Study shows domestication of dogs led to an increase in harmful genetic changes

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(Phys.org)—A team of researchers from the U.S. and Spain has found that domestication of canines appears to have led to an increase in harmful genetic changes in dogs. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes their study that included genome analysis of wolves, wild dogs and domesticated dogs

and why they believe notice should be taken of such genetic changes in domesticated animals moving forward.

Scientists believe canines first became domesticated approximately 15,000 years ago due to wolves co-mingling with human populations. Many in the field have suspected that not all of the genetic changes that came about due to the domestication that occurred were positive, but until now, no one had done the work to prove it. In this new effort, the researchers obtained sequenced data from samples of the genomes of 25 semi-feral dogs located within ten different countries along with data from 19 gray wolves and 45 breed dogs which represented dozens of domesticated dog breeds. They then conducted an analyses that revealed genetic variations with the different groups, looking specifically for alleles deemed deleterious, which in the natural world, would have been seen as a mistake—one that likely would not have been carried into future generations. The researchers found that the dogs had approximately 115 more such alleles than wolves, which translated to a 2.6 percent difference. The increase, the researchers suggest was likely due to bottlenecks associated with domestication, and then again to the aggressive breeding programs humans have applied to domestic dogs. Bottlenecks lead to less diversity, which can lead to negative value mutations that persist over generations.

The result, the researchers claim, are dogs that are less able to reproduce than wolves, and dogs that are more prone to certain ailments, such as asthma, some cancers, eye diseases or arthritis. The researchers note that dogs are not the only animals humans have domesticated and it is likely that the others also have the same sorts of harmful genetic changes. They note also that virtually all modern crops are domesticated plants, which likely also suffer from the same sorts of harmful genetic changes. The researchers suggest that increasing diversity in populations would allow the negative traits to disappear on their own, whereas maintaining programs such as selective breeding of dogs belonging to small

populations will likely to lead to even more problems for the animals in the future.

More information: Bottlenecks and selective sweeps during domestication have increased deleterious genetic variation in dogs, *Proceedings of the National Academy of Sciences*, www.pnas.org/cgi/doi/10.1073/pnas.1512501113