

Early Canid Domestication: The Farm-Fox Experiment

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outline

- domestication
- Belyaev's hypothesis
- the experiment
- results
- conclusions



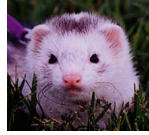
domestication

- variety of definitions
- morphology
- physiology
- reproduction
- behaviour



common traits

- brain weight
- parental care
- fur
- coloration
- dental change
- asymmetry
- juvenilization



Belyaev's hypothesis

- many theories about origins of domestication
- key factor behaviour
- tamability determines adaptation to human life



selection

- selecting for tameness/against aggression
 - = selecting for physiological changes
 - = far reaching effects on development of animals
- mammals share similar regulatory mechanism
- selection for tameness should alter mechanism similarly



the experiment

- replay the process of domestication
- selective breeding with tamability as factor



- silver fox *Vulpes vulpes*
 - taxonomically close to dog
 - species never been tamed



setup

- 30 dog foxes and 100 vixens
- mostly from fur farms
- 4-5% of male, 20% of female offspring will be bred
- untrained
- caged singly
- brief "time dosed" contacts with humans
- paper mentions a control group



selection criterion

- monthly tests for tameness, scored at 7-8 months
- food offered from human hands with stroking and handling
- once in cage, once with other pups in enclosure
- class III - flee or bite when stroked or handled
- class II - petted and handled, no friendly response
- class I - friendly; wagging tails and whining
- class IE - eager for human contact; whimpering, sniffing, licking



some results

- started in 1959, paper in 1999
- 45,000 foxes in 40 years



- 10th gen - 18% IE
- 20th gen - 35% IE
- 30-35th gen - 70-80% IE



physical changes

- respond to sound 2 days earlier
- open eyes 1 day earlier
- fear response after 9 weeks (vs 6 weeks)
- novel traits



- coat colour
- floppy ears
- rolled tails
- shorter tails and legs



developmental changes

- depigmentation
- snouts shorter and wider
- differences between male and female skulls smaller
- sexual maturity one month earlier
- litters on average one pup larger
- lengthening of mating season and out of season mating



dismissing alternative explanations

- inbreeding
 - recessive mutant gene?
 - 0.02-0.07 inbreeding coefficient
 - some traits are not recessive
- strong selection for quantitative trait
 - tend to be controlled by polygenes
 - new traits often harmful
 - effects will depend on population
 - changes in domestication strikingly similar



supporting evidence

- domestication selects for behavioural, not quantitative
- many polygenes determining behaviour engaged in ontogenesis
- corticosteroids halved in 12 generations, again after 28
- serotonin levels higher
- most novel traits from shifts in timing



conclusion

- observed morphological traits known only from archaeology
- shown physical and morphological changes could have resulted from selection for a single trait - friendliness towards people





references

- Early Canid Domestication: The Farm-Fox Experiment
Lyudmila N. Trut. American Scientist v87, March-April 1999.
- <http://www.grandin.com/>
- Bob Church posts from the Ferret mailing list
- <http://www.devbio.com/chap22/link2208.shtml>
- http://news.nationalgeographic.com/news/2002/11/1121_021121_DogEvolution.html



questions?

- how do I incorporate domestication into graphics?