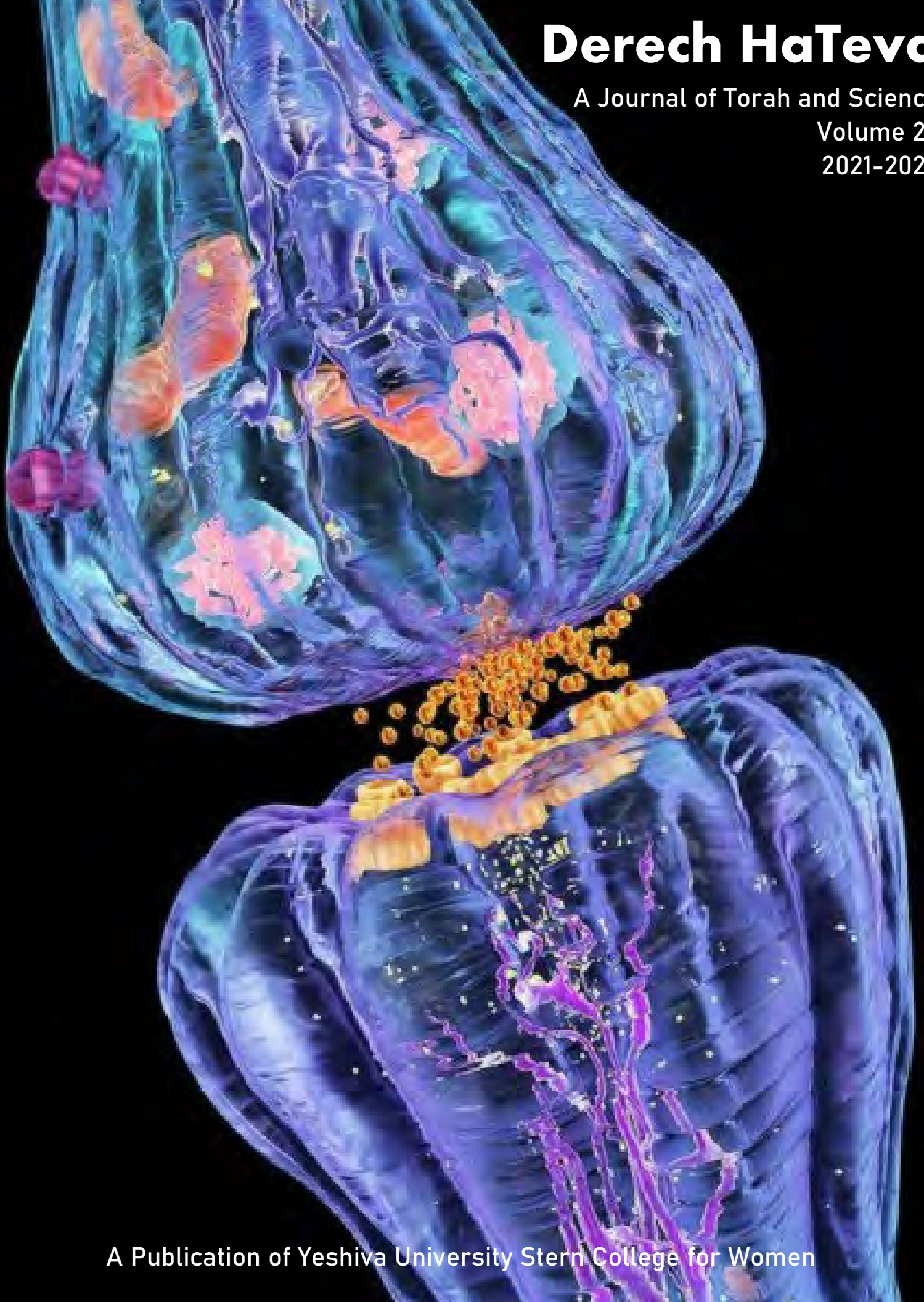


Derech HaTeva

A Journal of Torah and Science

Volume 26

2021-2022



A Publication of Yeshiva University Stern College for Women

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Editors-in-Chief Ellie Berger | Yael Laks

Co-Editors Eden Hariri | Avivit Nsiri | Taliah Soleymani

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We would like to thank Dr. Harvey Babich for all of the guidance and support that he provided us in helping publish Volume 26 of Derech Hateva. Derech Hateva is a journal that encompasses Torah Umadda, the foundation of this institution, and Dr. Babich's passion for Torah and science can be seen by anyone who knows him. Dr. Babich's dedication to his students and the success of the biology department is inspiring and this publication would not have been possible without his constant assistance and encouragement.

Sincerely,
Editors-in-Chief
Ellie Berger
Yael Laks

Co-Editors
Eden Hariri
Avivit Nsiri
Taliah Soleymani

Dedication

Rabbi Dr. Moshe Dovid Tendler *zt"l* was one of the greatest rabbinical figures and experts of medical *halacha* and bioethics of his time. By both learning under Rav Yosef Dov Soloveitchik and earning a PhD in microbiology from Columbia University, Rabbi Tendler exemplified a life devoted to Torah Umadda. Rabbi Tendler was a Rosh Yeshiva at Rabbi Isaac Elchanan Theological Seminary (RIETS), taught Jewish Medical Ethics, was a tenured biology professor, and chaired the biology department for decades at Yeshiva College. Rabbi Tendler committed his life to learning, researching, and publishing scientific and Torah articles: exactly what this journal is all about. All of this is just a small part of why we dedicated this year's volume of Derech Hateva to the memory of Rabbi Dr. Moshe Tendler *zt"l*.

As medicine has advanced exponentially in recent years, *halachic* questions have emerged in response. While many *poskim* shied away from answering complicated medical *halacha sheilot*, Rabbi Tendler tackled these issues with nuance and immense knowledge, and was the address to where countless such *sheilot* were sent from the four corners of the globe. Rav Moshe Feinstein, Rabbi Tendler's father-in-law, mentor, and one of the 20th century's greatest *halachic* authorities, relied on Rabbi Tendler's immense knowledge on medical *halacha* questions.

More specifically, Rabbi Tendler was an expert on brain death, fertility, organ donation, reproductive biotechnology and stem cell research. He authored and published *Pardes Rimonim: A Marriage Manual for the Jewish Family*, one of the first English language guides to the laws of family purity, and also authored translations of Rav Moshe's medical *teshuvot*. Many observant Jews used to believe that modern science contradicted the Torah, however, through his incredible reputation, Rabbi Tendler showed the symbiosis between Torah and science; rather than being contradictory, as many believed, knowledge of Torah and knowledge of science are complementary and together allow us to be true servants of *Hashem*.

We were lucky enough to experience Rabbi Tendler's influence firsthand as past students of his daughter, Mrs. Ruth Fried, at Yeshiva University High School for Girls. Mrs. Fried, like her father, showed us that biology and *halacha* go hand-in-hand and truly embodies the Torah Umadda lifestyle. She brought Rabbi Tendler's teachings into class through real life stories about her father and grandfather, Rav Moshe Feinstein, allowing us to fully grasp the interplay between Torah and scientific inquiries.

Our hope with this journal is to honor Rabbi Dr. Tendler's memory by further expounding upon his life's passion. Through the work of our Stern College community, we strive to embody Torah Umadda just as developed by Rabbi Tendler *zt"l*.

Sincerely,

Yael Laks and Ellie Berger, Editors-in-Chief

Table of Contents

Shani Adest , <i>Allergies and Their Impact on Tefillin Observance</i>	6
Ellie Berger , <i>The Jewish Approach to Community and How It Shapes Pandemics</i>	9
Eliana Farkas , <i>Pathologies of the Gut and Treatment During Talmudic Times</i>	13
Naomi E. Fried , <i>Holy Cow! Between Meat and Milk; a Scientific Explanation for Waiting</i>	15
Abigail Goldberg , <i>The Ethical and Moral Concerns of Preconception Gender Selection</i>	19
Sima Greenberg-Zucker , <i>Overeating: High Calorie Intake on Shabbos</i>	22
Rina Krautwirth , <i>Protecting Against the Unseen: Chazal’s Approach to Chemical and Biological Hazards</i>	24
Yael Miller , <i>The Bionic Human in Halacha</i>	34
Avivit Nsiri , <i>The Physical and Emotional Stress on Pregnancy: the Jewish Israeli Experience</i>	37
Rachel Sarraf , <i>Feeling Alive at the Dead Sea</i>	40
Taliah Soleymani , <i>Human Embryonic Research Within Halacha</i>	42
Olivia Zago , <i>Kashrut, Insects, and Organic Produce</i>	45
Dr. Harvey Babich , <i>Adom HaRishon and His Contemporaries – Soulless Humanoids</i>	47

Allergies affect a major portion of the population, with symptoms ranging from mild itching and irritation to life-threatening anaphylaxis. While allergies are common, they can uncommonly impact the way in which various *halachot* are performed. In recent years, various case reports have emerged detailing an allergic contact dermatitis reaction in men wearing phylacteries. Phylacteries, *tefillin*, are leather straps bound along the forearm and a leather box that sits atop the head, as prescribed in Deuteronomy 6:8. The leather, which is preserved using various chemicals, such as formaldehyde and chromate, can cause a severe skin reaction [1]. This then raises the question of what can be done to enable these men to continue to fulfill their *halachic* obligation.

In recent years, much research surrounding allergy development and prevention has focused on peanuts, a common and frequently life-threatening allergy in children. This is a common source of anxiety for parents, as their children attend school and camp, where snacks are frequently shared without supervision. Scientists have been exploring the root causes for allergy development, as well as the potential negative risk factors that can help reduce allergy development.

In years prior, doctors believed that reducing exposure to peanuts would reduce the prevalence of peanut allergies. Pregnant and nursing mothers were advised against peanut consumption to prevent peanut sensitization. Pediatricians frequently advised parents to avoid introducing peanuts to infants and children until the age of three [2]. Notably, there was no strong evidence to support these recommendations, and despite their stringent implementation, peanut allergies continued to rise in children.

Subsequently, a new hypothesis emerged, suggesting that early and frequent introduction of allergens could reduce the risk of allergy development. This was based on the prevalence of peanut allergies in Jewish children living in the UK and in Israel. George Du Toit and his team recognized that UK based children had higher levels of atopy and serious allergies, despite having similar genetics and socioeconomic backgrounds. This included the observation that UK residing children had a 10-fold higher incidence of peanut allergy than Israeli children. The prevalence of peanut allergies of children between the ages of 4-18 years in the UK was 1.85%, while in Israel it was 0.17% ($p < 0.001$) [3]. The researchers noted that in Israel, peanuts are consumed earlier in life and at higher quantities than in the UK. This cultural difference can be attributed, in part, to the popular Israeli snack called Bamba. This snack has a spongy texture that dissolves in the baby's mouth and is easy for babies to eat. While peanut consumption is higher in Israel and children are exposed to peanuts very early in life, in the UK, the general practice is to avoid peanut allergens. Taken together, these observations suggest that early and frequent exposure to peanut allergens can be protective against life-threatening anaphylactic allergies later in life [3].

Yet, studies have shown that while early oral consumption of peanuts is protective against allergies, environmental or cutaneous exposure without oral consumption may predispose and sensitize individuals for allergic reaction. While a single oral dose of peanuts may be enough to achieve tolerance, frequent high dose consumption can be more protective. Using mouse models, one study exposed mice to high oral doses of peanuts or low oral doses of peanuts. The mice that received high doses of peanuts developed oral tolerance for the consumption of

peanuts, while mice who were exposed to low doses of peanuts developed a greater risk of allergies [4].

This concept has since been applied to other common allergens including fish. The Stockholm BAMSE study found that regular consumption of fish before the age of one year was associated with a reduced risk of sensitization to fish and a reduced risk of developing an allergy to fish [6]. There are many other studies showing that early oral introduction to allergens induces a tolerance towards the allergens, while avoidance and environmental exposure alone induces a sensitization [3]. A 2008 report led by Prescott concluded that delayed exposure to allergens in children increased the risk of allergies, as opposed to reducing risk. This report found that tolerance to peanuts was mainly driven by regular exposure to peanuts during a “critical early window” of development, between 4-6 months of age. Delaying peanuts beyond this window may likely increase the chances of developing a food allergy [7].

However, the question regarding allergic responses to *tefillin* still poses a significant challenge. Unlike regular food allergies, for which oral exposure can be beneficial, the preserving agents in leather are toxic upon consumption and exposure to high doses is dangerous. Some Israeli rabbinic authorities addressed this issue by permitting the adornment of the phylacteries over clothes or a thin layer of clear plastic to prevent any skin contact with the treated leather. In addition, manufacturers are searching for new ways to create *tefillin* without the use of the preserving agents [10]. By recognizing the serious nature of allergies, the Jewish community, rabbinic leaders, and the scientific community must work together to develop safe alternatives, while still

supporting observant members in their *halachic* observance.

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The Jewish Approach to Community and How It Shapes Pandemics

By: Ellie Berger

The Jewish approach to community has guided its actions and governed its results in pandemics throughout history. The famous concept from *Pirkei Avot* 2:4 of “אל תפָּרֵשׁ מִן הַצִּבּוֹר” translated as “do not separate yourself from the community,” has promoted this value within the Jewish people and helped maintain tight-knit communities over centuries. Jews value community and run them differently from the general public, which has often affected the population’s actions and outcomes during times of widespread disease.

In past pandemics, *halachot* and social customs related to hygiene that were maintained by the Jewish communities are said to have contributed to decreased mortality rates. The bubonic plague, also known as the Black Death, caused by the bacterium *Yersinia pestis*, killed a third of Europe’s population between 1347 and 1352 [1]. There is a popular idea that Jews died at lower rates from the bubonic plague than the surrounding Christians because of various *halachot* and customs that promoted cleanliness within the Jewish communities. Women were obligated to go to the *mikvah* monthly, and people showered at least once a week in preparation for Shabbat, while the general population did not clean themselves nearly as often. Furthermore, the religious requirement of washing hands before eating bread fostered good hygiene practices during meals. Additionally, *halacha* requires Jews to bury the dead as soon as possible, allowing for the communities to remove an infected body from the public more readily than surrounding communities [2]. Such public health measures practiced by the European Jewish communities, albeit solely for religious requirements, greatly contributed to reduction in the spread of the Black Plague.

There may also be a genetic component, termed heterozygote advantage, to explain Jewish survival in the Black Plague. Heterozygote advantage occurs when “the fitness of heterozygotes is higher than the fitness of both homozygotes in a given population” [5]. Up to 40% of Israelis carry a recessive mutation for Familial Mediterranean Fever (FMF), an autosomal disorder characterized by recurrent attacks of fever, inflammation, swollen joints, and a specific ankle rash [3]. Supposedly, in the heterozygous condition, the FMF gene (termed *MEVF*) conferred resistance to the plague. Although other Middle Eastern peoples have this mutation as well, during the Black Death, the Jews were the only large community in Europe with Middle Eastern origin. The presence of this mutation within the European Jewish population allowed for their higher survival rate to the plague compared with their Christian neighbors [6]. While intermarriage is prohibited, “וְלֹא תִתְחַתֵּן בָּם” (Devarim 7:3), over the centuries, marrying within the Jewish community had communal value for Jews, even for the non-observant. This value likely contributed to the high prevalence of the *MEVF* mutation to be maintained within the Jewish gene pool, possibly conferring heterozygote advantage during the plague.

Disease ran rampant in the late 1800s and early 1900s in New York City and a tuberculosis outbreak plagued the population. The vast number of Jewish immigrants and the substantive record keeping from this era, allowed for the opportunity to identify how Jews fared as compared to their neighbors. Even though the Jews lived in awful, unsanitary conditions in crowded cities, American and European Jews surprisingly had overall better health and lower morbidity rates than their non-Jewish neighbors. Although the

numbers were most likely not completely accurate, the Charity Organization Society of the City of New York reported that “it still appears that the Hebrew constitution has a remarkable resisting power...in spite of narrow chests and slight stature, in spite of extreme poverty and still greater frugality, in spite of mental overexertion, lack of exercise, employment in the sweated industries, and contact with the probability of infection in second-hand clothing” [7]. This lower mortality rate from tuberculosis among Jews was recorded in Europe and Africa too, with striking differences between the Jewish communities compared to the non-Jewish ones [8].

Although none can be proven, there are a few theories as to why these significantly lower mortality rates existed, with many of them associated with communal standards. Alcohol consumption, considered a risk factor for tuberculosis, was associated with a three times greater increase in risk for the disease [9]. Alcoholism is said to be lower among Jews compared to other populations, likely because of social culture, and might have contributed to the decreased mortality rate due to tuberculosis [8].

Another proposed explanation for tuberculosis resistance was similar to resistance to bubonic plague – the performance of those Jewish religious laws which promoted proper hygiene. The *Shulchan Aruch* stated multiple laws regarding preparations for *shabbat*, including washing the whole body, or at minimum the face, hands and legs, as well as trimming one’s nails every Friday [10]. Women are also required to go to the *mikvah* once a month guaranteeing cleanliness when much of the population did not bathe this often [11]. There are also many *halachot* pertaining to food and diet that are conducive to proper hygiene. It is required to wash before eating bread and is also

optional to perform *mayim achronim*, washing one’s hands after a meal. This generally leads to better cleanliness when eating, a time when microorganisms are more likely to invade the body. In addition, *kashrut* laws ensured that kosher meat was safe to consume, as it had to be discarded after three days if not washed and salted or it would be considered non-kosher [8]. Additionally, for an animal to be considered kosher to eat, there cannot be any lung adhesions, resulting in only the healthy animals being consumed [12].

The third theory regarding resistance to tuberculosis was the immunity acquired by social customs. Bathing was a law, but it also became part of the Jewish social culture. When Eastern European Jews came to New York City they built sweat baths, so by 1897 over half of New York City’s 62 bathhouses were owned by Jews. Jewish women also tended to maintain cleaner households than their non-Jewish neighbors since they cleaned once a week for *Shabbat* and also did a deep spring cleaning every year for *Pesach*. Additionally, despite many Jews living in extreme poverty and being malnourished, many families made sure to prioritize a full meal on Friday nights in honor of *Shabbat*, no matter their financial circumstances [8].

The current COVID-19 pandemic differs from prior community health issues because our social customs of communal interactions were now detrimental to community public health. While our social norms during other health issues were advantageous, as they promoted good hygiene which contributed to our success, our social interactive customs of today did not have the same effect. Many of our social customs and culture nowadays are centered around large social gatherings, so before we even knew anything about coronavirus, it had already spread throughout our communities.

COVID-19 officially broke out during Purim, March 2020, and since we could not fathom what was to come, many gathered to hear *megillah* or to participate in large *seudot*, which promoted viral spread throughout our communities. Furthermore, because *davening* with a *minyán* is so strongly adhered to as a communal value, some *shuls* remained open, even amid governmental warnings, which contributed to viral transmission as well.

However, when the nature of viral transmission was fully understood, many within the Jewish community, the modern Orthodox in particular, rallied to quickly modify communal activities and promoted initiatives to limit viral transmission and aid in the fight against the virus. Some of the practices instituted included:

- limited and widely separated seating in synagogues
- encouragement of outdoor minyanim, where possible and permitted
- *davening*, *shul* activities, schooling, etc. via Zoom
- assisting hypersensitive groups (e.g., elderly) with shopping
- greatly limiting the number of guests at a *simcha*
- wearing of masks
- the creation of a makeshift hospital in Yeshiva Sh'or Yoshuv (Lawrence, NY)
- convalescent plasma drives
- encouraging vaccines when they became available

These adaptations to the pandemic crisis put a great strain on the Jewish community and on communal activities, but were needed, as saving lives was the goal.

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[11] Vayikra 15:18

[12] Tur 39:10

Long before antibiotics, colonoscopies, and camera endoscopy capsules of our time, people were fascinated by the pathologies and inner workings of the gut. In ancient Egypt and Greece, the gut was seen as a host to dangerous “residues” that were presumed to be the cause of all diseases [1]. Though we now know this to be untrue, by examining the ancient perceptions of gut health and understanding their treatments, specifically ancient Jewish perceptions, we may be able to gain greater insight into the development of gastrointestinal health care and where the future of innovation is directed.

In the times of the Talmud, there were several different methods that were seemingly employed as therapeutic and diagnostic tools in assessing the gut. In the *Mishnah Shekalim* (4:2), Rabbi Natan suggests that Moshe sequestered himself in a cloud for six days to purge his body of all food and drink, so that he may be like the angels. While the context is not seemingly of medical importance, the mere mention of such a procedure implies that the practice of “colon purging” was well known to the rabbis of the Talmud. It is likely that this procedure was used as a form of treatment or prevention of disease, much like that of the ancient Egyptians and Greeks. Today, physicians caution against such a procedure, for its false claims and potential to cause serious side effects, ranging from dehydration to bowel perforation. However, the common practice of this procedure indicates that the people of that era knew that the fecal content of the intestines was critical to the development and functioning of the gut [1].

Pushing the same point, in the Talmud *Nedarim* (50b), Shmuel describes the *turmita* egg, a unique diagnostic tool that was used frequently in cases of

gastrointestinal pathologies, which was tedious to prepare. The egg was shrunken using a series of hot then cold water baths until it could be swallowed whole. The residues on the egg were then examined by a doctor post excretion. Upon examination, the doctor could supposedly determine the type of medicine and treatment that the patient needed. The *turmita* egg is comparable to the diagnostic tools used today, such as analyses of stool samples or possibly gastrointestinal probes of today, like the capsule endoscopy [2].

The Pillcam is a capsule endoscopy that was invented in Israel. It is a small capsule with several cameras that, when swallowed, can capture high-quality imaging of the entirety of the intestines [2]. This capsule endoscope allows for imaging of middle portions of the intestines that colonoscopies and endoscopies cannot reach. The images are wirelessly transmitted to a receiver which can then be viewed by a doctor. This device is incredibly useful for the diagnosis of certain conditions. However, in certain cases, the use of the capsule would have to be followed up with a colonoscopy or endoscopy and simultaneous biopsy for treatment [3].

Much like today, however, the causes and treatments for certain gut pathologies remain unknown. The Talmud *Avoda Zara* (40b) mentioned that Rabbi Yehuda Hanasi suffered from a bowel disease. In Talmud *Bava Batra* (103b) there is a discussion about how the great extent of the pain he experienced was often accompanied by loud screams. Dvorjetski, in her paper on the ailments of Rabbi Yehuda Hanasi, suggests that Rabbi Yehuda likely had inflammatory bowel disease (IBD), a class of diseases associated with painful inflammation of the intestines. Much like today’s patients with IBD, Rabbi Yehuda Hanasi was careful

about his diet, because he felt that it played a role in his illness. He scheduled his meals, making sure that if he ate in the day, then he would not eat at night (*Mishnah Pesachim* 9:1). He also always made sure to include cucumber, radish, and lettuce into his meals, as he believed they aided in digestion (*Avoda Zara* 11a). Rabbi Yehuda Hanasi also seemed to have trusted in certain homeopathic remedies, such as apple cider, as suggested to him by Rabbi Ishamel, son of Rabbi Jose (*Avoda Zara* 40b), to help in the temporary alleviation of his gastrological pains [4].

Despite the many advances in our understanding of the gut and the development of treatments, there is still so much that we do not know. This is particularly true of our knowledge of the gut microbiome and the role it has on the well-being and well-functioning of the gut. Today's patients with IBD often suffer a similar fate as Rabbi Yehuda Hanasi, being forced to turn to homeopathic remedies and diet changes, when modern medicine, such as anti-inflammatory medications, cannot provide significant relief to their symptoms [5]. Many scientists believe that a possible key factor in the development of this disease has to do with the microorganisms that inhabit the intestines [6]. Gaining a greater understanding of the microbiome's role in the gut, as well as in gut-related diseases, is critical for developing future treatments of gastrointestinal diseases.

By examining the past through a Talmudic lens, we can not only see how much our understanding and treatment of gastrointestinal diseases have advanced, but also what has remained the same, and where we must look to advance.

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Holy Cow! Between Meat and Milk; a Scientific Explanation for Waiting

By: Naomi E. Fried

Jewish law prohibits cooking and eating meat and milk together. This is derived from the pasuk "לֹא תֵבֶשֶׁל גְּדִי בְחֵלֶב אִמּוֹ" which translates to "you should not cook a kid in its mother's milk"[1]. This law is expounded upon in the Talmud, where it is made clear that there is also a prohibition of eating meat and milk together. This stringency from the Talmud acts as a safeguard for the *issur* of cooking meat and milk together. *Halacha* further rules that one must wait a certain number of hours between eating meat and milk. Commentators offer explanations to this ruling and they can be categorized into three main reasons.

The first reason, associated with the Rambam, stems from the concern that meat may get stuck between the teeth and remain there even after a person is done eating. If he later drinks milk, he would essentially be eating meat and milk together [2]. Here the focus is on having meat and milk present in the oral cavity simultaneously. According to this opinion, it wouldn't matter how much of each food is in the mouth, or if both the meat and the milk can actually be tasted.

The second reason concerns taste. According to Rashi, eating milk and meat within a short time frame is prohibited in order to avoid having both tastes in one's mouth at the same time. Meat, which is fatty, can often leave an aftertaste in one's mouth, and if so, one cannot have milk products until this taste passes.

The third reason, brought down in *Kreisi Upleisi* 89:3, written by Reb Yonoson Aibshitz, refers to digestion. He argues that it wouldn't matter if both meat and milk tastes were present in the mouth, or if there was food stuck between the teeth. His is of the opinion the focus is that meat and milk should not be in contact with each other

until after digestion, long after either taste or stuck food would remain.

There are different customs as to how long one should wait between meat and milk. Even though the Gemara does not mention how long one should wait, specific times are brought down by later sources. The primary, and most well-known custom, is to wait six hours as suggested by Rabbi Yosef Karo. The Rema suggests waiting one hour. Some suggest three hours, and other opinions are to wait five or five and a half hours. Is there a scientific explanation for these times? How were these specific times decided upon and do the differences have to do with the different reasons for the prohibition?

Digestion of food involves two aspects: mechanical and chemical digestion [3]. In the oral cavity, the main digestion is mechanical which is done by our teeth. Our front teeth, known as incisors, bite and cut the food, and our back teeth, the molars, chew and grind the food in a process called mastication. The second part of digestion in the mouth is chemical digestion which consists of two main enzymes named salivary amylase and salivary lipase (or lingual lipase), secreted into the mouth in saliva. Each enzyme's activity is focused on a different type of food. Salivary amylase digests starch into maltose and maltotriose and works at an optimum pH of 6.7 to 7.0. Lingual lipase hydrolyzes the ester bonds in triglycerides to form diacylglycerols and monoacylglycerols. Meat is completely starch-free so the enzyme responsible for meat digestion is lingual lipase which digests the fat in the meat.

Once the food is small enough and mixed with enzymes, it is termed bolus and passes into the esophagus which will deliver it to the next part of the digestive tract. Lingual

lipase is also present in the stomach, where the pH is much lower. The low pH condition of the stomach is optimal for the enzyme's activity, making the stomach a more effective location for its work. Here, the lingual lipase hydrolyzes triglycerides to free fatty acids and partial glycerides. The stomach can convert close to 30% of fats into diglycerides and fatty acids by about two to four hours after eating [4].

Gastric emptying is the amount of time that it takes for the food to be emptied out of the stomach. Small bowel transit is the amount of time that it takes for the food to move from the oral cavity to the ileum, then to the cecum, after which the food is excreted from the body. Following a study conducted where a wireless motility capsule was inserted through the oral cavity, it was determined that the normal range for transit time was two to five hours for gastric emptying and two to six hours for small bowel transit [5]. Because the reason for waiting between meat and milk is for the food to be digested, the reason behind three and six hours is better understood. The wait time of three hours is based on the assumption that digestion is completed once the food leaves the stomach. Additionally, the wait time of six hours is based on the assumption that the food has to fully leave the body to be considered fully digested.

When understanding the concept of the taste remaining in the mouth, one must analyze where the flavor is coming from. Does the flavor come from parts of the food that are still in the mouth, or does it come from food that was already swallowed? Sometimes when eating a lot of food, the stomach distends and presses on the diaphragm [6]. This can cause a hiccup sensation and along with the hiccups comes an aftertaste. But this is not the main reason for aftertastes. Cordelia Running, director of the Saliva, Perception, Ingestion and Tongues (SPIT)

lab at Purdue University, says that aftertastes are generally caused by "little bits of the actual flavor stimuli that might hang around." Physical remnants of food can get caught in the mouth and molecules can remain in the saliva or mucus causing this aftertaste [7]. The gustatory cells, responsible for taste in our mouth, can pick up food stuck between the teeth, remnants of food on the gums, or the smallest molecules which can result in an aftertaste. However, the food or residual taste are considered having been digested sufficiently from a *halachic* perspective.

Meat contains two main parts which need to be digested: fat and protein. While both are mainly digested in the stomach, unlike protein, fat can be partially digested by lingual lipase in the mouth. This is substantial because fat is the major contributor to the flavor development in meat [8]. There is variation among animal species in flavor development resulting from their specific fatty components. Hard aged cheeses also have many fatty residues, which is the reason why we wait to eat meat after consuming these types of cheeses [9]. This means that it doesn't matter that protein can't be digested in the mouth because once the fat is digested the flavor will be gone. Due to the pH of the mouth not being ideal for lingual lipase, it may take longer for the fat to be digested and the aftertaste to disappear. Nevertheless, after a few hours the fat will be digested either by lingual lipase or the food particle being swallowed.

The different opinions on waiting times regarding eating meat and milk would support different reasons. When one chews meat but does not swallow it, he must still wait before eating milk. This would support the first reason suggesting that we wait because of food being present together in the mouth [10]. When one swallows meat without chewing, he is still obligated to wait

which would support the reason regarding digestion. When one swooshes meaty soup in his mouth and then spits it out without swallowing anything there is no requirement to wait. This would support the reason for meat being stuck between our teeth. With soup nothing gets stuck and therefore it is permitted to eat milk immediately after as long as he cleans his mouth out so that there is no aftertaste. This supports the second reason.

These scientific explanations offer insight into Chazal's reasoning behind waiting times. Although there isn't always consistency with the science, the *halacha* of waiting between milk and meat should be followed to the full extent of time as decided per rabbinic guidance or family tradition.

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The Ethical and Moral Concerns of Preconception Gender Selection

By: Abigail Goldberg

As a result of modern-day scientific advancements, the possibility of preconception gender selection has been made possible. This is a goal that both ancient societies and our society alike have worked to attain. In Rosner's "Sex Preselection and Predetermination" article, there are various methods that were utilized by members of ancient societies in order to achieve the goal of a couple choosing the gender of their child. Now that this theoretical goal has become achievable in practice, it is important to analyze the potential concerns that can arise from it.

There are many problems that individuals have with the concept of selecting the gender of a child. Firstly, many are simply uncomfortable with this notion and believe that trying to choose the gender of a baby is equivalent to "playing G-d." Others argue about whether or not the choosing of the child's gender would allow a couple to fulfill the Jewish commandment of having at least one child of each gender. Others go as far as saying that the desire for couples to choose the gender of their child is idiosyncratic and the intentions behind doing so must be examined. Some couples choose to select the gender of the child for medical purposes, while others do so in order to fulfill the Torah obligation. Either way, the ethical and moral concerns, as well as the stance of Jewish law towards this action, must be analyzed.

When it comes to gender selection, there are three main needs. The first kind is prenatal observation. In this method, individuals can utilize conveniences such as sonograms and chorionic villus sampling in order to determine the gender of the fetus. If a couple chooses to proceed with this method, they can determine the gender of the baby and subsequently abort the fetus if not the

desired gender. This method of aborting a fetus once the gender is determined is controversial amongst those who follow *Halacha* as well as amongst those who do not follow *Halacha*, but still find this method to be unethical. The other two methods of gender selection are more common in westernized societies such as the United States. The first common method used is called PGD, Preimplantation Genetic Diagnosis. When using this process, embryos are created using *in vitro* fertilization, IVF. Following this, a few cells called blastomeres are taken out of each chromosome and then analyzed for the determination of the sex. The embryo does not become damaged upon removing these blastomeres, and the embryo can continue to develop normally as if they were never removed in the first place. The doctors and scientists search for two X chromosomes if the couple desires a female child, and they search for an X and a Y chromosome if the desired child is a male. Once the cells are analyzed for the X and Y chromosomes, the cells of the desired gender can then be implanted into the woman. Similar to an abortion, the method of PGD is 100% effective and accurate.

There is a less commonly used method of gender selection which consists of separating the sperm cells pre-fertilization into the X and Y-bearing spermatozoa. Once this is done, Intrauterine Insemination, IUI, or IVF ensues using the desired sperm. This type of sperm sorting technology originated in the context of the Department of Agriculture of the U.S. government (USDA). The USDA desired to select the sex of livestock, and later on, this method was applied to humans. The success rate for this method is fairly high, but not near 100% like the PGD method.

Something that is not widely debated amongst ethicists is medical sex selection. If the couple is selecting the gender of their child in order to ensure that a sex-linked trait is not being transmitted to the fetus, it is generally accepted and deemed ethical. Issues arise when sex selection is used for non-medical purposes. Many are concerned that this type of sex selection can lead to skewed birth rates of male and female populations. Others are concerned that sex selection for non-medical purposes would be considered sexism. Although there are individuals who might be comfortable with destroying embryos because they will not develop into the desired gender, the overwhelming majority agrees that even though people want to choose the gender of their child, that interest is not strong enough to justify creating and destroying embryos that can one day develop into a person.

Many Jewish Rabbinic leaders endorse the use of technologies for reproduction when they are utilized to overcome infertility and reproductive struggles. One specific area where Jewish law is concerned is regarding the method of PGD. According to Kenneth Brander, one concern is what happens to the fertilized eggs that do not get implanted into the woman. He explains that this egg is frozen at an extremely low temperature (-80 °C), suspending any further development of the fetus. This allows the egg to be stored in this fashion for an extended period of time, and in some cases, even indefinitely. According to the Talmud (*Yevamos 69b*), a fetus that is less than 40 days old does not have any legal status, and it is considered to be “a sack of water.” This is proven by the fact that a woman who miscarries does not automatically attain the status of spiritually impure like a woman who gives birth. Additionally, if a woman does unfortunately miscarry, it does not interfere with the obligation to perform the ritual of a *pidyon haben* on her next child if the criteria for this

commandment is met. Many leading Rabbis, including Rav Zilberstein, agree that if the fetus possesses genetic abnormalities, the disposal of these embryos would be permitted. According to Jewish law, a fetus that is less than 40 days old is not considered to be human and therefore, if the embryo is not the desired gender, it would be permitted to be disposed of.

Rabbis debate whether the Torah commandment of having at least two children, a son and a daughter, is fulfilled using gender selection methods of technology. Rabbi Moshe Feinstein (*Iggros Moshe Even Haezer 2:18*) explains that the command of having two children, one of each gender, is not based on the result of the action; rather, this commandment is action oriented. Essentially, this commandment is not about what gender children the couple produces, but it is about the fact that the couples attempted to have children. Since this is the widely accepted opinion, using IUI, IVF, or PDG to produce children of different genders is not necessary in fulfilling this commandment. Therefore, someone who chooses the gender of their children does not fulfill the commandment to have children any more than someone who attempts to have children of both genders in a natural fashion.

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Maintaining a healthy diet does not come naturally to most in the Orthodox Jewish community because so much of our festival includes lavish meals with breads, meats, and potatoes. The command, “watch over your lives very carefully” (Deuteronomy 4:15), refers to seeking medical attention, eating healthy and staying physically active. Eating healthy and in moderate amounts keeps a person healthy and prevents medical conditions, gives a person physical strength, and gives them an overall qualitative life. Maimonides writes in his *Regimen for Healthcare* that if a person cared for himself the way that he cares for his horse, many serious illnesses would be avoided. Just like he makes sure that his horse is healthy, eats well and in proper amounts and gets proper exercise, he must do so for himself too [1].

There is a myth that it doesn't matter what a person eats because *Hashem* decides how long a person lives. However, this is not true. The Talmud (*Bava Metziah* 107b) says that 99 percent of people die before their time and only one percent die on time. The *Midrash (Vakiyrah Rabah)* says that sickness and death is 99 percent because of negligence and only one percent because it is the will of *Hashem*. These rabbinical sources show that a person has responsibility for his health and should not be irresponsible, expecting *Hashem* to keep him healthy [2].

Maimonides says that most sickness comes from overeating and a lack of physical activity [2]. In *Mishneh Torah*, he writes:

Overeating is like poison to anyone's body. It is the main source of all illness. Most illnesses which afflict a man are caused by harmful foods or by his filling his belly and overeating, even of healthful foods. This was implied by Solomon in his wisdom: "Whoever guards his mouth and his tongue, guards his soul from

distress" (Proverbs 21:23); i.e., "guards his mouth" from eating harmful food or eating his fill and "his tongue" from speaking [about things] other than his needs [3].

Maimonides clearly states that one is responsible for what he eats just like he is responsible for what he says, and these choices can affect his well-being. Regarding physical activity, finding time to work out is a challenge for men who work full-time, learn daily, and prioritize family time. However, exercising is preventative medicine, and its importance should not be taken lightly [2].

The Israel Ministry of Health reported that the ultra-Orthodox are seven times more likely to be obese than the rest of Israelis. This is because of the culture that is centered around eating large meals every Shabbos, every celebration and holiday. We have at least one food dedicated to each of our holidays including matzah on *Pesach*, cheesecake on *Shavuot*, donuts on each night of *Chanukah* etc. There is also a *mitzvah* to enhance each holiday with extra special meats and wine. Easily forgotten but still of significance, gluttonous eating violates the prohibition of *achilat gasah* (over-eating) [4].

A medical case study compared the eating habits of religious and secular Jews in America. The results showed that religious Jews were less likely to develop disordered eating. However, another study showed no correlation between the two groups. Maintaining healthy eating habits and a positive relationship with food can be conflicting when so much of our religious activity involves eating large lavish meals to celebrate. A person suffering with anorexia does not have an appetite and is repulsed by the look of food. Such a person is unable to do *mitzvot* that require an appetite [5]. The biblical story of Chana is an example of

depression causing lack of appetite. Chana and Peninnah were the two wives of Elkanah. Peninnah had ten sons and Chana was unable to have any children, but Chana was more loved by Elkanah. Year after year, they traveled to the temple in Shiloh to celebrate the holiday, but she refused to eat the offering, because she was depressed.

“Her husband Elkanah said to her, ‘Chana, why are you crying and why aren’t you eating? Why are you so sad? Am I not more devoted to you than ten sons?’” (Samuel I 1:8). Happiness is associated with eating, so it is a good thing that every religious occasion is celebrated with food. The problem is overeating at those times.

On *Shabbos*, we consume much more than on an average day. Dr Anders Nerman, N.D. calculated the typical calorie consumption on *Shabbos*. Friday night dinner was a total of 1867 calories. A *kiddush* (community gathering) on *Shabbos* day added up to 1068 calories. Lunch was 2360 calories, and a third meal before nightfall was another 835 calories. The total is 6130 calories consumed in 25 hours! This is three times the amount of an average person’s daily calorie intake [6].

A study in the American Jewish community showed that everyone eats more on *Shabbos* than the rest of the week. Interestingly, while those of normal weight ate an addition of 1000 calories on *Shabbos*, overweight and obese individuals ate approximately 2000 additional calories. This indicates a significant correlation between obesity in the orthodox Jewish community and overeating on *Shabbos* [7].

Taking responsibility for our health and eating healthy amounts of *Shabbos* and on holidays will not take away from the fulfillment of the obligation. Rather, it will increase healthy lifestyle choices in the orthodox Jewish community and enable people to live longer and healthier lives.

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Protecting Against the Unseen: Chazal's Approach to Chemical and Biological Hazards

By: Rina Krautwirth

Cultural Backdrop

In terms of the outside environments that surrounded the Talmud, the Sassanian empire surrounded the Rabbis of the Babylonian Talmud, whereas the Greco-Roman tradition surrounded those of the Yerushalmi. Regarding the approaches of the surrounding environments to health, Geller points to differences between the Greco-Roman and Akkadian/Babylonian approaches [1]. Greco-Roman medicine attributed disease to an imbalance of the four humours and as such, used diet, purges, changes of environment, and bloodletting as treatments [2]. In contrast, Akkadian/Babylonian medicine attributed disease to demons or other external factors and therefore used external drugs for treatment, rather than diet, purging, and bloodletting [3].

In terms of what public health might have looked like in the surrounding Babylonian and Greco-Roman cultures, Babylonia maintained a folk tradition, viewed the physician and magician as equal, and did not have any public health organizations per se [4]. They did however have a sense of illness being contagious, as they left records of quarantine [5]. Moreover, they did have drainage systems, as evident from archaeology, though it remains unclear if they had them for health reasons or for aesthetic reasons [6]. Roman society had many innovations, such as hospitals and C-sections for dying women; however, records indicate poor waste disposal, which contaminated food and water, and low life expectancy (25 years) [7].

The Greek doctor Galen had a significant influence on Western medicine. Would the Rabbis of the Talmud have had knowledge of Galen? Geller maintains that whereas the Yerushalmi Rabbis would have known Greek, the Babylonian Rabbis would not have known Greek (others maintain that the Babylonian Rabbis too knew Greek) and therefore the

Babylonian Rabbis would not have had a familiarity with the writings of Galen [8]. Preuss, writing earlier, likewise, maintains that the Rabbis of the Talmud would not have read Galen but instead offers the reason that in general, the writings of Galen did not commonly circulate at that time, when folk medicine instead prevailed [9]. According to Geller, the Babylonian Rabbis would have learned medicine from the surrounding Babylonian scholars, who read cuneiform [10].

Innovative Measures

In assessing the presence of pestilence, *Chazal* took an innovative approach in that they measured the rate of the epidemic rather than measuring an epidemic by an objective number of cases. The *Mishna* (*Yerushalmi Taanit* 3:1) established that three cases of death in three consecutive days in a town of 500 footman constitutes a pestilence; Rashi adds that one case per day needs to occur [11]. Moreover, *Chazal* utilized an early instance of case reporting, as *Taanit* 21b discusses an injunction to report to Shmuel, Rav Nahman, and Rabbi Yehuda in situations when many deaths occurred [12]. Additionally, *Chazal* issued a declaration to stay indoors with the windows closed when *dever* (pestilence) was present, an early example of quarantine [13].

Hygienic Water

The field of public health strongly concerns itself with water quality for the public. This concern in fact dates to antiquity:

Alcmaeon of Croton (floruit ca. 470 B.C.) was the first Greek doctor to state that the quality of water may influence the health of people. (Aëtius, *On the opinions of the philosophers* V.30.1) Hippocratic treatise *Airs, Waters, Places* (around 400 B.C.) deals with different

sources, qualities, and health effects of water in length. (*Airs, Waters, Places*. 1, 7, 8, 9) Various other Hippocratic treatises (mostly written around 400 B.C.) contain short comments on the influence of water on the health of people (*Internal Affections*. 6, 21, 23, 26, 34, 45, 47; *Diseases I*. 24; *Epidemics II*. 2.11; *Epidemics VI*. 4.8, 4.17; *Aphorisms*. 5.26; *Humours*. 12; *Regimen IV* or *Dreams*. 93).

According to B.C. Vitruvius from the late first century, marshy areas must be avoided when the site of a city is chosen. (*De Architectura*. I.iv.1) Pliny the Elder in the first century A.D. had in his works a long section concerning the different opinions on what kind of water is the best. (Plinius *NH*, XXXI, xxi–xxiii). Galen (2nd century A.D.), one of the most famous doctors during antiquity, summarized the preferable qualities of water (Galen. *De Sanitate Tuenda*. I.xi) [14].

Chazal might have had some familiarity with these teachings from antiquity and also would have had additional observations of their own about the effects of water quality on public health. Accordingly, we find various instances in the Talmud indicating that *Chazal* did recognize the need for access to high quality water. They even viewed some water sources as therapeutic or protective against disease. For *Chazal*, the Tigris and Euphrates rivers, the bathhouse of the *Deyomset* river, and the springs of Tiberias all had an impact on the health of the population.

For example, *Chazal* attributed the acuteness of the inhabitants of Mehoza to the fact that the dwellers of this city drank the water of the Tigris (Brachot 59b). Rav Ashi ascribed the

name of the Tigris (Hebrew: *Chidekel*) to an acronym of sharpness (Hebrew: *chadin*) and lightness (Hebrew: *kalin*). Rashi explained that the water of the Tigris was sharp and light, the latter of which rendered it healthy to drink because it did not weigh down on the body. One might also argue that perhaps *Chazal* thought that the sharpness of the water conferred sharpness upon those who drank it. Regardless, this example indicates that *Chazal* believed that access to healthy water brought about beneficial health benefits, such as acuteness.

A similar concept regarding water quality appears in the writings of Hippocrates, in the aforementioned “Airs, Waters, Places.” Hippocrates writes on how different types of climate, e.g. sunny, windy, etc., influence local water composition, such that different areas with their different climates have different types of water. Each type of water composition, in turn, influences the health of that area’s population. For example, he discusses cities that “lie to the rising of the sun,” namely to the east: “For the sun in rising and shining upon them [the waters] purifies them by dispelling the vapors which generally prevail in the morning. The persons of the inhabitants are, for the most part, well colored and blooming, unless some disease counteracts. The inhabitants have clear voices, and in temperament and intellect are superior to those which are exposed to the north, and all the productions of the country in like manner are better” [15]. Thus, according to Hippocrates, a sunny climate improves the purity of that area’s water source, which in turn benefits not only the health but the intellect as well of that area’s population. Strangely, in a similar vein, current science has found that the presence of perchlorate in drinking water drunk by pregnant women can cause a decrease in babies’ IQs[16]. However, the addition of fluoride to the water supply, as commonly occurs in many countries, does not impact

children's IQ, as previously suggested [17]. Nevertheless, the idea that chemicals in the water can impact brain development does not seem as unusual in light of modern scientific analysis.

In addition to believing in the health benefits of water, *Chazal* believed in the protective effect of certain water against disease. For example, *Chazal* posited that Babylonia had no lepers because its residents bathed in the water of the Euphrates (*Ketubot* 77b). Here we see a case in which *Chazal* believed that good quality water, in this case that of the Euphrates River, had the ability to prevent disease, either because the water remained uncontaminated of leprosy or because the water itself had inherent therapeutic power. A 2016 research study found that the bacteria responsible for leprosy, *Mycobacterium leprae*, appeared in 24.2 percent of the water in patient areas [18].

Additionally, *Chazal* thought that immersion in bathhouse water kept a person healthy. The list of ten things that a city needs to have in place in order for a Torah scholar to live there included a bathhouse (*Sanhedrin* 17b). Furthermore, the Talmud prohibited standing on the floor of the therapeutic bathhouse of *Deyomset* on Shabbat because even just standing on the floor of the bathhouse warmed and healed (*Shabbat* 147b), which would go against the limitations on healing on *Shabbat*. Rashi defined *Deyomset* as a particular river with salty water. The Talmud clarified that water of this particular bathhouse was therapeutic for twenty-one days starting from *Shavuot*, as during this time period the water naturally became warm. In contrast, a medicinal drink created with this water was effective during the time period from *Pesach* to *Shavuot*, when the water became cold. In both cases, *Chazal* viewed the water of the *Deyomset* bathhouse as therapeutic, whether one stood in the water or consumed it medicinally. The idea that *Chazal* thought of

the *Deyomset* water as therapeutic does not contradict modern scientific inquiry. Along similar lines, folklore about soil in an area in Northern Ireland traditionally stated that the soil held healing properties and, interestingly, researchers recently found that this soil contains a specific bacterium that produced a novel antibiotic bactericidal towards antibiotic resistant pathogenic microbes [19].

Conversely, *Chazal* discerned that the wrong kind of water could pose a public health problem. The Talmud mentioned the springs of Tiberias in the context of the water with harmful properties (*e.g.*, *Shabbat* 109a; 39a) [20]. Drinking this water upset the stomach. Rambam commented that since the water caused an upset stomach, it did not constitute an actual *halachic* liquid and, as such, it neither became impure nor imparted impurity, as per the *Mishnah* (*Machshirim* 6:7) [21]. Additionally, one could receive a wound (*halachically* considered a boil (*Nagaim* 9:1)) from contact with waters of Tiberias, presumably due to their high temperature. Accordingly, the spring waters of Tiberias could harm the population by drinking or by skin contact. Modern science has characterized the water of the hot springs of Tiberias as saline and radioactive: “the water...is of Na–Ca–Cl-type with a temperature of ca. 60°C...with a total dissolved salt content of 31 g/L [and] is characterized by high radium (226Ra) and radon (222Rn) concentrations [22]. As such, “[o]wing to its high salt concentration, this [hot spring] water was not fit for drinking. But it was used for cleaning and healing, for instance, with spas developing in the Jordan Valley in Second Temple and Roman and Byzantine times” [23]. Often, contamination of water by a pathogenic bacterium or a parasite can cause stomach distress. Researchers, in fact, have identified one class of bacteria found in the hot springs of Tiberias as of the order *Hyphomicrobiales* [24]. However, these particular bacteria are nonpathogenic [25].

Contaminated Water

Today, water contamination has become an extremely pressing issue. Water contamination by two main sources, sewage and industrial waste, became such a severe problem in America that it necessitated both the Clean Water Act of 1972 (modified in 1977, 1987, and other times) and the Safe Drinking Water Act of 1974 (modified in 1996) [26]. Historically, many outbreaks of microbial disease occurred due to unsafe water, such as outbreaks of cholera and dysentery [27].

Chazal too dealt with the problem of water contamination and issued injunctions to address this problem [28]. For example, the *Mishnah* stated that one must distance flax-steeped water from vegetables, because the flax water ruins them (*Bava Batra* 2:10). In this case, *Chazal* took preventative measures not to allow contaminated water to damage food. In modern times, agricultural runoff still poses a problem: “Agricultural runoff into surface water is a problem...in arguably all agriculturally active countries” [29]. Moreover, many contaminants have the potential not only to damage food sources via water but to render those foods a health hazard. Threats to food safety include the heavy metals: mercury, lead, and cadmium, as well as pesticides and industrial waste [30]. A new pollutant of concern involves brine (concentrated saltwater) from desalination plants that produce the brine as a byproduct, which if deposited into the environment could cause deleterious ecological effects. As some countries increasingly rely on desalination to compensate for freshwater shortages, improvements in the desalination process are needed to avoid the harmful effects to terrestrial and aquatic ecosystems [31].

Sewage also has the potential to contaminate water. Jewish law provided injunctions against improper disposal of sewage [32]. The Talmud

cited a *Beraita* that discussed guidelines for dumping sewage into the public domain: “those who open the gutters and drain the sewage or shovel [sewage from] their caves [into the public domain], during the summer they do not have permission [but] during the rainy season they do have permission; even when they do have permission, if it causes damage then they are liable to pay [for the damage]” (*Bava Kama* 6a) [33]. Today too, sewage has the potential to contaminate water and many regulations are in place to prevent this from happening.

Pathogens

Chazal adhered to various theories as to how disease emerged and spread. Although they did not have modern epidemiological tools, some of their ideas and observations resemble current public health concepts and fit in with what we know today. For example, *Chazal* discussed insects, animals, and dirty clothing as entities that have the potential to spread disease. Moreover, while they might have learned some public health concepts from contemporaneous medical knowledge, *Chazal* also made some observations on their own.

Modern research has identified three means of the spread of contagious diseases: vectors, airborne transmission, and reservoirs. A vector involves an organism, for example a fly or tick, that can transmit vector-borne diseases, such as malaria, dengue, and West Nile virus [34]. Although they did not know about microscopic pathogens, *Chazal* intuitively recognized the concept of vectors. Regarding *raatan*, a disease characterized by watery eyes, upset stomach, and other symptoms, Rabbi Yochanan issued a warning to avoid the flies of a person with this disease (*Ketubot* 77b). Incidentally, Ostrer defines *raatan* as a pulmonary disease, rather than as a skin disease, as previously suggested [35]. Rashi clarified that flies that reside on someone with this disease can transmit the disease to another person. Likewise, healers at the time also

thought that the causative agent of *raatan* was a type of insect. As such, part of the treatment protocol required the healers to eradicate the insect by burning it. Furthermore, *Chazal* had a concern for airborne transmission of diseases, even though they did not necessarily know of the modern concept of airborne pathogens, as Rabbi Zeira worried about staying in the same area, *i.e.* breathing the same air, as the person with *raatan*. The concept of a reservoir in modern public health involves a non-human source where pathogens live and multiply and can include rats, food, or water [36]. Scientists often work to trace the source of a disease to its appropriate reservoir, such as *Coxiella burnetii* in rats, which transmit this bacterium to humans to cause Q fever [37]. Without a formal definition, Rav Ami and Rav Asi developed the concept of a reservoir, in their case food: Rav Ami and Rav Assi would not eat eggs from the alley of a person who had *raatan*, an expression of concern that food can spread disease. Additionally, pigs can serve as a reservoir for influenza, as human influenza viruses can in fact incubate in a pig's digestive system [38]. *Chazal* believed that disease could spread from pigs to humans, based on the belief that pigs and humans have similar intestines, to the point that when a pestilence spread amongst the pigs, Rav Yehuda declared a fast so that the people could repent and not become susceptible to the pestilence (*Taanit* 21b).

In advance of modern public health measures, *Chazal* believed in the importance of hygiene as a preventative against disease, especially so in the case of laundry. *Chazal* in fact believed that not laundering one's clothing led to insanity (*Nedarim* 81a). Rashi clarified that this referred to clothing unwashed to the point of being blackened.

Air Pollution

Even prior to and certainly since industrialization, air pollution has become a global problem that poses a threat to public

health. Studies have shown that air pollution can contribute most obviously to respiratory diseases, such as asthma [39-40] and possibly less obviously even to diseases such as autism, though researchers of this latter finding noted that the results need to be interpreted with caution [41]. Energy consumption, a basic part of modern life, significantly contributes to air pollution in modern times [42].

As is the case for water pollution, Jewish law offers injunctions against air pollution [43]. For example, *Chazal* issued ordinances about threshing floors (chaff), tanneries (odors), and kilns (smoke). The Mishnah prohibited building a threshing floor or a tannery within 50 cubits of a town (*Bava Batra* 2:8-9). The threshing floor also must remain distant enough from plantings and plowed fields that its chaff would not cause damage to them (*Bava Batra* 2:8) and similarly from gourds and cucumbers, as the chaff infiltrates their flowers and dries them (*Bava Batra* 24b). According to Rabbi Akiva, one may not build a tannery at all in the western direction of the city, as the winds would carry the odor (*Bava Batra* 25a). In the tosefta, Rabbi Natan ruled that kilns too must remain at least 50 cubits away from a city (*Tosefta Bava Batra* 1:7). Furthermore, *Chazal* viewed smoke damage as severe enough to exclude it from the stipulation of *chazaka* (acquired by privilege) (*Bava Batra* 23a). Moreover, the Talmud also discussed how when a specific family separated chaff from flax, the chaff would fly into the air and harm people (*Bava Batra* 26a). When those affected by the chaff complained to the Rabbis, Mar Bar Rav Ashi ruled that the family was liable for any resulting damage, on the grounds that the chaff harmed people. As a comparison, the Talmud cited a similar ruling about damage caused by one who beat a hammer to the point that sparks flew into the air and caused damage [44]. Additionally, during the time of the Talmud, a toxic odor from black cumin had occasion to permeate the air and one who slept downwind of the storage

area of black cumin had their own blood on their head (*Brachot* 40a).

From these examples, we see that *Chazal* took preventative measures against harmful substances in the air. In the case of the chaff and the hammer, although they did not prohibit the causative activity, they did warn that any resulting damage would incur a liability. This penalty, perhaps, incentivized people to not pollute the air to the point that it harmed people. Like the odor-producing tanneries mentioned in the Mishnah, a case recently occurred in California regarding farms of flowering Cannabis plants: “As a result of the stench, residents in Sonoma County, north of San Francisco, sued to ban Cannabis operations from their neighborhoods...‘I can’t be outside more than 30 minutes,’ Mr. Guthrie said of peak odor times, when the Cannabis buds are flowering and the wind sweeps the smell onto his property. ‘The windows are constantly closed. We are trapped inside. There’s no escape,’” [45] which indicates that similar cases still occur.

Foodborne Toxins

Chazal were proactive against food contamination. For example, *Chazal* took measures against snake poison finding its way into the water supply and into food: they forbade the drinking of water, wine, or milk left uncovered for the duration that it would take for a snake to drink from and to inject its venom into it (*Terumot* 8:4). They clarified that this edict applied to all liquids in vessels, but allowed for liquid in the ground if it measured forty *seah* (a type of liquid measurement) or more, because that amount of liquid would dilute the poison (*Terumot* 8:5). Moreover, one cannot eat fruit if it has bite marks, even a large fruit, because a snake might have bitten the fruit (*Terumot* 8:6).

Chazal were concerned not only about the presence of toxins but also about how toxins spread. Bartenura explained that for a large

fruit with a bite mark, if the fruit has moisture, one cannot eat even the part without the mark, as the poison could permeate the moisture and spread throughout the fruit. Similarly, for the same reason, one cannot eat an animal if it has a snake bite: Rambam explained that the snake poison could spread to the limbs of the animal and kill the person eating the animal. Here we see that *Chazal* thought of ways by which toxins could infiltrate food and took steps to prevent danger from these toxins.

Similar concerns remain today about toxins produced by bacteria. “Certain fish and shellfish may also contain toxins--for example, ciguatoxin or scombroid poison--produced by bacteria or algae that fish feed on or that infect the fish, thereby contaminating the flesh for human consumption” [46]. Regarding fruits, “fresh produce is responsible for an increasing proportion of foodborne illness. For the period 2002 to 2011, fruits and vegetables caused more cases of illness than beef, poultry, and seafood combined. In 2008, the largest foodborne disease outbreak in the previous decade was attributed to *Salmonella*-contaminated jalapeño and serrano peppers imported from Mexico” [47]. *Chazal* would not have known about bacteria or algae, but their measures taken against snake venom resemble modern public health measures against toxins produced by bacteria and algae.

The mandate of *mayim achronim*--to wash one’s hands after eating bread--serves as another example in which *Chazal* established a religious enactment that protected against a toxin. In this case, *melech sedomite* (sodomite salt) used with the bread potentially could blind the eyes (*Chullin* 105a-b). According to Rashi, since *Chazal* in fact advised eating salt with food (*Brachot* 40a), they needed to warn against touching the eyes without initially washing, as small grains of sodomite salt within the regular salt could stick to the hands and blind the eyes.

Healthy foods

Much as nutritionists today seek to pinpoint healthy foods, *Chazal* as well believed that certain foods provided health benefits. The Talmud in several places (e.g., *Brachot* 40a) detailed a list of various foods and their curative or harmful properties. *Chazal* viewed garlic, leeks, and radishes as beneficial to a person's health. Additionally, Rabbi Akiva maintained that a city that houses a Torah scholar must have various fruits, because a variety of fruit 'illuminates' the eyes (*Sanhedrin* 17b). Moreover, *Chazal* thought that some foods could prevent disease. For example, they attributed the fact that the Babylonians had neither *raatan* (mentioned above) nor leprosy to the fact that they ate beets and drank beer made with *hizmei* (*Ketubot* 77b) [48]. Apparently, *Chazal* believed in the curative power of certain foods. Similarly, many nutritionists today seek to find foods that provide health benefits or hinder disease. Regarding the statement in the Talmud about garlic, historically, including in ancient Greece, garlic served a medicinal role [49-50]. Intriguingly, it turns out that garlic has some antimicrobial properties [51-52]. Regarding the statement in the Talmud about fruit, many nutritionists recommend several servings of fruit per day; Moreover, fruits that contain beta carotene – such as mango, cantaloupe, and red/pink grapefruit [53] – have health benefits for the eyes.

Conclusion

Chazal did not have modern methods to detect the underlying chemicals or biologics behind the damage that they saw caused by water pollution, air pollution, pathogens, or food contaminants. Likewise, they did not recognize the underlying mechanism behind the water and food that they viewed as healthy. They did not have microscopes with which to view bacteria or protists. They could not take measurements of air pollution to the order of parts per million. They did not have the means by which to determine vitamin content of

foods, nor did they have the science of food chemistry at their disposal. However, *Chazal* did make empirical observations of how things appeared and also had a familiarity with scientific knowledge of their time. Accordingly, when they detected that something might cause harm to the population, *Chazal* created regulations that resemble current public health practices and much of what they recommended still passes muster today. They recommended healthy water and created laws against air pollution. They created restrictions against pathogens and set up regulations against food contamination. They provided dietary recommendations. Just as *Chazal* determined fair practice in terms of air pollution and water contamination, we can learn from those guidelines that they established. Likewise, we can follow healthy dietary practices, just as they recommended. Bernstein et al. write, "the wealth of Talmudic medicine is best revealed when it is compared with the methods of modern medicine, for many of the views, hygienic rules and methods of treatment of the ancient Talmudic physicians stand inspection in the light of today's scientific knowledge" [54]. Similarly, the lessons that *Chazal* taught about public health still remain relevant and timely today.

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The field of prosthetics may be small, but there is a considerable amount of interface between the topic of prosthetic limbs and *halacha*. The Romans are said to have crafted the oldest known prosthetic leg [1], while the original prosthetic limbs are suggested to date back to ancient Egypt. The devices were impractical, barely functional for everyday life activities and often unaffordable for the average person because they consisted of wood, metal, and basic materials. Ancient Egyptians wouldn't even recognize today's highly specialized prosthetics. Thankfully, victims of limb loss can now expect a stronger, lighter, more controllable appendage that is more realistic in appearance [2].

The goal of a prosthetic limb, whether it be a manual device or a mechanical one, is to mimic human-like limb function and is intended to restore the normal functions of the missing body part. Artificial limbs give rise to a large range of *halachic* questions that are relevant to various areas of Jewish law such as *hotza'a* (carrying on *Shabbos*), *nizikin* (damages), *chatzitzos* (separations) and women's immersion in the *mikvah*. With an ever-changing and rapidly advancing field, there are practical *halachic* ramifications for a Jew who wishes to wear a prosthetic limb and still fulfill one's *halachic* obligations.

Putting aside devices with mechanical and/or electrical components for now, manual devices open a Pandora's box of *halachic* concerns. The *melacha* of *hotza'a* discussed in the *Gemara* (*Masaches Shabbos* 96b) prohibits the transporting or carrying of an object on *Shabbos* without an *eruv* for more than four *amos* [3]. Rav Moshe Feinstein *paskened* that one who is disabled and cannot walk unaided, may go through a public domain on *Shabbos* in the absence of an *eruv* using crutches, a cane, a walker, or a wheelchair, given that they can push themselves (Feinstein, M. Responsa *Iggeros Moshe, Orach Chayim*, Part 4 #90). Torah

law permits this because it considers mechanical aids as substitutes for one's body part and embodies the status of that body part. In a similar manner, the *Shulchan Aruch* notes that one is permitted to wear leg braces because the braces are treated as articles of clothing just like one would wear glasses to see (*Shulchan Aruch, Orach Chayim* 301:16) [4]. A prosthetic limb, therefore, even if designed to be removable, can be worn on *Shabbos* in a public domain in the absence of an *eruv*. This is so long as one doesn't carry it after it has been taken off, as it would be considered a substitute for the body part it is mimicking [5].

Prosthetics and *halacha* may also overlap in the laws of *nezikin*, damages, brought down in the *Gemara* (*Bava Kama* 86a). From a secular law standpoint, the United States currently treats damage to a prosthetic limb as property damage, as opposed to personal injury [6]. Considering how deeply integrated prostheses are, the secular world— even outside of the Jewish Orthodox one— is reassessing much of what they thought they knew. Oxford researchers argue that treating damage to a prosthesis, simply as property damage, may be inadequate to fully reflect the wrongdoing [6]. There are currently no sufficient laws that compensate individuals for the psychiatric harm caused by injury of their prosthetics like there would be for bodily injury.

Jewish law considers many of these components from the start. From the *halachic* perspective, there are numerous factors that go into assessing one's liability for damages including what one damaged, with what intentions, and the loss ensued [7]. One's compensation would be far greater if one caused personal injury versus property damage. The reason for that is because in addition to the monetary compensation that they are obligated to pay, the *halacha* considers the money that the now injured person could have earned for the heavy work

they would have done if they were healthy and devoid of disability (*Bava Kama* 86a).

If Jewish Law is working on the premise that a prosthetic device is a part of one's body and plays the role that one's body part plays (Feinstein, M. Responsa *Iggeros Moshe, Orach Chayim*, Part 4 #90), as discussed previously regarding *hotza'a*, it would be another area in which questions could loom. It is problematic as to whether one is obligated to pay property damages or personal injury damages to the individual whose prosthesis they damaged. Rabbi Zvi Ron expresses that this may be subject to a case-by-case situation, depending on the type of prosthetic and how much damages are associated with personal injury, such as missing work and embarrassment.

Another instance in which one with an artificial limb may confront a *halachic* issue is regarding *chatzitzos* and women's immersion in the *mikvah*. The criterion for a valid immersion is that there cannot be a *chatzitzah*, a separation, between one's body and the water. The body must be completely clean, devoid of any foreign materials. The criteria, on the Torah level, for a *chatzitzah* to invalidate the immersion is only if the substance covers a majority of the body surface and the person is '*makpid*', does not want it there. Rabbinic Law considers it *chatzitzah* even if it covers less than half of the body surface but the person is '*makpid*' and does not want it attached to them. However, if one desires that attachment to their body, it would be considered as an extension of oneself and would not be considered a *chatzitzah* (Rashi, *Shabbos* 57a, s.v. Ha nami: *Sukka*6b).

Perhaps the vast amount of *piskei halacha* regarding the status of other synthetic body parts as *chatzitzos* can shed some light on the discussion of prostheses. Regarding temporary dental fixtures and their status as

chatzitzos, there is a difference of opinion among *poskim*; a number of *poskim* would say that it is permissible to wear in the *mikvah* since it is desired by the patient and covers less than the majority of their body; other *poskim* consider it a *chatzitzah* because it is scheduled to be removed in a short period of time. The *Avnei Nezer* made a distinction between temporary and permanent dental fixtures. Whereas a temporary dental fixture would hold the status of *chatzitzah*, a permanent gold tooth would not invalidate the immersion because it would be considered an extension of one's body (*Yoreh Deah* 259). It is held that if one has a removable dental fixture, one is obligated to remove it prior to immersion in the *mikvah* for it to be considered a valid immersion. Modern *halacha*, in discussions about having to remove a glass eye before going to the *mikvah*, is of the opinion that if it is something removed nightly it should be removed as it is considered a *chatzitzah*. This may also apply to prosthetics (Babberger, Y. Responsa *Zecher Simcha*, #118). Additionally, prosthetics are generally removed when bathing at home have been classified as a *chatzitzah* (Weiss, Y. Responsa *Minchas Yitzchak*, Part 5 #21).

The question becomes significantly more complex when electronic movement of the prostheses come into play. Modern mechanical prostheses, otherwise known as "myoelectric devices," contain electrodes that sense when the muscles in the limb move, causing the device to then open or close [1]. These brain-powered prosthetic limbs that work via brain signals allow a person to accomplish the same tasks that a real limb would; all the person has to do is think about what they want to do and the neural messages facilitate the action via the prosthesis. Essentially, the limbs have been designed with the ability to communicate directly to the body using electrical signals [8]. With this advanced technology comes new modes of

communication through which the prosthetic limb can operate in nearly an identical manner to that of the biological limb.

As a result of these medical and technological breakthroughs, the lines have been blurred between what is the human body and what is a prosthetic limb— which is precisely the goal from an industrial standpoint. From a *halachic* standpoint, the lines have now been blurred between what is *halachically* permissible and what is not. It is important to note that the application of the general principles to individual cases is complex and it is beyond the scope of this article to provide all the rapidly emerging modern *piskei halacha*. Yet it is clear that even within the broader categories of prostheses, there are novel *halachic* considerations to be made about each kind of device on its own. A *posek* must consider the various *halachic* factors and practical details of each individual situation in order to appropriately assess. Oftentimes, the best we can do is to raise the questions and not necessarily answer them all. *Halacha* is not static, rather, it is dynamic and ever-changing and the goal of modern *halacha* is to apply established principles to new technological advancements because of the rapidly changing world that we are lucky to be a part of.

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The Physical and Emotional Stress on Pregnancy: the Jewish Israeli Experience

By: Avivit Nsiri

Pregnancy can be a very special time in a woman's life. It is usually a time filled with excitement and anticipation and is a journey unlike any other. It is filled with many ups and downs ranging from morning sickness, to marveling nervously at the first ultrasound, to the unbearable heaviness of the last few weeks, leading up to the birth. Despite the many wonderful things associated with pregnancy, physical and emotional stress can sometimes have a negative impact on pregnant women. Doctors often advise women to get plenty of rest in order to relieve stress, in an attempt to reduce any potential harm to the fetus or to the pregnancy. There are certain situations specific to Jewish Israeli women, including fasting on religious fast days and the fear of war and terror, in which women have to be cognizant of the risks that physical and emotional stress poses to fetuses.

Every year during Yom Kippur, pregnant Jewish women face the question of whether or not it is safe to fast. Although it is considered to be a big *mitzvah* to fast on Yom Kippur, exceptions to this *mitzvah* come into consideration between doctors and rabbis because of a life and potential life put at risk.

Many doctors advise against pregnant women fasting since there is reason to believe that fasting can cause premature birth. While many women would like to fast on Yom Kippur, a very holy day in Judaism, most doctors don't recommend it. The *Shulchan Aruch* writes that a person who is seriously ill or may become seriously ill by fasting, is not permitted to fast on Yom Kippur (*Shulchan Aruch Harav, Orach Chaim* 618:1) [1]. Thus, pregnant women may not be obligated to fast if there is a chance of becoming ill or putting the pregnancy in danger of preterm labor. A study on the effects of Yom Kippur reported an increase in preterm deliveries. The study

stated, "the mean delivery rate in the Jewish population was significantly higher during Yom Kippur and the day after" [2]. Another study compared deliveries of Jewish and non-Jewish patients. This research showed that Jewish pregnancies were at a significantly higher risk of preterm delivery during a 25-hour fast. However, although this might be true, the research stated that there was still a need for a larger study to really understand the effects of fasting on delivery outcomes [3].

Another study focused on the effects of fasting on Yom Kippur and Tisha B'Av with regard to pregnancy and found that there was an increase in births one day after Yom Kippur and two days after Tisha B'Av. However, there was no significant increase in births one day after Tisha B'Av. The results of the study suggested a random variation in birth rates. In addition, when the birth rates were compared to the overall mean birth rate, there was not a significant difference. This study concluded that a 25-hour fast doesn't necessarily lead to an increase in the birth rate [4]. An additional study noted a special risk of fasting may exist for women who have a tendency toward early delivery [5]. Other researchers found an additional risk to fasting specifically in Israel. The dry and high temperature in Israel can cause a high risk of dehydration and women who have a high tendency of dehydration aren't recommended to fast as it can affect delivery. Such women concerned about being dehydrated should drink liquids in larger quantities before the fast and should try to reduce exertion. Women should also try to avoid being out in the hot weather and stay in air-conditioned environments to take the most effective precautions [6].

Yom Kippur is not the only example of stress endured by Jewish Israeli women during

pregnancy. For many Jews, living in Israel is a dream come true, however, due to the Arab-Israeli conflict in Israel, there have been many wars and terrorist attacks causing stress to its people and everyday life. Many women, regardless of being pregnant, are forced to watch their husbands and loved ones being called to the line of duty. These stress factors, which are an inherent part of being an Israeli citizen, might lead to the development of medical disorders in unborn children. There are many studies conducted which argue both sides of whether there is an effect or not of such stresses on the pregnancy of a Jewish Israeli woman.

An article in the Jerusalem Post discussed the effects of psychological stress on pregnant women. The article stated that there was a link between stress during pregnancy and schizophrenia in children. The article noted that “women who are in the second month of pregnancy when exposed to psychological stress in a war zone or other extreme traumatic events are significantly more likely to give birth to children who eventually develop schizophrenia.” The disorder is found in 1% of Israelis and tends to appear in young adulthood. Additionally, a study found that stress in the second month of pregnancy during the 1967 war in Israel seemed to be linked to a higher incidence of schizophrenia. Girls were 4.3 more likely, and boys were 1.2 times more likely, to develop schizophrenia. Although the study found a significantly higher incidence of schizophrenia, Prof. Arie Shalev, the chief of psychiatry at Hadassah University Medical Center, told the Jerusalem Post that it is still very low incidence and that women should not be frightened. Although this study is important, it does not prove a correlation between the two [7]. Another study using data from Israeli women exposed to the Six-Day War and the Yom Kippur War states that maternal stress during pregnancy is a possible risk

factor for schizophrenia, but the evidence still remains insufficient.

Yom Kippur and the Arab-Israeli conflict are two examples of a myriad of stresses facing Jewish Israeli women during pregnancy. The studies above show that these examples may cause physical and emotional stress on pregnancies. Although this is the case, is it still possible to live normally as a Jewish Israeli woman without worrying too much about the effect. If a woman is thinking of fasting for Yom Kippur or any 25-hour fast, she should consult a doctor and rabbi to request guidance. The majority of rabbis will state that if the woman is still early on in her pregnancy, she should try her best to fast. However, rabbis emphasize that if at any time, a woman feels ill, she should drink some water and eat small amounts of food. This would be true even for women who are in late-term pregnancy, as the goal is to avoid dehydration or inducing preterm labor. Although some argue that there is insufficient evidence of potential health risks associated with fasting while pregnant, women should still keep in mind that the physical stress caused by fasting can lead to preterm labor. Another factor of stress that Jewish Israeli women should be keeping in mind is the emotional stress that comes with living in Israel. Again, many studies say the evidence is insufficient, but there is still reason to be cautious of the correlation of prenatal stress and schizophrenia in children. Overall, Jewish women should not be concerned about living in Israel and the emotional and physical stress associated with it. They can go on to enjoy their pregnancies, as it continues to be the most special time in a woman’s life.

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The remarkable combination of special sun rays and the waters of the Dead Sea help alleviate pain and suffering for people in Israel and all around the world [2]. People who are suffering from different conditions, such as psoriatic arthritis, rheumatic disease, and lung ailments, have all been able to gain relief from bathing in the Dead Sea. The natural healing properties of the Dead Sea have substantial scientific health benefits.

There are many different health conditions that can be treated at the Dead Sea including vitiligo, atopic dermatitis, cystic fibrosis, and psoriasis. The combination of sun exposure, bathing in the sea, and other environmental factors have indicated their effectiveness in treating these medical conditions. Of the conditions mentioned, psoriasis has been reported to have a highly effective treatment of climatotherapy at the Dead Sea [1].

The relief that people receive from the Dead Sea cannot only be attributed to the water. The different sun rays illuminating the 310 square mile area of the Dead Sea are also effective in promoting healthy skin [2]. Ultraviolet B radiation (UVB) from the sun can be extremely dangerous. If a person is exposed to UVB for too long, there is a greater risk for skin cancer, as this wavelength of light directly damages DNA [3]. However, the dense air that hovers over the Dead Sea obstructs the passage of UVB radiation from the sun, protecting people from potential damage, while allowing them to benefit from the sun at the same time.

A study was conducted by Drs. Zvi Even-Paz and Dov Efron about heliotherapy, the use of the sun's natural rays as a form of therapy, to treat psoriasis. Psoriasis is a chronic skin disorder that has an undetermined origin. Although there is currently no cure for psoriasis, symptoms can be alleviated in several different ways. This study demonstrated that heliotherapy was a major

factor in the process of treating psoriasis at the Dead Sea. The results of the experiment showed an excellent improvement or even complete clearing in 75% to 90% of the patients [2].

In addition to the sunlight, the rich haze of evaporation that appears above the sea is enriched with bromine, which further helps filter out the rays from the sun [2]. Other mineral contents of the Dead Sea water include chloride, magnesium, calcium, potassium, sulfate, and bicarbonate [1].

The medical treatments associated with bathing in health springs is discussed in Israel in regards to the *halachic* prohibitions of healing on *Shabbat*, as well as bathing on fast days. There are five physical pleasures that we refrain from on Yom Kippur and the Ninth of Av. One of these prohibitions is bathing or washing as stated in *Yoma* 8:1. The prohibition includes the act of *pleasurable* bathing, however washing or rinsing the body with the intention of cleanliness is permitted. An example is the incident mentioned in the Talmud *Yerushalmi, Moed Katan* 3:5, which discussed the concept of therapeutic bathing on fast days. Shmuel bar Abba had a potentially fatal rash and if not kept clean, could cause death. He asked Rabbi Yassa whether he is allowed to wash himself on a minor fast day and the response was in the affirmative. Rabbi Yassa added that Shmuel bar Abba may even wash on the Ninth of Av and Yom Kippur [4].

Many passages in the Talmud and the *Mishna* discuss the several contexts of therapeutic bathing. According to a *Tosefta* (*Shabbat*, ed. Lieberman, 12:13), one is permitted to bathe in the waters of Tiberias and in the Great Sea [*i.e.*, the Mediterranean Sea], but not in steeping pools and not in the Sea of Sodom [*i.e.*, the Dead Sea]. There are different rulings in regards to bathing on *Shabbat* in spring water compared to bathing in sea

water. This *Tosefta* distinguishes between different sources of water, which supplemented the ruling of bathing on *Shabbat*. Other medicinal treatments at the Dead Sea also include the application of the mud from the Dead Sea over one's entire body - whether for pleasure, therapeutic purposes or healing purposes. Questions arose around the idea of applying therapeutic mud and bathing in mud on *Shabbat*. It is noted in the *Mishna* in *Shabbat* 22:6 that it is prohibited to go down into the *keroma* (wrestling ground) on *Shabbat*. We learn from the Talmudic explanation of this *Mishna* that it is making a reference to the action of immersing one's body in mud for therapeutic reasons. In Talmud *Shabbat* (147b) it mentions that "Rabbi Hiyya bar Abba said in the name of Rabbi Yohanan: It is prohibited to stand on the mud [of hot springs] ay Diosmsith because it is therapeutic." This statement indicates that bathing in mud would be prohibited in hot springs because the type of bathing is therapeutic [4].

There are also other obstacles that are involved indirectly in the context of treatment at a health spring. Some of these include: carrying a towel on *Shabbat*, squeezing the water from the towel on *Shabbat*, swimming, and more [4].

Whether it be to help relieve a certain condition, for therapeutic reasons, or simply for relaxation, there are many aspects of the Dead Sea that help our bodies in many different ways. Dating back to biblical times, the Dead Sea is known for its healing properties [5]. Men, women, and children from all over the world gather at the Dead Sea for its unparalleled environment and natural remedies [2].

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In 2015, in the research laboratory of Dr. Ali Brivanlou at The Rockefeller University, a human embryo was successfully grown in a Petri dish for 13 days. During this time, the International Society for Stem Cell Research (ISSCR) instituted a rule prohibiting the growth of human embryos in a laboratory beyond the arbitrary point of 14 days. The 14-day mark was chosen because they believed nobody would be able to grow a human embryo that long. With this rule in place, Dr. Ali Brivanlou was faced with the tough decision to continue and violate federal guidelines, or to put his research to an end—research that could have saved lives [1].

Between days 14 to 22, the human embryo goes through the developmental stage of gastrulation. During this stage, foundations are laid for organ generation to take place. A greater understanding of this stage could unlock how organ cell types arise and how miscarriages and birth defects occur. The 14-day rule was established in 1979, a time when a human embryo could hardly survive outside the uterus. However, with the advancement of laboratory techniques, medical ethicists are now faced with the question of whether the 14-day rule should be updated with a newer upper limit, perhaps a 28-day rule [1]?

One concern that medical ethicists have is that the embryo may experience pain or suffering. However, at 28 days, the embryo does not possess functional neural connections or sensory systems [2]. Therefore, within this extended period of research, the embryo cannot experience sensation, pain, or suffering. While this is true, the question as to whether one is committing murder due to the embryo's potential to develop into an independent live entity goes unanswered.

In Judaism, there is a great value for life pre and post-natal. The value of life is not seen as one that is limited to the Jewish people. In Bereshit 9:6, G-d tells Noah

”שׁוֹפֵךְ דָּם הָאָדָם בְּאָדָם דָּמוֹ יִשְׁפָּךְ כִּי בְצַלְמֵ אֱלֹהִים
“עָשָׂה אֱתֵה-אָדָם” [3]. From this statement, it is made clear that murder is one of the seven Noachide laws that are expected for all humanity—both Jews and non-Jews—to follow. Additionally, the word “בְּאָדָם” literally means “within man”, so who is the man within man. Rav Yishmael answers this question in *Sanhedrin* 57b: “What is a person that is in a person? You must say: This is a fetus that is in its mother’s womb” [4]. Accordingly, the concern of killing a fetus becomes a much greater issue than one only impacting the Jews.

To establish if *halachically*, one can take part in embryonic research by either conducting research on embryos derived from Jewish or non-Jewish sperm and egg, or donating their own egg or sperm, the *halachic* status of murdering a fetus must be established.

It is understood from Rav Yishmael that foeticide is a prohibition directly from the Torah. Considering this is not a Rabbinic law, there is little flexibility when discussing its ramifications. One may suggest that because one can break Shabbat—a Torah-given law—to save a life, one may be able to take part in embryonic research since it too can save lives. However, according to Rav J. David Bleich and Rav Moshe Feinstein—two major contemporary poskim—the action must have immediate life-saving implications, rather than long-term possibilities [5,6]. Without the possibility of this exception, a greater understanding of the *halachic* status of an embryo developing outside the womb is needed.

As stated by Rav Yishmael, there is a great concern with killing a fetus within the mother’s uterus. However, the human embryos in the laboratories are being developed outside the uterus. One can

question if being developed within a uterus is a prerequisite to having the *halachic* status of being a human living entity. Rabbi Shimon Bar Yochai stated in the Zohar, Shemot 3b that G-d will not answer the prayers of those who destroy a fetus in the uterus [7]. By stating “in the uterus,” he places emphasis on its significance. Additionally, in *Niddah* 23b Rabbi Meir states that if an offspring that has the characteristic of an animal was developed in a uterus of a woman, it has the *halachic* status of a human being: “According to Rabbi Meir, who said that an item that is similar to an animal in the womb of a woman is considered a full-fledged offspring”[8]. Through this logic it is understood that the characteristics of the fetus do not determine its *halachic* status but rather the uterus that it is in, emphasizing the role of the uterus in establishing the status of the fetus. One could determine that *halachically* the development in the uterus is a prerequisite for a being to be considered a human entity.

Nevertheless, Rabbi Gershon Leiner rebuts this argument [9]. He states that if one was to murder Adam—who had not been developed in-utero—it would still be considered murder. Thus, this criterion alone is not considered the definition of a human being. The criteria to be a human being are not clearly outlined and it is unknown if the human embryo can develop ex-utero until the completion of the nine-month gestation period. With these unknowns, human embryonic research can only be deemed permissible if the abortion of an embryo is permissible.

In *Yevamot* 69b, Rav Chisda discusses the laws pertaining to a pregnant woman who would like to take part in *terumah*. He states that “if she is pregnant, until forty days from conception the fetus is merely water. It is not yet considered a living being, and therefore it does not disqualify its mother from partaking of *terumah*”[10]. From this text, one can conclude that in accordance with Jewish law

an embryo is not considered a life until 40 days from conception. Likewise, in *Niddah* 30a, the Mishna states that if a woman has a miscarriage within 40 days of conception, she is not considered impure since there was no death of an offspring: “A woman who discharges on the fortieth day since she immersed herself and engaged in intercourse with her husband need not be concerned that it might have been an offspring” [11]. From here, some halachic authorities conclude that feticide before 40 days is permissible since it is not considered a living entity.

Nonetheless, many other halachic authorities are of the opinion that abortion within 40 days is still considered feticide since one is inhibiting the developing life which has a status of its own [5]. Accordingly, in *Sanhedrin* 91b a Roman emperor asks Rav Yehudah HaNasi when is the soul placed in the body, questioning if it is at conception or at 40 days after conception? At first, Rav Yehudah HaNasi stated that the soul was placed in the embryo at 40 days; however, the emperor refuted his statement by claiming it is impossible for the embryo to exist without a soul for that long. Rav Yehudah HaNasi then agreed [12]. Through a statement presented by both Rabbi Yochana and Eliezer in *Menachot* 99b, the discussion between the emperor and Rav Yehudah HaNasi is better understood. The two rabbis state that just like it took Moshe 40 days to learn the whole Torah, it takes 40 days for the soul to reach completion [13]. Therefore, as stated by many rabbinical authorities, those 40 days are crucial for the development of life since during this period the soul is being formed.

Accordingly, other poskim, like Rabbi Plocki, state that destroying an embryo during the first forty days after conception does not constitute feticide, but rather is an act of “destroying the seed”—the potential for life [14]. Although gentiles are prohibited from murder, they are not prohibited from

destroying potential lives. Thus, Rabbi Unterman holds that a gentile is not prohibited from aborting an embryo before the fortieth day and a Jew is not prohibited from aiding the abortion [14].

Although there are diverse rulings amongst rabbinic authorities, Rabbi Tendler states—in his testimony published by The National Bioethics Advisory Commission—that it is critical to find a way within *halacha* to continue stem cell research. Rabbi Tendler acknowledges that many times a fence is needed in Judaism to ensure Jewish values are being protected. However, he notes that a fence here would cause more harm than benefit: “But a fence that prevents the cure of fatal diseases must not be erected, for then the loss is greater than the benefit. In the Judeo-biblical legislative tradition, a fence that causes pain and suffering is dismantled” [15]. Furthermore he stated that not only is it not prohibited but “mastery of nature for the benefit of those suffering from vital organ failure is an obligation.”

While there is some controversy regarding whether Jews can use their own gametes for stem cell research, it is widely accepted gentiles can. As Rabbi Tendler argued, it is the Jewish obligation to aid this research to ensure that life saving knowledge can be completely elucidated. Through embryonic stem cell research, scientists will better understand how organ cell types arise and how miscarriages and birth defects occur. Additionally, this research is being used to discover how organs can be developed in laboratories for transplantation. *Halachic* issues with organ donors could be avoided by using laboratory-produced organs. Hence, stem cell research within the guidelines of *halacha* is crucial.

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The most well-known laws of *Kashrut*, Jewish dietary laws, relate to fish, birds, animals, and insects. Plant foods, such as fruits, vegetables and herbs, do not have the same restrictions in place. However, bugs more commonly infest produce and can make these foods unsuitable for consumption by the kosher consumer. The Torah states in Leviticus 11:41 that “all the things that swarm upon the earth are an abomination; they shall not be eaten.” Rashi, author of the most widely used biblical commentary on the Torah, states on this verse that “the insects in peas and in beans and the mites in lentils... so soon as they have emerged into the air and have moved about they become prohibited to be eaten” [1]. The Talmud (*Makos* 16b) notes that one who eats a type of wasp transgresses six biblical prohibitions. Bugs are commonly found in produce, especially in lettuces, since their many layers and crevices provide a safe home for the insects to hide in. However, the common use of pesticides has lowered the incidence of insects in crops.

Pesticides are poisonous chemicals that are sprayed on fields to kill and prevent bugs from settling on and eating the produce. The U.S. Environmental Protection Agency (EPA) reported that in the US alone, 1.1 billion pounds of pesticides are applied each year [2]. Insecticides are used for killing bugs on produce, allowing for mainly insect-free fruits and vegetables. Although insecticides that are applied to crops, such as fruits, vegetables, grains, and herbs leave traces of toxicants on the produce. Multiple studies looked at different types of pesticides and showed how pesticide exposure has cancer-inducing effects in mammals [3-6]. In addition, direct exposure to larger doses of pesticides can cause symptoms such as dizziness, headache, confusion and vomiting. In cases of severe poisoning, it can cause unconsciousness and death [7]. When a person consumes crops with pesticide residue they are directly exposed to chemicals which can induce

genetic damage and the pathologies resulting from that genetic damage. Multiple studies comparing children on organic and non-organic diets found pesticides present in the urine of children on the non-organic diets, suggesting that pesticide traces remained on the crops consumed by these children [8-10]. To avoid the issue of pesticides, it is recommended to buy organic produce. However, when organic produce is not available, it is recommended to thoroughly wash produce to remove as much of the pesticides as possible. In addition to the health effects, there are numerous environmental effects of pesticides, including contamination of consumable water. Insecticides also contribute to another major concern, the endangerment of bees. The United Nations Environment Program emphasizes bees importance to the ecosystem stating, of the 100 crop varieties that provide 90% of the world’s food, 71% are pollinated by bees [11].

Because of the insecticides sprayed on produce, non-organic produce contains fewer insects than organic produce. This has created a *halachic* question of whether it is better to avoid organic produce because of the great possibility of finding insects on them compared to non-organic crops. In fact, many kosher organizations bring up the fact that organic produce has more bugs and is therefore harder for the consumer to check for bugs. This is of great concern to many kosher certifications, including the Orthodox Union. The OU states that “the popularity of organic produce has complicated matters. The term organic usually means grown without pesticides, herbicides, and synthetic fertilizers. Understandably, organic produce could be subject to higher levels of insect infestation” [12]. Therefore, organic produce must be washed better than conventional produce because of the bugs that can render it non-kosher [13]. However, this is misleading because non-organic produce must also be

washed thoroughly in order to avoid the negative health effects of ingestion of pesticides. Especially vegetables, such as kale and lettuce, which are on the EWG (Environmental Working Group) list of the “dirty dozen” most frequently infested with insects. Buying these produce items non-organic, does not mean that a brief wash to remove the insects is sufficient because of the health hazards of pesticide residue lingering on the surface.

In conclusion, the *halachic* implications of organic produce should not be much of a concern because non-organic produce also requires a thorough washing. Buying organic produce is beneficial for the environment and individual health. Organic is usually more expensive than conventional produce, although by purchasing organic produce, even periodically, one is not only supporting a farming industry designed to be healthier for humans and the environment, but also keeping organic farmers in business.

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Adom HaRishon and His Contemporaries – Soulless Humanoids

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On a Friday morning, in the very late summer, 5782 years ago, *HaShem*, using the generative nature of soil, formed the first human being, *Adom HaRishon* (Sanhedrin 38b). As with all animals, *Adom HaRishon* was provided with a life-giving force, or *nefesh*. However, *Adom HaRishon* was unique among the animal kingdom, as he was given an additional spirit, a soul (*neshama*). “And *HaShem* God formed the man from dust of the ground, and He blew into his nostrils the soul of life and man became a living being” (Bereishis 2:7).

At this point, it is customary to mention that the Torah may be understood on several levels (*i.e.*, the 70 facets to the Torah (Bamidbar Rabba 12:15-16)) and, thus, the approach herein is acceptable, albeit, it may not be palatable, to all readers. This article presents a little discussed thought, that *Adom HaRishon* entered the world to find a preexisting society of primitive man, probably Cro-Magnon man. An important caveat is that primitive man is described as a creature that is human-like in appearance, with intelligence, but lacking a *neshama*. This idea of soulless humanoids is found in Ramban (Guide for the Perplexed, chapter 1, part 7) and Teferes Yisrael (Rav Israel Lipschitz, see Drush Or HaHayyim), as well, as noted by Rav Shimson Schwab [1-3], Rabbi Ari Kahn [4], Rabbi Steven Pruzansky [5], and Dr. Gerald Schroeder [6, 7].

Ramban, as well as S’forno, noted the possibility of soulless humanoids. According to these sages, *Adom HaRishon* was developed in three stages, created initially as an entity formed from soil, with a force that produced growth “like that of a plant.” Next, man was made animate, able to move. Ramban continued that this primitive form of

man had both the physical structure and the power of perception of a human. Lastly, this primitive man acquired a *neshama*, now achieving the status of a human being (Bereishis 1:26; 2:7). Apparently, according to Ramban and S’forno, it was possible to have a creature who appeared human, but who was not human, because of the lack of a *neshama* [see 6-8].

Adom HaRishon entered the world to find an abundance of life forms, both invisible to the naked eye (*e.g.*, bacteria and protozoa) and visible to the unaided eye (*e.g.*, multicellular plants and animals). At the apex of the animals were creatures, biologically classified as *Homo sapiens*, but different from *Adom HaRishon* (also biologically classified as *Homo sapiens*), as these *pre-Adomites* (*i.e.*, prehistoric man) lacked a *neshama*. A cytological analysis of primitive *pre-Adomites* and *Adom HaRishon* would show that the somatic (body) cells of both contained 46 chromosomes and the gametes (egg and sperm) of both contained 23 chromosomes. Physically, there was no biological difference between the two, and interbreeding between *Adom* and *Chavah* and *pre-Adomites* was possible and produced fertile progeny. The difference between the two was spiritual - the *pre-Adom HaRishon* humanoids were “soulless” and, as such, are considered to be “animals,” whereas *Adom HaRishon* and his descendants have a soul and are human beings.

It is important to note that, although these *pre-Adomites*, spiritually are “animals,” there is a sufficient distinction between soulless humanoids and other traditional animals. Traditional animals lack a *Yetzer Hara* (an evil inclination) and their behavior is instinctual. Rav Samson Raphael Hirsch

(Bereishis 3:1), wrote that “animals are endowed with instinct, which is the voice of God, the Will of God as it applies to them.” Thus, a lion would not be punished for killing another animal nor for cohabitating with any female lion, even its daughter. Although the soulless pre-*Adomites* are viewed as “animals,” they are at a higher intellectual level than what we traditionally refer to as an animal. Prehistoric man had a more complex brain, was able to discern right-from-wrong, had free will (as opposed to instinctual behavior), and functioned with reason and thought. Prehistoric man had sufficient intelligence [1-3] to follow basic principles of humanity (e.g., possibly, the Seven Universal Commandments, later to be known as the Seven Noahide Commandments). Their lack of adherence to the basic principles of humanity will eventually be the driving force for their destruction in the Flood.

Who were these soulless humanoids and when did they come upon the scene? According to one kabbalistic thought (as put forth by Teferes Yisrael) based on the Talmud Chagiga (13b, 14a), *HaShem* destroys (i.e., transforms) worlds and replaces them with more improved, more advanced worlds. Apparently *HaShem* orchestrates natural cataclysmic events – such as volcanic eruptions, movements of the tectonic plates, meteorites crashing into the planet – that destroy the world along with a large percentage of its inhabitants, both plants and animals [9]. Such a destructive event accounted for the sudden disappearance of dinosaurs from this planet. A giant asteroid crashed into this planet, launching more than 12,000 cubic meters of debris and material into the atmosphere, which blocked sunlight from reaching the planet, caused a winter that lasted for decades, and acidified the oceans. When the air cleared, three quarters of all

species on Earth, including the dinosaurs, were dead [10]. The discovery of fossils of dinosaurs excited the Teferes Yisrael, as these artifacts confirmed the kabbalistic idea of an everchanging planet. The extinction of dinosaurs paved the way for mammals, including prehistoric man, to develop and to repopulate the transformed planet.

Teferes Yisrael suggested that the reason the Torah started with the Hebrew letter “*bais*,” or the number two, was to hint that this present version of planet Earth is the second time in which *Homo sapiens* were at the apex of the animal kingdom. In the immediate prior version of planet Earth, the apex of humanity was represented by Cro-magnon man, the pre-*Adomite* soulless humanoids, who replaced Neanderthal man (not classified as *Homo sapiens*). The Cro-magnon civilization was significant and extended from France to Ukraine and across northern Canada [6, 7]. Subsequently, the crown of humanity was replaced by *Adom* and *Chavah*, and their descendants became the dominant form of *Homo sapiens*.

Perhaps, the presence on the planet of prehistoric man was advantageous to *Adom HaRishon* and his descendants, as the world that *Adom HaRishon* entered had existing sociological and technological accomplishments that laid the groundwork for humanity to rapidly progress and advance. Rav Schwab [1-3] considered prehistoric man to be highly intelligent. Archaeological data note that prehistoric man practiced agricultural farming, animal husbandry, metal working, construction of complex shelters, and invented boats, weaponry, harpoons, bone needles, and tools. Other accomplishments included construction of personal adornments such as strings of beads, statuettes of bone and stone, cave art, and clothing, as well as a

social system that included care for the infirm [11].

Modern day man, beginning with *Adam* and *Chavah*, and pre-historic man biologically are classified as *Homo sapiens*, thus, interbreeding between these two subspecies was possible, producing hybrid progeny. Eventually, different strata of people existed: (a) progeny resulting from intrabreeding between prehistoric man; (b) progeny tracing a direct lineage to *Sheis* (Seth, in English), the third son of *Adam* and *Chavah*, and (c) as will be discussed, hybrid progeny, resulting from interbreeding between human beings and prehistoric man. When the Flood came, most of humanity, *i.e.*, human beings, prehistoric man, and hybrids, was wiped out.

The concept of soulless humanoids (prehistoric man), coexisting with human beings, may clarify several *midrashim* and touch upon one *halacha* (Kilayim 8:5). Below are some examples.

(1) Towards the end of the *parshas Bereishis*, the Torah enumerated the human lineage from *Adom* until *Noach*, and noted their life spans. Regarding *Adom* it stated: “When *Adom* had lived one hundred and thirty years, he begot in his likeness and his image, and he named him *Sheis*” (Bereishis 5:3). After expulsion from the Garden in Eden, *Adom* and *Chavah* physically separated from each other for 130 years and did not have intimate relations. When the estranged couple reunited, *Sheis* was born - in the likeness and image of *Adom*. Why was it necessary to add that *Sheis* was in the “likeness” and “image” of *Adom*. Apparently, during their 130 years of separation, *Adom* and *Chavah* bore offspring who were not in their likeness – *i.e.*, not human beings. There are many versions of the following *midrash* (Bereishis Rabba 20:11;

also Eruvim 18b) -- during these 130 years of separation, *Adom* mated with female “demons” and produced hybrid offspring and *Chavah* mated with male “demons” and produced hybrid offspring. Rambam, a rationalist who did not believe in demons, explained this *midrash* as follows: *Adom* and *Chavah* mated with soulless humanoids, to produce hybrid progeny that lacked the image of God (The Guide for the Perplexed, 1:7) [7, 12].

(2) “And the man said, “This at last is the bone of my bones and flesh of my flesh. This shall be called ‘woman’ for from man was she taken” (Bereishis 2:23). Rashi, citing the Talmud Yevamos (63a), noted that from here we learn that *Adom HaRishon*, in search of the appropriate mate, was intimate with domesticated and wild animals, but was not fulfilled until matched with *Chavah*. Many commentaries rejected that this occurred. The Alshikh (Toras Moshe 2:19-20) suggested that *Adom HaRishon* merely entertained these possibilities in his mind and did not put them into action. The Maharal (Be’er HaGolah, fifth *be’er*) also put forth a nonliteral approach to this teaching [1]. Yet, Rashi clearly did state *Adom HaRishon*, in search for a mate, was intimate with animals. Rav Shimon Schwab [3] offered the more palatable suggestion that the “animals” with which *Adom HaRishon* mated were female Cro-Magnon soulless humanoids. *Adom HaRishon* found no psychological satisfaction with these relationships as these pre-historic females lacked a *neshama*.

(3) *HaShem* placed *Adom HaRishon* in the Garden in Eden, which housed the Tree of Knowledge, and commanded him not to eat from that tree, for on the day you eat from it, you will surely die (Bereishis 2:16, 17). Subsequently, *Chavah* is formed and later is

seduced by a creature, the so-called “snake,” to eat a fruit from Tree of Knowledge (Bereishis: chapter 3). Why was the “snake” concerned that *Chavah* eat from the Tree of Knowledge? The “snake” had spied upon *Adom* and *Chavah* in a moment of intimacy and lusted for *Chavah* (Rashi, Bereshis 3:1). If the “snake” lusted for *Chavah*, why did it encourage her to eat from the Tree and die? The snake assumed that *Chavah* would serve her husband first, as wives normally do (Gur Aryeh; Sifsei Chachamim) (Bereishis 3:6). With *Adom* dead, *Chavah* would be his to marry (Gur Aryeh). However, *Chavah* ate the fruit, and afterwards gave some to *Adom* and he ate from it (Bereishis 3:6). If *Chavah* was aware that consumption of the forbidden fruit carried the death sentence, why did she offer it to *Adom*? Rashi provided the rationale for *Chavah*’s action, stating that she gave *Adom* the fruit so that if she alone died and he survived, he would then remarry. Rabbi Pruzansky [5] asked, “Marry, who?” there were no other human beings? He answered, *Chavah* was concerned that *Adom* would remarry a prehistoric Cro-magnon female.

(4) The identity of the seducer as a “snake” is problematic. This creature is described as a biped, walking upright (Rashi, Bereshis 3:14), with arms, communicating with speech and reasoning, and lusting after a human being. Snakes lack appendages, they slither and do not walk, they lack a larynx and cannot talk, and mate by instinct, not by lust. It is important to remember that the punishment was that this creature was transformed into a snake, not that it initially was a snake (Bereishis 3:14). Rav Schwab (2014) and Rabbi Kahn [1] suggested that this “snake” was a prehistoric Cro-magnon male, human-like in appearance, capable of speech and reasoning, highly intelligent, and with a sexual desire directed for *Chavah*. This

specific creature was the most intelligent of all the pre-*Adomites* (Sanhedrin 59b). In the Torah, this specific creature was described as, “Now the snake was cunning beyond any beast of the field that *HaShem* God had made” (Bereishis, 3:1); this specific prehistoric man was destined to be the king of the soulless humanoids, probably explaining its access into the Garden in Eden.

There is a discussion (Sanhedrin 59b) of the intended purpose of the “snake.” Apparently, that “snake” (*i.e.*, that prehistoric Cro-magnon man) was intended to be the personal servant of *Adom* and *Chavah*, to be used to perform tasks beyond the capacity of other animals. If *Adom* and *Chavah* had not sinned, each Jew was to be given “two snakes” – to perform tasks too difficult for human beings, such as journeying to the frozen North or the scorched South to gather precious gems. In addition, these servants would handle agricultural issues involving soil (Maharsha, cited in the Artscroll edition of Sanhedrin 59b). This *gemora* is more understandable when viewed according to the Rav Schwab (2014) and Rabbi Kahn (2011) – that the above noted “snakes” were references to pre-historic man, who existed in the time of *Adom* and *Chavah*.

(5) Upon killing *Hevel*, *Kayin* was punished to “become a vagrant and a wanderer on earth” (Bereishis 4:12). Worried about survival as a wanderer, *Kayin* complained to God, “I must become a vagrant and wanderer on earth, whoever meets me will kill me” (Bereishis 4:14). As a protective measure, *HaShem* “placed a mark on *Kayin*’s forehead so that whoever encountered him would not kill him” (Bereishis 4:15). Of whom was *Kayim* afraid? Rashi suggested that *Kayim* was worried about attack from wild beasts. Most probably, wild animals would not discern a facial mark on *Kayin*’s forehead as a

warning sign from God. Maybe, that is why another opinion is that *Kayin* was given a ferocious dog to ward off attack from wild beasts. Upon leaving God's presence, *Kayin* "settled in the land of wandering ("nod"), east of Eden" (Bereishis 4:16). Rashi noted that the phrase, "the land of Nod," referred to anywhere *Kayin* would go, the earth would tremble beneath him and the people would say, "Keep away from him! He is the one who killed his brother!" (Bereishis 4:16), What people? At this point the only people were *Adom*, *Chavah*, their daughters, and *Kayin* and his wife. A possibility is that Rashi was referring to the soulless primitive humanoids.

(6) *Kayin*, cursed to wander, built a *city*, and named it after his son, *Enoch* (Bereshis 4:17). Did *Kayin*'s small family need a city? A town? A village? A small cottage would have been sufficient. An obvious question is for whom was this city -- for his wife and one son? It is logical to assume that this city was constructed to be co-populated with prehistoric man.

When the Flood came in the time of *Noach*, most of the descendants of *Adom* and *Chavah* and of the soulless humanoids were destroyed (Bereishis 22:22). The exceptions were *Noach*, his wife *Naamah*, and their three sons and three daughters-in law. Rabbi Kahn [1] made the interesting observation, that *Noach* was a direct descendent of *Sheis* (*i.e.*, a human being; created in the image of God) whereas *Naamah* was a descendant of *Kayin* (*i.e.*, a hybrid). Apparently, as we all are descendants of *Noach* and *Naamah*, all human beings of today are an admixture of humanoid and human DNA. As support for this theory, it is important to note that human chromosomal DNA of today has regions that match to DNA extracted from fossil bones of

Neanderthal man. Specifically, the centromere of human chromosome #2 has sequences of nitrogenous bases that match with Neanderthal man [13], a very early form of primitive man who emerged prior to, and mated with, Cro-magnon man.

In addition to the *Noach* family, seven pairs of kosher animals and a male and female of each non-kosher animal species entered the ark. These animals were spared to repopulate the world (Bereishis 7:14-16). As the soulless humanoids are defined as "animals," a non-corrupted pair of Cro-magnon humanoids would be accepted into the ark to survive and subsequently to repopulate their species. This would explain how these creatures resurfaced in a Mishnah in Kilayim (8:5). The Mishnah in Kilayim discussed, if a person is under the same roof as a dead *adnei ha-sadeh*, does this corpse transmit *tumah* to the human. The question revolved around the *halachic* status of the corpse of an *adnei hasadeh* - was it a human corpse or was it a corpse of an animal? The Artscroll edition of Mishnah Kilayim provided a host of suggestions for the identity of the *adnei hasadeh*, including: a ferocious animal attached by an umbilical cord to the ground, a chimpanzee, an orangutan, a feral human, and a mountain man. Dr. Schroeder [7] and Rav Schwab [3] proposed that the *adnei hasadeh* was a prehistoric soulless humanoid, whose ancestors coexisted with *Adom HaRishon*. Dr. Schroeder [7] noted, "Recall that upon death, the *neshama* leaves the body. With the *neshama* now gone, there is no way of distinguishing a human corpse from the corpse of one of these beasts."

Rav Schwab suggested that the *adnei hasadeh* is the *avnei hasadeh* mentioned in *sefer* Iyov (5:23). In Iyov, Rashi described the *avnei hasadeh* as a humanoid lacking a *neshama*. Rav Schwab [1-3] proposed that these

prehistoric, primitive soulless humanoids are still alive - today. "It is very possible that some of them might even be alive today as uncivilized tribes in the jungles of the Amazon, or other remote areas of the world. These man-like creatures - who do not seem to be able to learn enough to advance out of the Stone Age - may not be descendants of *Adom HaRishon*; rather, they may be highly developed animals who can be as dangerous as wild beasts" [3].

In the Epilogue to his book, *Genesis and the Big Bang*, Dr. Schroeder [6] made some poignant remarks to the Orthodox Jewish reader. "For the Bible scholar, it is not an easy task to accept as reality that for the past 100,000 years there existed animals such as hominids and that the skeletons of these ancient animals are near replicas of those of modern man. But the fossil evidence is abundant and irrefutable. It is folly, no it is counterproductive, to close one's eyes to this fact." He continued, "The existence of pre-Adam animals with shapes and intellect similar to humans was discussed 1,000 years by biblical sages, just as it has been discussed during the past 100 years by archeologists. The data are not a threat to either side."

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