

## Chapter 25

# Ubervveillance, Standards, and Anticipation: A Case Study on Nanobiosensors in U.S. Cattle

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### ABSTRACT

*Ubervveillance of humans will emerge through embedding chips within nonhumans in order to monitor humans. The case explored in this chapter involves the development of nanotechnology and biosensors for the real-time tracking of the identity, location, and properties of livestock in the U.S. agrifood system. The primary method for research on this case was an expert forum. Developers of biosensors see the tracking capabilities as empowering users to control some aspects of a situation that they face. Such control promises to improve public health, animal welfare, and/or economic gains. However, the ways in which social and ethical frameworks are built into standards for the privacy/access, organization, adaptability, and transferability of data are crucial in determining whether the diverse actors in the supply chain will embrace nanobiosensors and advance the ideals of the developers. Further research should be done that explores the possibilities of tripartite standards regimes and sousveillance in relation to nanobiosensors in agrifood.*

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## INTRODUCTION

Ubervveillance is the ability to track an item, handling, or life form through a nexus of its identity, location, and properties in real time through embedded radio frequency identification (RFID) chips—technologies that use radio waves to exchange data between a reader and an electronic tag attached to an object (Michael & Michael, 2010). Historically, ubervveillance follows after dataveillance, which is “the systematic use of personal data systems in the investigation or monitoring of the actions of one or more persons” (Clarke, 1988, p. 498). One of the marked distinctions between the two types of tracking is that ubervveillance “takes that which is static and discrete in the dataveillance world, and makes it constant and embedded” (Michael & Michael, 2010, p. 9). Ubervveillance is made possible by emerging technologies like RFID in combination with data management software that promises to create an effect of almost omnipresent monitoring of subjects in which the chips are embedded.

Yet omnipresence does not entail omniscience; facts and information do not become actionable by themselves without applying additional premises, judgments, and assumptions that are based on varying combinations of values and interests. The large amount of data and the integration of values and interests create more numerous possibilities for misinformation, misinterpretation, and information manipulation (Michael & Michael, 2006). This suggests that the development of standards including standards of information analysis, provenance, access, and granularity, are areas where values and interests are integrated with data, which can generate relations of control over the variables being tracked. Systems of analysis can serve to guide and discipline the monitored subjects and to create desirable or preferred interpretations of their behavior.

The emerging literature on ubervveillance focuses on tracking humans through RFID chips embedded in humans. However, ubervveillance of humans will also emerge through embedding chips within nonhumans in order to monitor humans (e.g. chips in packaging can be used to monitor the activities of those who transport the packages). Consequently, ubervveillance should also be explored within technologies that allow human actors to be evaluated and controlled, for example, through constant tracking of animals, products, transactions, and handlings in supply chains.

The case explored in this paper involves the development of nanotechnology and biosensors (nanobiosensors) for the real-time tracking of the identity, location, and properties of livestock in the U.S. agrifood system. Biosensors promise many dramatic real-time applications, from monitoring of blood parameters to detect the presence of metabolic or infectious diseases, to cortisol levels in cattle as one potential (and controversial) measure of animal welfare. In the U.S. agrifood system, nanobiosensors could be integrated into the broader initiatives to improve national food traceability.

The primary method for research on this case was an expert forum. The method is modeled on scientific committee processes in which individuals with complementary domains of specialization convene to develop an integrated statement of what is known about a given problem, and to identify key areas for further research. The approach has been generalized as a method for sustainability science (Carpenter et al., 2009). Over the last thirty years, this method has been extended to an array of ethics and values problems in the medical arena by the Hastings Center of Garrison, NY (Callahan, 1999).

Our workshop, funded by a National Science Foundation (NSF) grant titled “Anticipatory Workshop on Agrifood Biosensors”, was held at Michigan State University (MSU) in December 2010. It included specialists in biosensor design and development, zoonosis in livestock, animal production, regulation, tracing and tracking technology, ethics of emerging technology, public engagement and environmental justice and specialists in both technical and social dimensions of standards development.

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