

EDITORIAL

Can we rescue an endangered species?

The timely editorial by Ignacy Misztal (*J. Anim. Breed. Genet.*, **124**, 255–256) on the current shortage of quantitative geneticists in animal breeding is alarming. We in the field have been well aware of the problem for some time, but how to correct this trend is a formidable challenge. There are several reasons for the present situation. A major factor is that funding for research and training of graduate students in quantitative genetics and animal breeding (QGAB) began to decline as molecular genetics took center stage in the early 1990s. The prevailing view was that molecular genetics would soon solve all relevant problems in animal breeding. Experience has shown this assumption to be incorrect. Although molecular genetics has become a very important tool for understanding quantitative genetic variability, there are still many research questions that require a firm foundation in QGAB. There is a shortage of well-trained quantitative geneticists to meet all the demands of industry. It is imperative that government agencies and breeding companies that rely on qualified quantitative geneticists for their survival recognize the seriousness of the situation. Otherwise, the industry may soon find that the problem solvers trained in QGAB have become an extinct species. How then can we develop a plan to get QGAB off the endangered species list?

Quantitative genetics is presently alive and well in areas other than animal breeding. For example, evolutionary biology and human genetics draw heavily on the discipline of quantitative genetics, and these fields are successfully training quantitative geneticists. I recently participated in a Gordon Conference on Quantitative Genetics that was well attended by colleagues and graduate students in evolutionary biology and genetics. Of note were several researchers who have 'jumped ship' from animal breeding to human genetics. While the reasons for making the change are complex, the lack of adequate funding for QGAB research most certainly played a role in their decision.

To develop a plan to get QGAB off the endangered species list, at least four general factors must be addressed: (i) government funding, (ii) industry support, (iii) grooming undergraduates and (iv) recruiting and funding graduate students.

Government agencies that traditionally fund agriculturally related research, as well as legislators that

have a strong commitment to agriculture, must be apprised of the economic impact of QGAB research. To do so most effectively, professional societies such as the American Society of Animal Science and the European Association for Animal Production should appoint a commission of experts to study the problem and make appropriate recommendations to federal funding agencies on the importance of funding research and graduate training in QGAB. In this regard, the commission should look at the global picture of how past research in QGAB has improved the genetic quality and yield of food and fiber obtained from domestic animals, including aquatic species such as oysters and shrimp. Quantitative geneticists in animal breeding are specifically trained in aspects of application to animal genetic improvement that are generally not in the purview of molecular biologists. For this reason, the commission should also explore the economic benefits for research collaborations between well-trained quantitative geneticists and molecular geneticists. This point is particularly relevant in light of the current push to complete the gene sequencing of food animal species.

Federal agencies generally have a policy of limiting research funding under specific headings. For example, in the United States, the United States Department of Agriculture funds agricultural research whereas the National Science Foundation (NSF) has generally funded only basic research to the exclusion of research in agriculture. However, in recent years NSF has begun to fund plant genetics research that might in the broad sense be considered to have application to plant breeding. Therefore, it is certainly conceivable that NSF might be persuaded to focus on funding certain aspects of quantitative genetics research applied to food animal species that bridges the basic-applied spectrum.

The support of industry is vital if QGAB is to survive. This support can take on many forms. It should include funding for QGAB research that is related to both the goals of the breeding industry and to answering more basic questions, funding for graduate student assistantship stipends and specialized short courses, sharing of data that can be used for M.S. and Ph.D. dissertations and sponsoring summer internships for undergraduates. While many companies participate in these types of activities, their

participation needs to be more widespread to have a greater impact. It would be worthwhile to have some statistics available on the level of support provided by industry.

Enticing bright undergraduate students to consider a career in QGAB is challenging because of competition from other fields. This is particularly so among animal science students. The profile of animal science undergraduate students at many land grant universities in the United States has changed dramatically in recent years. The majority of students now are women, most come from urban or suburban areas and the number one career goal of the majority of entering students is veterinary medicine specializing in companion animals. Among those interested in graduate school, there is strong competition from the fields of nutrition, reproductive physiology and molecular genetics.

To steer undergraduates into a career in QGAB, the first step is to advise them to do an undergraduate research project, preferably under the direction of a faculty member in QGAB. A research experience with laboratory animals can be just as effective as one using economic species, particularly given the length of time a student can devote to a research project. The research should be designed to be completed within an academic year and provide suffi-

cient substance so that the research results can be presented at an undergraduate poster programme and perhaps even at a regional or national professional scientific meeting. Also essential is advising students interested in QGAB to take appropriate courses in genetics, animal breeding, calculus, matrix algebra and statistics and to attend research seminars. Finally, the student should participate in at least one summer internship with a breeding company or in a QGAB research laboratory.

I believe the final point, recruiting outstanding graduate students, is perhaps the most critical issue. Recruiting top-quality students will be made easier as we groom those outstanding undergraduates in the manner suggested and if adequate funding for graduate student stipends begins to flow from federal grants and industry. The training of graduate students is perhaps our most urgent issue because of the time involved; 3–5 years toward a Ph.D. plus 1–2 years of postdoctoral experience are involved before germination of the seeds that are essential to get QGAB off the endangered species list. I believe the time has come for the actions needed to begin planting these seeds.

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