

Conflict enters early European farm life

For five decades, archaeologists studying the remains of Europe's first farmers—who flourished on the north European plain from about 6500 B.C. to 5900 B.C.—held that these early farm settlements were simple, self-sufficient communities existing peacefully among themselves and with nearby hunter-gatherer groups.

Recent excavations at three early farm villages in northeastern Belgium have uprooted that view, however. According to a report in the summer *JOURNAL OF FIELD ARCHAEOLOGY*, the villagers, who apparently specialized in the production of flint tools and pottery, built defensive fortifications to keep enemies at bay.

"They were either fighting among themselves or they were fighting the hunter-gatherers," says archaeologist Lawrence H. Keeley of the University of Illinois at Chicago, who directs the project with archaeologist Daniel Cahen of the Royal Institute of Natural Sciences in Brussels, Belgium. "Either way, this is something completely unsuspected."

Keeley and Cahen are excavating three villages of the Linearbandkeramik (LBK) culture, named for the distinctive linear designs on their pottery. The LBK people constructed hamlets and villages across northern Europe and moved into areas inhabited by hunter-gatherers.

The archaeologists' most extensive work has taken place at a site called Darion, which dates to about 6200 B.C.

The village is surrounded by a 1,300-foot-long ditch, with gaps at several places. The V-shaped ditch is 13 feet wide and 9 feet deep. Behind the ditch was a palisade, a row of stakes now indicated by a series of postholes, that formed a defensive barrier.

The pattern of postholes at openings in the ditch suggest these were "baffled" gates, the researchers say. Instead of entering directly into the village, intruders had to turn and pass through a short passageway leading to armed villagers.

"This is a typical feature of fortresses up until the age of gunpowder," Keeley says.

Darion's inhabitants probably did not construct or defend the fortifications by themselves, he adds. The site contains four households, representing no more than 30 adults. Keeley estimates that all of them would have had to work steadily for at least a month and a half to construct the ditch and palisade. Farmers are unlikely to neglect their fields for that long, he contends.

Defending the fortification with primitive weapons in use at the time, such as spears, required between 80 and 100 people, Keeley adds. Both laborers and defenders must have been drawn from

nearby LBK villages, in his view.

After completing work at Darion, Keeley and Cahen began excavating two nearby LBK sites containing the remains of similar V-shaped ditches and palisades.

One site yielded a large amount of pottery as well as debris from a ceramics workshop. Flint tools were found, but none of the waste associated with tool production was present.

The third site showed no signs of pottery production. However, large amounts of flint-flaking waste were recovered around one house. A similar emphasis on flint production was observed at Darion.

There was at least some village specialization in either flint or ceramic manufacture in the LBK culture, the researchers conclude.

Another fortified LBK village was uncovered in the 1930s, Keeley notes, but it has largely been ignored. Most investigators assume there are no defensive features on the periphery of such sites, he says.

Who threatened the LBK villages remains unclear. But as the LBK people cleared the forest in northern Europe and replaced wild deer with their livestock, hunter-gatherers may have stolen the livestock and spurred confrontations, Keeley says.

— B. Bower

FDA finds dioxin in milk

Trace quantities of the most toxic dioxin and furan popped up in almost half the U.S. milk tested — 7 of 15 samples — Food and Drug Administration chemists reported last week. FDA analyzed milk from half-pint plastic-coated cardboard cartons, the type used in federally subsidized school programs.

Produced during the chlorine bleaching of wood pulp, dioxins and furans contaminate a range of consumer paper products (SN: 2/18/89, p.104). Though the Canadian government detected these chemicals in milk last year (SN: 10/29/88, p.279), FDA scientists noted at the time that those data failed to prove the compounds came from the packaging. FDA now says its data confirm these chemicals "migrate from bleached paper cartons" into milk.

"During the short period of time it will take to complete corrective steps, milk is safe to drink," says FDA Commissioner Frank E. Young. His agency has estimated that drinking milk for another three to five years from chlorine-bleached cartons contaminated at levels approaching those FDA detected — 0.02 to 0.62 parts per trillion — should pose a lifetime cancer risk of less than one in a million. □

EPA limits industrial benzene emissions

For roughly 15 years, the Environmental Protection Agency has wrestled with how to regulate nonoccupational exposures to benzene, a human carcinogen and the sixteenth most widely used chemical by U.S. industries. Last week, EPA finally unveiled a sweeping control strategy to cut industrial air emissions of the hazardous chemical by 90 percent. These benzene rules also establish a new health-based standard by which the agency will begin regulating other toxic industrial air pollutants.

These controls do not, however, address the 80 percent of outdoor benzene pollution emitted by gasoline vapors as motor vehicles are fueled and driven.

The final rules, announced Aug. 31 by EPA Deputy Administrator F. Henry Habicht, give several major benzene-using industries two years to implement required controls. Emissions from plants that recover by-products of coke production (such as tar, ammonia and light oil) represent the single largest industrial source of benzene in air. Newly required controls — such as blanketing surfaces of stored liquid benzene with a layer of a heavy gas to limit evaporation — should cut annual emissions from this source from about 18,700 tons to just 550 tons, or about 97 percent. New controls should also reduce emissions from other benzene-storage vessels by up to 60 percent

and limit by nearly 70 percent the evaporative leaks — from pumps, valves and other equipment — in chemical plants and petroleum refineries.

Habicht also proposed rules for controlling between 65 and 95 percent of the emissions from all other industrial sources: facilities that treat chemical wastes, operations that transfer benzene or gasoline (which contains from 2 to 5 percent benzene) from bulk terminals and production plants to a user's storage tanks, pharmaceutical manufacturing and tire manufacturing.

These rules are EPA's first to comply with the "vinyl chloride decision," handed down by the District of Columbia Court of Appeals in July 1987. The court ordered EPA to provide an "ample margin of safety" when regulating hazardous industrial pollutants under the Clean Air Act. Moreover, it said, risk calculations used to derive these standards must be based purely upon health considerations, not costs or technology constraints.

Expected to cost about \$1 billion to install, the new controls should reduce leukemias from industrial benzene emissions from an anticipated four annually to at most one every three years, according to Gerald A. Emison, EPA's director of air quality planning and standards, based in Durham, N.C.

— J. Raloff