

How it Works: Hormones

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The word “hormone” brings different things to mind for different people. Beef consumers might think about advertising they saw on social media while producers might think about how their cattle turn their genetics into phenotype. Some folks immediately think about growth-promotant implants while others think about estrus synchronization protocols.

This article will focus more on the basic nature of hormones, with a few examples, rather than discussing label claims or misperceptions in the marketplace. Leaving aside opinions, it is important to know what the word means on a factual and scientific basis. Knowing that might lead to a better understanding of what hormones do and how they relate to profitability for producers as well as affordability and safety for consumers.

The Basics

There are two ways animals send messages through their bodies. One is through nerves - think of the nervous system as a hard-wire telephone system where the brain can talk to other parts of the body. The other way an animal’s body communicates with itself is by sending chemical (hormone) messages – think of hormones like letters sent through the postal system where one part of the body can send a letter to another part telling it to do, or stop doing, something. Hormones are nothing to be scared of, all living organisms make them and they are essential for life.

Two types of hormones get the most attention for cattle management; steroid hormones and protein or peptide hormones. This is the point where discussing hormones could quickly become complicated. But, for the purpose of grasping how cattle produce and use hormones, just realize that steroid hormones move through the body easily and go directly to where they act (where the signal is being sent). Protein hormones take a little longer to move around and do not go directly to where the message is being sent.

How does this relate to cattle production?

Examples of steroid hormones are progesterone, testosterone and estrogen. These are all related primarily to reproduction but also play many other roles in cattle. They are mostly produced by the ovaries in heifers and cows and testicles in bulls. They all start out as cholesterol and are turned into these specific steroids by tissues in the sex glands. In addition to controlling reproduction (the estrous cycle and sperm production), they are also important for muscle growth and fat deposition.

The most common use of steroids as a management tool is growth promotant implants. These implants, when placed under the skin on the back of the ear, slowly release a small amount of steroid into the blood stream. The additional steroids are either the same or very similar to the steroid naturally made by the calf itself. They are used in very small amounts and, while they can be measured in the blood or meat, are used in concentrations at a fraction of what cattle normally produce themselves.

Another example of using steroids for managing cattle is estrous synchronization – managing the estrous cycle so that heifers or cows come into heat at roughly the same time. This makes artificial insemination more effective and reduces the length of the breeding season for natural service (bull mating). Progesterone, a steroid hormone naturally made by a cow or heifer’s ovary, can be applied through a vaginal insert to keep cows from coming into standing heat until a specific time.

Steroid hormones are quickly cleared from cattle's blood and tissues. So, for both of the examples described above, the additional steroids are "cleared" rapidly after the implant or insert is removed. On the other hand, protein hormones take a little longer to clear out of a cattle's system.

The addition of protein hormones is not as commonly used in beef cattle production as the examples of adding steroid hormones mentioned above. But, a good example is the use of gonadotropin releasing hormone (GnRH) to treat cystic follicles or in an estrous synchronization protocol to make a cow or heifer ovulate – "drop an egg" – at the correct time. Another example, used even less frequently, is the use of follicle stimulating hormone (FSH) in superovulation protocols for embryo transfer. Protein hormones take a bit longer to clear from cattle's system compared to steroid hormones. But, they still clear the system within days of injection.

For those that have a background in biological science, this article will seem fairly remedial. On the other hand, those who focus on other specialties might find this a bit confusing. Either way, the take home message is that all cattle produce many different types of hormones and the word "hormone" should not be reduced to a marketing buzz word. Hormones are as essential as the chemical dihydrogen monoxide for keeping cattle alive, in good shape and producing efficiently. The way cattle are managed – all the way down to the quality of hay they are fed – can change how much or how little of these hormones they produce. That is what ultimately leads to a difference in weaning weights or the number of open cows that are culled each year.