

MDH Speaks: “Sundaes to Sonic” by Ray Erickson (11:55)

Anna Strain: “Well, hello and welcome, everybody, to the first of hopefully many MDH Speaks events. I’m Anna Strain, the Infectious Disease Lab Manager at the Public Health Laboratory. The Minnesota Department of Health has a long history of serving Minnesota, since the first State Board of Health was established in 1872 in Red Wing, MN. It’s no longer located there, but it’s a lovely town to visit.

“The goal and the responsibilities of the Department of Health have been the same since it was first established: to assure the health of communities by keeping track of births and the causes of deaths in the community to establish policies and practices that help to limit the spread of infectious diseases, and to assure sanitary conditions so that the environment remains safe for healthy communities.

“The Health Department has numerous divisions and programs that help to maintain the health of Minnesotans, but today, we’re going to focus specifically on the Public Health Laboratory, more specifically on how the lab and supporting services help to utilize the power of science to keep Minnesotans healthy. We have eight amazing speakers today who worked in various positions throughout the Laboratory, and they each bring a unique perspective to the work that they do and how they help play a role in engaging with the community and keeping Minnesotans healthy.

“So in addition to our amazing speakers, this event is possible today through community partnerships that have been established with the Public Health Laboratory. We want to thank you, St. Paul College, for opening up this space to us that allows us both to invite people from the community in, but also to be able to record and share this event later. Thank you for that. [applause] Our community outreach program works very closely with public schools to bring science education opportunities into the classroom. We’ve been working specifically this year with Heritage Public School and the wonderful staff and students there, to help them explore scientific discovery.

“So with that, the most interesting part of today is going to happen next when we turn this over to our speakers. There’s going to be a little bit of juggling between microphones, so bear with us as we make that transition. I want to turn this over to our first speaker, who is Ray Erickson from the Infectious Disease Laboratory. He’s a Bacteriology Laboratory Specialist that specializes and focusing on diarrheal diseases. And his title today is ‘Sundaes to Sonic; a History of Fighting Minnesota’s Outbreaks.’

“With that, I’ll bring up Ray. Thank you very much.”

[applause]

Ray Erickson (con't): “Garage doors open. It was a brisk morning, late September 1994, one of the first days of fall, the coldest since the previous spring. Refrigerated yellow trucks start their engines and begin their normal routes on the upper Mississippi Valley through Rochester and the college towns of Northfield and Winona, all over rural southeastern Minnesota. Normally, these trucks carry an ice cream. Today, something else was traveling with them.

“A few weeks later, a medical detective with the Minnesota Department of Health named Craig Hedberg started to notice a trend. An unremarkable strain of salmonella called Salmonella Enteritidis had begun to pop up in the lab. In a little more than a week, more than 30 cases had come to the lab. There were less than 100 cases in all of 1993. Craig knew that diarrheal diseases are vastly underreported in the United States. People rarely seek treatment for diarrhea, and those who do rarely have their stools analyzed. So Craig knew that 30 cases wasn’t just 30 cases. 30 cases in that short amount of time was the tip in an iceberg. He made a phone call.

“Craig Osterholm was the state epidemiologist for Minnesota when he answered the phone in 1994. Under his tenure, he'd made foodborne diseases a special priority, and through his leadership, clinical labs around the state had begun to routinely send samples to the Minnesota Department of Health's Minneapolis lab for confirmation and serotype testing. Osterholm was a fan of the phrase ‘Mother Nature gives us opportunities to learn.’ 1994 would be a big learning curve.

“After that phone call, Osterholm and Hedberg initially started a case control study on the Salmonella Enteritidis patients. They were asking about common events, common locations, common restaurants; they were looking for a common source. They asked about meat products, they asked about canned fruits and vegetables, asked about leafy greens, but mainly based on the most common cause of Salmonella Enteritidis: eggs.

“But what they found surprising was, three people had a common source, but it wasn't what they expected. It was ice cream. But that didn't make sense, ice cream is pasteurized. But when 11 of the first 15 people they called had also eaten that same type of ice cream, they knew they had to act fast.

“Two days later, Hedberg, Osterholm and representatives from the Minnesota branch of the FDA were in a conference room with a representative from the food company. The FDA had never initiated a recall based solely on epidemiological data before. But at that meeting, Osterholm gave the company’s representatives an ultimatum: ‘Either you put out a recall statement by this evening’s news or we will.’

“Two days later, garage doors open. Refrigerated yellow trucks start their engines and begin their routes on the upper Mississippi Valley through Rochester and the college towns of Northfield and Winona, all over rural southeastern Minnesota. Normally, these trucks delivered ice cream, but today they were collecting it.

“The food company announced its largest recall ever nationwide. It closed down its production facility in Marshall, Minnesota, and sent letters to all of its customers to either discard or send back any unused product for testing. After this happened, cases began to slow to a trickle. MDH estimated that as many as 30,000 Minnesotans could have contracted salmonella enteritidis, over 200,000 Americans nationwide. The largest single source Salmonella outbreak in the history of the United States was winding down. But the search for that source was still underway.

Ray Erickson (con't): “Technology can often be a frantic march towards faster, more powerful processors and information transfers. Science can often be a steady walk toward a different target sensitivity. Most datasets from infectious disease rates have a baseline. This common, unremarkable average that makes up most of the data. And it's only when something rises above that baseline, rises above that threshold, it's noted, and it's investigated. And that's where a lot of science is working; to lower the threshold for investigation so we can more easily find the signal through all the noise. Whether that's screenings for Cancer, like the one that took my grandmother. Or our early detection for the Alzheimer's, that took my grandfather years later. Or the newborn Bilirubin screening that detected the jaundice in my son before we even left the hospital, now, going home with the cool light-up blanket.

“In 1994, the threshold for Salmonella Enteritidis was high. Salmonella Enteritidis is one of the most common serotypes of Salmonella. But the '94 outbreak was about ten times normal background. What if it had been two times? What if it had been one time? What if this had been missed?

“This is an actual quote from the CDC in 2019: ‘Don't kiss or snuggle with hedgehogs.’ It doesn't make a lot of sense. But in the previous three months, the infectious disease community from around the country was winding up a different infectious disease mystery: a national surveillance network had linked together 11 different samples from eight seemingly random states with no obvious common source. But here's the thing, one or two samples in each of these states was well below a threshold. So how is this detected? Why are we talking about what changed our thresholds?

“In the previous 30 years, scientists have been diligently working to lower the threshold of detection. It used to be a couple of times background, but now it's five, not five times background, not even five samples, not five alleles; five genetic differences or fewer between two bacterial samples that come into our lab, and we investigate. This often can be only two samples. These can be weeks apart, hundreds of miles apart. But we investigate. They investigated.

“In 2019, the CDC and state health labs from around the country looked into the Typhimurium cases. They brought back the questionnaires. The questionnaires, asked about purchases traced back to those purchases led to an uncommon common source: hedgehogs. When lab technicians from the Minnesota Department of Health linked samples from three hedgehogs to their two ill owners, the whole case clicked into focus. Overall, 84% of those who reported the sickness reported contact with hedgehogs. Who are these people? 54 cases total across 23 different states over a full year's time has a relatively common serotype of Salmonella. That's lowering the threshold for infection. That's making progress.

“Investigating the source of an outbreak used to take thousands of hours both in the lab and in the field. It still can, but today, what used to take weeks, can now take days or hours. What used to be a hunch is now a national surveillance network, updating in real time, with devoted lab scientists and epidemiologists working on it. Now our tests are more accurate, our results are quicker, our targets are more precise. And every day, more and more data that we generate is captured and fed back into these national surveillance networks to better connect and track outbreaks in the future. Tracking the source of an outbreak can still be hard work, but every day we're in the lab we're making progress. Every day in the lab, we're becoming more efficient.

M D H S P E A K S

Ray Erickson (con't): “So what was the source of the Salmonella Enteritidis 1994 outbreak? After months of investigating, the Minnesota Department of Health and the FDA cleared the Marshall facility, and they also collected more products for them to study. They all came back clean, so where was the source of the contamination in the shipment? Well, it used to be that under an old contract, the base products were shipped to the facility and then unloaded and traveled back empty. And under the new contract, they would continue to pick up a second load. It turns out that all this was more efficient. So, what was in that second load, sloshing around in those tankers, between heavy metal beams, and under every row? Any guesses? It was eggs. They’re the most common cause of Salmonella Enteritidis in 1994. They’re the most common cause today.

“See, sometimes efficiency isn't always progress, and sometimes with all our tracking infectious diseases, some things never change.

“Thank you.”

[applause]