

Embalming with honey

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Honey is an aromatic viscid sweet material derived from the nectar of plants by the honeybees and modified by them, for their food, into a denser liquid.¹ It has been reported that approximately 181 substances are present in honey. Several classes of compounds have been identified while others await further studies. Sugar represent the most important constituent. Honey has an average composition of fructose 38.19%, glucose 31.28%, sucrose 1.31%, maltose 7.31% and 17-20% water, in addition to the acids, minerals, enzymes, vitamins and proteins.² Moreover, honey was found to contain inhibin, a thermolabile bactericidal substance, identified as hydrogen peroxide.³ Honey is known from ancient times to be a good preservative for meat and fruits.⁴ In a recent communication, Sharquie and Najim⁵ reported that honey may be a good preservative for skin biopsies, confirming the earlier findings of Subrahmanyam.⁶ The present study was designed to demonstrate the embalming potential of honey. The question was first studied in mice followed by a larger animal; rabbit and finally we used human fetuses.

The present study was carried-out at the College of Medicine, University of Baghdad, Baghdad, Iraq. The protocol for the research project was approved by the ethical committee at the College of Medicine, University of Baghdad, Iraq. For human fetuses embalming, the nature of the experiment was explained to the parents and their approval was taken, to use the fetus for the experiments. The study was divided into 3 phases of experiments, 1. Six Swiss albino mice, weighing 20-22g, of either sex were used. Each mouse was killed by a sharp blow on the head. The abdomen and chest were opened by a midline incision and the viscera were all removed. The animals were then immersed in unprocessed and un-boiled honey. Pure honey was obtained from a bee-keeper from Baghdad. Honey was harvested in spring season. It was a mixed floral honey. Jars containing the animals immersed in honey were kept at room temperature for one month. After one month, each animal was removed from honey, washed in normal saline and kept at room temperature to dry for few days. The dried animals were then kept in closed sterile jars at room temperature and observed for any change for a 3-year period. After 3 years, the animals were in a contracted, dry and mummified state. However, their external shape was kept. The external hairs

were also normal. During the observation period no change was noticed on the mice despite being kept at room temperature. 2. Six rabbits of a local breed weighing 1-1.2kg of either sex were used. They were killed by a sharp blow on the head, viscera removed and immersed in honey. After one month, rabbits were removed from honey, washed in normal saline and left to dry. Once dried, rabbits were kept in closed jars at room temperature and observed for a 2-year period for any change. After embalming rabbits were contracted, dry, and mummified. Their color became darker. However, their external shape was kept. The external hairs were also normal. During the 2-year observation period, no change was noticed on the rabbits despite being kept at room temperature. 3. Two human fetuses were used. The first was a female fetus, spontaneously aborted at 20 weeks gestation. It weighed 500gm and was normal on examination. It was obtained one hour after death (**Figure 1a**). The other fetus was a male fetus, spontaneously aborted at 16 weeks gestation. It weighed 400gm, when obtained an hour after death. Both fetuses were put in a glass box and immersed in honey. After one



Figure 1 - The female fetus (a) 20 weeks gestational age before and (b) after embalming for one month in honey.

month, they were removed from honey washed with normal saline and kept at room temperature to dry-out. Once dried, they were kept in a closed glass box at room temperature and observed for one year. After embalming the 2 human fetuses in honey for one month and leaving them to dry at room temperature, they were mummified and shrunken. The weight of the first fetus changed from 500gm to 115gm while the second fetus weight changed from 400g to 95g. Both fetuses were darker in color (**Figure 1b**). Both fetuses were observed for a period of one year without any change in their shape despite being kept at room temperature.

Embalming character of honey and beeswax is held in antiquity.⁴ Alexander the Great was transported to the home country in a coffin filled with honey after his death in Babylon.⁴ Our results clearly demonstrated that unprocessed natural honey successfully embalmed and preserved small animals, large animals and human fetuses for long periods of up to 3 years. Honey is a concentrated solution of sugar.³ Thus, the tissues preserved in honey are dehydrated gradually. This is evidenced by the decrease in weight of the human fetuses up to 20% of their original weight. Another property of honey, which probably contributed to the successful embalming effect, is the antibacterial effect of honey.⁵ The antibacterial effect of honey is attributed to the hypertonic nature of honey⁵ and other constituents, as inhibin and various enzymes.⁷ Thus, bodies immersed in honey were dehydrated in a hypertonic solution while at the same time being kept in a sterile environment free from any microorganism. These observations verify the previous report regarding the use of honey to preserve skin grafts. Skin biopsies kept in honey were found to become small dehydrated and darker in color. However, on transfer to normal saline they regained their consistency, texture and color, similar to fresh biopsies. Microscopically the pieces of skin were found to be well preserved.⁵

Although, honey has been used in embalming in antiquity, the use of honey for mummification in ancient Egypt was controversial. Recently scientific research using modern techniques of analysis, such as gas chromatography and mass spectrometry, thin

layer chromatography, infrared spectroscopy and x-ray fluorescence has turned-out the use of beeswax in mummification in ancient Egypt, especially from the fifth century B.C. onward.⁸ The similarity of the embalmed human fetuses in the present study to the Egyptian mummies might possibly indicate that honey might have been used for embalming at least small bodies. To prove such use of honey by ancient Egyptians, it is necessary to research ancient Egyptian mummies with the help of modern technology.

In conclusion, natural un-processed honey was found to be a successful embalming agent. It preserved bodies immersed in it for relatively long periods.

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