The first GMO (Hint: Human's best friend)

What was the first GMO? That's easy: the dog. OK, the dog is not strictly speaking a GMO if you hew to the conventional definition of a genetically modified organism as involving lab insertion of a single gene rather than traditional selective breeding. But the dog was undoubtedly the first living human invention, a series of genetic modifications of the gray wolf. The two still can interbreed and, as far as taxonomists are concerned, are still members of the same species, *Canis lupus*.

The GM event(s) happened many thousands of years ago, but just how many thousand is a matter of scientific investigation and scientific dispute. Late last week a new paper weighed in, although it focused more on where than on when. A study of mitochondrial DNA from fossil canids, the paper argued that dogs were derived from now-extinct groups of gray wolves in Europe.

There are also theories that dogs were invented in the Middle East and in East Asia. A paper from last May places dog origins in South China. The redoubtable Carl Zimmer described these geographic theories in the *New York Times*.

The two recent papers disagree about the place, but they agree on the time. If they're right, then we began this GMO stuff (or, if you insist, selective breeding) a lot longer ago than current mainstream thinking would have it. Both papers argue that dogs date from our hunter-gatherer period, perhaps as much as 30,000 years ago or even a bit more. Conventional wisdom about dog development is that it happened closer to the earliest beginnings of agriculture, something like 12-15,000 years ago.

An older date makes logical sense. Paleolithic human hunters would have found it handy to have with them another species with a far superior sense of smell for tracking, one by nature inclined to follow alpha males and cooperate in hunting. The wolf's native social structure may have pre-adapted it to join with *Homo sap*. In return the incipient dogs got a powerful ally, another big carnivore with a cooperative social structure, one that had invented clever technologies for catching and killing and was by nature willing to share meat from a jointly successful hunt. A marriage made in Late Stone Age heaven. Maybe.

But it's not at all clear whether the dog was a planned GMO. We may not be entitled to take much credit for our brilliant first living invention. Wolves could have participated in their own genetic modification, more or less domesticating themselves. Rather than joining human hunting parties, maybe they began hanging around us because we are a slovenly species, a skilled creator of garbage and attractor of vermin.

The leading exponent of the dogs-as-vermin theory is Clive Wynne, who heads Arizona State University's Canine Science Collaboratory. Wynne talked about the vermin idea at a recent science writers meeting. (He also pointed out that most of the Earth's hundreds of millions of dogs–he estimates 75 percent–still are vermin, living as scavengers in cities the world over.)

Wynne argues that dogs did develop before agriculture, but not all that long before. He dates dogs to about 15,000 years ago, when some humans were beginning to give up a nomadic life of following seasonal plants and migrating herds and plunked themselves down in semi-permanent settlements.

I asked Wynne what he thought about last week's mtDNA paper on dog origins and its proposed much older date of 30,000 years or so. In an email he replied, "genetics is too blunt an instrument for dating origins on this scale. The genetics seems to work for 'true' speciation–which is typically millions of years ago, and errors of a few tens of thousands of years don't matter much. But for domestication, which likely took place 15,000 years ago, 15,000 years is too big an error."

Like the mtDNA paper, Wynne bases his argument on fossil evidence. The oldest firm date for dog fossils from archaeological sites is about 15,000 years ago. There are lots of older fossils, but whether they are more dog-like or more wolf-like is in dispute, a point the new mtDNA paper acknowledges. It's easy to see why it's often quite difficult to tell wolves and dogs apart if you're looking only at old bones. They are, after all, the same species. One of the best clues to proper classification is behavior, which doesn't fossilize.

Even if dog origins turn out to be longer ago than 15,000 years, Wynne could still be right that wolves first cozied up to humans in order to dine on our leavings. Becoming a dog needn't only have been a matter of rooting through settlement garbage dumps. Wolves could have prospered in earlier times by following hunters and scavenging hunt leftovers. The new mtDNA paper agrees that what it calls proto-dogs could have been scavengers. They might, the researchers say, have taken advantage of carcasses left on site by early hunters.

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