Computer model reveals where food pathogens grow

December 3 2009, by Stu Hutson

(PhysOrg.com) -- An outbreak of food-related illness, such as E. coli-tainted spinach, often leaves food safety experts scratching their heads over the source of the contamination.

Thanks to a new computer model developed by researchers at the University of Florida, Wageningen University and the University of Groningen in the Netherlands, food safety experts may have a better chance of predicting where contamination risks lie and what can be done to minimize those risks.

The program, dubbed COLIWAVE, can predict the growth and death of pathogenic bacteria in substances like compost, soil and water. The program uses variables such as oxygen availability, temperature and substance characteristics to predict how much bacteria is present at different periods of time.

As they describe in a paper in the online version of the journal *Ecological Modelling*, the researchers have already used the model to predict the growth of harmful E. coli in composted manure used as fertilizer on organic farms. Organic farming typically relies on compost or manure rather than chemical fertilizers.

“Many people have been skeptical of organic foods because of reports that the manure can be a source of contamination,” said Ariena H. C. van Bruggen, a researcher for UF’s Institute of Food and Agricultural Sciences and the Emerging Pathogens Institute. “However, what we found is that manure, when properly stored and treated, is actually safer than we previously thought."

Before being spread as fertilizer, manure is composted. This process allows beneficial bacteria to "digest" the material, breaking it down into nutrients more easily absorbed into the soil.

This digesting process emits heat, and compost piles can often exceed 150 degrees — temperatures that kill many harmful pathogens.

However, the model revealed that it's not just the heat that makes the manure safe, it's the changing temperature. As the pile is mixed and turned, the temperature of the material rises and falls. Those changes put more stress on the harmful bacteria than high temperature.

As a result, the pathogenic E. coli in the turned pile had a 70 percent shorter survival period. Within eight days, the dangerous bacteria could no longer be detected.

Heat isn't the only factor affecting pathogens. For example, the model also shows that the presence of other bacteria, such as nonpathogenic strains of E. coli, is beneficial because they compete for the same resources as the dangerous strains.

"Bacteria lead complicated lives," van Bruggen said. "This is a way of looking at the bigger picture."

Along with UF colleagues such as food safety expert Anita Wright, van Bruggen is now using her methods to examine potential sources of salmonella in Florida, such as ponds and other bodies of water.

"You might not expect it, but if there's bacteria in a pond used for irrigation, that might be enough to cause a problem," Wright said. "As we continue to find out, it's important to take an intelligent look at things and not just assume we know what's going on."

Provided by University of Florida (news : web)