

IT IS OFTEN STATED THAT EDUCATION IN TORAH MUST BE A continual, life-long process. A child that terminates his/her Torah education at an early age remains with that minimum knowledge, which further lessens, throughout later life. The depth of discussion of a topic in an elementary or high school is much different from a subsequent discussion of the same topic, but reexamined at a later stage of intellectual development. For a child who terminates his/her Torah education after elementary or high school, the topics discussed at these earlier ages may seem too simplistic when recalled later in life, especially when that same individual now has increased secular knowledge and sophistication without an accompanying increase in religious growth. The intent of this article is to review topics that may evoke "giggles" in an elementary or high school, but to demonstrate that with the appropriate scientific explanation such topics can be transformed from highly skeptical to very credible. This article discusses three topics: Dovid's body coldness that occurred in his seventieth year; the lactation experienced by a poor widower and by Mordecai; and the concept of shinuy hatevah.

Strange, but true

Case 1. Dovid's hypothermia

"And king David was old, he came into his old age, and they covered him with clothes, but he was not warmed" (I Kings 1:1). Dovid's physicians suggested that, as a solution to his body coldness, the young woman, Abishag the Shunemite, "shall be to him a warmer" (I Kings 1:2). Although the commentaries offered suggestions why clothes per se were not able to warm Dovid and why the physicians proposed this specific remedy, the following discussion will focus only on the biological aspects of this story. Three points will be addressed: (a) clinically, what was Dovid's diagnosis; (b) if chilled, why not simply provide Dovid with a warm quilt; and (c) if in fact he did require a human "warmer," why not select any of his eighteen wives.

Dovid, apparently, did not age well and his physical condition was extremely poor. He was seventy years old at this time; he ascended the throne at age thirty and reigned forty years. He lived a contentious life of victory and defeat, glory and ignominy, and had suffered grievous losses, including the death of his son, Absalom, and the wickedness of Ammon and Adoniah (Redak). Dovid's clinical diagnosis may have been hypothermia, defined as an internal (or, core) body temperature lower than 35°C, which is most common in the elderly. This diminished capacity to maintain body heat coupled with a greater vulnerability to core heat loss when exposed to the cold can, at times, can be more than a discomfort, it can be life threatening to the elderly.^{1,2}

Thermoregulation, or the control of internal body temperature, is achieved through a number of involuntary, systemic measures, such as shivering, which generates heat, vasoconstriction

of peripheral blood vessels, which conserves internal heat, vasodilation of peripheral blood vessels, which releases heat, and sweating, which cools the body. These homeostatic mechanisms are under control of the central nervous system and tend to function less well, and less promptly, in the elderly.¹ Normal core body temperature is 37°C. Hypothermia, defined as a core body temperature lower than 35°C, causes global dysfunction, adversely affecting all body systems in proportion to the severity of the temperature reduction. The earliest symptoms, occurring at a core body temperature of 32 to 35°C, include unusual fatigue, increased weakness, some slurred speech, and minor confusion. The person's skin feels cold and the pulse is unduly slowed and irregular. At a core body temperature of 28 to 32°C there is an inappropriate reduction in shivering. Cardiac rate and output fall. Breathing becomes significantly slowed and the skin appears somewhat purple (cyanosis). If the core body temperature is lowered to 28°C, kidney function is altered and the body enzymes begin to malfunction, causing damage to organs, such as the pancreas. Terminally, the voluntary muscles become more rigid, the pupils of the eyes dilate, reflexes are diminished or abolished, and coma supervenes.³

Dovid's body temperature was not recorded (the clinical thermometer was developed in 1866).² Verse 1:1 of I Kings, however, clearly states that Dovid's clothes did not provide warmth. In discussing Dovid's loss of innate heat, Dr. E. Reichman⁴ cites Rabbi David Kimchi: "In his old age, he became infirm and bedridden ... and as long as the aging process progressed, the innate heat continued to diminish." Apparently, Dovid's ability

to maintain body heat was so lowered that bedclothes were useless. The Ralbag notes that clothes per se do not provide heat but only serve to retain the innate heat radiated from the body. Thus, if the body were not generating sufficient heat, clothes or a bed quilt would serve little function.

Dovid's physicians suggested that a young woman, rather than any of Dovid's eighteen wives, serve as a warmer (Mezudat David on I Kings 1:14-15). Today, rewarming therapies for the hypothermic patient include the application of fluid-circulating heating blankets, convective air warmers, reflective blankets, heating pads, and radiant heat sources, all procedures that require modern technology. The methodology noted in Ta'nach apparently was suitable for that era. Body heat is derived from the various metabolic reactions, principally exothermic, catabolic reactions. For example, in the aerobic cellular respiration of glucose, only 39% of the energy in glucose is transferred to ATP; 61% of the energy in glucose is lost to the environment as heat.⁵ The amount of body heat produced is a reflection of the energy in the total amount of food consumed. It is well known that in American society,⁶ teenagers/young adults consume the most calories, and are among the most active. Thus, it is most reasonable that Dovid's physician suggested that the human "warmer" be a young adult, rather than an older woman. The commentaries specifically noted that a young woman, rather than one of Dovid's more mature, older wives, was required, as a younger woman releases more body heat (e.g., Rashi on I Kings 1:2).

From 1979 to 1998, 6,857 elderly Americans 65 years of age and older died of hypothermia.¹ The incident in I Kings occurred when Dovid was 70

years of age, during his last year of life. Rashi, on I Kings 1:1, hints that Dovid's hypothermia was the clinical cause of his death. Rashi quotes a Midrash: Rav Shmuel bar Nachmeni says, Dovid's body coldness was a result of the fear of dying, "As Dovid saw the angel of death standing in Jerusalem and his sword was in his hand, his (Dovid's) blood became cold from fear of him."

Case 2. The widower and Mordecai's lactation

Male lactation is noted, at least, three times in traditional Jewish sources.^{7a} In Sabbath 53b an event is noted in which a woman died, leaving her husband with an infant to be suckled. Being poor, the father was unable to hire a wet nurse. A miracle occurred and he was able to suckle the infant. Another event involves Mordecai and his orphaned niece, Esther. Esther's father died prior to her birth and her mother died at her birth (Megilla 13a). There are various viewpoints concerning the relationship between Mordecai and Esther. According to a Midrash, Mordecai adopted Esther as his daughter and subsequently nursed her (Bereshis Rabba 30:8). Lastly, 'milk of a male' is mentioned in Machshirin (6:7) and is considered as an unimportant liquid with regard to issues concerning tamei.

Male lactation is noted in the medical literature. It is a type of galactorrhea, which is defined as any amount of persistent discharge or material expressible from the breast, that appears like milk and that either does not occur in relation to parturition or continues postpartum in the absence of nursing for more than six months. In addition to male lactation, galactorrhea includes lactation in virgin females, menopausal females, and in the newborn of either sex ("witch's

milk"). Although many hormones interact to promote lactation, prolactin, a hormone produced by lactotrophs, cells of the anterior pituitary gland, is of prime importance. Excessive production of prolactin resulting from a tumor of the pituitary gland, a prolactinoma, is the most common cause of male lactation.⁸ However, in the medical literature there is a case report of male lactation caused by exposure to excessive levels of estrogen.⁹

Did the poor widower and Mordecai have cancer of the pituitary gland, the most common cause of male lactation? Probably not, as their lactation was considered a miraculous occurrence, rather than an adverse side-effect of a carcinoma. If estrogen was the cause of lactation in the poor widower and Mordecai, what was the source of their exposure to estrogen, which is a female hormone? Interesting, in environmental toxicology a new chemical hazard has been identified, namely exposure to chemicals, both industrial and natural, that mimic the activity of estrogen. Xenoestrogens are synthetic, man-made environmental chemicals with estrogenic activity and include some chlorinated organics, such as DDT, polycyclic aromatic hydrocarbons (PAHs), triazene herbicides, and some pharmaceuticals. Exposure to such xenoestrogens during critical periods of human development has been postulated to play a role in the etiology of breast cancer in women¹⁰ and in the deterioration of male reproductive health.¹¹ As most of these xenoestrogens were not synthesized during the eras of the poor widower or Mordecai, their exposures to estrogen-mimicking chemicals may have from a different source, possibly from plants. Environmental toxicologists are also concerned about overexpo-

sure to plant-derived phytoestrogens, which, as noted with the synthetic xenoestrogens, have estrogen-mimicking properties.¹² Perhaps, HaShem guided both the poor widower and Mordecai to consume plants containing elevated levels of phytoestrogens, thereby inducing galactorrhea.

Case 3. Shinuy HaTevah

Peppered throughout the Talmud and in halachic literature are instances of shinuy hatevah, i.e., the changing of nature. For example, Sanhedrin (69b) notes that in prior generations a human female could give birth as young as six years of age and a human male of eight years of age could father a child. However, by Talmudic times, this was no longer possible as nature had changed. The Mishnah in Berchoros (19b) states that a cow can not produce its first offspring before the age of three years. However, by the time of the Tosafos, cows at younger ages were able to produce progeny (Avoda Zorah 24b). Rabbi Dovid Cohen¹³ notes other examples of shinuy hatevah.

Shinuy hatevah is not a magical, overnight transformation of an individual organism, rather, it is the gradual transformation of a population. Probably, shinuy hatevah is what biologists refer to as environmentally induced adaptation. Adaptations are modifications that an organism makes in response to alterations in the specific physicochemical parameters of its environment; these adaptations occur through time. There is an intimate relationship and interaction between the biota and its abiotic environment. Alterations in the physicochemical characteristics of the environment have a direct impact on its indigenous biota, so that over time, the characteristics of the biota change to reflect the change in the environment. The Mogan Avraham

(Shulcan Aruch, Orach Chaim to 173:2) succinctly stated this concept: concerning shinuy hatevah, "everything goes according to the nature of the lands."

Shinuy hatevah may result from two distinct events: either a population is relocated to a new environment and thereafter changes to conform to the new environment or an environment changes and thereby induces its existing population to undergo changes. An example of the shinuy hatevah induced by relocation of a population to a new, different environment has been noted with Yemenite Jews. In a 1958-1959 survey of Yemenite Jews carried out shortly after their immigration to Israel, it was found that the prevalence of diabetes mellitus and the rate of mortality from coronary heart disease were extremely low in these immigrants.¹⁴ However, when

after they changed their environment by immigrating to Israel, the prevalence of diabetes among them rose to that of Israelis who had originated from European and American communities."

An example of the environment changing and thereby affecting change in the resident population is seen in age at which females start to menstruate (i.e., age at menarche). In the United States, the menarchal age has been falling since the mid-nineteenth century, with an acceleration of approximately four months per decade between 1830 to 1960. This change is most likely related to socioeconomic factors, such as improved nutrition.¹⁷ The suggestion that a critical body weight must be attained before menarche occurs¹⁸ is consistent with the idea that improved nutrition played a critical role in lowering the age of menar-

chers to the dangers of childbirth. That women died at earlier ages than men was confirmed in archeological studies of the skeletal remains of the Jewish population in Israel from 100 B.C.E. to 600 C.E. The researchers concluded, "It will be noted that the average life span, as here suggested, was considerably lower among women than for men, very likely the result of high rates of maternal mortality, which in fact persisted world-wide until relatively recent times.²⁰ Thus, the reduction in female mortality during childbirth is not attributed to shinuy hatevah of women but rather to better healthcare and more extensive medical knowledge. Another aspect of technology affecting change is related to the viability of a baby born after eight months of gestation. Based on the Talmud (Shabbos 125a), the Shulcan Aruch (Orach Chaim 330:8) concludes that a babies born in the eighth month of pregnancy will not survive and, thus, it is forbidden to violate the Sabbath to try to save them. The Chazon Ish (Yoreh Da'eh, 155:4), however, states that today the nature of premature babies has changed (i.e., shinuy hatevah) and that all efforts should be made to save them. Rav Shlomo Auerbach (as cited by Rabbi D. Cohen¹³) also concludes that every effort should be made to save the life of an eight-month neonate, however, not because of shinuy hatevah, but because of the advances in modern medical technology in neonatal care. In other words, as explained by Rabbi Cohen,¹³ Rav Auerbach's position is that the earlier rabbis drew conclusions based on the medical technology of their time.

A similar incidence of shinuy hatevah is evidenced in life expectancy.

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restudied twenty¹⁵ and forty¹⁶ years later, during which time the diet of Yemenite population changed and was now similar to that of western civilizations, their incidence of obesity, diabetes mellitus, hypertension, and ischemic heart disease increased and paralleled that of other ethnic groups in Israel. The researchers conclude, "Thus, it appears that in the specific ethnic group of Yemenite Jews, 40 years

che.¹⁹ Rabbi D. Cohen¹³ has reviewed the concept of shinuy hatevah as applied to the female and male reproductive system.

In addition, there is a "perceived," but not actual, shinuy hatevah that is related to advances in technology rather than to changes in a population. For example, in discussing the concept that "death is a common occurrence" in women (Kesubos 83b), the Tosafos relate that this

As noted in the Shulcan Aruch (Yoreh Da'eh, 244:1), it is a mitzvah to stand when an elderly individual, even one not versed in Torah, enters into your presence. Elderly is defined as an individual of 70 years and above. In the United States, the average life expectancy is greater than 70 years and rising. Because of the decline in smoking, death rates from heart disease, stroke, and cerebrovascular diseases have been reduced, and because of safer cars and more people wearing seat belts, death rates from motor vehicle crashes also have declined. Whereas, the average American baby born in 1900 could expect to live 47.3 years, today life expectancy has reached 76.9 years.²¹

This article began with the thought that some topics may evoke "giggles" in class. For example, when I noted Mordecai's lactation in a college class, several students laughed and then gave strange looks. However, there is a scientific basis for this, rather unusual, phenomenon. It should be noted that Rohn⁸ in his article on male lactation, published in the prestigious medical journal, the Journal of Adolescent Health Care, was not ashamed (and, apparently, not worried about giggling colleagues) to begin the article as follows: "Inappropriate lactation – which occurs beyond the usual postpartum or breast-feeding period or in the male – has been of medical interest for centuries. There is a suggestion

that the first recorded case occurred in the Bible in the Book of Esther wherein Mordecai may have breast his niece Esther. The Talmud describes a man who nursed his infant after his wife's death during childbirth."

P.S. In my younger days I was also one of those who giggled at these stories. However, I now understand that some of the, albeit strange, events noted in the Talmud are true! The limiting factor in understanding these events was my knowledge.

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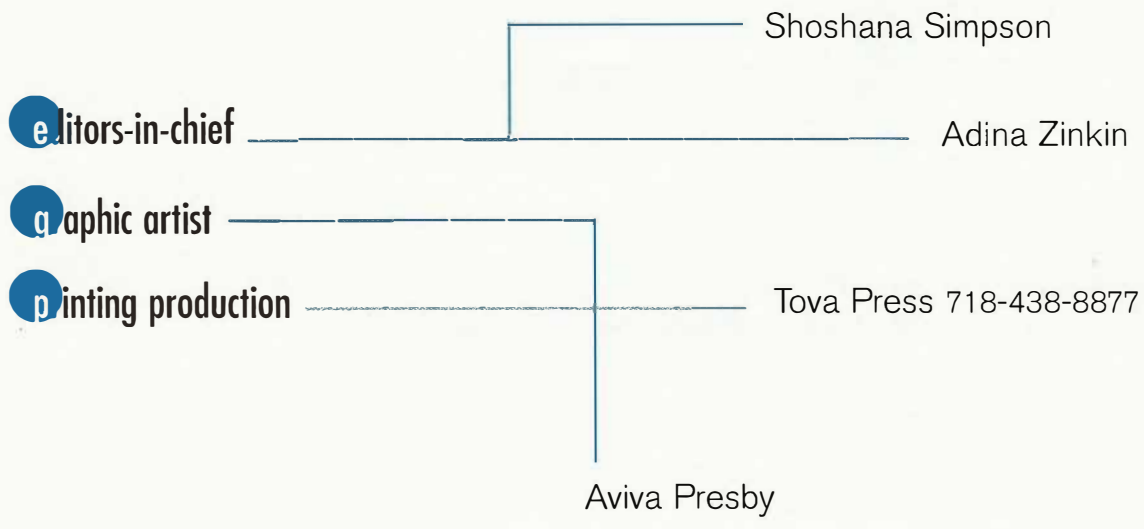
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Notes

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Staff

derech haTeva





edication

We dedicate this year's Derech HaTeva journal in memory of Israeli astronaut Ilan Ramon and all the other crew members that perished aboard the space shuttle Columbia on February 1, 2003.

By showing the world that there is a place for both Torah and science, Ilan became a role model to us all.

Thank you

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