi, to meet the woman and inquire as to the welfare of her child. The woman responds, strangely enough, that everything is well with her child. The woman continues her journey to Elisha and upon seeing him grabs his feet in desperation (Kings II 4:18).

Elisha understands that her soul is troubled and bitter over the state of her child and instructs Gehazi to take his staff and rush back to the child and place the staff upon the child's face. Elisha specifies that even if Gehazi meets someone along the way, he is not to greet him, nor is he to respond if anyone greets him. Elisha, slowly making his way to the woman's house, promises the woman that he will not abandon her. Upon reaching the child, Gehazi followed Elisha's instructions, but still, no voice nor sound is heard from the child. Gehazi goes back to tell Elisha what has happened. Elisha arrives, enters the room, shuts the door behind him and prays to G-d. He proceeds to stretch himself out on top of the child, puts his mouth upon the child's mouth, and his eyes upon the child's eyes, his hands upon the child's hands. The child was warmed and sneezed seven times (Kings II 4:34).

As with Eliyahu, an analysis of Elisha's character may shed light on the mystery shrouding the revival of the child. The midrash in Yalkut Shimoni notes that Eliyahu performed eight miracles, and Elisha, wanting double the power of his master Eliyahu, performed sixteen. Previous to this occurrence, Elisha had helped the poor woman maintain her sustenance by telling her to borrow jugs from neighbors and to fill them with her jug of

oil; miraculously the jugs were never emptied (Kings II 3:6). If Elisha was acting as a messenger of G-d, and the miracle would undoubtedly occur, why was it necessary that the woman exert such effort to sustain herself? Why did Elisha not miraculously create the jugs and the oil? We can posit the suggestion that perhaps even though Elisha was performing the miracle as a messenger of G-d, he wanted the miracle to occur through natural means and with her individual initiative. To the same effect, Radak suggests that in both Eliyahu and Elisha's resuscitations, the Divine plan was for a miracle to occur, but with a natural physiological basis (Kings I 17:21).

Further support for the miraculous basis of the resuscitation is in the element of secrecy, which is prevalent throughout the episode. When asked if the child is well, the woman blatantly lies both to her husband and to Gehazi. Metzudat David comments that she did not wish to reveal to her husband the reason for going to the prophet because she preferred that the miracle be performed secretly (*mootav sheyase hanes betzinah*). She then takes the child and places him on Elisha's bed. Ralbag comments that she hoped that in Elisha's merit the child would miraculously be revived. Human nature can understand the desire to keep a miracle a secret, lest talking about it may prevent it from being actualized.

Further evidence for the miraculous basis for the resuscitation comes from examining the time elapsed during which the episode occurs. Between the time the child died in the arms of his mother in Shunam to Elisha reviving him would be much too long for a purely physiological process to revive the child. Wislicki<sup>9</sup> points out that approximately fifteen miles separates Shunam, where the child collapsed, and Har Carmel, where Elisha

was. He calculates that the time it took for the mother to go to Har Carmel and for Elisha to return to the child in Shunam was approximately twelve hours, "far too late for resuscitation by artificial respiration." Wislicki also posits that severe heatstroke will lead to respiratory and circulatory collapse due to central depression. Thus, he maintains that the child's respiration became imperceptible to the mother, but that his heart was still functioning, as stated in the Talmud (Niddah, 70b). It is highly unlikely that an individual's heart can continue beating twelve hours after respiratory arrest. It is far more likely that the severe heatstroke led to both respiratory and circulatory arrest. Supporting this theory is the Heart and Stroke Foundation's statement that "the greatest chance of survival in cardiac arrest victims occurs when CPR is begun within four minutes."<sup>1</sup> Clearly, resuscitation twelve hours later would require a miracle.

If in fact the revival was a miracle, what was the purpose of Elisha's putting his mouth over the child's mouth and his eyes over the child's eyes? Furthermore,

why does Elisha attempt to revive the child with natural warmth? Stilisky's suggests that the child was in a state of hypothermia and Elisha resuscitated him, completely through natural means, by rewarming him. According to this theory, heat stroke was the cause of the child's circulatory collapse, which in turn led to depressed respiration, central depression, and a cooling of the body's core temperature, known as hypothermia. The hypothermic condition of the body made it seem like he was dead. However, assuming heat stroke did cause the child to lapse into hypothermia, it is highly doubtful that rewarming would have been sufficient to revive the child. As Weinberg states, "although the clinical presentation of hypothermia may be such that the victim appears dead, aggressive management may allow successful resuscitation in many instances. Initial management should include CPR if the victim is pulseless."<sup>10</sup>

Radak, in line with his views on this episode, provides a far more reasonable explanation as to the need for physiological attempts by both prophets, if in

fact the revival in both cases was a miracle. Radak states that in both the Eliyahu and the Elisha episodes there is some natural, scientific element on which each miracle is based. In both cases, this natural physiological element took the form of the prophet blowing air into the child's lungs.

In conclusion, no physiological or medical explanation can account for the revival of both children. The two biblical narratives, however, seem to give weight to the theory that the prophets attempted resuscitation techniques: Eliyahu's technique was likely a primitive version of AR or CPR, while Elisha's was predicated on the principle of AR. Clearly, the techniques as described in the texts would not alone suffice in resuscitation, thus implicating Divine intervention in the revival of the two children. Nonetheless, the first traces of resuscitation can be seen in these scriptural instances. Today, twenty eight hundred years later, the more refined forms of these techniques are universally accepted.<sup>11</sup>

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# The Holiness of the Body

**T**he prohibition against disgracing and defiling the dead, *nivul hamet*, to maintain the sanctity of the human body is based upon verses in Devarim (21: 22-23). These verses state that if a man commits a sin for which the punishment is death, he must be put to death and hanged on a gallows. His body must not be left overnight on the gallows, but

rather, he must be buried on that day because a hanging person is a curse to HaShem. Rashi comments on these verses, stating, "Since a human being is created in the image of HaShem, and HaShem calls the Jewish people His own children, as it were, the hanging body is disgraceful to HaShem Himself. It can be likened to the twin brother of a king, who is a bandit and hanged for his crimes. People who see the body will think it is that of the king" (Rashi on Devarim 21:23). The Rabbis further explain these verses in the Talmud, "Yes, this is indeed possible, for when HaShem said in the Torah 'You shall not leave his body overnight on the gallows,' this means only that you shall not leave him in a manner similar to someone who is hanging"

(Sanhedrin 47a). Just like hanging a body overnight is disgracing it because the body is holy, and therefore prohibited, so too any action that disgraces the dead is also prohibited. If the Torah is so concerned over the respect that must be paid to the body of a criminal, certainly the body of one who was not a criminal must be treated properly, without disgrace and a lack of respect. In addition, a body must be treated with respect because it was once animated by a soul, which itself is something holy.

Halacha firmly condemns the excavation and removal of human bones from their graves, even when they will be buried elsewhere, because of the prohibition against disgracing the dead. The Talmud

relates the following occurrence. "There was an incident in B'nei Brak involving one who sold property of his late father and subsequently died. The other members of the family challenged the validity of the sale in that the seller may have been a minor at the time of death. They inquired of Rabbi Akiva about examining the body of the seller to determine whether he was an adult when he died. Rabbi Akiva replied, 'You are not allowed to defile him through such an examination.'"<sup>1</sup> The *Minchat Yitchak*, among other commentaries, also condemns the excavation of graves, so not to cause pain to the part of the soul that remains with the body of the deceased.<sup>2</sup> Other Rabbis prohibit the removal of a body from its grave because doing so might cause the bones to be disordered, which may be problematic during the resurrection of the dead after the arrival of the Messiah. The grave of a dead person is considered to be his property and therefore, removing the dead from his "home" falls under the prohibition against theft. If the dead person was buried near fami-

## ● “Moshe excavated the bones of Yosef to rebury them

ly members, exhuming and reburying elsewhere will deprive the deceased of the “enjoyment” of being in the grave of his ancestors. One last problem is the prohibition against deriving benefit from the dead and his gravesite, the prohibition against receiving benefit, *issur hana’ah*, from the dead. This prohibition remains on the gravesite, even after the dead person is physically removed from the site. However, some halachic authorities maintain that this prohibition does not apply to the undisturbed soil that the dead was buried in, thereby permitting one to use the dirt on the sides of an open grave.

Under certain circumstances, however, one is allowed to excavate a body. We derive this from the Torah, “Moshe took the bones of Yosef with him, for he had firmly adjured the children of Israel, saying, ‘HaShem will surely remember you, and you shall bring up my bones from here with you’” (Shemot 13:19). Moshe excavated the bones of Yosef to rebury them in the land of Israel, proving that in certain situations one may exhume and rebury a body. The Talmud concludes the previously noted story of B’nei Brak, stating, “If you say that it was the family members who were challenging the purchasers’ seizure, this explains why they were silent when Rabbi Akiva denied their request to defile the seller’s body for the idea of defiling their relative was disagreeable to them. But if you say that it was the purchasers who were challenging the family’s possession on the property, then why were they silent when Rabbi Akiva forbade the examination? They should have responded to Rabbi Akiva, ‘We paid the seller money for the property but we never received it, so let him be defiled if this is necessary to prove our case.’”<sup>3</sup> Because the dead

person owed money to another party before he died, they are allowed to exhume his body. Rav Ettlinger is of the opinion that one is, therefore, allowed to excavate and rebury a body if the dead has an outstanding debt that can be determined by exhuming him, if he was buried without permission of the landowner, or if the grave interferes with other graves or damages the rights of the public. In each of these cases the dead person owed something to another person or his grave interfered with the rights of others.<sup>4</sup> Many other authorities, including the Shulchan Aruch, agree that one may unearth a body in order to transport a previously buried person to Israel or to his ancestral gravesite.<sup>5</sup> The Shulchan Aruch also notes that a body may be excavated if the grave and remains are likely to be damaged by sewage backups or vandalism. Furthermore, one may excavate a body if the person was buried in one place with the specific intention of later moving the remains to a different site, such as with Yosef. However, the transport of a body should be done with caution and the remains must be handled with the appropriate respect.

There are many halachic problems with autopsies performed on Jewish bodies, similar to the difficulties involved in exhuming a body. Autopsies touch on several issues, such as *nivul hamet*, *issur hana’ah*, the “pain” autopsy causes to the dead person, and the problems that could arise during the resurrection, especially if the body is not put back together properly. Autopsies are also problematic because they delay the burying of the dead. Leaving any part of a body unburied is a transgression both of the positive commandment of burying the dead and of the negative command-

ment of delaying burial of the dead. Until the entire body has been buried, the soul will not be at peace.

Rav Ettlinger cites an example of a time when it might be permitted to perform an operation on a person after death. If a pregnant woman dies before her baby is born, a question arises as to whether a cesarean section can be performed to save the life of her unborn baby. According to Rav Ettlinger, an operation that one would perform on someone living does not constitute *nivul hamet*, so a cesarean section on a dead mother to save her baby is permitted. Furthermore, the operation can be performed because the mother was responsible for the baby and therefore owes it life. Rav Ettlinger, however, raised the issue that to dissect a dead body to save someone the deceased was not responsible for, like in the case of an organ transplant, may be prohibited.<sup>6</sup> Most halachic authorities agree that for saving a life, *pikuach nefesh*, autopsies are permitted because *pikuach nefesh* supercedes all the mitzvot in the Torah. Therefore, the question of whether or not one is allowed to autopsy the dead for another person that the deceased was not responsible for is not applicable. According to Rav E. Landau<sup>7</sup> and the Chatam Sofer,<sup>8</sup> an autopsy is permitted if it may directly contribute to saving the life of a patient present at that moment. The Chatam Sofer

in the land of Israel, proving that in certain situations one may exhume and rebury a body.”

writes, "And according to this, if there is a sick person with a terminal illness, and the doctors want to autopsy the dead to save him, it is permissible because he is currently before us and it is possible by doing so they will be able to save him." Because of *issur hana'ah*, autopsies are permitted only if the knowledge gained has the potential to save one who is in need at that time, not for knowledge for the future. Similar to Rav Ettlinger, Rav Moshe Feinstein adds that even when *pikuach nefesh* is not involved, needle biopsies of organs are permitted to gain knowledge for the future, because they do not constitute desecration, since biopsy procedures are often performed on the living.<sup>9</sup> Despite the leniency involv-

Unterman, quoted by the *Seridei Aish*, who notes that the removal of the cornea from a dead body does not constitute desecration of the dead, *nivul hamet*, as a person's eyes are closed immediately upon death and the absence of the cornea will not be discerned by a viewer.<sup>11</sup> The *Seridei Aish* is of the opinion that the prohibition against getting benefit from the dead, *issur hana'ah*, does not apply to skin according to the Torah, and that corneas are equivalent to skin. Nonetheless, he notes that corneal transplants may transgress a rabbinical prohibition. Yet, he continues, that the corneal transplant may be allowed because the cornea will remain as viable tissue in the recipient. Most other author-

legally brain dead may not be used, because halachically a person is living until the heart stops beating. Some authorities, such as the *Tzitz Eliezer*,<sup>12</sup> do not permit organ donation under any circumstances.

Once the permissibility of organ donation has been established, a question arises as to whether or not an individual has a religious obligation to donate his organs after death, because a person must do whatever he can to save another Jew. Rav Moshe Feinstein states, "According to the law one is not obligated, but it is a *mitvah* and an honorable action to remove a portion of your own body to save another Jew." To remove organs from someone who died also is a *mitvah*.<sup>9</sup> A person does not have to give a part of himself to save someone else's life and therefore, there is no halachic obligation to donate organs, rather it is an honorable act, *midat chasidut*. Clearly, this question does not apply to those who prohibit organ donation.

Recently, a new issue concerning *nivul hamet* and *issur hana'ah* has arisen regarding the removal of semen from a dead man in order for his widow to bear his child. In theory, this procedure is similar to performing a biopsy on a corpse, which is permitted according to Rav Moshe Feinstein as discussed previously.<sup>9</sup> Similarly, sperm retrieval does not fall under the category of *nivul hamet* when done in a dignified matter, as though the corpse was a living man.

However, post mortem sperm retrieval appears to fall under the prohibition against deriving benefit from a corpse, *issur hana'ah*, and therefore should be prohibited. Rav Z. Goldberg, as quoted by Dr. Mordechai Halperin, is of the opinion that according to halacha, men have an obligation to produce off-

The **desecration of the dead** is not permitted, except when doing so may immediately **save a life**. In such a circumstance, **autopsies and organ donation are allowed**, according to most authorities.

ing *pikuach nefesh*, the *Tzitz Eliezer* feels that autopsies are prohibited because a person must return his entire body to HaShem. Man returns his soul spiritually and his body by burial.<sup>10</sup>

The halachic problems encountered with organ transplants are similar to those encountered with exhuming and autopsying a dead body. At first glance one might think that this includes the prohibitions against *nivul hamet* and *issur hana'ah*, as well as the prohibition against delaying burial of the dead. However, although not everyone agrees, there are halachic authorities who state that *nivul hamet* does not apply to cornea transplants. Among them is Rav

ities disagree with this reasoning. The *Seridei Aish* further notes that blindness causes a person to trip and bump into objects, which puts his life into danger, making cornea transplants *pikuach nefesh*, and, therefore permitted according to Jewish law. However, according to this argument a corneal transplant is life saving perhaps only if the recipient is blind in both eyes. *Pikuach nefesh* is the rationale for permitting most other organ transplants. Nonetheless, even for *pikuach nefesh*, heart transplants are not permitted according to most authorities, unless the donor was definitely dead at the time the heart was removed. Therefore, the heart of a person who is

spring and therefore *issur hana'ah* does not apply because it will be beneficial for the dead to have the procedure done in order for him to fulfill a mitzvah.<sup>13</sup> This is applicable only if the man gave consent to the procedure or if it was known that he would want the procedure done.

The question then arises as to whether a mitzvah can be fulfilled after death. According to the Talmud a person is exempt from halachic obligations after death (Shabbat 31a). Nonetheless, there are some post mortem acts that are considered the results of actions performed while living, and therefore it is possible that the dead can still fulfill the mitzvah of procreation. Dr. Mordecai Halperin quotes the opinion of the *Minchat Hinnukh*, stating that the essence of the mitzvah of procreation is the existence of

children, not the action by which children are attained, the *ma'aseh*.<sup>13</sup> Therefore, having a child after death allows a person to fulfill the mitzvah of procreation and is allowed according to some halachic authorities, unless the dead person did not implicitly or explicitly agree to have the procedure before his death. A qualified halachic authority must be consulted for each individual case.

The purpose of an autopsy is to aid doctors in understanding illness to help other patients. Autopsies are a valuable tool and essential for medical education. However, in Judaism, the dead must be treated with respect and dignity. The desecration of the dead is not permitted, except when doing so may immediately save a life. In such a circumstance,

autopsies and organ donation are allowed, according to most authorities. In a situation where autopsies and organ donations are permitted, burial should not be delayed any longer than necessary and the body must be buried as intact as possible. When exhuming and reburying the dead, care must be taken and the body must be treated with respect. No benefit can be derived from the dead, except in order to save a life. Some authorities rule that it is also permissible to impregnate the deceased's wife, using his sperm after he has passed away, if it is known that he would want this procedure done.

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#### NOTES

1. Baba Batra 154a
2. Responsa, *Minchat Yitzchak* 5:9
3. Baba Batra 154b
4. Responsa, *Binyan Tzion* 170
5. *Shulchan Aruch*, Yora Daya 363
6. Responsa, *Binyan Tzion* 171
7. Responsa, *Node BiYehuda* 5:210
8. Responsa, *Chatam Sofer*, Yora Daya 336
9. Responsa, *Iggrot Moshe*, Yora Daya 2:174
10. Responsa, *Tzitz Eliezer* 3: 66
11. Responsa, *Seridei Aish* 2: 102
12. Responsa, *Tzitz Eliezer* 3: 66
13. Halperin. (2001) Post-Mortem Sperm Retrieval. *Jewish Med. Eth.* 4: 29-37

#### Additional Notes

Cole, Feld, and Sherbin. (1998) Barriers to Organ Donations in the Jewish Community. *Transplant Coord.* 8: 19-24  
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# The Return of the Chazir

**T**he Aseres Yimay Teshuvah (i.e., the Ten Days of Repentance between Rosh HaShanah and Yom Kippur) mark the time period when HaShem waits – anxiously and expectantly – for the Jewish nation and each Jewish individual to return to His embrace. HaShem is most responsive during this time and yearns for us to do teshuvah – to repent for the sins

committed throughout the year. This concept of teshuvah is just one of the many examples regarding a fundamental theme in Judaism – the theme of returning. Each day, every Jewish person yearns for the redemption, the time when Jews from the Diaspora will return to Jerusalem. The Jewish nation hopes and prays for the rebuilding of the Bays HaMikdash and the ultimate reinstitution of the sacrificial order. As this theme of returning is so fundamental to Judaism, it is no wonder that rabbinic leaders pay special attention to any hint or reference to this concept. The Hebrew, for the verb “return” has the three-letter root, chet-zayin-resh. Of great etymological significance, the Hebrew word for pig (chazir) has the same

root letters. This suggests that one day the pig – the very symbol of the exile – will return as a permissible source of meat.<sup>1</sup> What kind of a return can we – as human beings – expect from a pig? Evidently, that will depend on the investment of time, effort, and research we are willing to commit towards understanding this animal.

Before delving into a detailed discussion about the swine, it is necessary to have some background knowledge about the animal, in terms of its place in Jewish history and in biology. Swine is the common name applied to a group of four-legged mammals that have stout bodies, short legs, thick and mostly bristled skins, long snouts, and short tails.<sup>2, 3</sup> The adult male

swine is designated as the boar, the adult female as the sow, and the young as pigs.<sup>4</sup> The terms pig, swine, and hog are used interchangeably to describe this animal. Using scientific classification, domesticated pigs belong to the phylum Chordata within the kingdom Animalia, to the family Suidae within the class Mammalia, to the order Artiodactyla, and to the genus and species, *Sus scrofa*.<sup>3, 5</sup>

The domestic pig has become increasingly popular throughout the scientific arena, as a pig’s internal organs are designed and oriented very much like those of a human being. Quite ironically, it is precisely these vast similarities between pigs and humans that render the pig non-kosher and unfit for consumption according to the laws of kashrus (i.e., Jewish dietary laws). A kosher animal is required both to chew its cud and to have split hooves. The non-kosher status of a pig is mentioned in Parshas Shmini: “And the swine, though its hoof is parted and is cloven-footed, yet it chews not the cud; it is unclean to you. Of their flesh shall you not eat and their car-



cases you shall not touch; they are unclean to you" (Vayikra 11:7). Interestingly, the Rambam reasoned that the rationale for the biblical prohibition of consuming swine is related, for large measure, to its inherent filth, health risks, and resulting distemper in those who consume it. Pork contains more moisture than necessary for human food and too much superfluous matter. Furthermore, the habits and food of swine are extremely repugnant and loathsome.<sup>4, 6</sup> Moreover, pigs suffer from various illnesses: "Ten measures of (skin) diseases descended to the world of which the swine took nine" (Kiddushin 49b).<sup>7, 8</sup> For example, trichinosis is a disease caused by the parasitic roundworm, *Trichinella spiralis*, which may infect humans that eat parasite-contaminated meat (most notably, pork) when raw or inadequately cooked.<sup>9</sup>

There are ten animals listed as possessing the two characteristics required of kosher animals. While there are a few animals that have only one of the two traits necessary for kosher meat, the pig is the only animal with split hooves that does not chew its cud. The Talmud, therefore, presumes that if a new species of split-hoofed animal is discovered, it may be eaten, as it can be assumed that it also chews its cud (Chullin 59a).<sup>1</sup> Rumination, or "chewing the cud," is a means by which many animals glean nutrition from their foods. Kosher (herbivorous ruminant) animals lack upper incisor and canine teeth but rather have a horny pad in their upper jaw. When chewing, the front teeth of the lower jaw are directed forward and upon closing the mouth, they simply press the grass tightly against the pad.<sup>10</sup> Pigs, in contrast, have 44 teeth, including two enlarged canines that grow upward and outward to form tusks in each jaw.<sup>3</sup>

While the chewing mechanism of ruminants is suitable for the mechanical digestion of vegetation, cows, deer, and other ruminants lack the enzyme necessary to chemically digest cellulose – the carbohydrate that functions as the chief structural component of plants. To compensate for their lack of this digestive enzyme, their digestive tracts contain bacteria and protozoa that degrade cellulose into simpler substances the host can absorb. While digestion by gastrointestinal microorganisms plays a relatively minute role in human nutrition, it is an essential feature in the nutrition of many other animals, including a few groups of herbivorous mammals. These animals have large, subdivided stomachs that perform a more complete and perfect digestion.<sup>11</sup>

A typical ruminant's stomach is divided into two main portions. The first portion includes a large chamber, called the rumen, and a smaller chamber, known as the reticulum. The second portion also consists of two chambers: the omasum and abomasum. When swallowing, the herbage passes through the esophagus and into the rumen, which may reach the capacity of up to fifty gallons of food and in which bacteria and protozoa convert cellulose and other complex organic molecules into a variety of simpler compounds. After the ingested material is softened and formed into cuds, a portion of the cud is regurgitated by spasms back into the mouth – an activity known as rumination (Heb. *ma'alay gayrah*).<sup>12</sup> The location of the rumen at the front of the four chambers is significant because it allows the animal to easily regurgitate and rechew the contents of the rumen. The cud is then swallowed and enters the reticulum, from which it passes to the omasum and then to the abomasum. Gastric glands

in the walls of the abomasum secrete digestive juices which mix together with the cud to further digest it. Only the abomasum is equivalent to the human stomach in function. This process of rumination is an extremely efficient process of digesting cellulose.<sup>11, 12</sup> According to Jewish tradition, chewing the cud alludes to the need to review and reexamine our actions – a procedure that is at the very core of Torah and mitzvos.<sup>13</sup>

Cloven hooves, the other sign required of kosher animals, symbolizes the need for a person to be complete from head-to-toe.<sup>13</sup> The Torah uses the words, *pasa* ("separate") and *shesa* ("tear apart"), to indicate that only the cloven hoof, divided in the front with a tiny separation and a large gap in the rear, is a true kosher hoof (Midrash Lekach Tov and Torah Shelayma Parshas Shmini).<sup>12</sup> A hoof, the horny covering of an animal's foot, is composed of three parts: the blade, which forms the forward wall; the sole, which forms the base; and the frog, which is the part of skin that fits into the cutaway portion at the rear. An animal may either have a closed hoof – as the horse, a partially split hoof – as the camel and llama, or a cloven hoof – as in the ten kosher animals, where the blade, sole, and rear end are divided into two parts.<sup>3, 12</sup> Swine are classified in the latter category, as artiodactyl ungulates (hoofed, with even-numbered toes).<sup>3</sup>

Although the Torah prohibits the consumption of swine, and the Rabbis (Bava Kama 79b) forbid the breeding of swine (this prohibition originated following an incident during the reign of Hyrcanus II when, instead of an animal fit for sacrifice, a pig was sent up the walls of Jerusalem during a siege),<sup>6</sup> there is a principle which champions that for

everything HaShem has forbidden us, He has permitted an equivalent substitute. The brain of the shibbuta, (suggested to be the mullet fish) tastes nearly identical to swine flesh (Chullin 109b and Vayikra Rabbah 22:10).<sup>8, 10</sup> Interestingly, there is another animal in the swine species whose meat is nearly indistinguishable from that of *Sus scrofa* and that may possess the criteria required of a kosher animal! This species of swine, closely related to the domestic pig, is the babirusa. Initial analysis suggested<sup>10</sup> that the babirusa possesses two stomachs, may chew its cud, and, as is common with all swine, has split hooves.

Not surprisingly, when first discussed in the 1980s, the idea of a

(14:7) mentions the shesu'ah, which is explained by Chazal to be a fourth species of animal that is described as chewing the cud but not possessing cloven hooves. The Talmud (Chullin 59a) explains that this list is exhaustive. Furthermore, the absence of upper incisors and canines is a characteristic of all ruminants, with the exception of the camel which has canines in both jaws. Accordingly, the Talmud explicitly negates the possibility of the existence of another ruminant that is non-kosher by virtue of its lack of cloven hooves. Thus, if it were to be shown that the babirusa lacked incisors and canines in its upper jaw, it would be defined as a kosher species on that basis alone. Absence of

Interestingly, there is another animal in the swine species whose meat is nearly indistinguishable from that of *Sus scrofa* and that may possess the criteria required of a kosher animal!

"kosher pig" created a definite sensation throughout the Jewish community. Nevertheless, it would appear that an animal with split hooves and that chews its cud is ipso facto kosher. In fact, according to Jewish law it is not essential to examine an animal for the manifestation of both split hooves and the chewing of the cud. As previously mentioned, the Torah (Vayikra 11:7 and Devarim 14:8) names only one animal, the swine, as a non-ruminant which has split hooves. Furthermore, Sefer Vayikra (11:4-6) enumerates three species of ruminants which chew their cud but which do not have split hooves: the camel, the rock-badger and the hare. Sefer Devarim

incisors and canines is itself evidence that the animal is a cud-chewing ruminant.<sup>1, 10</sup>

Assuming the babirusa possessed the required criteria of a kosher animal, that it closely resembles a pig is not sufficient for prohibiting its consumption. There are, however, two reasonable possibilities that would prohibit the consumption of the babirusa, regardless of its physical characteristics. The animal may have originated from crossbreeding between a kosher species and the swine. However, thorough analysis of this prospect deems it improbable, as the possibility that interspecific cohabitation between animals could yield viable

hybrid offspring is highly unlikely. From a halachic perspective, although the Talmud (Bechorot 7a) accepts the possibility that mating between animals of different species may produce offspring, it rejects the notion that progeny may be born of a union between members of kosher and non-kosher species.<sup>10</sup> As a result, the possibility of genetic mutation, transmitted from one generation to the next, is much more within the realm of both scientific and halachic considerations. The halacha to be applied in this situation is extremely clear. The Shulchan Aruch (Yoreh De'ah, 79:2) rules that the offspring of an unclean mother is non-kosher, regardless of whether the animal itself exhibits all the characteristics of a kosher animal. In addition to these two possibilities, it would still not be permitted to eat the babirusa because of an entirely different consideration. According to a number of rabbinic authorities, it is forbidden to eat the meat of any hitherto unknown species, even if it possesses the required characteristics of a kosher animal and does not resemble a non-kosher species (Chochmat Adam 36:1 and Rema, Yoreh De'ah 82:3).<sup>10</sup> Logically, if the babirusa were indeed a kosher animal, it would certainly serve as a much more obvious example of a kosher counterpart to the non-kosher swine than the brain of the shibbuta.<sup>10</sup>

In any event, this entire discussion is purely of intellectual interest. Closer examination of the babirusa revealed that it is a non-ruminant.<sup>10</sup> Originally, it was postulated that the anatomy of the babirusa's stomach was substantially different from that of the other pigs. Scientists recognized two clearly defined areas in the stomach; a cardiac and a pyloric portion. The apparent divisions of the babirusa stomach suggested to

these scientists that the babirusa was a transitional species between *Sus scrofa* with its simple stomach and ruminants with their more complex stomach. One scientist even suggested that he could identify in the babirusa all the chambers of the ruminant stomach, except the omasum.<sup>10, 14, 15</sup> However, more recent studies of the anatomy and histology of the babirusa stomach revealed that the basic abdominal structure closely resembles that of the other members of the swine species. The babirusa stomach is unilocular with a largely glandular, luminal surface. Furthermore, the histological composition of the glands is similar to that of *Sus scrofa*. The main feature that distinguishes the babirusa stomach from those of other swine is its bigger volumetric size and the proportionately larger surface area of the lumen, which is covered by mucus-producing cardiac glands. Mucus secretions which provide sufficient nutrients to support bacterial flora, apparently lead to the hypothesis that the babirusa is a non-ruminant forestomach fermenter. In conclusion, the babirusa is certainly a non-kosher animal.<sup>10, 14, 15</sup>

Interestingly, the Malbim (1809-1879) describes an animal remarkably similar to the babirusa. According to the Malbim, (Vayikra 11:7) this animal, referred to as a *tai'asu*, is found in the tropical areas of South America and possesses four stomachs. Although the Malbim seemed unclear, and perhaps even contradictory, with regard to whether this animal chews its cud, he reported that it has incisors in the upper jaw. As has been noted earlier, the presence of incisors is incompatible with chewing the cud (except for the camel). Accordingly, it must be assumed that the Malbim's intention was for us to realize that the *tai'asu* does not chew its cud.

The animal that the Malbim referred to is the *tayassu*, found primarily in Central and South America. While the Malbim appeared to be inaccurate in describing the *tayassu* as possessing a four-chambered stomach (the scientific debate is between two or three chambers), all agree on the crucial point – that the *tayassu* is non-ruminating.<sup>10</sup>

Were the babirusa to chew its cud as originally speculated, its kashrus status still would be doubtful. However, as all evidence clearly indicates that the babirusa lacks the necessary physical criteria of a kosher animal, it must be regarded as non-kosher. The Talmud is, of course, all the more than willing to send the pig "back to the mud." Throughout Talmudic literature, the pig is consistently vilified and degraded. Any reference to the pig is completely negative and associated with inherent filth or evil. In fact, the abhorrence of swine is so great that the Talmud avoids mentioning it by name. Rather the pig is referred to as *davar acher* – another thing (Menachot 64b, Bava Kama 7:7, and from the Yerushalmi, Shekalim 47c).<sup>1, 6</sup> Recall, for example, that the pig is the only non-ruminant animal with split hooves. This characteristic of the pig symbolizes hypocrisy, as the pig is outwardly acceptable – yet deficient in terms of an inner analysis. Moreover, unlike other animals, which fold their legs underneath their bodies when crouching, the pig stretches out its legs, thereby advertising its one and only kosher sign and pretending that it is a kosher animal.<sup>1</sup> This image of the swine presenting its split hooves as falsified evidence of its purity is a powerful image to which various personalities in the Torah deemed hypocritical are compared. For example, the following Midrash is told about Cayin. "And

Cayin went out...Whence did he go out? Rabbi Aibu said: 'It means that he threw the words behind him and went out, like one who would deceive the Almighty.' Rabbi Berechiah said in Rabbi Eleazar's name: 'He went forth like one who shows the cloven hoof, like one who deceives his Creator'" (Midrash Rabbah: B'rayshis 22:13).<sup>1</sup> Other biblical figures are described in reference to the pig as well. Eisav, Pharaoh, and Vashti exhibited the behavior of pigs. Furthermore, the wild boar, and its domestic variety (i.e., pigs) parallel Eisav and the kingdom of Edom (Rome) in several ways. Just as the swine feigns purity with their hooves, the Roman State committed violence and robbery under the false pretenses of establishing a judicial tribunal (Midrash Rabbah: Vayikra: 13:5).<sup>1, 6, 16</sup>

As another example, pigs are unusual creatures in that they have virtually no neck. Their massive skulls emerge almost directly over their shoulders. As a result, they have very little mobility of the head. The significance of this relates to the following verse: "Lift up your eyes upon high and perceive Who created these!" (Yeshayahu 40:26). This pasuk is an instruction to lift up our heads and be awed by the vastness of the universe. By doing this, humans submit themselves to HaShem's authority. However, the pig, with its short neck, cannot lift up its head to contemplate the skies. As such, it represents Edom, who does not accept the lessons the heavens are trying to teach us. The second Bays HaMikdash fell to this evil empire, sending us into the exile which has continued for the past two thousand years. Naturally, we pray for the end of this exile, and for the fulfillment of HaShem's promise: "And I shall banish the terrible beast from the land...(Vayikra 26:6). The terrible beast



is none other than the pig...the wicked Eisav” (Midrash Tehillim 120:6).<sup>16</sup>

From a Jewish perspective, pigs have never been able to acquire much positive attention or interest; instead they have always been considered destructive, beastly animals that enjoy a complete lack of popularity. Still very common in the Galil, Golan, and Carmel regions of Israel, wild boars frequently raid orchards leaving mass destruction in their trail. On rare occasions they have been known to injure and even kill people.<sup>16</sup>

The pig tends to be destructive to human populations in other ways, as the domestic swine is capable of spreading fatal and contagious diseases to humans. As the anatomy and physiology of the pig and human are remarkably similar, viral transmission across species is possible, as noted in the early 20th century with the rapid spread of a “killer flu” that had a human-pig pedigree. The great flu pandemic of 1918 killed approximately 40 million people worldwide – 675,000 in the United States alone.<sup>17</sup> Scientists claim, after nearly 80 years of research, that this specific influenza virus originated in pigs.<sup>17, 18, 19</sup> Several researchers at the Armed Forces Institute of Pathology in Washington, D.C., including pathologist Jeffery Taubenberger and molecular biologist Ann Reid, spent much time focusing on the cause of the 1918 Spanish flu. Taubenberger and Reid began this research project with several dozen samples of lung tissues, preserved in their Institute’s archives, from soldiers who died of the 1918 flu. They analyzed nucleic acids from these specimens by polymerase chain reaction (PCR), a technique which creates millions of copies of a single gene or any specific

fragment of DNA or RNA. Although PCR can amplify any nucleic acid, in the case of the flu virus this technique may not be useful. The flu virus normally infects the respiratory system, replicates there, and is subsequently released into the exhaled air via the lungs – all in just a few days. Therefore, viral genes could only be located in a victim who died immediately upon infection. Furthermore, the flu virus stores its genetic information on single strands of RNA, which are much more susceptible to degradation by cellular enzymes than DNA.<sup>17</sup>

To find viral RNA, the researchers attempted to refine their PCR procedure. In addition, they carefully examined each of the lung-tissue specimens for any indications of viral infections, such as lung air spaces filled with fluid and damaged cells in the bronchial epithelial linings. Of the 28 tissue samples examined, only one exhibited all the features of viral pneumonia. This sample was also the only specimen in which flu virus RNA sequences were identified. These sequences included segments of five genes; two of which encoded hemagglutinin and neuraminidase – proteins that help the virus get into a host cell, and three viral structural proteins. Hemagglutinin and neuraminidase gene fragments confirmed earlier conclusions about the source of the virus. Since the flu viral genes from the positive specimen closely resembled those of viruses isolated from pigs, the researchers concluded that this virus had been in the pig population. Their theory was further enhanced by previous studies of antibodies in blood from people who had lived through the 1918 pandemic, indicating that this killer plague was a classical swine flu.<sup>17</sup>

Obviously, it is extremely important for epidemiologists and public health professionals to monitor pig populations throughout the world, as the ever-mutating flu viruses in swine potentially are the sources of virulent strains that could infect humans. Incredibly, our Talmudic sages were well aware of the homology between pigs and humans and understood the dangers pigs could cause to the human population. In the Talmud (Ta’anit 21b) the following incident is related: Rabbi Yehudah was informed that pestilence was raging among the swine and he ordained a fast. In response to this, it was questioned as to whether Rabbi Yehudah was under the impression that a plague raging through one species of animals poses a threat to other species. It was concluded that the case of the swine is unique, because its intestines are similar to those of human beings. (This halacha is also mentioned in the Shulchan Aruch, Orach Chaim 575:3). Therefore, a plague that strikes pigs poses a potential threat for the people in that area. Furthermore, Rashi explained that pigs, like humans have no rumen, unlike other livestock. Therefore, the Meiri believed that people are more susceptible to intestinal epidemics that affect pigs than to those affecting other livestock.<sup>19, 20</sup>

Although the remarkably similar anatomies of pigs and humans can pose a threat of viral

pigs and humans and understood the dangers pigs could cause to the human population..”

transference from pigs to human beings, recent scientific breakthroughs have revealed that the pig may harbor the solution to one of the most vexing problems of modern medicine! Over the past several decades, breakthroughs in transplant surgery have extended the lives of patients with failing organs. Advances in surgical techniques and immunosuppressive drugs now allow surgeons to transplant practically the entire inventory of human organs, including the kidney, liver, heart, lung, pancreas, and small intestines.<sup>2</sup> With such surgical advances, just 22,854 transplants were performed in the year 2000, with about 77,000 people awaiting organs.<sup>21</sup> To survive, most desperate patients must rely on another's tragedy. Others receive transplanted whole organs, such as kidneys, and segments of the liver, lung, and pancreas from living donors. Even more troubling is the thriving international black market involved in the sale of human organs.<sup>2, 22</sup> As the supply of organs in the United States and other nations is inadequate, it is no wonder that many are looking for an organ source that is not another human body.

Medical researchers are trying to solve the problem of a deficient supply of transplants. One proposed solution is to grow or culture new human body parts in the laboratory. Laboratory-grown skin for burn victims and cultured cartilage for joint repair are already available. However, these are primarily single cell types, while an organ, such as a heart, is composed of various types of cells, and it is extremely challenging to culture all the cell types and then manipulate them to work together. Tissue engineers estimate that complete organs grown in vitro are at least 5 to 10 years away.<sup>2, 23</sup> Another option is to use organs from genetically altered pigs.

Five piglets have been recently cloned for this endeavor. The pigs' potential as organ donors are not obvious, but they are definitely real. As mentioned previously, the organs of the pig are nearly identical in size and function to those of the human, which is why fetal pigs are the standard choice for dissection in undergraduate anatomy courses. Although pigs grow to over a half a ton, researchers believe the transplanted pig organ will take growth cues from the human host.<sup>2, 23, 24</sup>

For a variety of reasons, more attention is focused on the pig rather than on primates because most people question the ethics of breeding chimpanzees, gorillas, and orangutans for their organs.<sup>2, 25</sup> Raising pigs is commonplace, as 95.7 million pigs are slaughtered yearly for their flesh<sup>2</sup> and the number of pigs needed for donor organs is less than one-thousandth that number.<sup>6</sup> Moreover, the great apes reproduce extremely slowly and it would be impossible to raise a sufficient supply. In contrast, pigs multiply quickly. The Talmud (Bechorot 8a) mentions that the swine's gestation period is only 60 days.<sup>8</sup> Furthermore, a sow can become pregnant at six months of age and have two litters annually – with approximately 10 piglets each.<sup>2</sup> In addition, pig heart valves have been used to replace human heart valves since 1974.<sup>23</sup> (Pig valves are treated and do not contain living cells, while major organs must be alive to function.)<sup>23</sup> People have also utilized hormones, such as insulin and growth hormone, harvested from pig.<sup>24</sup> Furthermore, patients with severe liver failure have been able to wait longer for a transplant by having their blood filtered outside the human body through a pig liver.<sup>23, 26</sup> Of great significance, Dr. David K. Cooper, an immunologist at

Massachusetts General Hospital, acknowledged that "the quality of donor pig organs will certainly be better than those from human cadavers. Brain injury and brain death can stress organs, particularly the heart."<sup>27</sup> However, there is an incredible challenge with regards to xenotransplants (i.e., interspecies transplantation). In humans, transplanted organs from animals elicit a violent immune response, called hyperacute rejection. Antibodies identify alien sugar antigens on the xenotransplanted organs, igniting an explosive inflammatory reaction that destroys the organ, causing it to die even before the surgeon can close the incision.<sup>2, 23, 28</sup> While organs from chimpanzees or baboons do not trigger as strong a hyperacute rejection, they do pose a larger threat of disease transmission.<sup>29</sup>

Hyperacute rejection kills by suffocating the organ, as it starves the organ of oxygen by causing the blood to clot. Antibodies in the recipient's blood attach onto the endothelium – the inner lining of the organ's blood vessels – and signal the immune system to mount an attack. The assault is generated by the human complement system – a collection of plasma proteins that when activated permeate throughout the endothelial cells and disrupt their mechanisms. Gaps open between these cells, creating leaks in the blood vessels, and the endothelium becomes rough, causing blood cells to stick and form clots. Smaller blood vessels become entirely blocked, and the affected organ loses its source of oxygenated blood and dies within minutes.<sup>2</sup>

In 1992, researchers cloned the gene for the human complement inhibitor. Complement inhibitor, a protein manufactured by the cells that shield other cells from complement attack,



allows the immune system to destroy an invader with minimal damage to the body's own cells. As a result, researchers created genetically engineered pigs whose cells produced the human complement inhibitor. It was postulated that this could offer a natural approach to lengthening the time a pig organ could survive inside a human host. Although this method did prolong organ rejection, its benefits were still too limited.<sup>2, 28</sup>

Several years ago, researchers in Australia discovered the actual weapon in the pigs' organs that triggers the human immune system so violently. The sugar molecule, alpha-galactose, surrounds the endothelial cells lining a pig's

innocuous human counterpart. These pigs carry a second human gene for an enzyme called H-transferase. When this enzyme is active, most of the precursor for alpha-galactose is transformed into the sugar molecule that appears on human type O blood cells, which all humans tolerate. As a result of this discovery, genetically manipulated farm animals that produce the human H-transferase enzyme (and a tiny bit of alpha-galactose) were engineered.

Recently, using nuclear transfer technology, scientists cloned five female pigs which were genetically altered to remove one allele of the alpha-1,3-galactosyltransferase gene. In the future, researchers hope to create alpha-1,3-

Researchers plan to continue identifying and replacing the **various features of pig tissue** that alarm the human immune system. It is desired to create a **universal donor pig** whose **organs are accepted by the human body.**

blood vessels and is immediately recognized as a foreign antigen by the human immune system, which then produces antibodies. These antibodies direct complement proteins and other components of the human immune system to focus their attention on pig tissue. Presumably, by deleting the gene for alpha-1,3-galactosyltransferase, which encodes for this specific sugar molecule, a pig's organs are much less threatening to the human immune system. However, at the time of this discovery it was not yet feasible to create a pig without this gene. Therefore, researchers have taken an indirect approach and created pigs that convert the alpha-galactose into an

galactosyltransferase null (homozygous knockouts) pigs either by breeding the female clones to heterozygous males produced by nuclear transfer or by sequential nuclear transfer modification of cell lines produced from the cloned piglets. As alpha-1,3-galactosyltransferase null mice have already been produced, it is not anticipated that this genetic modification will be lethal in the null pigs. Researchers plan to continue identifying and replacing the various features of pig tissue that alarm the human immune system. It is desired to create a universal donor pig whose organs are accepted by the human body.<sup>2, 30, 31</sup>

Jewish law places great importance upon treating living creatures with kindness and posits an unequivocal prohibition against causing cruelty to animals.<sup>10</sup> Nevertheless, the Rama ruled that any activity deemed necessary for medical situations is excluded from the prohibition of cruelty to animals (Shulchan Aruch, Even Haezer 5:14). The Rama based this statement on the fact that the world and everything in it was created by HaShem to serve mankind. While none of the 15th century sources that the Rama based his ruling actually specify any medical use to which living animals can be manipulated, all subsequent permissive rabbinic rulings on animal experimentation for medical research are based on this statement. Therefore, the prohibition of cruelty to animals does not apply in the medicinal world.<sup>24</sup>

In the aforementioned sources, it was explained that Jewish people who observe the laws of kashrus are forbidden to raise pigs or eat their meat. As a result, it might be argued that transplanting pig organs into observant Jews would be prohibited. However, the only halachic prohibition regarding pig-derived products is eating them and, under certain circumstances, deriving monetary benefit from them. It is, therefore, permissible to use pig-derived products for manufacturing clothing and developing pharmaceutical products. Furthermore, the preservation of human life in Judaism is a Divine commandment. Even the prohibition against eating pig products is set aside whenever there is a danger to life. Therefore, Judaism would certainly condone the uses of xenotransplants in order to save lives.<sup>24, 32</sup>

There is, however, one consideration that needs to be dealt with before we can declare the laboratory pig "ready to

go." The pig-human boundary warrants careful consideration. For example, just as the virus responsible for AIDS apparently originated in monkeys and was somehow transmitted to humans, a similar virus might be lurking in pigs.<sup>2</sup> Indeed, researchers in England reported that pigs do carry at least one virus in their kidney cells that can infect human cells. As this virus is actually encoded in the pigs' DNA, it would be nearly impossible to delete it without genetic engineering, and even then no one would know what other viruses might be hiding in pigs.

However, many researchers feel that we can still "go on with the show." As pigs are distant enough genetically from people, latent viruses hiding in their DNA may pose little risk. The researchers involved in detecting these latent viruses recognize that they do not reproduce easily in human cells and may not cause disease inside the human body.<sup>2, 26</sup>

Most significantly, researchers certainly acknowledge the imminent need for transplant organs. However, inherent dangers are a real possibility. From a halachic standpoint there is always a question of moving from the laboratory to the clinic. It has always been a leap of faith, as there is certainly no way to determine whether the human organism will respond as the laboratory animals did during the years of research. This is certainly an intriguing halachic issue. Obviously, before surgeons transplant pig organs into humans, disease specialists need to determine all the dangers involved. If it is judged too hazardous, the hopes of those needing new organs will turn to other possible sources, such as culturing human replacement organs. In fact one research scientist, Jonathan S. Allan, D.V.M., of Southwest

Foundation for Biomedical Research, explained that "there are more promising approaches down the road. We may see better artificial organs, or ways to regenerate our own organs."<sup>27</sup> Nevertheless, if pigs live up to their expectations, hospitals all over the world may be ordering organs from large farms, where thousands of pigs are raised in fully antiseptic conditions in order to prevent viruses or microorganisms from infecting their organs. Although these pigs will undoubtedly look just like any pig, our immune systems will deem them (almost) human-like.<sup>2, 26</sup>

When it comes to rising above expectations, a pig can certainly have its day. In the north woods of Presque Isle, Pennsylvania, Jo Ann Altzman suffered a heart attack while on vacation. Although the family dog failed to respond, LuLu, "the family pig," leaped out of the Altzman's mobile home and, presumably by trailing chipboards, ran to the nearest road and threw herself down on her back in the path of traffic. While drivers probably honked and swerved, the determined sow eventually persuaded a young man to follow her back to the mobile home, where he immediately called for help. This achievement made LuLu a media star, but for pigs too, fame has its price; since the event the heroic LuLu has more than doubled her weight to 320 pounds. "Sometimes, given the opportunity, even a pig can rise above its nature and risk all to aid a loved one. Most of the time, though, a pig is just a pig."<sup>33</sup>

Although the pig has been vilified for centuries, it appears that the chazir does have a fighting chance at repairing its reputation. Interestingly, the Or HaChaim champions this view. The Or HaChaim (Vayikra 11:7) quotes an

unidentified Midrash which comments: "Why is it named 'chazir'? Because it will one day return to become permissible." The pig will eventually return to the status (as a permitted source of meat) it held before the Torah was given to the Jewish nation. Naturally, the Or HaChaim questions the intent of this statement. As it is a fundamental principle of Judaism that the Torah is immutable, it follows that a pig, which does not chew its cud, cannot be declared a kosher animal. Therefore, the statement "but it does not chew its cud" (Vayikra 11:7) must be conditional in nature, and it is forbidden to consume the pig only as long as it does not chew its cud. The Or HaChaim continues by stating that in the eschatological era it will chew its cud and become permissible. "Indeed, the etymological analysis presented by the Or HaChaim would lead to acceptance of a cud chewing pig not only as a kosher animal but as a harbinger of the eschatological era as well."<sup>10</sup> It is debatable as to whether or not this Midrash is allegorical in nature, however, recent scientific breakthroughs may give this Midrashic source more validity than once anticipated. While the babirusa demonstrates a futile attempt at explaining the Midrash, this Midrash certainly "sheds some light" on the phenomenon of a pig saving thousands of lives.

This Midrash illustrates a profound message as well. Everyone is aware that perceptions can change. Attitudes can change. People can change. Although the Jewish nation is described as an am keshei oref, a stiff-necked, stubborn nation that resists change (Yevamos 79a), change is still possible, and the reward is immense. People who change feel exhilarated. They feel they are in control of their lives. Most significantly,

when people change, they feel closer to HaShem and closer to each other.<sup>34</sup> Certainly, if the chazir can change, become kosher, and cease to be a symbol of hypocrisy and evil, then the Jewish nation, being inherently close to

HaShem, can undoubtedly invest positive effort and return to HaShem's embrace. The "return of the chazir" serves not only as a reminder for us to utilize HaShem's creations to their utmost potential, but also for us to take full

advantage of our status as am hanivchar – the Chosen nation.

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# The Kof, Reverse Evolution, & the Adnei Ha-Sadeh

As noted in Chagigah (16a), human beings have three characteristics in common with, and three other characteristics distinguishing them from, animals. The similarities include eating and drinking, elimination of wastes, and reproduction. Human beings are distinct from animals in that human beings have understanding, communicate verbally, and walk erect.

According to kabalistic thought, kofim (or, primates) are the connecting link between animals and human beings. The Arizal taught that in between every two levels of reality there is always an intermediate level. The kof is the intermediate level between animals and human beings. As every intermediate has two sides, one aspect of the kof relates to its animalistic tendencies and the other aspect relates to its similarities to human beings.<sup>1</sup> This idea was elaborated upon by Rabbi Solomon Ibn Verga (1460-1554) in *Shevet Yehudah*, a compilation of accounts of the persecutions undergone by the Jews from the destruction of the Second Temple until his own day. Interspersed within the historical accounts was a brief discussion of the natural sciences, in which he described

the hierarchical sequence of life as follows: Coral is the connecting link between inanimate matter and plants. The aquatic sponge, which has senses and feeling, is the connecting link between plants and animals. The kof is the connecting link between animals and human beings. This article discusses the kof in midrashic and talmudic literature.

Although kof is translated as "monkey," "primate" may be a more appropriate term. The biological order of Primates includes about 180 mammalian species. Primates are characterized as having opposable thumbs, or thumbs that can touch each of the other fingers and thereby can function in grasping objects. In addition, primates have shortened snouts, with eyes on the front, rather than on the side, of the head, thereby allowing

for stereoscopic (or, three-dimensional) vision. Primate gestation is lengthy, with one birth at a time and with an extended juvenile period of dependency, during which there is an emphasis on learned behavior and complex social interactions. The order Primate contains two suborders, Prosimii and Anthropoidea. Prosimians, or the pre-monkeys, include the squirrel-like lemur and the mouse-sized tarsier, and anthropoids include monkeys, apes, and human beings.<sup>2</sup> Monkeys are subdivided into two categories: the Old World monkeys, which include those indigenous to Africa and Asia, and the New World monkeys, those of the Americas. These two types of monkeys differ in appearance. The New World monkeys have grasping tails and flattened noses, with round nostrils that face to the side. Two of the better known New World monkeys are the spider monkey and the capuchin, or the organ grinder's monkey. Old World monkeys lack grasping tails, have protruding nostrils, are diurnal, and generally are larger than their New World counterparts. Two of the better known Old World monkeys are the baboon and rhesus monkey.<sup>3</sup>

Apes differ from monkeys in several ways. Apes have no tails and



generally have a larger body weight than most other primates. They have a more upright body posture and a broad chest, rely more on vision than on smell, and have a broad nose rather than a snout. Apes have a larger brain relative to their body size than do other primates. Gorillas, orangutans, and chimpanzees are categorized as apes.<sup>3</sup> It is doubtful that primates were indigenous to Eretz Israel. The first mention of kof is in Melachim I (10:22). Hiram's ships acquired exotic animals from Tarshish (Tunisia, according to the Abarbanel; Spain, according to the Malbim) and returned once every three years to King Solomon with "ivory, kofim, and peacocks." The acquisition and transport of kofim to Eretz Israel by sailors is also cited in Divrei HaYamim II (9:21) and

animals that defile anyone who touches their carcasses. "And everyone that walks on "ka'paav," among all the animals that go on four legs, they are unclean to you; whoever touches their carcasses shall be unclean until the evening" (Yayikra 11:27). Rashi translated "ka'paav" as "its paws" and included such species as a dog, bear, and cat. The Sifra, however, translated "ka'paav" as "its hands, like an ape" and "all that go" was interpreted to encompass the long tailed monkeys.

As noted by R' Ibn Verga, the kof is an intermediary creation, between animals and human beings. In Berachos (58b) it is stated that upon seeing a kof, an elephant, and a vulture, one is required to recite the blessing, "Blessed are You .... Who diversifies the creatures." Apparently, the

the life of a human being are described, a bent, old man is compared, in appearance and demeanor, to a kof. An interesting similarity between primates and human beings is menstruation of the females, as cited by R' Tobiyah ben Yirmiyahu Moses HaCohen (?-1729) in his sefer, Ma'ase Toviyyah (Olam HaKatan, chapter 11), written about 300 years ago, and by R' Phinchas Elijah Hurwitz (1765-1821) in Sefer HaBris. R' Hurwitz also mentioned other similarities between primates and human beings, including facial appearance, hands and feet subdivided into digits, and walking erect. In Sefer HaBris, R' Hurwitz also acknowledged differences amongst the primates, differentiating between tailed monkeys and tailless apes and further among chimpanzees, gorillas, and orangutans.

However, similarities between kofim and human beings extend beyond appearance. The intelligence of primates and their ability to perform specific tasks were recognized in the Talmud. Primates were trained to clean house (Bava Kama 80a; Tosefta, Bava Kama 8:17) and to dye wool, although the quality of their work left much to be desired (Tosfot, Bava Kama 101a). In Sefer HaBris R' Hurwitz noted that primates were taught to chop wood, gather firewood, eat from a plate with a fork and knife, and to drink from a glass. Although primates were trained to perform simple tasks and domestic duties, Chazal were still cognizant of the wild nature of these animals. Thus, Chazal questioned the suitability of raising kofim, as they frequently bite or wound their owners (Kohes Rabbah 6:11). The use of primates to perform work is, apparently, still news worthy, as noted in a recent Associated Press item, dateline Thailand. The article related the ingenuity of Tawee Phanthachang, an owner of orchards of tamarind, mango, and coconut. Concerned with the rising cost of hiring farm workers, he trained twenty macaque

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in Nedarim (50b).

Professor Y. Feliks<sup>4</sup> suggested that most designations of kof in rabbinical literature refer to long tailed Old World monkeys, rather than to tailless apes. For example, in Berachos (57b) it is stated, "All kinds of beasts are a favorable sign when they are beheld in a dream, except for an elephant, kof, and kipod." Rashi suggested that as these animals have an exceedingly strange appearance, their appearance in a dream was a bad omen. The kipod was defined by Rashi as the marten [a type of weasel], an animal whose appearance resembles a kof, in that it has a long tail. Kofim were recognized as wild, not domesticated, animals (Kalyim 8:6) and were enumerated with those wild

Baraisa specified these three specific species because of their strange appearance. However, according to the Meiri, these specific creatures were noted as they have features in common with human beings; this is most obvious in comparisons between kofim and human beings. The genetic closeness between human beings and kofim has been confirmed through DNA analyses. Human beings and chimpanzees share in common 98.4% of their DNA, differing by only 1.6%. Gorillas differ somewhat more, by about 2.3% from human beings and orangutans by 3.6% of their DNA.<sup>5</sup> Physical similarities between kofim and human beings were noted in midrashim and in the Talmud. In Kohes Rabbah (1:3), in which the seven stages in

monkeys to pick fruit from his orchards. Towee noted that the monkeys “are loyal ... and not afraid of heights. On top of it, they neither complain nor ask for a raise.”<sup>6</sup> On a more serious note, Helping Hands, an organization devoted to aiding quadriplegics, provides capuchin monkeys trained to perform some of the simple tasks a quadriplegic can no longer perform.<sup>7</sup>

That kofim can be taught specific tasks (Rashi, Eruvin, 31b) prompted rabbinical discussions concerning whether a primate can be used to perform a mitzvah (e.g., see Yadayim 1:5, for a debate on the suitability of a kof for the pouring of water to cleanse one’s hands). A primate lacks the mental focus and purposeful intent (i.e., *kavanah*) for intellectually performing a mitzvah. In fact, the performance of a mitzvah in an inappropriate manner has been likened to it being performed by a kof (Menachos 7a, 100b; Yoma 29b). The phrase, “*ma’aseh kof*” is used to describe an act that does not have halachic significance, such as a circumcision performed incorrectly by irreligious mohallim (Chatam Sofer, Yora De’ah, 248). As a primate’s intelligence is not equivalent to that of a human being, a kof cannot be utilized to perform a mitzvah in its totality. Although a primate can carry an object from one location and deposit it at another specific location, the kof – by itself – cannot establish an *eruv techumin*, as it is incapable of formulating the purposeful intent needed to acquire the place as a dwelling. However, if the kof merely functioned as the transport vehicle and another person was instructed to receive the object from the kof and then to properly deposit it, the *eruv* is valid (Eruvin 31b).

R’ Ibn Verga’s statement that kofim serve as the connecting link between animals and human beings undoubtedly included similarities in social organization and interactions. Over two centuries ago, R’ Hurwitz in Sefer HaBris wrote about the

food gathering behavior exhibited by a colony of kofim. Groups of monkeys enter a field containing produce. Sentry monkeys are placed at each corner of the field; should a predator approach, the sentries scream thereby alerting the group to flee. The gathered food was passed from one to another and finally placed in a storehouse for community use. R’ Hurwitz also noted that the female monkeys menstruated and carried their offspring on their chest (rather than clinging on their backs). Male monkeys showed an interest in the offspring and would take the offspring from the females, carry the offspring in their arms, and eventually return them to the females. Male-female conflicts were also noted. R’ Hurwitz’s descriptions of social interactions among primates were similar to those of Jane Goodall, in her studies of chimpanzees in the wild. As summarized by D.R. Schwartz,<sup>4</sup> Goodall’s chimpanzees exhibited craft at tool making, cherished their loved ones, experienced family disputes, were depressed at the loss of their loved ones, hunted meat, gathered flora, and engaged in war over territory, females, and offspring.

Human speech is recognized as the dividing line between us and the rest of the animal world. Targum Onkeles translated “and man became a living being” as “and man became a speaking being” (Bereshis, 2:7; see also R’ Sorotzkin’s commentary<sup>9</sup> on this verse). While monkeys are noisy creatures, chattering and shrieking to one another using different alarm cries to signal different types of dangers, the apes, for the most part, are fairly quiet and do not depend as much on calls and cries to keep their group acting in harmony. The slow-paced life of gorillas does not need cries to coordinate the action of the band and the fairly solitary life of the orangutan also does not require such calls. The chimpanzee is the noisiest of the tailless apes, yet still only uses about a dozen different

noises, such as grunts, hoots, screeches, and whimpers compared to the hundreds of sounds the human vocal organs can produce. Although calls and cries are effective, they are not a true form of communication, whereby an animal deliberately sends a message to another member of its group rather than just giving voice to an emotion. In the 1960s and 1970s, the discovery that apes could use hand gestures and symbols to communicate resulted in many primate learning research facilities. In one such facility, Koko, a gorilla, was trained to use American Sign Language (ASL) to express her feelings and desires. Washoe, a chimpanzee, was taught ASL and learned 132 different words, which she used in her daily interactions with her human companions. The vocabulary and sentences of ASL-taught apes are comparable to that of a two-year old human.<sup>10, 11</sup> Perhaps, such gestured communication was a criterion recognized in kabalistic thought and contributed to the kof’s classification as an intermediate between human beings and animals.

Many linguists, however, still believe that apes have no real grasp of human language, but are merely imitating their human companions.<sup>10</sup> In Sefer HaBris, R’ Hurwitz told of an interesting incident regarding a kof that fatally mimicked human behavior. Apparently, a kof was accustomed to enter a specific house of a human being and therein to cause much damage. The human being, unable to trap the animal, thought of an ingenious plan. While the

kof was watching, the human being took a knife and passed it by his throat several times. When the human being placed the knife down, the kof grabbed it, repeated the gestures performed by the human being, and in the process the kof slaughtered itself.

Current biblical commentaries have coined the term, reverse evolution, to explain the various midrashic and talmudic references of mammalian anthropoids arising from human beings. R' Elie Munk,<sup>12</sup> a chief proponent of this concept, noted that according to tradition, Abel, Cain, and Seth were not the only progeny of Adam (Eruvin 18b). Based on Bereishis 5:4, R' Munk quoted Rav Sherira Gaon (as cited in the Radak) and the Rambam (Guide to the Perplexed 1:7), who suggested that some of these progeny were anthropoid mammals, half-human and half-animal. According to the Zohar (1:54), other degenerate human-like creatures were begotten by acts of bestiality committed by Cain. Furthermore, during the generation of Enosh, the human appearance degenerated, becoming more primate-like (Bereshis Rabbah 23:6). According to these sources, human beings and various other primitive, mammalian anthropoids simultaneously existed in a common environment. Interestingly, this is in accord with current thought. For example, four different species of hominoids – *Paranthropus boisei*, *Homo rudolfensis*, *Homo habilis*, and *Homo ergaster* – presumably lived in what is now part of northern Kenya. Although paleoanthropologists have no idea how these different species interacted, they all foraged in the same area around Lake Turkana.<sup>13</sup> R' Munk also cited Sanhedrin (109a), in which are noted the varied punishments meted out to the generation of the Tower of Babel. One group of the Generation of Dispersion was flung into the forests; these people degenerated to kofim (Margaliyos HaYam). The M'la'chas Shlomo (Kilayim 8:6), ques-

tioned why the b'racha, "Who diversifies the creations," is specifically recited upon seeing a kof (and two other animal species) but not upon viewing the myriad of other strange creatures, and presented an interesting answer. Literally, this b'racha can be translated as, "...Who changes the creations," i.e., the kofim were changed from humans into primates. The gradual, but progressive, degradation of the human appearance was elaborated in Bava Basra (58a): Compared with Sarah, all other people are like a kof to a human being; compared with Chava, Sarah was like a kof to a human being; compared with Adam, Chava was like a kof to a human being; and compared with HaShem, Adam was like a kof to a human being. R' Munk concluded that "the Sages of the Talmud and Midrash stand opposed to Darwinian theories, which have human beings descending from the ape. For the Rabbis, the ape is, on the contrary, a malformation of man."

Whereas the majority of primates undoubtedly were distinct creations at Ma'aseh Bereshis, a specific species of non-human primate may have evolved from the Generation of Dispersion. It is interesting to speculate on the possible identification of this specific species of primate. Based solely on size and physical appearance, gorillas and orangutans would be the logical choices. As noted, there is much similarity in the DNA composition between apes and human beings.<sup>5</sup> Although the gorilla is the larger hominoid and its DNA composition is more similar to that of human beings, of the two apes, orangutans are the closest – at least in reproductive behavioral patterns and physiology – to human beings. Most mammals, including most primates, can mate only when the female is in estrous. At any other time of the menstrual cycle, mating for the female is physiologically and physically impossible – even if the opportunity to copulate were to present itself. The peri-

od of estrous is timed to the menstrual cycle: a female comes into estrous at the peak of her fertility, which is during ovulation. At estrous there are also external physical signs, such as the ballooning of the female genital region that coincides with peak fertility, which is ovulation. Such external signals alert males to the female's sexual receptivity and, thus, to the opportunity to produce offspring. Female orangutans are unique among the apes in that they do not have an estrous cycle, with its behavioral constraints and external physical signs, imposed upon their menstrual cycle. Given the chance, female orangutans copulate throughout the menstrual cycle. For gorillas, however, copulation is restricted to the period around ovulation. Female orangutans have not been found to show any external physical changes in the genital region at ovulation or any other phase of the menstrual cycle. Female gorillas, however, have some physical signs of estrus. Copulatory bouts between orangutans are quite long, in contrast to the seconds it takes gorillas. Orangutans and human beings have the longest gestation period of any primate. A chimpanzee usually gives birth after 245 days, a gorilla after about 260 days, and an orangutan and a human being after about 270 days. When the female orangutan is ready to mate (they do so infrequently, there being up to 7 years between offspring), she forms a partnership with an adult male. This partnership is for many weeks, not for just a brief period around the time of ovulation. Bouts of "lovemaking" are quite long, no quick thrusts of intromission as characterize most mammals, including chimpanzees. Rather than mounting the female from behind, as, for example, a male monkey does, the male orangutan frequently mates in a face-to-face position with the reclining female. It appears that the same orangutan male pairs with the female when she enters the next birthing phase of her life. Thus, there are obvious



positive comparisons in the sexual and reproductive behavior of orangutans and human beings. Furthermore, orangutans and human beings share several anatomical similarities. Neither walks on knuckles (as do chimpanzees and gorillas) nor is normally ambidextrous; both have heavy molar enamel, widely separated pectoral breasts, and a steady secretion of estradiol. Most mammals display some asymmetry between the right and left sides of the brain in size and morphology. Among mammals, human beings have the most extreme of cerebral asymmetries. Next to human beings, the orangutan has the greatest amount of right-left cerebral asymmetry, the chimpanzee noticeably less, and the gorilla the least.<sup>14</sup> The orangutan appears to be an excellent candidate for the nonhuman-primate that arose by reverse evolution from the Generation of Dispersion. Interestingly, the orangutan may also be the modern identification, at least according to the Tifereth Yisroel and possibly also to R' Pinchas Kahati, of the adnei ha-sadeh.

An added dimension to kofim in midrashic and Talmudic literature is the identity of the "adnei ha-sadeh" (Kilayim 8:5) (also termed, avnei ha-sadeh (Iyov 5:23)). In the mishnah there is a discussion whether the laws of ritual uncleanness, which apply to a human corpse, also apply to the creature termed the adnei ha-sadeh. The following is from the Artscroll Mishnah edition of Kilayim, which provides an extensive discussion of this creature. Rav described the adnei ha-sadeh as a dangerous creature, which lived in the jungle, had an overall human-like appearance, but was attached to the soil by a cord extending from its navel. Its movements were limited to the radius of the cord. This creature was unapproachable and killed anything that entered its domain. Its life depended on the cord remaining intact and severing this lifeline was the only mode to kill it. Hunters, standing just out-

side the creature's domain, would shoot arrows at the cord. When this cord was severed, the creature emitted a loud groan and died. The Yerushalmi translated adnei ha-sadeh as a large kof that has the form of a wild human. Aruch offered two explanations of the adnei ha-sadeh: either they are feral humans who grew up in the jungle or they are creatures that resemble human beings. The Rambam identified the adnei ha-sadeh as "al-nasnas," a creature which was reputed to speak incessantly without interruption (chimpanzee)<sup>15</sup> and whose speech was like that of a human being. In modern Egyptian Arabic, al-nasnas is a monkey. The Artscroll Mishnah concluded the discussion by citing the Tifereth Yisroel who identified the adnei

human-like, ferocious creature connected to the ground by a cord with its current designation as a large primate, possibly, the orangutan? Note, no commentaries employ shinuy hatevah as an explanation, i.e., that the adnei ha-sadeh evolved into an ape. A fuller description of the orangutan might clarify this discrepancy. Orangutans are large, strong creatures, with fully-grown males weighing 198 to 242 pounds and about 4 feet tall. At maturity, males have big cheek pads and facial hair that can be identified as a beard and a mustache. The strength of the orangutan is legendary. A male orangutan's strength is more than four times as great as his human counterpart. It has been claimed that an orangutan can kill a

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ha-sadeh as an organutan. The Tifereth Yisroel (see Boaz) appeared bothered with the classical description of the adnei ha-sadeh as a human-like creature attached by a cord to the ground. The lack of its discovery was attributed to the adnei ha-sadeh now being extinct. However, questions remained. For example, if the cord functioned as an umbilical cord allowing the creature to receive nourishment from the ground, he questioned the purpose of the adnei ha-sadeh possessing a mouth, eyes, and a gastrointestinal system. Lastly, R' Pinchas Kahati noted that many commentaries now concur that the adnei ha-sadeh is a large kof.

How can one reconcile the classical description of the adnei ha-sadeh as a

crocodile "by main strength, by standing upon it, pulling open its jaws and ripping up its throat." Males are not sociable; they stake out areas which they defend as their own home and fight other males if necessary. The diet of the orangutan is varied. Aside from the staples – fruit, leaves, buds, young shoots, and small animals – orangutans also seek dietary supplements, including epiphytes (e.g., orchids that grown on other plants), lianas (probably best known as what Tarzan used for swinging through the trees) and the pith of wood.<sup>14, 16</sup> It is doubtful whether the original compilers of the Mishnah actually saw the adnei ha-sadeh. Rather, descriptions of this creature, probably, were transmitted through unsubstantiated stories of explor-



ers and travelers. And, apparently, there were sufficient numbers of these reports for Chazal to consider the halakhic ramifications of the potential existence of the adnei ha-sadeh. [A similar suggestion (see the Artscroll Mishnah edition of Chulin, 9:6) was presented to explain the existence of the mouse that arose from soil by spontaneous generation (Chulin, 126b)]. Traveler's reports of chimpanzees, gorillas, and orangutans only began to emerge in the written literature in the early 1700s,<sup>14</sup> including in the Torah literature (i.e., in Sefer HaBris). Suppose, an explorer traveling through the jungles or forests of a foreign, exotic land suddenly came upon a fully mature male orangutan that was munching on a long vine (liana). Male orangutans exhibit territoriality and fiercely defend their area. Upon seeing the human being, the startled animal, still

holding its long liana, might stand erect and emit a loud screech. The initial fright of the explorer would preclude careful scrutiny of the creature; the long trailing vine held by the orangutan possibly could appear as an umbilical cord linking the creature to the soil. The explorer, perhaps, would shoot arrows and throw spears, hoping to sever the "umbilical cord" and thus to kill the creature. As the cord is much narrower than the animal's huge chest, the majority of the arrows and spears would undoubtedly miss the intended target (i.e., the cord), but hit the animal. The orangutan would eventually fall, mortally wounded.

Perhaps, by telling us that kofim are the connection between animals and human beings, the Arizal has indicated that kofim are an excellent animal model system to study and to better understand

human beings. The human genome has been sequenced, as well as the genomes of other vertebrates, such as mice and rats. Attention will soon be focusing on deciphering the genetic code of other vertebrates; the chimpanzee is a prime candidate. As noted, the genome of the chimpanzee is about 98% identical to that of the human being. "By finding those few critical genetic differences between humans and chimpanzees, geneticists hope to solve the mystery of what makes humans unique. Specifically, they want to find the genes that underlie the striking differences between humans and chimpanzees in cognition, reproductive biology, and behavior."<sup>17</sup>

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