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Spice of Life: Variety Is Also Good for Hares

*Since 1871, when Charles Darwin wrote *The Descent of Man*, it has been widely accepted that "Variability is the necessary basis for the action of selection." Variability is associated with the ability to adapt, which is clearly beneficial at a species level. But there is increasing evidence that genetic variability may also give rise to advantages at the level of the individual. Steve Smith and Franz Suchentrunk at the Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna have now shown that variation at a particular gene locus in hares is associated with greater reproductive success.*

The results are published in the October issue of the journal *Molecular Ecology*.

One of the key questions of evolutionary biology is how variation at the level of single genes affects animals' ability to produce young. Together with collaborators in the UK and in Belgium, Steve Smith and Franz Suchentrunk at the Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna have designed a mathematical model to describe the effects of genetic variation on the reproductive success of the European hare. They tested the model on data obtained from wild hares in Belgium and in eastern Austria.

Smith and colleagues elected to examine the influence of two different sites in the major histocompatibility complex (MHC). The MHC is involved in immune reactions and MHC genes have recently received a great deal of attention as representing a possible link between genetic variation and fitness. A number of studies have implicated them as possible causes of reproductive failure in humans but to date no experiments have attempted to assess whether MHC genes are associated with fitness in populations of wild animals.

Reproductive success results from a combination of two factors: fertility (whether an individual produces young)

and fecundity (how many young are produced per fertile individual). Smith and colleagues have now found that females that carry two different versions of a particular MHC locus (i.e. that are heterozygous at this locus) have a significantly higher reproductive success than homozygous females. The scientists observed a marked reduction in sterility in heterozygous hares, together with a slight but detectable increase in fecundity. Their results confirm for the first time that variability at a particular genetic locus is associated with reproductive performance and have extremely important consequences for studies on human fertility as well as for wildlife management.

Intriguingly, although the positive effects of heterozygosity could be clearly detected in hares from Belgium they were not found in hares from eastern Austria. The difference presumably stems from different selection pressures on the two populations. For example, the annual range of temperature is significantly wider in Austria than in Belgium, so hares in Austria may be subjected to greater fluctuations in the availability of food. As Smith says, though, "the difference between Austria and Belgium shows just how complicated the whole question is and thus how hard it is to extrapolate results from one system to another."