

The Role of Animal Identification in Public Health

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It is both unusual and a pleasure for me to be addressing an audience such as this one. I come to this meeting with a background in clinical infectious diseases and epidemiology. What I share with many of you is that I too deal with the consequences of foodborne disease, albeit from a different perspective. This morning I hope to emphasize the tremendous role that animal and product identification can have in solving this shared problem. To do this, I wish to outline for you what it is that we at CDC do - and why we do it.

This is the continuum between farm and table and some of the federal agencies involved at each step. Between rearing and consumption, animals and product transverse this gamut of agencies with all their associated checks and regulations. Public health agencies such as CDC become involved when someone develops illness. We investigate these cases for two reasons: first, to remove any immediate threat to the public's health by identifying and recalling contaminated product, and second, to learn what we can about where the pathogen got into the food chain and how it arrived at its end. We view outbreaks of illness as natural experiments from which we can learn about the pathogen, about the steps that lead to human illness, and most importantly, about what we can do to prevent the illness. To do this we must work backwards, retracing events until we understand the entire route of transmission well enough to intervene in a rational, effective way.

For the purposes of illustration, I wish to discuss some examples of public health activities involving *E. coli* 0157:H7. *E. coli* 0157:H7 will cause at least 20,000 cases of bloody diarrhea in the United States in 1995. Approximately 1,000 of these people will develop kidney failure, and some of will die as a result. There is no specific therapy that may be used to cure a person once infected. The only way to reduce the burden of illness is to prevent infection.

Foods of bovine origin are directly responsible for the majority of reported cases of *E. coli* 0157:H7. Farm animals are the only known reservoir of the organism and are consequently a potential point of intervention. Unfortunately, little is known about the ecology of the organism on farms or the factors that result in its entry into and propagation through the food supply. This lack of knowledge is the crux of our shared problem. Is there something different about farms whose animals give rise to human illness? What is it about the sources of food or water for these animals, the way they were reared, transported, or slaughtered, that explains why they gave rise to human illness while cattle from the farm down the road did not. The answers to these questions have far-reaching consequences for intervention. There are other questions, many of which can be studied through farm based research.

What is ultimately important, however, is to prevent human infection, and to do this, one must study the circumstances associated with human infection.

In 1993 in the Western United States, a single lot of hamburger meat contaminated with *E. coli* 0157 caused over 700 cases of illness. Traceforward efforts led to the identification and recall of over half of the contaminated meat. This action prevented an additional 900 cases of illness, 250 hospitalizations and five deaths. In other instances, traceback investigations have provided critical, basic information about *E. coli* 0157:H7. Examples include: the demonstration of cattle as a reservoir, transmission through raw milk and undercooked meat, and the value of molecular subtyping.

Both traceback and traceforward investigations require the ability to maintain livestock and product identity. The next slide gives you some idea of the problem: working one's way back upstream is not simple. The source of many animal products becomes obscured at the retail level, either because records lack the necessary detail or because - as in the case of ground beef - product from multiple sources is combined. Handling at the retail level can further complicate matters by contaminating other types of food, which in turn become the proximate source of human disease. It is harder still to work back to the farm of origin. The volume and number of sources for most plants - and the tendency for animals to go through a series of owners prior to slaughter - makes further tracing logistically impossible. This has greatly limited the number of tracebacks which occur and retarded our efforts to develop prevention strategies. It has limited not only our ability to identify - but also to exonerate - possible sources of contamination.

Advanced technology offers a way around these obstacles. The widespread application of new techniques for livestock identification has the potential to greatly advance our knowledge about what does and does not work in preventing foodborne illness. To reach its full public health potential, an identification system should extend all the way from the farm of origin to the point of final purchase.

Clearly there are issues beyond technology which influence the feasibility of such a system. Confidentiality is a concern that becomes all the more critical in the traceback setting. By linking human illness with product source, traceback investigations invariably raise the specter of litigation. Furthermore, there is uncertainty about what to do with healthy livestock found to harbor human pathogens. The authority and mechanisms for dealing with such animals are not well established. These are very real issues, and they need to be addressed if we are to get to the science of protecting the food supply without terrorizing the food industry. The important thing is that such concerns not subvert the benefits to public health that an identification system can provide.

Let me close by noting that, although I have used *E. coli* 0157:H7 as an example, many of my comments pertain to other pathogens and products. Perhaps as significantly, they pertain to pathogens that have not been recognized. Remember that *E. coli* 0157:H7 was only identified as a cause of human illness in 1982. Imagine how much more we would know about controlling this organism - and how much greater the confidence of the consumer in the meat supply - if a fast and accurate system of animal and product identification had been in since that time.