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CHICKEN GROWTH HORMONE RESEARCH AT THE DEPARTMENT OF POULTRY SCIENCE

Herb Siegel
Department of Poultry Science

As many of you know, the genetic makeup of the bird determines its optimum rate of growth. That is, characteristics inherited from its sire and dam determine how fast the bird will grow and how large a size it will attain.

Within this genetic background, factors in the bird's environment — such as temperature, light, diseases and nutrition —interact with each other and with the inherited characteristics to modify this growth. One of the important internal mechanisms that is genetically determined, but which is significantly influenced by the environment, is the endocrine or hormone system.

A vast array of hormones, sometimes acting alone but mostly interacting with each other, control or modify not only the growth of the bird but the composition and distribution of its muscle and fat. This distribution is of great importance not only to the growers and processors but also to the consumer.

Research in the Department of Poultry Science at Penn State by Dr. Regina Vasilatos-Younken, her associates, and students on chicken growth hormone (cGH), a hormone important for its effect on growth and carcass composition, has revealed some fascinating facts about how cGH works.

They found that during the rapid stages of growth in the broiler (1 to 4 weeks of age), the level of cGH in the blood is very episodic — about every 90 minutes there is a pulse of cGH, which then subsides. This pulse timing is very consistent for an individual bird. As the bird passes the most rapid growth stage, the heights of the pulses become smaller but do not disappear entirely.

What is the purpose of this pulsatile output? For most hormones to be effective, there must be a receptor for that hormone in the cells of the tissues that are most affected by the hormone, such as liver or muscle.

Dr. Vasilatos-Younken and her students are studying the receptors in livers of growing chickens. Their results suggest that when all receptors are in use (scientists use the term "saturated"), the growth hormone has little or no effect.

The rise and fall of cGH levels in the blood that flows through the liver allows these cGH receptors to desaturate. Dr. Vasilatos-Younken has shown that cGH is more effective in promoting more efficient growth, with less fat in the carcass, if the hormone is given in a pulsatile manner.

Cow Research — Minus The Cow

NEWARK, Del. — Innovative lab equipment is allowing University of Delaware scientists to research cow digestion minus the cow.

Continuous culture fermenters are the laboratory equivalent of the cow's rumen, the first of the animal's four stomachs.

Dr. Limin Kung, assistant professor of ruminant nutrition, said the rumen is especially interesting to researchers because it enables cows to use bacterial protein as well as protein from plant sources.

"The rumen is a fermentation vat that allows cows to use fibrous feeds efficiently," he said. "The fermentation also increases bacterial production of protein. Cows and other ruminants get protein from the feed that they eat as well as from the bacterial protein produced in the rumen."

According to Kung, theoretically cows do not need an amino acid or protein source in the diet to build muscle tissue or produce milk. However, to maximize production, supplemental proteins are fed to today's ruminants.

He said that ruminants do not have to compete with humans or other animals that need protein from grains, because non-protein nitrogen sources, such as urea and ammonia, are used to produce protein by the bacteria that live in the rumen.

Studying ruminant digestion in the laboratory is not new. But most studies have used batch fermenters, thus limiting the types of experiments. A continuous culture fermenter, such as the one Kung uses, allows for a greater range of experiments. Most importantly, it can simulate the digestion of cows over a period of time.

The continuous culture fermenter system is one of only 6 or 7 in the country. Eight 500 ml glass cylinders simulate eight rumens. They are nestled in a bath, a 20-gallon aquarium, held at 40 degrees centigrade, the temperature of a rumen.

Dr. Ken Lomax and research associate Stephen Gottfried, both of the department of agricultural

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'Digging For Data' Shows Leaner Beef

CHICAGO, Ill. — Sixth grade students who view a new science video are getting the message that today beef is leaner.

"Digging for Data" is a 20-minute video produced by the education department of the Meat Board to help students understand scientific problem solving.

The new science program is provided free to teachers and includes the video, teacher's guides, and activity masters. Since sixth-grade students are often concerned about how tall they will be, the video attracts their attention by talking about height.

In "Digging for Data," students research how the food available to the Indians and early settlers affected their average height. Students explore an archeological dig, travel to a mid-nineteenth century immigrant's home, visit a university beef cattle research center, and finally meet with a food technologist in a supermarket.

"Improvements in food technology provide us with a greater variety of foods all year long," said Maureen Lambe, Meat Board assistant director of education. "Through the video, students learn that this variety and a balanced diet are key to reaching their full height potential."

Pilot testing was conducted to measure the value of the tape as a teaching aid. One question asked, "New methods of breeding and feeding cattle reduces the amount of fat in beef, resulting in a better diet. True or False?" Before seeing the video, only 30 percent of the students correctly answered true. After seeing the video, 77 percent answered correctly.

This message is reinforced with the worksheet, "Cattle Go On A Diet." This worksheet compares cattle raised in the 1950s to those raised in the 1990s to show changes in beef in response to consumer desire for lean meat.

Teacher, comments about the video have been very positive. For example, Charlotte Burns, a sixth-grade science teacher from Houston, Texas, said, "If you have ever searched for an interesting video to reinforce scientific problem solving, this is it! Students are encouraged to gather information and actually think like scientists."