Lesson 4:
The Impact of Biotechnology in Animal Agriculture

With more than twenty companies dedicated to the development of animal biotechnology products and many other large companies that conduct research in this field, new animal biotechnology products will likely be on the market soon. A variety of career opportunities exist in this new but rapidly growing field. A number of economic and social impacts accompany this growth in animal biotechnology. The industry will have to address these issues.

Careers in Animal Biotechnology

Careers in animal biotechnology include jobs that use the products of animal biotechnology (such as a livestock producer) and positions in the companies that develop and market these products. Biotechnology companies have a variety of job positions. Large companies usually have more specialized positions, while smaller companies have positions that include a broad range of responsibilities. However, most companies have one or more employees working in eight major areas. These major areas are research and development, quality control, clinical research, manufacturing and production, regulatory affairs, information systems, marketing and sales, and administration. The jobs in the different areas vary in the amount of education they require, ranging from a high school diploma to a doctorate in a specific scientific field.

Research and development - The area of research and development (R&D) involves the actual laboratory research needed to develop potentially useful products. Positions in this area include glass washer, laboratory assistant, research assistant, postdoctoral fellow (a term for a new scientist), and research director/principle investigator (experienced scientists).

Quality control - This area includes positions such as quality control analyst, environmental health and safety specialist, equipment validation engineer, and validation technician.

Clinical research - After some products are developed, they must be tested on live animals in a clinical research setting. Positions in this area include clinical coordinator, clinical data specialist, clinical research associate, and animal handler/technician.

Manufacturing and production - The manufacturing and production area offers a variety of positions, including product development engineer, manufacturing engineer or technician, instrument calibration technician, and packaging operator.

Regulatory affairs - Regulatory affairs offers positions for specialists who work with regulatory agencies to obtain approval for products. Examples of positions available in this area include regulatory affairs specialist and documentation specialist.

Information systems - Positions in information systems include scientific programmer analyst and literature research assistant.

Marketing and sales - Biotechnology products must be marketed, which is the responsibility of those involved in the marketing and sales area. Positions in this area include market research analyst, sales representative, and customer service representative.

Administration - In administration, positions such as human resources representative, supply buyer, and patent administrator are available.

Economic Factors Affecting Producers

One of the most important questions livestock producers face when a new technology is put on the market is whether to use it. To answer this question, producers must consider the benefit-to-cost ratio. The ratio is a comparison of the economic benefits of using the product to the costs of using the product. For example, if a new genetically engineered feed additive costs $6 per feeder calf to use but increases feed efficiency by 20 percent, which saves $18 in feed costs, then the benefit-to-cost ratio would be 3 (18 ÷ 6). If the ratio has a value of two or greater, the product is considered cost effective.

A second economic consideration that producers must take into account is the cost of not using a biotechnology product, which is not a simple task. Producers must be able to provide a competitive product. If most producers begin to adopt a new technology, the price of livestock may drop, making the use of the product necessary.

The reliability of a biotechnology product is also important. Producers must evaluate the actual effects of using the product. If a product does not perform as well as expected or is not reliable in its performance, the value of the product is not as high.

Finally, livestock producers must consider not just the cost in actual dollars but the time required for the additional management and training that is often associated with the use of new products. This economic consideration is frequently overlooked when a new product is introduced.

Consumer Health and Safety Concerns

The public, those who buy meat, dairy, and egg products, are consumers of animal biotechnology. Many people are concerned or fearful about animal biotechnology because they do not understand the technology. This lack of understanding lends itself to the acceptance of rumors as fact. Consumers have also become skeptical about research findings due in part to research reports like those about substances “shown” to cause cancer, since the quality of some cancer research studies has come into question.

The effect of these factors on biotechnology is that when research is published that suggests that new biotechnology products are safe, many consumers are not convinced. Consumers of fresh vegetables have recently turned to higher-priced “natural” or “organic” foods because they see them as healthier than nonorganic foods. This consumer perspective may be transferred to animal products, producing a new market for “natural” meat, milk, and eggs.

Is there a justification for these consumer concerns? The answer to this question is both yes and no. Yes, because consumers should always be concerned about the safety and wholesomeness of the foods they buy. They should also be informed about the methods used to produce those foods. No, because animal biotechnology products must be shown to be safe before regulatory agencies approve them.

Global Social Impacts of Animal Biotechnology

Agriculture has historically had a worldwide social impact. As the world population grows, the need for animal products will increase as well. Biotechnology has the potential to increase the global supply of meat, dairy products, and eggs. The real question, which cannot be conclusively answered, is whether animal biotechnology can increase the production of animal products without an equal increase in production inputs. BST, for example, causes cows to produce more milk, but these cows require more feed. Unless those extra inputs are available, production cannot increase.

The mid-1990s has also seen a considerable amount of debate take place in Europe over the use of biotechnology by the developed world. For example, Europeans have debated the development of transgenic animals, such as genetically modified species of fish. Scientists have developed thirteen genetically modified species of fish that grow 20 to 100 percent faster than unmodified fish. If these modified fish are accidentally or intentionally released into some of the world’s oceans, will the unmodified fish be able to compete for food?

Will the fish spawn differently? What would be the result of a cross between a modified and an unmodified fish? Could one country release modified fish without the approval of other countries? These types of international concerns must be addressed. The international political environment will determine the extent of the use of animal biotechnology.

A third impact of animal biotechnology is that it may change the number of livestock producers needed in the United States and the world. If animal products can be produced more quickly and with fewer losses due to disease, will fewer producers be able to supply the meat, milk, and egg demands of the national and worldwide markets? The answer to this question is unclear. On one hand, if population growth causes demand to increase faster than production, the need for producers will grow. On the other hand, if the production of animal products increases faster than the demand, fewer producers will be needed.

Summary

Livestock producers demand biotechnology products that make economic sense. Consumers demand food products that are safe and healthy. The world needs answers concerning the social impact of animal biotechnology. The field of animal biotechnology faces several challenges but promises many rewards. As animal biotechnology continues to advance, the number of career positions available in this field will increase.

Credits

Abbott, Alison. "European Debate on Biotech Highlights Policy Differences." *Nature* 379 (18 January 1996): 197.

Australian Biotechnology Association. "Biotechnology in Animal Agriculture." http://203. 17.97.17/leaf4.html (8 June 1997).

"Careers in Biotechnology." http://www.public. iastate.edu/~biotech_ed_info/BIOTECH_INFO/ bio2.html (5 June 1997).

Comai, Luca. "Impact of Plant Genetic Engineering on Foods and Nutrition." *Annual Reviews in Nutrition.* 13 (1993): 191-215.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Jensen, David G. "15 Hot Biotech Jobs." http:// www.bio.com:80/hr/search/15hot.html (5 June 1997).