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How to Maintain Genetic Diversity Without Losing Breed Identity in Small Populations

Presented at the 2010 NAIA Conference, Denver, Colorado

While the subject appears daunting, Dr. Famula presented research in Genetic Diversity with ease. Dr. Famula's research focuses on the statistical aspects of genetics and animal improvement. He stated that each study begins as a statistical problem. Once it is established that a disease is inherited, pedigree and disease information are combined with DNA markers to discover the genes marking the disease. The research that he and others are doing at the University of California at Davis' Canine Genetic Analysis Project (CGAP) can be found at: <http://cgap.ucdavis.edu/Guidelines.htm>

The goals of the CGAP Project are: To evaluate the mode of inheritance of canine diseases, to identify the genes responsible for disease expression, and to join the tools of statistics with the promise of molecular genetics.

Dr. Famula stated that most recently, the project has concentrated on the inheritance of disease in dogs, a topic that has focused on epilepsy in Belgian Tervuren, deafness in Dalmatians and Addison's disease in Bearded Collies. It was discovered that deafness in Dalmatians was associated with the spotting pattern on their ears. The epilepsy and Addison's disease studies include other breeds as well. The breeds involved in these studies are listed on the project website, as well as instructions on how to submit blood samples and become involved in the studies.

Flowing from the statistics, Dr. Famula moved to the importance, the positives and the pitfalls of inbreeding, especially in small populations. He contends that inbreeding is inevitable and that knowing the dynamics behind the practice can heighten the positives and, as much as possible, avoid the negatives. Avoiding breeding to health problems in inbred populations can diminish genetic health disorders. Inbreeding can include genetic improvement in type, structure, conformation, behavior, and temperament. Breeders inbreed to become aware of and analyze the possible accumulation of health disorders. Dr. Famula warns to breed the best to the best as like begets like, which is what breeders should seek.

Robert Bakewell, an 18th century farmer and livestock breeder, introduced the concept of inbreeding. By breeding the best to the best, Bakewell succeeded in fixing and exaggerating the traits he desired most in his herds, thereby improving meat production and other characteristics. Inbreeding doesn't make disease, but it can expose it. The principal concern when using inbreeding as a tool is to avoid "inbreeding depression" whereby there is a decline in health due to the breeding of close relatives.

The goals for animal improvement in all species are to reduce the incidence of disease, to maintain and improve breed identity, desired behavior, temperament and structural conformation conformity.

Dr. Famula states there is limited application in estimating breeding values in dogs, i.e. coefficients of inbreeding, except in large, closed kennels. In those large closed kennels, they likely breed best animals to best animals, therefore possibly exacerbating inbreeding. Finding a statistical breeding value, using the thousands of traits now found via genetic analysis in large closed kennels can increase the measure of success in maintaining diversity while enhancing breed quality and type.

Finally, Dr. Famula shared some parting advice for small kennels, individual breeders and breed clubs. He suggests that breeders cooperate with each other by providing accurate pedigree information. Breeders need to share a common goal; they need to make information available, and they need to TRUST. Trust involves the cooperation, the drive to improve the breed, and the willingness to work together. It involves teamwork among clubs and members.

Glossary of Genetic Terms

<http://cgap.ucdavis.edu/Glossary%20of%20terms.htm>

Multi Breed Studies

<http://www.vgl.ucdavis.edu/research/index.php>