Fla. lake contaminants affect alligator weight, biological responses in offspring

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(Phys.org) -- Five-month-old female alligators exposed during development to toxins found in a polluted Florida lake show changes in ovarian gene function and decreased body weight at hatching, but paradoxically showed accelerated growth rates in the months after hatching, according to a study at the University of Florida.

Alligators are a species whose relative well-being in a given environment is indicative of the health of its ecosystem, and scientists say the study may have broader implications for ovarian function and obesity in other animals. The findings appeared in May in the journal *Molecular and Cellular Endocrinology*.

Previous research demonstrated that repeated contact with chemical runoff from spills in Lake Apopka, near Orlando, caused male alligators to develop shorter than normal sexual organs and the loss of normal patterns of sex differences in hormone levels and gonad function.

Now, scientists show that environmental exposure to hormonally active toxins such as PCBs and DDT and its breakdown products are also affecting normal genetic functioning in female alligator ovaries. The results: contaminant-exposed female hatchlings are born smaller and shorter, but gain weight at a faster rate during post-hatching development than alligators exposed to fewer toxins.

In this study, the researchers found an association between altered ovary function and changes in body growth rates. Many human reproductive

illness syndromes that affect female fertility, such as polycystic ovary syndrome, or PCOS, have symptoms that include altered ovarian gene functioning, a lack of normal ovulation and metabolic diseases such as obesity and diabetes.

“The ovaries of the hatchling alligators at first seem to function normally, but when you hormonally stimulate them, that’s when gene expression abnormalities start to appear,” said Louisiana Tech University professor Brandon C. Moore, who led the study, which was based on his graduate research at UF in the laboratory of reproductive biologist Louis Guillette.

To investigate dysfunction in reproduction, Moore and his colleagues collected alligator eggs from Lake Apopka which has been examined for three decades by scientists surveying the effects of industrial pesticides and sewage pollution. Eggs were incubated and hatched under laboratory conditions. They injected the young alligators with Follicle Stimulating Hormone, or FSH, which regulates reproductive processes in many species, including alligators and humans.

“When you give an animal FSH, it’s like revving the gas pedal,” Moore said. However, there was no “revving” for pivotal ovarian genes of pollution-exposed alligators when injected with FSH in Moore’s experiments.

In addition, the researchers explored the parallels between the lack of FSH responsiveness and potentially environment-induced human reproductive diseases, such as polycystic ovary syndrome, a disorder where levels of the female sex hormones estrogen and progesterone become imbalanced.

“Even though we’re studying alligators, what makes endocrinology so powerful is that the chemical structure of most of the steroid and thyroid

hormones are identical among vertebrates, from fish to people," said Ashley Boggs, a postdoctoral researcher at the Medical University of South Carolina who also studies alligators near Cape Canaveral. "It's not just about your genes but also about what you've been exposed to throughout your whole life, from embryonic development to puberty to pregnancy."

Boggs suggested long-term epidemiological studies would need to be conducted to determine whether human reproduction and development may also be influenced by the same contaminants affecting Florida alligators. Such a study would require taking blood samples from expectant mothers and screen for similar chemicals.

However, because thousands of chemicals such as BPA and phthalates are used and easily found in the environment, Boggs said it is an enormous task to separate which toxins are influencing specific biological functions. This study at Lake Apopka is an important step to answering that challenge, she said.

Provided by University of Florida