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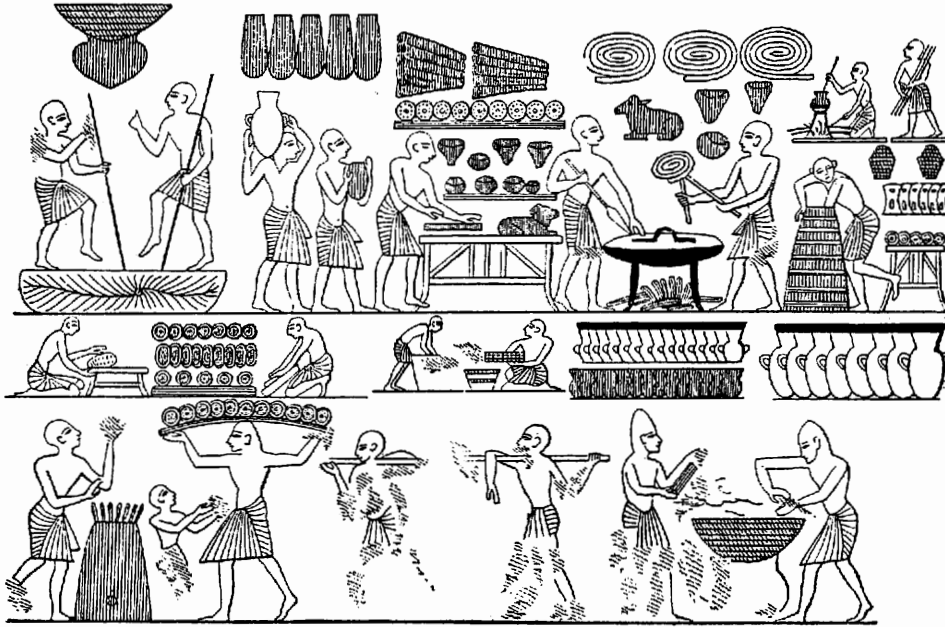
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BREAD. Central to the ancient Egyptian diet were beer and bread. Both were consumed at every meal, by everyone, and no meal was considered complete without them. Nutritionally, bread was a valuable source of energy—of protein, starch, and trace nutrients, and it played much the same role as beer in the Egyptian economy and in ritual. Made from a wide variety of ingredients, the most abundant constituent of bread is normally a starch-rich material, most often a cereal ground into flour. Often, only a specific species of wheat is thought best, the bread wheat (*Triticum aestivum*), yet almost any cereal is suitable. With each grain or type of flour, the structure and texture of a loaf will vary considerably; all breads are not light, risen, or spongy.

The arid climate of Egypt has preserved a rich record of organic materials, including bread loaves. Several hundred specimens survive, mostly from funerary offerings, and these are now scattered in museum collections throughout the world. Among the earliest loaves are fragments from Predynastic graves of the Badarian culture. Although a direct source of evidence about ancient Egyptian bread and baking, these loaves have been surprisingly little studied. Many different breads and cakes were named in Egyptian documents, but their distinguishing features are in fact unknown. Scholars have suggested some possibilities, for example, that *pesen*-bread was a flat round loaf. The preserved loaves show that breads of the same shape were not always made from the same materials or the same recipe and, therefore, may not have had the same name. Some surviving hand-formed conical loaves were made from emmer wheat (*Triticum dicoccum*), whereas one specimen was made largely from figs (*Ficus carica*). In contrast, various shapes and textures might be made from the same batch of dough.

Baking has usually been described from the evidence of artistic scenes. One of the most quoted examples is the relief in the fifth dynasty tomb of Ti at Saqqara. Also, Old Kingdom statuettes show baking activities, such as milling. Middle Kingdom models, such as that from Meketre's tomb, give a lively sense of a busy bakery, and several tombs at Beni Hasan contain bread-making scenes. One



BREAD. *The court bakery of Ramesses III.* Various forms of bread, including loaves shaped like animals, are shown. From the tomb of Ramesses III in the Valley of the Kings, twentieth dynasty.

example of baking in a New Kingdom wall painting was found in the Theban tomb of Nebamun.

Bread making in ancient Egypt has been misunderstood by some Egyptologists, because the distinctive nature of the ancient staple wheat, emmer, differs in some properties from most wheats grown today. This includes bread wheat (*Triticum aestivum*), with ears that easily separate into chaff and grain when threshed; its traditional processing removes the chaff from the grain through winnowing and sieving. In contrast, emmer needs a more extensive treatment; when threshed, it breaks into packets called spikelets, each of which is a thick envelope of chaff tightly surrounding two kernels. Vigorous but careful processing is needed to break the chaff apart without damaging the grain kernels, before winnowing and sieving clean the chaff from the kernels.

Research based on archaeological, ethnographic, and experimental evidence has provided information on the way the ancient Egyptians processed emmer. Whole spikelets were moistened with a little water and pounded with wooden pestles in limestone mortars. The water made the spikelets pliable, so that the chaff shredded without crushing the grain kernels inside. Although this operation was not time consuming, ancient Egyptian mortars were small and several batches of spikelets had to be processed before enough freed kernels were produced to make bread for a family. The damp mixture of freed grain kernels and

broken chaff then had to be dried, probably by spreading the mass in the sunshine. This was followed by a series of winnowing steps, which removed the fine chaff, and by sieving, which removed the heavier pieces. The final fragments of chaff still had to be picked out by hand.

The clean, whole grain was then milled into flour, by the use of flat grinding stones called saddle querns. From Neolithic to Old Kingdom times, they were placed on the floor, making a laborious process. According to tomb scenes, by the Middle Kingdom the querns were raised onto platforms, called quern emplacements, and examples of some have been excavated at a few New Kingdom sites; they were much easier, more comfortable, and perhaps quicker to use. Experimental work with ancient querns has shown that no grit was needed to aid the milling process, as is sometimes suggested, and flour textures could be precisely controlled by the miller.

In ancient Egypt, baking changed with time. An excavated Old Kingdom bakery at Giza demonstrated that heavy pottery bread molds were set in rows on a bed of embers to bake the dough placed within them. In the Middle Kingdom, square hearths were used, and the pottery molds were modified into tall, narrow, almost cylindrical cones. By New Kingdom times, a new oven type was introduced, a large open-topped clay cylinder encased in thick mud bricks and mortar; then flat disks of dough, perhaps leavened, were slapped onto the pre-

heated inner oven wall. When baked, they peeled off and were caught before they could fall into the embers below.

New Kingdom tombs were especially well supplied with bread, and the loaves varied widely in size, shape, and decoration. Some were formed into recognizable shapes, such as fish and human figures; others were simple shapes, such as disks and fans. The dough textures of those loaves ranged from very fine to mealy. Whole or coarsely cracked cooked grains were often added to create a texture much like modern multigrain breads. The cereal grain used for flour was almost always emmer. Added barley (*Hordeum vulgare*), as flour of grains, is so rare that barley seems to have been accidentally mixed into dough in small amounts. Flavorings, such as coriander seeds (*Coriandrum sativum*) and dates (*Phoenix dactylifera*), were occasionally added. Yeast was added to some recipes, but leavening was not always used.

More research is needed to determine whether different breads were available to the various social classes. It seems reasonable to suppose that bread flavored with exotic ingredients was normally accessible only to the wealthy. Until bread has been recovered from arid settlement sites, tomb loaves will continue to inform mainly on funerary practices. Numerous remains of cereal-processing equipment and baking installations at settlement sites, however, have provided some developmental evidence for the preparation of ancient Egyptian bread.

[See also Beer; and Diet.]

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LYN GREEN

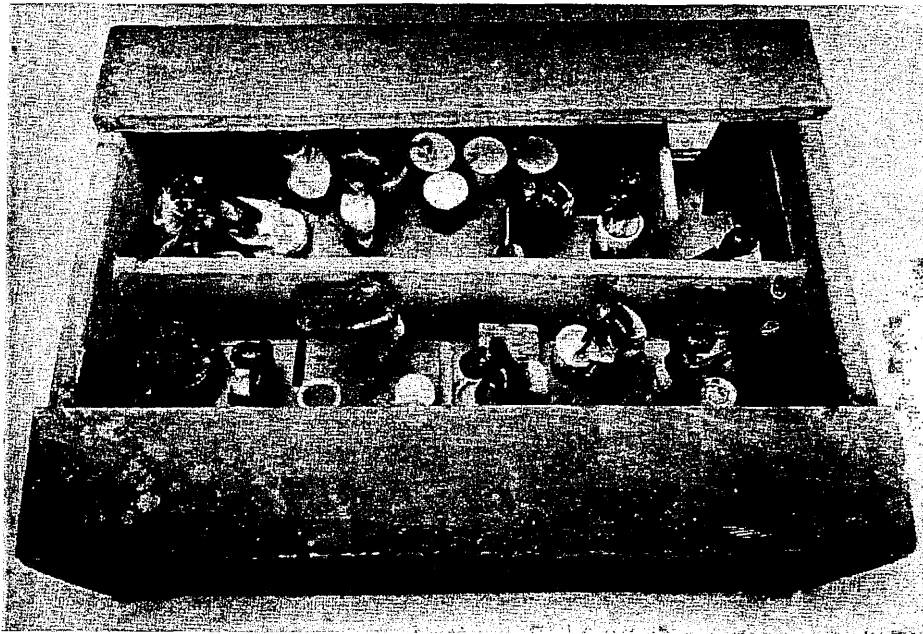
BEER. In ancient Egypt, from Neolithic sites to the written sources of historic times, beer was known, together with bread, as a staple food. Unlike most modern commercial beers, which are clear, ancient Egyptian beer was cloudy, with suspended solids; it was rich in complex carbohydrates and sugars that provide food energy and was an important source of essential fatty acids, amino acids, minerals, and vitamins. As reflected in ritual practice, beer was always a major part of offerings to the dead and to the gods. Perhaps because of its central dietary role, beer was a key economic commodity. The values of goods were calculated in terms of beer-jar equivalents, and rations might be paid with beer. In addition, beer was an ingredient of many medications, and whether efficacious for specific ailments or not, it would have been easily digested and was an agreeable way to ingest medicinal concoctions.

Words that may refer to beer have been found in Early Dynastic sources, while the standard Old Egyptian word for beer, *hnkt*, first appeared in fifth dynasty offering lists;

it was used thereafter. Few specific types of beer were listed and precisely how those types, such as sweet beer, were differentiated is as yet unknown. Beer is a beverage made from fermented cereals. Fermentation results from the metabolic action of certain microorganisms (yeasts or bacteria) as they change sugars into alcohol and other by-products. Cereals, rich in starch, allow for fermentation, as the starch is converted to sugars and the sugars to alcohol. Much of the brewing process involves this conversion (see below).

The earliest evidence for Egyptian brewing comes from the Predynastic sites of Hierakonpolis and Abydos, where large conical vats set into mud-brick installations were found. The vat contents have sometimes survived as residue, consisting of coarsely broken chaff and cereal grain (identified as emmer wheat) embedded in a dark, vitreous matrix. The large amount of ash and charcoal surrounding the vats and the slight reddening of the vats' exterior walls indicate that the vats were gently heated. The combination of the cereal residue, the application of heat, and the later importance of beer in the culture suggested early brewing vessels.

Artistic representations of brewing were common. During the Old Kingdom, these were presented either as statuettes, like those found in the tomb of Ni-kau-hathor, or in tomb reliefs. By the Middle Kingdom, wooden models were popular, as well as tomb paintings, such as those



BEER. *Brewery and bakery, a wooden funerary model.* From the tomb of Meketre in Thebes, early twelfth dynasty. (The Metropolitan Museum of Art, Museum Excavations, 1919–1920; Rogers Fund supplemented by contribution of Edward S. Harkness. [20.3.12])

at Beni Hasan. Brewing scenes in New Kingdom tombs were less frequent, but a few wall paintings show beer making, for example, a scene in the tomb of Ken-amun. Artistic depictions have been the main source of evidence for the interpretation of ancient brewing methods (supplemented by observations of the modern Egyptian beer called *bouzah*). Greco-Roman descriptions have been used but are problematic, since they were dated to a much later time, when cultural influence, technologies, and ingredients had changed considerably. Nevertheless, a recipe written about the fourth century CE, by the Egyptian Zozimus of Panopolis, has frequently been quoted as a model for ancient Egyptian brewing practices.

The general consensus has been that ancient Egyptian beer was made by first preparing bread; this so-called beer bread was well leavened and lightly baked, so that the yeasts were not killed. The partially cooked loaves were then crumbled over a sieve, washed with water into a vat, and there left to ferment—through the action of yeasts derived from the bread. Some Egyptologists maintain that dates (from the date palm tree, *Phoenix dactylifera*) were a major ingredient, providing the initial source of sugars for fermentation. Others suggest that malt (*bs3*) was a beer ingredient (barley or other grain soaked, sprouted, then kiln dried). No standard view exists for the way these ingredients might have been prepared or at what stage they entered the brewing process. Archaeological data has, however, provided a different perspective on brewing in ancient Egypt. A major source of information is the residues of beer and beer precursors that were desiccated and preserved by the arid Egyptian climate. When beer residues are studied by microscopy, starch granules, yeast cells, and plant tissues are clearly visible. Starch changes its structure when prepared in different ways, and its resultant shape thus preserves a record of how the grain had been treated. Observations of the starch structure allow investigators to reconstruct the sequence of ancient Egyptian brewing steps.

The first stage of brewing was to sprout one batch of grain; this natural process produced compounds called enzymes, some of which are able to convert starch into sugars. Next, another batch of grain was well cooked in water, which dispersed the starch. The two batches of grain—the sprouted and the cooked—were then mixed. The enzymes easily attacked the cooked dispersed starch and produced large quantities of sugar. At that stage, the mixture was sieved, separating most of the chaff from the sugar-rich liquid. Then the liquid was enriched with yeast, and probably lactic acid bacteria, which fermented the sugars into alcohol. (Bread does not appear to have been an ingredient, as was originally supposed.) The reconstructed brewing method, presented above, has only a slight resemblance to modern Egyptian *bouzah* making—

but it is similar to many other domestic (nonindustrial) African brewing techniques. Ancient Egyptian brewing thus seems to belong to a known local tradition.

The majority of ancient Egyptian beer residues contained barley (*Hordeum vulgare*), whereas only some were made entirely from emmer wheat (*Triticum dicoccum*). Occasionally, both cereals were mixed together. Very few residues examined showed any trace of ingredients apart from cereal, yeasts, and water. No tissues from dates have yet been found; present evidence indicates that additives, including dates, were not standard for brewing, although beer may have sometimes been flavored. Residues so far studied with microscopy date to the New Kingdom. There are fewer known residues from earlier Egyptian periods, and most still await scientific investigation. A better understanding of the diversity of beers, the way brewing may have developed, and the differences in use among social classes—all require further archaeological investigation.

[See also Diet; and Intoxication.]

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