

Cleopatra, famous Queen of Egypt, ascended to the throne at the age of 17. She later owned a perfume factory and recorded recipes for early cosmetics—many used early chemical techniques.

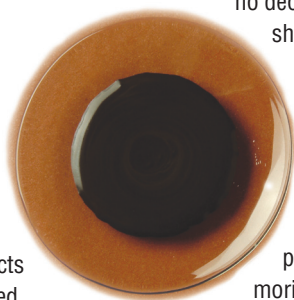


By Lois Fruen

These real treatments from our fictional ancient spa brochure, (on the previous page), may not seem appealing, but they were sought after in ancient times, and many are still available today, albeit with different names. It was Cleopatra, the famous queen of Egypt, who popularized skin care treatments in her book titled *Cleopatra Gynaeciarum Libri*. There, she recorded recipes for making cosmetics and perfumed ointments. She was so interested in spa treatments and perfumes that her lover, Mark Antony, gave her the gift of a spa and perfume factory that had been built by Herod the Great at the south end of the Dead Sea.

Asphalt skin care

Archaeologists unearthed jars at Cleopatra's spa that contained residues of ancient skincare products that Cleopatra likely used. When chemists analyzed the residue from one jar of Dead Sea mud treatment, they were surprised to find it had a similar chemical composition to asphalt, better known as tar or pitch, a complex mixture of high molecular weight hydrocarbons, with partially oxidized and sulfur-containing compounds mixed in for good measure. Their analysis was confirmed by Pliny the Elder, a first-century AD historian, whose histories tell us that ancient spa treatments started with an application of asphaltite mud followed by a treatment of Dead Sea salt.



Imagine Cleopatra submitting to being smeared in muddy tar and then having the tar rubbed off her skin with bath salts. Pliny also tells us that perfume was used to cover the smells of the pitch and salts. Boy, would Cleopatra have needed perfume after a spa treatment like that!

Perfumes

For Cleopatra, perfumes were important not just for masking the smells of skin treatments but to cover offensive body odors. Cleopatra would have carried small containers of her perfumed ointments and powdered perfumes that she would have reapplied several times a day to keep her complexion looking fresh and her skin sweet smelling. Remember that there were no deodorants available in her time, and she lived in a hot climate.

Chemists have reconstructed a number of ancient perfumes using Cleopatra's own recipes and analysis of perfume residues found in jars from Cleopatra's spa. They discovered that Cleopatra favored perfumed ointments made from moringa oil or horseradish oil (*Moringa pterygosperma* or *M. aptera*). Those ointments would have disappeared into her



Before you sneer at the spa treatment using asphaltite, Dead Sea mud skin care products and bath salts are still marketed today. In fact, some of the finest spas advertise wraps and facial masks made from mud and Dead Sea salt.



Two Minneapolis students from the Breck School, Stacy White and Caroline Kaylor, made a project of trying to recreate ancient perfumes. They used natural materials such as lard (as a nonpolar solvent) to extract fragrant organic molecules from rosemary and borneal heather.

skin quickly and left no greasy feeling behind. Moringa oil is still used in Persian perfumes today, and chemists at L'Oreal have recreated ancient Egyptian perfumes using moringa oil.

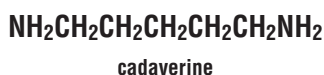
Other chemists have followed Cleopatra's ancient recipes that call for mixing herbs, flower petals, leaves, or seeds with hot vegetable oil made from pressed olives. They let the mixture soak for a week at 30–40°C. Then, they pressed the mixture through a cloth bag to extract the perfumed oil from the pressed olive mixture. Besides using perfumes made with olive oil to anoint herself, Cleopatra may also have added perfumed oils to her wine to give it a more pleasant smell since those made with olive or vegetable oils were edible.

You may have heard the saying, "Flies in the ointment." It comes from a very real problem in Cleopatra's spa. Flies were ever-present in Egypt and the near east, and they were attracted to the fats and oils used to make perfumes. The flies would get trapped in the perfumed oint-



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ment and die. The ointment putrefied as the flies decomposed, giving off a foul odor that spoiled the batch. Even the Bible makes reference to this in Ecclesiastes 10:1. "Dead flies make the perfumer's ointment give off an evil odor ...". The odor is the result of the chemical breakdown of the proteins that produce diamines called **putrescine** and **cadaverine**. The names of these two amines are appropriate—they smell like rotting bodies. They can also contribute to bad breath and the less-than-desirable body odors that made the use of perfumes so necessary in ancient times.



When chemists used crystallographic and other chemical tests to analyze the residues of ancient eye makeup, they found that the green eye makeup contained malachite, which is hydrated copper(II) carbonate ($\text{CuCO}_3 \cdot 5\text{H}_2\text{O}$). They discovered that the black eye paint, called kohl, contained galena, a gray-lead ore of lead(II) sulfide (PbS), and cerussite, which is lead(II) carbonate (PbCO_3). The kohl also contained laurionite (PbOHCl) and phosgenite ($\text{Pb}_2\text{Cl}_2\text{CO}_3$). These last two chemicals were unexpected, because they do not occur naturally; ancient Egyptians had to synthesize them. Following recipes reported by Pliny,

chemists duplicated ancient methods for making kohl by crushing PbO with natron (Na_2CO_3) or rock salt (NaCl) and then filtering the mixture and repeating the process over the course of several weeks. The rock salt produced PbOHCl , while the carbonate resulted in $\text{Pb}_2\text{Cl}_2\text{CO}_3$. Modern-day chemists say these syntheses developed by ancient Egyptians were the first "wet-bench" chemistry ever done.

Cleopatra would have dyed her nails, hands, and feet and perhaps her hair with henna from a shrub called Egyptian privet (*Lawsonia alba*). Henna is a reddish-brown organic dye that was used in Turkey as early as 7000 B.C. In Cleopatra's time, henna could have been applied as a paste or by a more complex formulation using oil, sugar, and citric acid. Henna is still used today for temporary tattoos and by a variety of cultures to signify a woman's fertility.



GETTY IMAGES



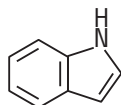
COURTESY OF BRECK SCHOOL

The results of their project? Good ... if you like fragrant lard! Stacy and Caroline suggest that further work exploring the effects of temperature, light, and other solvents such as olive oil is necessary.

Besides perfumed essential oils, Cleopatra used powdered excrement from Egyptian crocodiles to clean and embellish her complexion. This is not as odd as it sounds.

Indole, used to moderate modern-day perfumes, is derived from feces, and urea, a component of urine, is used in modern skin-care products.

To keep her skin soft and supple, Cleopatra bathed in milk of asses, having discovered an important property of protein in a fatty emulsion—it contains lactic acid that is an alpha-hydroxy acid which breaks down dead skin cells. Today, you can buy foaming milk baths,



indole



PHOTODISC



COURTESY OF BELOIT COLLEGE, LOGAN MUSEUM

Finally, Cleopatra would have stored her perfumed oils and cosmetics in attractive jars that were designed to hold skin care products and pigments. Archaeologists have discovered hieroglyphs on similar jars that advertise the benefits of using the product. Some things just don't change! ▲

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