

## Talmudic medications: Saliva, honey, and silver coins

by

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Although I am somewhat knowledgeable in science and medicine and participate in a 5:30 A.M. *daf yomi* (along with other insomniacs), there are times when I cannot understand the medical advice offered in the Talmud. The advice seems so strange, that it is difficult to accept. However, ancient civilizations were not unsophisticated peoples and their medical remedies have a scientific basis, although these societies were unaware of the science behind the curative remedies. When I encounter such passages, it usually means, at least to me, that either the Talmud was ahead of the science or that if I research the topic, eventually I will come across the science to explain the Talmudic medicinal cure. This article discusses three such medicinal cures mentioned in the Talmud: (a) the use of human saliva as a remedy for eye illnesses, (b) the use of honey to heal wounds, including those of the eye, and (c) silver coins used to treat foot wounds.

The Talmud (Shabbos 108b), in the midst of a section discussing various medicinal cures, cited Levi and the father of Shmuel who stated “To put raw saliva even over the eye is prohibited” on Shabbos. Apparently, saliva has curative properties and, under most circumstances, the taking of medicine on Shabbos is forbidden. Rashi elaborated that raw saliva is obtained from one who has not tasted anything since waking up; such saliva has medicinal properties. The healing property of saliva was also mentioned in another volume of the Talmud (Bava Basra 126b): “A certain person once came before Rav Hanina and said to him, ‘I am sure that this man is a firstborn.’ Rav Hanina said to him, ‘How do you know?’ The person replied to him: ‘Because when people came to his father, he used to say to them, ‘Go to my son Shikhath, who is firstborn and his saliva heals.’ Might he not have been the firstborn of his mother only [but not of his father]? There is a tradition that the saliva of the firstborn of a father heals, but that of the firstborn of a mother does not heal.” Rashbam explained that the healing property of saliva referred to the usage of saliva as an eye medication.

From both Talmud citations it would seem that the saliva of a person, particularly that of a fasting person and, apparently, that of a first born son, had curative properties towards ocular health issues. It is apparent that the saliva was applied not merely to irrigate the eye, as if so, water would have been sufficient. Also, the Talmudic passages did not elucidate the nature of the eye illness, whether due to an infection or due to some wound or non-infectious pathology.

As the nature of the eye illness was not specified in the Talmud, one possibility is that the health issue was due to a viral or microbial infection. If saliva has curative properties, there should be chemical constituents within saliva that have antiviral and/or antimicrobial properties. In fact, saliva contains numerous peptides and proteins with antiviral and antimicrobial properties, with each chemical exhibiting a different mode of

action against the biologic agent causing the health issue. The protective chemicals in saliva include: (a) a group of cationic proteins, termed histatins, which are antibacterial and antifungal proteins that also play a role in wound closure; (b) lactoferrin, a chelator of  $\text{Fe}^{3+}$ , which exhibits antibacterial and antifungal properties; (c) lysozyme, a disruptor of bacterial cell walls; (d) peroxidases, *i.e.*, a group of oxidoreductase enzymes that catalyze the reduction of lipid hydroperoxides to their corresponding alcohols and hydrogen peroxide to water; (e) specific microRNAs (miRNAs), which are recently recognized endogenous RNAs, that play a biochemical role by targeting messenger RNAs (mRNAs) for cleavage or translational repression [1].

Little research has been directed to study the protective effects of saliva on ocular infections. However, Irmak *et al.* [2] showed the therapeutic use of miRNAs in saliva against ophthalmic herpes zoster. Herpes zoster is a common infection caused by the varicella-zoster virus (VZV). Approximately 20% of the world's population suffers from herpes zoster at least once in a lifetime, with 10 to 20% having ophthalmic involvement (ophthalmic herpes zoster) limited mainly to the cornea. Ophthalmic herpes zoster has a very variable course; some cases resolve without a trace and after a minimum of treatment, others become indolent with chronic cellular and lipid infiltration. Such patients present with varying degrees of decreased vision, pain, and light sensitivity. The researchers showed that saliva-derived miRNAs exhibited antiviral activity. In the cytoplasm of an infected corneal cell, human salivary miRNAs base-pair with specific viral mRNAs and inhibit their translation, thus limiting the replication of the virus. Although the application of saliva to the eye, as noted in the Talmud, seemed highly unusual (to me), these authors noted that **“the therapeutic use of saliva for certain painful ocular diseases such as ophthalmic herpes zoster is a well-known public practice in our region”** (*i.e.*, Turkey).

In the above paragraph it was assumed that the ocular pathology treated with saliva resulted from a viral or a microbial infection. However, what role, if any, does saliva have towards wounds in general, not related to microbial or to viral transmission? Although there is no research on the medicinal role of saliva on ocular pathologies not caused by viruses or microbes, there are several studies on the general wound healing properties of saliva. Several constituents of saliva promote wound healing: (a) saliva contains substantial amounts of tissue factor, which dramatically accelerates blood clotting; (b) saliva contains growth factors, including epidermal growth factor (EGF) which promotes the proliferation of epithelial cells and vascular endothelial growth factor (VEGF), an angiogenic growth factor (*i.e.*, promotes the formation of new blood vessels from pre-existing blood vessels) which is also involved in re-epitheliation and regulation of the extracellular matrix; (c) saliva contains secretory leucocyte protease inhibitor (SLPI), which inhibits the tissue-degrading activity of enzymes like elastase and trypsin; and (d) salivary histatins promote wound closure by enhancing cell spreading and cell migration [3].

Another interesting natural medication is honey. *Bulmos* is an ill-defined life threatening disease induced by hunger and which adversely affects vision (Yoma 83a). Later in the same volume (Yoma 83b) it is stated: “The Rabbis taught in a *Baraisa*: one

who was seized with *bulmos*, we feed him honey and all kinds of sweets because honey and all kinds of sweets restore the eyesight of a person.” The Talmud (Yoma 84b) brought support for the medicinal properties of honey regarding eyes from *I Samuel* 14:28, “See now how my eyes lit up when I tasted just a bit of honey.” This was stated by Yonathan running to do battle with the Philistines. The Talmudic passage, as well as this passage from the *navi*, refers to the ingestion of honey. Yet, a Lebanese ophthalmologist [4] published a clinical research manuscript, citing this *pasuk* from *navi*, as the source for applying diluted honey, as a treatment, into the eyes of patients with ocular edema. Earlier, Emarah [5] successfully treated patients with bacterial corneal ulcers, inflammation of the eyelids, and catarrhal conjunctivitis with topically-applied honey. Maitanova *et al.* [6] extended the usage of honey to treat dry eye disease, post-operative corneal edema, and bullous keratopathy.

The protective effectiveness of honey towards ocular injuries has been shown in the laboratory. Using rats as the animal model system, corneas were wounded by creating an epithelial defect using a surgical blade; subsequently, the rats were untreated or treated with honey applied to their eyes. Overall, abrasions of the honey-treated eyes healed faster than abrasions of untreated eyes. In another study, keratitis (inflammation of the cornea) was induced by topically applying *Pseudomonas aeruginosa* endotoxin to scarified corneas and the inflammatory response was followed in untreated and honey-treated rats. Markers of inflammation, such as VEGF and pro-inflammatory cytokines, such as IFN- $\gamma$ , IL-12, TNF- $\alpha$ , and TGF- $\beta$ , were lower in corneas treated with honey [7]. Using an *in vitro* rabbit corneal abrasion wound healing model, Ker-Woon *et al.* [8] showed that honey accelerated corneal epithelial cell wound closure by stimulating the expression of genes and proteins associated with wound healing. And, Yusof *et al.* [9], using an *ex-vivo* corneal model, showed that honey potentiated the proliferation of corneal keratinocytes in cell culture.

The use of honey as a general therapeutic agent was noted more than 2,000 years ago. In the Talmud (Bava Metzia 38b; Shabbos 76b, 77b, 78a, 154b), mention is made of honey applied on sores and blisters that developed on the backs of horses and camels due to the constant rubbing of the burdens that were carried (Rashi, Shabbos 76b). The biologic wound healing effectiveness of topically applied honey is due to its “multiple bioactivities that work in concert to expedite healing. For example, (a) its acidity increases the liberation of oxygen from hemoglobin thereby making the wound area unfavorable for the activity of destructive protease enzymes; (b) the high osmolarity of honey draws fluid out of the wound to create an outflow of lymph (thereby, mimicking negative pressure wound therapy); (c) the presence of broad spectrum antimicrobial chemicals (*e.g.*, hydrogen peroxide, antioxidants, lysozyme, polyphenols, flavonoids, and methylglyoxal) to fight infection; and (d) its immune modulating and anti-inflammatory properties [10, 11]. The application of honey in the treatment of diseases, as well as in the healing of wounds and ulcers, has recently been reviewed by Samarghandian *et al.* [12].

Honey is derived from the nectar of flowers and produced by bees, most commonly the European honey bee, *Apis mellifera*, and is a complex mixture of sugars, amino acids, phenolics, and other substances. Honeys are not equivalent in their curative

properties, as honeys derived from different species of flowering plants vary substantially in their ability to kill bacteria. A particularly potent honey is manuka, derived from the nectar of flowers of *Leptospermum scoparium*, *Leptospermum polygalifolium*, and some related *Leptospermum* species native to New Zealand and Australia; manuka is currently being used as a medical-grade honey in clinical applications [13]. Use of honey in wound healing has entered the business world; please “goggle” the phrase “honey and bandages” to view the variety of bandages that can be purchased with honey impregnated into the dressing.

A remedy for a foot wound is mentioned in the Talmud (Shabbos 65a): “A woman may go out on Shabbos with a *sela* (*i.e.*, a thin silver coin) that is bound upon a *tzinis*,” which is defined as a wound on the sole of the foot. The characteristics of the *sela* that made it suitable for healing a foot wound are: (a) it is hard, thereby affording protection to the wound; (b) it has a graven image stamped on it (*i.e.*, it was believed that such images have healing power); and (c) because its silver generates moisture, which promotes the healing process. In a passage cited in another Talmud (Kesubos 93b), note was made that even old *sela* coins were suitable for healing a foot wound.

Although the type of foot wound was not mentioned, a silver coin would be an excellent remedy to treat bacterial infections. Metals, such as silver, are said to have an oligodynamic nature, meaning that a very low concentration of the metal ion is sufficient to be highly toxic to bacteria. In the “old days” when I taught Microbiology laboratory, the students would swab an agar plate with a bacterium and place a silver or copper coin in the center of the plate. Metal ions would leach from the coin and after a day or two of incubation, the bacteriocidal effect of the metal ions were noted as a zone of inhibition of no growth around/beneath the coin followed by a lawn of bacteria (figure 1).



Figure 1. The oligodynamic nature of metals on bacterial growth. Note, “old” coins were needed, as the coinage of today lacks silver and copper.

The nature of the foot injury was not noted in the Talmud, but the requirement of a silver coin strongly suggests an infection. Also, the Talmudic passage noted that the silver coin generated moisture, which is important, as moisture (*i.e.*, water) promotes the leaching of silver ions from the coin. The standard explanation for the biocidal effect of

silver ions is their inactivation of proteins and enzymes by binding with sulfhydryl groups to form silver sulfides. Brian [14] found that silver - in the form of dissolved ions ( $\text{Ag}^+$ ) - attacks bacterial cells by making the cell membrane hyperpermeable and by interfering with cellular metabolism, leading to the overproduction of reactive oxygen free radicals. Why did the Talmud specify that a coin of silver was needed and not a coin of a different metal, perhaps, of gold? Guggenbichler *et al.* [15] found that of all the metals with antimicrobial properties, silver had the most effective antibacterial action and the least toxicity to human cells.

Prior to the discovery of antibiotics, silver had many medical applications, such as in the treatment of wounded soldiers in World War I to deter bacterial infections. Interest in silver declined, as usage was antibiotics accelerated. However, because many pathogenic bacteria have developed resistance to antibiotics, there is renewed medical interest in the bacteriocidal effectiveness of silver ions. For example, surgical masks using silver nanoparticles have been developed. Furthermore, several over-the-counter silver-impregnated antibacterial products for wound healing are readily available, including topical creams, soaps, and wound dressings [16].

Apparently, the ancients had some level of sophistication to ascertain the healing properties of saliva, honey, and silver coins, albeit without knowing the science behind the healing.

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