

TRACEABILITY TOOLBOX

Anatomy of an outbreak

By Michael McCartney and William R. Pape

In this column we take a deeper look at the recent *E. coli* 0157:H7 outbreak linked to spinach, identify a critical gap in the perishable produce industry and recommend actions to close it.

Contaminated spinach has been linked to 199 illnesses, including 31 cases of hemolytic uremic syndrome; 102 hospitalizations and three deaths. And these are only the cases that have been reported to the Centers for Disease Control and Prevention. There are likely many others. The other fallout from this incident has been as much as \$150 million in direct economic damage to the bagged fresh greens industry. The majority of these losses are being borne by processors, shippers, and growers who had no role in the problem.

What extra precautions and prevention measures need to be taken, and how can the perishable produce industry change the perception of the consumer from doubt to confidence? Are there gaps in the current systems? Is the industry response fast enough?

For a better understanding of the situation, let's look at a timeline of events:

Aug. 30-Sept. 4: Individuals begin falling ill, with an increasingly large number requiring hospitalization. The last reported onset of symptoms occurs around Sept. 9.

Sept. 8: Washington and Oregon public health officials notify the CDC of identified *E. coli* outbreak clusters. The CDC then connects these clusters with other reported outbreaks that may be related. DNA fingerprinting confirms the same *E. coli* 0157:H7 strain. An FDA investigation begins in earnest.

Sept. 13: Spinach is identified as the most likely source of the *E. coli* outbreak, because 95% of ill individuals reported eating spinach within 10 days of their illness.

Sept. 14: FDA advises consumers against eating fresh spinach. Spinach is removed from grocery shelves and restaurant menus.

Sept. 15: Contaminated spinach is traced to a California packer, Natural Selection Foods, LLC, which voluntarily recalls all its spinach products.

Sept. 16: The voluntary recall is expanded to include all spinach-containing products from all packers and labels.

Sept. 22: FDA issues a new advisory limiting its warning to the three California counties that were the source of the contaminated spinach.

Sept. 30: FDA declares that spinach is safe because their investigation shows that there were no additional *E. coli* cases and that the bad spinach was traced back to the processor.

Oct. 4: Having made no major progress, FBI and FDA officials visit National Selection Foods and one other packer to gather evidence for possible indictments.

Oct. 12: The contamination is linked to cattle manure, which carried the same *E. coli* 0157:H7 strain.

Oct. 26: Wild pigs are suggested as the vector carrying contaminated manure to the spinach fields.

The obvious conclusion from this timeline is that it took government and industry officials 18 days (Sept. 13-30) to sound the "all clear" signal and allow most operators in the fresh spinach industry to resume their business. Could industry react faster and narrow the scope of the problem the next time such an incident occurs?

Natural Selection Foods issued a press release Oct. 4 announcing additional testing to safeguard its product. While stepped-up testing is certainly one way to reduce the potential for future contaminations, experience has shown that testing can't entirely eliminate the threat. Another such incident is inevitable, and industry must react more rapidly next time.

Rapid response requires changes

Rapid response requires changes at the packing plant, because many plants can't quickly "connect the dots" between raw incoming materials and packed, outgoing bags. It would be very simple if raw product from a single farm field was dumped on the packing line and immediately packed into bags bearing a single label and a unique lot number. There would be a direct 1:1 relationship between each bag and a farm field.

Unfortunately, in today's competitive produce world, raw materials with different characteristics are often

associated with different branded labels based upon size, grade or other quality variable. Raw product from a single farm field harvest rarely can satisfy 100% of any single order for a specific brand, because the single farm field yields raw material with a wide range of quality variables. To meet the requirements of a customer's order for a number of bags for a particular brand, the packinghouse will typically grade, sort and commingle incoming raw product from one farm field with other raw product of similar characteristics from other farm fields.

Commingling complicates traceability, as few packinghouses have systems that follow the raw material dump to the final carton packout. There may also be some time delay between the receipt, grading and sorting of raw product and the final packout, which further complicates traceability. Given today's consolidation of packing into relatively few factories, a typical plant will process thousands of cartons and tens of thousands of bags in a single shift. Thus, it is no surprise that FDA and the packinghouse took so long to determine the source of the spinach contamination.

Could industry react faster and narrow the scope of the problem the next time such an incident occurs?

So what do we do differently? A computerized traceability system could have instantly connected the bag in the infected consumer's refrigerator with the specific farm field or the limited number of farm fields that could have contributed product to the bag. As it was, the information on the bags found at the consumer sites provided only the lot number and the shift number. They didn't tell investigators which farm fields were potentially involved.

In fact, the farm information, the farm block information, and the harvesting information on the spinach were lost the moment the product was received at the processing site. At the receiving area, this lot was blended in with product from at least 20 third-party growers that was received on that day and following days.

What is required is a system that connects incoming raw material information with each outgoing bag, each outgoing carton and each outgoing pallet. Such a system must take into account raw product

commingling and sorting, and the time delay from product dumping to product packout. Such a system can rapidly identify the specific farm fields inspectors should visit to find the contamination source, and this can be done in minutes, not days or weeks.

Barcode and RFID systems

We have had extensive experience implementing systems that economically connect the dots within the packinghouse, using both barcodes and RFID technology. These systems are real, not theoretical. They create a unique barcode for each shipment received from a farm field and track the raw product through sorting, commingling and temporary storage until it is packed out into a single bag that has its own unique barcode or RFID number. The bags are then packed into cartons with their own numbers and shipped on a pallet with its own number.

Using the traceability map created by these systems, it is easy to connect farm fields, harvest blocks, harvest laborers, bags of produce packed, cartons into which bags are put, pallets onto which cartons are stacked, bills of lading that ship the pallets and customers that receive the pallets. Having such a system would have sped up a large portion of the spinach investigation, reduced the adverse impact on those companies not directly involved, and brought some peace of mind to food company executives in this category.

As the timeline demonstrates, a traceability system won't solve all problems. There was a period from Sept. 8 to Sept. 13 when government officials were trying to determine the source of the illness. However, once spinach was identified as coming from National Selection Foods LLC on Sept. 15, there's no reason the "all clear" couldn't have been sounded that same day or very soon thereafter, not 16 days later at the end of the month.

Future traceability problems will occur in the perishable food industry. What the industry needs to do is to work on both quality control (enhanced testing) and rapid response (traceability). We can't expect the system to work any better next time unless we take swift corrective action now.

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