

Patuxent Wildlife Research Center

Development of a 2-Generation Test for Endocrine Active Compounds in Birds



- **The Challenge:** The release into the environment of natural and synthetic hormones, antibiotics, preservatives and chemicals found in personal care and cleaning products and plastics is on the rise. Wildlife are exposed throughout their lives to low levels of these continually emitted chemicals, many of which interfere with the animal's hormonal, neural, and/or physiological systems. Current ecotoxicological tests span a single generation and are based on dose-response relationships. However, endocrine system effects are rarely immediately observable and may be difficult to relate back to a specific insult. The nature of the effects can depend on the animal's developmental stage and fitness as well as the presence of other stressors.. Accurate assessment of the risk from endocrine modulating contaminants requires modification of current test protocols and identification of relevant endpoints.



- **The Science:** Biologists at the USGS are conducting a multiple generation demonstration study using Japanese quail as a model organism to test effects of these persistent endocrine modulators on birds. The Japanese quail develops, grows, and matures very quickly relative to other avian models, such that immediate and latent effects can be detected during critical stages, from embryonic development through egg production, over multiple generations. The test chemical is trenbolone, a US FDA-approved synthetic anabolic steroid feed additive used to enhance growth and carcass quality in food producing animals. Trenbolone by-products are present in agricultural fields, feedlot retention ponds, and surface and ground water systems, where they potentially pose a threat to wildlife. USGS scientists are evaluating measures of growth and productivity and endpoints such as mating behaviors, hormone concentrations, and expression changes of key genes to assess the endocrine effects of trenbolone.



- **The Future:** To be an effective surrogate for wildlife, the sensitivity of Japanese quail to endocrine modulators must be evaluated relative to that of other species. The USGS will also test the effects of multiple generation trenbolone exposure on an alternative wild bird model, using the same dosage and similar endocrine endpoints. Validation of the multigenerational Japanese quail system as a model for other birds will help evaluate potential consequences from endocrine active chemicals before they are released into the environment.