lar offenses. Animal-control agencies frequently deal with chronic offenders of leash laws and other ordinances, so recidivism is a good measure of the impact of such laws. Prior to Multnomah's revised dangerous-dog law, 25 percent of all biting dogs had bitten someone else within one year. Under the new regulations, that rate fell to 7 percent. The number of dog ownership and responsive animal control.

He observed, "We were facing a 75 percent cut in funding, but being able to document the effectiveness of our program helped lead to full reinstatement of our budget in a very competitive fiscal arena." Despite the dramatic rise in awareness of the problems caused by dangerous dogs, the widespread adoption of dangerous-dog laws, and continued successes against dog-fighting, there seems to be little evidence in most areas that the dangerous-dog situation is improving. What is preventing effective solutions?

We know from the experience of Multnomah County and others that currently employ full-time trainers or animal-control services, but they have no idea of what is being done to deal with the underlying problems that have very deep human roots. The underlying causes are the ways people breed, raise, train, socialize, and supervise their animals. It is time to look at what individuals, rather than governments, can do to end the dog-bite epidemic. puppy kindergarten, and play groups can work together for fair dangerous-dog legislation with strong enforcement that is designed not simply to respond to dangerous-dog problems, but also to educate the public about responsible pet ownership.

At a time when stories of dog attacks continue to fill the media, it is often easy to forget that most of our more than 50 million dogs never bite anyone. However, the problems caused by the highly visible majority of animals and their owners have far-reaching consequences for all of us who care about the special relationship between people and dogs. Each of us must re-nurture the commitment to ensure that safe and healthy animals share their lives with understanding and responsible owners.

Randall Lockwood, Ph.D., is HSUS vice president, Field Services. Field Services.

Transgenic Animals

S cientists in the United States, Canada, Japan, Europe, and Australia have created a number of transgenic animals: pigs, lambs, calves, and fish who contain the growth-hormone genes of other species, including those of humans. To date, an estimated ten thousand varieties of transgenic mice have been created. However, gene-splicing success rates are extremely low, and the entire process is time-consuming and costly. Much of the future for this research comes from the public via tax revenues.

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An Update on Gene Engineering

By Michael W. Fox, D.Sc., Ph.D., B. Vet. Med., MCVS

Several recent developments in genetic engineering show how the new industry applies biotechnology to agriculture and medicine. The value of these new developments in terms of real progress in improving agricultural practices and human health remains to be seen. The following examples, "New Creation," are the most promising that I have been able to identify.

One can read between the lines of new patent applications, news releases, and scientific reports concerning the latest feats of genetic engineering and glimpse the near future. The wonder-word of New Creation is not quite here today, but it may be upon us sooner than we expect. A whole new generation of genetically engineered, or transgenic, animals is on the way. Transgenic animals will be regarded as "new" species, the patentable commodities of a new world order.
Researchers at the University of California at Davis opted to splice extra growth-regulating genes from sheep into lambs to avoid the use of human gene tissue donor James Murray.Merck, in particular, to reach puberty. Dr. Murray concluded, the efficient, fast-growing birds, Merck developed the slaughter before severe health problems ever develop.

suffer? distributors, and consumers—consequences that have their new patentable creations. Trade secrets notwithstanding, the short- and long-term costs of such research are not considered (see the Spring HSUS magazine, has praised what he terms “molecular pharming technologies,” as exemplified by research teams from the United Kingdom, the United States, and the Netherlands. In Australia, Merck's Macro-Chickens may well have a variety of health problems, but if the birds eat well and grow quickly, they may be ready for slaughter before severe health problems ever develop.

What will happen to the reserve stock of transgenic chickens, the ones not raised for slaughter? Will they suffer?

Because such information is proprietary, corporations are not likely to reveal the problems and risks of their new creations, creating secrets notorious for standing, creating transgenic farm animals has social and economic consequences for farmers, agribusiness distributors, and consumers—consequences that have been given scant attention.

Critics of the genetic engineering of farm animals have expressed concern about the use of public funds to make these animals produce more meat (even if it is leaner) when the short- and long-term costs of such research are not considered (see the Spring HSUS magazine). A major problem of modern intensive animal agriculture is overproduction. In many nations, meat and milk overproduction is a significant issue. It is unlikely that the creation of transgenic farm animals will help feed the hungry of the world, since meat-production efficiency has its limitations and inevitable environmental costs.

Genetic engineers are now attempting to alter milk from farm animals to improve the safety of disease in milk production. It is easier to create a new generation of cows able to produce “humanized” or more digestible, milk. Such research may be more helpful in feeding the hungry since milk production is far more efficient, ecologically sound, and cost-effective than meat production.

Other innovations in development in farm technology that do not entail gene transfer but which can have profound social and economic ramifications include the development of cow clones! and a technique to presell the offspring. Scientists are baffled by the fact that some 25 percent of calves produced by cloning are almost twice normal size at the time of birth and must therefore be delivered by cesarean section.

To date no plant genes have been inserted into animals, but animal genes have been successfully incorporated into the genetic structures of various plants. Researchers have successfully implanted human genes into tobacco plants to produce functioning human anti-bodies that may be used to diagnose and treat human diseases. The “antifreeze” gene of the flounder, which produces a protein that stops fish from freezing, has been cloned and inserted into tomatoes and tobacco. In the future, fish genes may protect such crops from frost.

Fish farming is growing, so biotechnologists have been busy developing “superfish” by inserting growth-hormone genes into various species of fish to increase their size. However, the horizon of transgenic farm animals is not limited to fish: other species of fish into a variety of commercially valuable enterprises, such as carp, eel, salmon, catfish, tilapia, sarco, carp, eel, salmon, catfish, tilapia, perch, and northern pike. The antifreeze gene of the flounder is also being inserted into other fish species to expand commercial fish production in cold regions.

At the Army Research Laboratory in Natick, Massachusetts, biotechnologists are seeking to genetically engineer sheep who secrete in their milk a blood-clotting factor that may be used in the treatment of bleeding disorders. One way to create these sheep is to insert a gene from a fly that produces a protein that prevents blood from clotting. This gene has been inserted into sheep, and the animals secrete the protein in their milk. The protein is then collected and purified, and its use in the treatment of bleeding disorders is being investigated.

Researchers continue trying to identify the genes responsible for various inherited diseases (especially those found in the Golden Retriever). For example, in the human immune system to serve as organ donors for people needing new hearts and other organs. It may take many years before these problems are solved, but it is unlikely that the problems created by transgenic farm animals will help feed the hungry of the world, since meat-production efficiency has its limitations and inevitable environmental costs.

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Five sheep cloned from a single embryo in England: in a recent poll, fewer than half of the European patentable subject matter. The patenting of animals could be carefully studied. In 1988 Sen. Mark Hat­
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