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Steroids for cattle causing sex changes in fish



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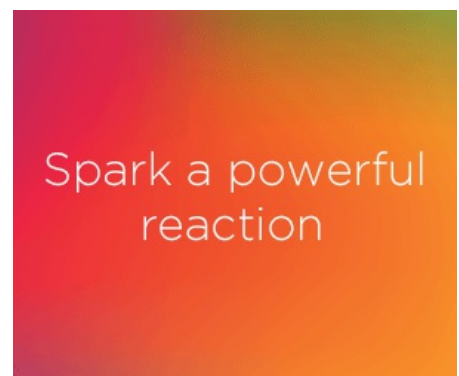
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A hormone used to raise beef cattle may be staying in the environment longer than previously believed and changing the sex of fish, among other effects.



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A team of American researchers says the information regulators are using to govern the use of the chemicals in livestock farming is faulty, and the way in which all chemical substances are regulated needs an update. The team [published its results in the journal Nature Communications](#) last week.

"It is an example where we don't know as much as we thought, and that means there are consequences we didn't expect," said lead author Adam Ward of Indiana University.

Chase Adams, a spokesman for the National Cattleman's Beef Association, said he was unable to immediately locate anyone able to respond to the findings.

Trenbolone acetate (TBA) is a potent hormone—many times stronger than testosterone. It is an "androgen"—a steroidal hormone that's sometimes used as a performance-enhancing drug by athletes. Though human use of trenbolone is illegal, discussions about it can be found on places such as online bodybuilding forums. It can also be found in the bodies of cows across America.

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Livestock farmers are permitted to use such hormones in the United States, and the use of several of the chemicals is "ubiquitous" among beef producers, according to the researchers. The study cites data saying hormones can reduce costs by about 7 percent, which translates to roughly \$1 billion saved annually by the industry in the United States.

The chemicals are illegal to use in farming in some parts of the world, including in Europe.

Trenbolone acetate is regulated, but the rules around TBA are based on the assumption that the chemical breaks down when exposed to sunlight.

But a research team including scientists David Cwiertny and Edward Kolodziej conducted a study in 2013 that found that sunlight appears only to render the substance inert—the chemical can become active again when it's dark out.



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Cwiertny and Kolodziej collaborated with two other scientists to factor that new information about TBA into models that examine the impact the substance.

Ward's models showed up to 35 percent of the substance remains in the environment even after exposure to light. The substance may remain in the ecosystem 50 percent longer than previously believed.

That matters because chemicals similar to TBA can affect the health of fish in streams and rivers, among other environmental effects.

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"At very low levels, trenbolone acetate has been documented to cause partial or incomplete sex reversals in fish, to decrease reproduction rates in fish, and to alter their endocrine system," Ward said. "They are essentially being bathed in this very low level of testosterone-like stuff for their entire lives." ([Tweet This](#))

These hormones are so effective at causing the sex changes in fish that some fish farms in both the U.S. and abroad intentionally feed similar compounds, such as 17-alpha methyltestosterone, to their fish—usually tilapia—to prevent breeding by turning all of their fish into males. This helps farmers control populations, and divert the energy the fish would use for breeding to growing more tissue, producing a larger animal.

Collaborative studies conducted by the [U.S. Geological Survey](#), the National Cancer Institute and others turned up considerable levels of

similar androgenic chemicals in water samples already.

The chemical structure of the substances that re-emerges in darkness is slightly different from what goes into the environment, but it is by no means inert—it is still an androgen, and can still have effects on the health of wildlife, and potentially on humans.

"We have for years, decades, we have regulated individual compounds on the idea that when you release that compound and when that compound changes, the risk is gone," Ward said. "I think our findings challenge that in two ways. One is the reversion process—the compound isn't going away, it is just hiding. The other point that is important to make is just because it has changed slightly does not mean it doesn't pose any kind of a risk."

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Ward says trenbolone is just one of the countless chemicals that could be having effects far greater than expected on both the environment, and even, eventually, people's health.

"What we tried to do in our study was to consider more generally the concept that when you have unexpected transformations in the environment, you generate unexpected risk," Ward said. "This is not just trenbolone acetate: this is caffeine; this is ibuprofen, this is Viagra. This is a cocktail of chemicals that are pharmaceuticals, personal care products, cleaning products, that go down the drain and make it into the environment."

Ward pointed out that the farmers who use this chemical have been doing so largely because they, along with regulators, are under the impression that it has little impact on the ecosystem. "I wouldn't want you to hear me saying beef producers are doing something wrong or that the chemical industry should have never been permitted to do this," he said.



Robert Ferris
Science Reporter



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