

# Multi-generational Effects of Endocrine Active Compounds in Birds



**The Challenge:** Wildlife are exposed throughout their lives to low levels of natural and synthetic chemicals that are present in the environment, many of which interfere with the animal's endocrine, neural, and/or physiological systems. The reproductive and other detrimental physiological responses to these chemicals are commonly difficult to observe using acute or short term laboratory exposures based on traditional dose-response relationships. A protocol that includes reproductive and biochemical endpoints for identifying potential endocrine disrupting effects in two complete generations has been proposed by the US EPA for assessing endocrine disruption in birds and other wildlife.



**The Science:** Using the EPA's avian model species, Japanese quail (*Coturnix japonica*; JQ), USGS biologists are completing a multigenerational study of two endocrine active chemicals: trenbolone, an androgenic anabolic steroid used to enhance growth in farm animals, and hexabromocyclododecane (HBCD), a widely distributed flame retardant currently of concern for its presence and bioaccumulation in wildlife, and its persistence in the environment. A suite of hormonal and genomic response markers were analyzed in adult and embryonic JQ exposed through feed and/or by maternal deposition. Measures of productivity and reproductive success across the treated groups were compared to those in control quail. Additionally, targeted endpoints for each class of endocrine disruptor are being identified through genomic analysis in order to improve protocol sensitivity.

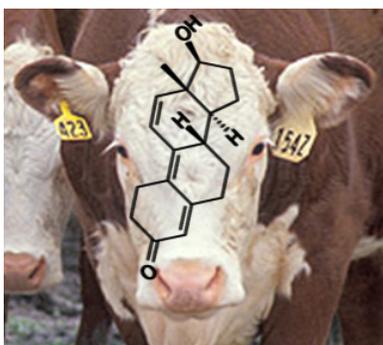


Photo by Keith Weller, USDA, ARS,  
Photo Library

**The Future:** Results from these multi-generation testing trials will contribute to finalizing the US EPA's standard Tier 2 *in vivo* testing requirements for endocrine active compounds in birds and will provide previously unavailable information on multigenerational effects of two different putative endocrine disrupting compounds. This work lays the foundation for future studies to compare variations in species sensitivity between JQ and wild North American avian species that are likely to be exposed to these chemicals in the environment.