

## Effects of Ecologically Relevant Exposure to Trenbolone

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Highlander in Action Grant Proposal

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### Background:

Today, we live in a world where living “chemical free” is unavoidable. There are extra chemicals in our clothes and furniture to be flame retardant, in our plastics to make them last longer, in our food to make them look a different color, and in our water simply because they weren't filtered out. This chemical-filled environment isn't a place of waste that is quarantined with high fences and reactive barrels buried deep in the ground, this chemical-filled environment is what we are living amongst...we are literally bathing in it.

These chemicals in our environment are sometimes in the form of endocrine disrupting chemicals (EDCs), which are environmental pollutants that interfere with a person's natural endocrine-system function. These chemicals can cause side-effects at a range of doses, and sometimes have the worst effects at very minute doses(1). The endocrine-system produces hormones responsible for controlling everything from sleep patterns, metabolism and growth, mood, to the reproductive cycle. EDCs are chemicals that mimic the actions of the endocrine-system using lab synthesized, similarly structured hormone “look-a-likes”, that act like your bodies natural hormones, but often with adverse effects. For instance, Bisphenol-A (BPA) is a synthesized estrogen mimic developed as a possible birth control, but when found it wasn't suitable for birth-control, companies began using it as plasticizer to strengthen plastic bottles(2). Imagine that every time you eat out of a plastic bowl you ingest a low dose of estrogen. That is what living with EDCs means for us.

In the past, the US government has made several attempts to protect us from these chemicals in our environment, most recently the Toxic Substances Control Act (TSCA) in 1976. Restricting only five chemicals in the past 38 years, the TSCA has shown no improvement in protecting public-health or the environment and should be updated(3). All the TSCA restrictions are on known carcinogens, with none of them being EDCs. In the meantime, we have been exposed to over 80,000 new synthetic chemicals, mostly unregulated and lacking appropriate testing(4). With the EPA being charged to protect the public from “unreasonable risk of injury to the environment”, it is discomfoting to know that EDCs have not been well regulated, thus highlighting issue of what makes for effective policy.

#### **My Learning Experience:**

Trenbolone is a novel EDC and acts as an androgen, meaning that it was made to be a testosterone mimic. It is given to beef cattle at a young age to stimulate weight gain(5,6). Trenbolone-treated cattle are constantly excreting trenbolone into the environment through their sweat, urine, and manure, and therefore into water runoff from feedlots into nearby streams and ponds. A newsletter published by Virginia Tech, addressed the question of trenbolone supplement usage. The veterinarian writing the letter responded with the question “Can you afford not use these additives?” and proceeded to describe the price of using trenbolone at \$2, with a \$15-\$50 return per steer(5). This response leads me to believe that trenbolone is widely used, including by local cattle farmers.

Therefore, my question asks how trenbolone is affecting our local ecosystems? This conundrum also demonstrates the complexities of environmental protection at both an economic and ethical cost leading to the need for carefully constructed regulatory policy based on sound science.

**My Experiment:**

I want to measure the environmental effects of trenbolone run off from local cattle lots, by collecting water runoff samples from affected lots. Via ELISA analysis I will measure the amount of trenbolone in our local environment, at points nearer and further down-stream from the cattle lots to see how far trenbolone is traveling downstream. Once determining the levels in our locality, I plan to use these ecologically relevant levels of trenbolone to expose freshwater fish that are found here in Virginia and measure the influence the androgen has on them, including developmental and reproductive effects. Having explored the regulatory guidelines, history of TSCA policy, and the scientific literature on EDCs, I have developed my experiment to create a much-needed model to explore this local and national problem. This model will address what the unintended effects of trenbolone may be and add my results to the growing evidence displaying the need for increased regulation of EDCs like trenbolone. This experiment addresses the real world issues of how to best formulate protection of both wildlife and human health.

**The Outcomes:**

The issue surrounding trenbolone is both a local (the New River Valley) and national issue. It highlights the need for relevant and sophisticated scientific research to guide sound regulatory policy development, especially with the economic and ethical impacts regarding this commonly used EDC. While the effects of EDCs from scientific, ethical, economic, and political issues are not explicitly explored in the classroom, they are an important issue to be explored as we are exposed to them continuously. Therefore, as part of my project I will do community outreach to make the public more scientifically literate and knowledgeable about EDCs. I will use trenbolone as an example to show how important it is to know what we are being exposed to and how it impacts our

lives. I will work with the nursing department to participate in University health-based information sessions, to educate our future healthcare providers about EDCs, and to also participate in the University-wide health fair. Also, because EDCs not only impact RU students, but the surrounding community, I will share my knowledge at community health fairs, such as the Women and Minorities Health fair in Christiansburg. I plan to complete my project through experimental design and management, by analyzing data, interpreting results, and effectively communicating my findings in a poster that will be presented at the OURS SURF forum, the undergraduate-research forum, and possibly submitted for publication. I will share the results with the aforementioned Virginia Tech newsletter to educate the readership not only about the economic, but environmental and human-health costs of using trenbolone additives.

It's exciting to be a part of something much bigger than myself, and contribute to the community in an integral way.

WORD COUNT: 996

## WORKS CITED:

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3. Natural Resources Defense Council (n.d.). Take out toxics. Retrieved from <http://www.nrdc.org/health/toxics.asp>.
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**Budget:**

Please Note - I have successfully garnered a Summer Undergraduate Research Fellowship (SURF) from the Office of Undergraduate Research and Scholarship (OURS). The stipend provided by OURS will allow me to afford to stay here in Radford over the summer to do this research, however, there is a need for funding for research supplies. This budget outlines the material products necessary to complete this work. Through this cost-sharing set-up, I will successfully gather funding necessary for both the time and hours to work on the project as well as the supplies to conduct this research.

Item	Merchant	Price	Qty	Item total	Subtotal
Trenbolone ELISA Kit	ELISA Technologies: laboratory testing services and diagnostic kits	\$520.00	2	\$1,040.00	\$1,040.00
Gambusia fish	Carolina Biological Supply Company – 50 fish/order +\$20 shipping +\$2 Living item fee	\$50.00	2	\$120.00	\$1,160.00
Gambusia Wildlife Collection Permit	Virginia Department of Game and Inland Fisheries	\$40.00	1	\$40.00	\$1,200.00
Glass Fish Tanks	Carolina Biological Supply Company	\$37.95	6	\$227.70	\$1,427.70
Non-carbon Fish filter	Carolina Biological Supply Company	\$6.95	6	\$41.70	\$1,469.40
Live Brine Shrimp (for fish food)	Carolina Biological Supply Company – 50 fish/order +\$2 Living item fee (shipping with previous product)	\$17.75	15	\$268.25	\$1,737.65
Fish Net	Petco	\$4.99	2	\$9.98	\$1,747.63
Fish Net Breeder	Petco	\$8.99	1	\$8.99	\$1,756.62
Water Clarifier	Petco	\$6.99	2	\$13.98	\$1,770.60
KiloSports capsules (trenbolone powder)	Amazon +\$14.99 shipping	\$89.99	1	\$104.98	\$1,875.58

TOTAL: \$1,875.58