AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

William Hansel on

Genetics and the Happy Hypothalamus

by William Hansel

Look for dramatic breakthroughs in animal genetics and physiology during the next 15 to 20 years. As a result, animal fertility, health and feed conversion will improve much faster than they have in the past and bring about a new era in animal productivity.

By the end of this century, for example, cattle breeding will be completely controlled, production per animal will rise dramatically and the amount of feed needed to produce each unit of meat and milk will decline substantially.

By the end of the century, cattle breeding will be a completely controlled procedure. Artificial inseminators will be "in-embryonators," implanting embryos produced by cows of superior genetic background and fertilized by sperm from outstanding bulls. Techniques for controlling estrous cycles will be perfected so that groups of cattle, sheep, swine and goats will be inseminated or impregnated with embryos at a predetermined time, eliminating the need to check the animals for estrus.

Superovulation techniques essential for embryo transfer will be fine-tuned, making it possible to harvest 100 or more eggs at a time. In vitro fertilization and embryo freezing, techniques also will be perfected so that embryos can be stored indefinitely.

Already, the sex of embryos can be determined through intricate laboratory procedures. By the end of the century, the current high rates of embryo mortality will be curbed, vastly improving the fertility of recipient animals.

Rapid recent advances in recombinant DNA techniques, or gene splicing, allow scientists to prepare purified genes and inject them into fertilized embryos. New genetic materials thus introduced can be disseminated in domestic animals by embryo transfer. Genetic engineering of embryos, cloning and dissection of embryos are among areas of research requiring and getting major efforts.

These are just a few examples of genetic manipulations that will be accomplished. Many cattle producers already use superovulation and embryo transfer techniques. A great deal of fundamental information remains to be developed, however, before these genetic engineering techniques can become widely used. But the stage is set for introducing new genes into embryos of genetic animals. These genetic changes will come at the same time that breakthroughs in animal physiology are realized.

"Genie" In Command

Over the years, animal scientists, notably physiologists and nutritionists, have learned a great deal about the endocrine system and other physiological mechanisms that control animal growth, reproduction and lactation. This knowledge has been basic to improved animal growth rates, more efficient use of energy and protein by animals, leaner carcasses and increased milk production.

We are now entering a new era, however, during which more rapid changes will occur. It is now possible to control the hormones produced by the endocrine glands, especially the anterior pituitary gland, to develop techniques to improve animal performance.

It is appropriate to refer to this period

HOPPER . . .

counties—Farming, Manufacturing, Mining, Government, Poverty, Federal Lands, and Retirement.

See The Diverse Social and Economic Structure of Nonmetropolitan America, by Lloyd Bender and others for more detail. For a copy, write to Superintendent of Documents, Washington, D.C. 20402. Ask for Rural Development Research Report Number 49. GPO Stock Number 001-019-00389-8. The price is $1.50.

Sometimes a hedge is not a hedge

"To hedge or not to hedge?" is a question that confronts many farm producers and business people who buy and sell farm products. Most of us think that hedging in futures markets reduces price risks. However, Carter and Lyons of the University of Manitoba have recently demonstrated that the Chicago fat cattle futures cannot reduce your price risk if you happen to own cattle in feedlots in western Canada.

Using price data for the years 1972 into 1981 and data related to 100,000 head of cattle actually fed in western Canada during these years they asked if it paid to hedge the cattle. They found "not to hedge" was the preferred strategy. Western Canadian feedlots were better off by not hedging than by hedging in the Chicago futures. Hedging lowered average returns and increased price risks. This conclusion was tied closely to the risks associated with the basis—in this case the difference between spot cattle prices at Canadian feedlots and the price of the nearby Chicago futures.

This finding has special significance since futures markets for fed cattle are not operating in Canada. Thus, there appears to be no way for Canadian cattle feeders to protect themselves against price risks.

For more detail, see the February 1985 American Journal of Agricultural Economics, pp. 33-39.

Education pays for some

We know that people who have Master's degrees can often command higher salaries than can people with Bachelor's degrees. But do you know how much more? Broder and Deprey of the University of Georgia decided to find out. They surveyed University of Georgia graduates between 1970 and 1981 who had received bachelors and masters degrees in agricultural economics. Their findings: "Alumni who received masters degrees in agricultural economics earned approximately $3,333 more in annual salary relative to bachelors degree alumni." This amount exceeds the boost that two years of work experience give to a salary—$2,900.

Their research also shows that if you are going to work for a masters degree it pays handsomely to get an assistantship. It cuts the calculated cost of getting a masters degree about in half.

as the era of the "happy hypothalamus." It is this organ, located in the brainstem, that receives messages from an animal's environment. The "genie" in the hypothalamus translates them into commands to the pituitary gland to increase or decrease production of its six major hormones.

Some of these chemical commands from the hypothalamus are inhibitory; others are stimulatory. The hypothalamic thyrotropic releasing hormone (TRH), for example, controls production and release of thyroid-stimulating hormone (TSH), which in turn controls the thyroid gland and regulates the metabolic rate of most tissues. TRH also stimulates the release of two other hormones from the pituitary, prolactin and growth hormone.

Understand The Hypothalamus

These six different hormones produced and released by the pituitary profoundly influence growth, reproduction, lactation and adaptation to stress. Thus, a better understanding of the hypothalamus is crucial.

The hypothalamus also produces hormones that stimulate and inhibit feed intake and regulate functions mediated by the nervous system. We can expect to see new methods for regulating the hypothalamus and for using the hormones it produces to increase lactation, improve growth rates and produce leaner carcasses.

Some of the areas that will be given stepped up research efforts include synthesis through recombinant DNA techniques of large quantities of all the pituitary hormones in cattle, sheep, swine and poultry; use of hypothalamic hormones to regulate growth, feed efficiency, lactation and carcass characteristics; and development of new ways to manipulate such environmental factors as light and temperature to maximize production of the hypothalamic hormones that have a major effect on growth and milk production.

Significant breakthroughs have already been made in techniques which will induce increased milk production of cows. It is now possible to use relatively low-cost hormones that induce increased milk production by cows of 10 to 15 percent. We can expect the first of these bovine growth hormones to be commercially available within 3-5 years.

Trend Will Accelerate

Over the years, animal food production has increased tremendously. This trend will continue and even accelerate as the demand for animal products rises. Higher productivity per animal will be achieved largely as a result of discoveries in the areas of forage production and utilization, animal reproduction and genetics, and animal physiology and nutrition.

Increased production of meat and milk in each animal, as well as improved carcass characteristics, could be achieved by regulating the animal's endocrine system and other physiological factors.

In the next several decades, most of the major pituitary and hypothalamic hormones will be synthesized in large quantities through recombinant DNA techniques. Bovine growth hormone, which has been shown to cause dramatic milk yield increases in cows with limited effects on the need for feed, has already been produced successfully in the laboratory with gene-splicing techniques.

Genetic engineering and manipulating the pituitary and hypothalamus may be used to accomplish the same ends. For example, it is theoretically possible to modify the production of hormones and enzymes by introducing genetic materials into the embryo. The same techniques can be used to produce animals with resistance to debilitating diseases, which would boost the productivity of animals even further.

Thus, a new era in animal agriculture will be propelled not only by genetics and physiology, but also by a combination of the two.

William Hansel is Liberty Hyde Bailey Professor of Animal Physiology, Department of Physiology, New York State College of Veterinary Medicine, Ithaca, New York.

The next column by Professor Hansel will focus on processes that control lactation; how it can produce milk more efficiently and increase production per cow by at least 15 percent.

If you use an 8-percent interest rate as the cost of money, it only takes you nine years to recover your graduate school costs if you have an assistantship; 29 years if you do not. These estimates are for people that go for a master's degree immediately after receiving a bachelor's degree.

The calculated graduate school costs are higher for those who work a while after getting a bachelor's and then go back for a master's. They give up more when they go back to school. Consequently, the number of "recovery" years are greater—12 with an assistantship and 47 without.

See the August 1985 American Journal of Agricultural Economics for details.

Economics can simplify food stamp calculations

You'd be surprised at how many statistics and how much economic analysis affect your food stamp allotment. One of the key calculations is the "base allotment" for a standard four-person household. It is based on a "Thrifty Food Plan" which in turn is keyed to our requirements for nutrients as well as availability and costs of food.

This base allotment for four is adjusted for families of different sizes, but not proportionately. For example, the allotment for a family of five in October 1984 was 1— percent of (less than 125) the allotment for four. And the allotment for a family of one in the same month was — percent (more than 25).

Now, Brown and Johnson say that with the use of utility analysis, the adjustments for family size can be done much more simpler than is now done by USDA.

One reason for the difference is that their numbers take in account the age of family members, the present system does not. In the end they conclude that their system would mean more foodstamps for small families and less foodstamps for larger families than does the present system. More detail are in the August 1984 American Journal of Agricultural Economics.

HAVE YOU HEARD

"The changing fortunes of the U.S. Beef Industry do not bode well for the future, as 1979-83 was the worst of all possible 5-year periods between 1950 and 1983. Also, 1978-82 was the only 5-year period in which both gross quantity moving through the market and inflation adjusted price trended downward. This pattern contrasts sharply with the eight sequential 5-year periods between 1963 and 1974 when both gross quantity and real prices trended upward." in Joseph C. Purcell's University of Georgia's Research Report 473, August 1985, The Changing Fortunes of the United States Beef Industry, 1950 to 1983.