Transcript

00:00:03 Nicole Marshall

Imagine a quiet sun-kissed morning on a picturesque Pennsylvania farm. The air is crisp, and the fields stretch out far into the horizon. Cows graze along the land peacefully, and the feeling of a fresh new day hangs in the air.

00:00:21 Nicole Marshall

But in this scenic American setting, where local dairy is produced and distributed throughout the state, a tale of microbial intrigue began to unfold. In 2012, this serene backdrop set the stage for a health crisis that would impact communities miles away and bring new insights into the field of food safety.

00:00:43 Nicole Marshall

Join us as we uncover an outbreak of Campylobacter jejuni, learning from the first-hand accounts of public health professionals who were on the case. I'm your host, Nicole Marshall, with the Washington Integrated Food Safety Center of Excellence, and this is Foodborne.

00:00:58 Nicole Marshall

You might be thinking, what is Campylobacter, and why should I care about it?

00:01:02 Nicole Marshall

So the thing about Campylobacter, or Campy for short, is that it's a stealthy intruder. It can be present in the intestinal tract of wild and domestic animals like chickens, turkeys, and cows, and still show no signs of presence, meaning on the outside, these animals look completely healthy.

00:01:21 Nicole Marshall

The real danger arises when a cow's udder encounters manure that's carrying these bacteria, potentially leading to contamination of their milk. In epidemiologists' speak, these habitats and hosts that can carry Campylobacter, such as intestines and udders, are referred to as reservoirs.

00:01:40 Nicole Marshall

Campylobacter is also commonly found in commercial poultry, especially in raw or undercooked meat, and it doesn't end there.

00:01:48 Nicole Marshall

Even fruits and vegetables can become contaminated with Campylobacter after encountering water or even soil that is contaminated with the bacteria. Campylobacteriosis is an infection caused by the bacteria Campylobacter jejuni.

00:02:03 Nicole Marshall

Although the name may seem less familiar than Salmonella or Norovirus, it's actually one of the top causes of foodborne illnesses, hospitalizations, and deaths every year in the US.

00:02:15 Nicole Marshall

And don't let the cute name fool you, Campy can pack a punch. If you do get sick from it, you can unfortunately expect to experience diarrhea, which is often bloody. A fever and stomach cramps that are certainly not fun.

00:02:29 Nicole Marshall

In order to diagnose and treat Campylobacter infections, laboratory tests play a critical role. These tests can identify Campylobacter bacteria in stool, body tissues, or fluid samples. For most individuals, recovery from Campylobacter infection occurs without the need for antibiotic treatment.

00:02:47 Nicole Marshall

Meaning it will result with lots of rest and hydration. People with severe illnesses, people aged 65 and older, pregnant individuals, and those with weakened immune systems may require the use of antibiotics.

00:03:00 Nicole Marshall

Approximately 20 cases per 100,000 people are diagnosed each year in the US. However, many more cases go unreported or undiagnosed.

00:03:10 Nicole Marshall

For every confirmed case of Campylobacter reported, it is estimated that there are likely 30 undiagnosed cases.

00:03:17 Nicole Marshall

Before getting into the outbreak investigation, let's briefly consider the difference between traditional dairy production and raw milk. Typically, dairy undergoes a process called pasteurization to kill harmful bacteria. Raw milk, on the other hand, is milk that hasn't been pasteurized and can carry harmful bacteria, which can lead to illnesses.

00:03:39 Nicole Marshall

We sat down with Epidemiologist Allison Longenberger at the Pennsylvania Department of Health to learn more about the outbreak in her state and the investigation that followed.

00:03:49 Allison Longenberger

At the time of this outbreak, I was a CDC Epidemic Intelligence Service Officer assigned to the Pennsylvania Department of Health.

00:04:01 Allison Longenberger

And currently, I am an Epidemiologist Supervisor with the Pennsylvania Department of Health. I supervise our district epidemiologists as well as our emerging infections epidemiologist, and continue to provide guidance during outbreak investigations.

00:04:22 Allison Longenberger

There are a lot of different ways that we learned about outbreaks at the Pennsylvania Department of Health.

00:04:25 Allison Longenberger

In this particular instance, on January 24th of 2012, we received a call from a Pennsylvania family with five individuals who had bloody diarrhea. They all had reported drinking raw or unpasteurized milk. I will refer to this as raw milk throughout.

00:04:45 Allison Longenberger

And they purchased this from a Pennsylvania dairy, which I will refer to as Dairy A during the conversation.

00:04:53 Nicole Marshall

The Dairy A Allison referenced was a dairy in Pennsylvania, a company that promotes and sells organic foods such as raw cow milk and other raw dairy products.

00:05:03 Allison Longenberger

So this family was agreeable to sending some stool and some leftover milk to our state public health laboratory just for some testing. At this point, we really didn't know what was causing illness in the family. And so, typically when we learn about family clusters of illness with the raw milk exposure, we will notify our partners at the Pennsylvania Department of Agriculture, and then we'll look for more cases.

00:05:31 Allison Longenberger

We'll look kind of backwards, we'll look forwards, and typically it does take some time to identify a larger issue, but in this instance.

00:05:42 Allison Longenberger

The situation actually moved really quickly.

00:05:48 Nicole Marshall

Now you might be wondering, how did the outbreak trace back to this specific dairy company?

00:05:53 Allison Longenberger

So 2 days later then, on January 26th, we received a call from the Maryland Department of Health. And they also had a family with Gastroenteritis. And they also reported drinking milk from Dairy A. So we were pretty sure that there was an issue going on with this dairy, or at least the milk from this dairy at this point. That family also sent leftover milk, but they sent it to the Maryland State lab for testing.

00:06:23 Nicole Marshall

To investigate this outbreak, the Maryland Department of Health conducted Pulse Field Gel Electrophoresis, or PFGE, on stool and milk samples, which is used to find the unique genetic fingerprint of the pathogen that caused the outbreak.

00:06:38 Nicole Marshall

That next day, on January 27th, they identified Campylobacter jejuni in an unopened bottle of raw milk from Dairy A. They quickly notified Pennsylvania of the results.

00:06:50 Nicole Marshall

Additional cases of Campylobacteriosis began to call in from hospitals in the surrounding area, and after interviews with public health nurses, Allison realized they were all connected to Dairy A. Then on January 27th, 2012, the dairy company received word from both the Pennsylvania Department of Health and the Pennsylvania Department of Agriculture about this series of illnesses.

00:07:14 Allison Longenberger

And at that point, we had a great conversation with Dairy A. We explained all the epidemiology and the details that we had so far, and the dairy did agree to voluntarily halt sales of the milk. And then from there, the outbreak just expanded really quickly,

particularly following some media coverage and some press releases, and a health alert that was sent out.

00:07:38 Nicole Marshall

But just because a product is recalled doesn't mean cases immediately stop coming in. Lags in the reporting time of cases due to the large illness onset range. The time it takes to test someone and the fact that media releases never reach everyone often mean that cases continue to be reported well after a recall.

00:07:59 Nicole Marshall

So what happened next?

00:08:00 Allison Longenberger

By February 1st, we already had 23 confirmed cases and 12 probable cases of Campylobacter, all among consumers of Dairy A milk. So at that point, we really suspected that we would continue to learn about new cases.

00:08:18 Allison Longenberger

The dairy is large, so given the size of the dairy and the widespread distribution of its milk, we really thought at that point that it might become quite a bit larger, and it did.

00:08:28 Nicole Marshall

Epidemiologists use case definitions to determine whether someone meets the criteria to be considered part of an outbreak and use terms like confirmed and probable to further classify those cases. Let's quickly define these terms for this outbreak. A confirmed case involved a laboratory confirmed Campylobacter infection with illness onset between January and February of 2012.

00:08:53 Nicole Marshall

In an individual who had consumed the dairies unpasteurized milk or had a clear epidemiologic link to a confirmed case. On the other hand, a probable case was categorized as those who had a diarrheal illness within the same period, lacking laboratory confirmation, which means they weren't actually tested for a Campylobacter infection, and who had consumed milk from the dairy.

00:09:17 Nicole Marshall

Overall, investigators would come to learn that illness onsets of these cases ranged from January 14th of 2012 through February 1st of 2012, a two-week period, and this outbreak

wasn't confined to the borders of Pennsylvania. It spread across multiple states, affecting those populations, too.

00:09:37 Nicole Marshall

In total, 81 confirmed cases were identified, with three in West Virginia and 2 in New Jersey.

00:09:43 Nicole Marshall

To the surprise of investigators, almost all patients except one reported consuming unpasteurized milk from the specific dairy. Additionally, there were 67 probable cases identified across these four states, bringing the total case count to 148. The size of the dairy and the broad distribution of its products amplified the reach of this outbreak, emphasizing the potential risks of consuming raw milk.

00:10:13 Nicole Marshall

Now let's get to the bottom of the cartoon. The dairy itself. We can start with a quick lesson in biology. And for those of you who still remember your middle school science lessons, consider this a friendly refresher. You might be asking yourself, why do we keep talking about raw milk, and how is it different from pasteurized milk?

00:10:31 Nicole Marshall

Well, let's take a trip back to 1864. There was this scientist named Louis Pasteur. He developed a process that revolutionized food safety. The pasteurization process involves heating milk to a specific temperature for a set amount of time.

00:10:46 Nicole Marshall

Effectively, this process eliminates the harmful bacteria in the milk. This discovery has been a breakthrough for public health. Today, it plays a critical role in preventing diseases such as campylobacteriosis, listeriosis, tuberculosis, and many more. The Food and Drug Administration, or FDA, has really highlighted how important pasteurization is to protecting the public's health.

00:11:14 Nicole Marshall

And there's raw milk, this comes straight from the animal source, whether it's a cow, sheep, or goat.

00:11:22 Nicole Marshall

But without undergoing the pasteurization process, it can harbor dangerous bacteria. These bacteria don't cause harm to the animals they come from, but they can make the people that consume those animal products sick. Very sick, in fact.

00:11:36 Nicole Marshall

Health departments from across the US reported 202 outbreaks linked to raw milk from 1998 to 2018. These outbreaks were responsible for at least 2,645 illnesses and 228 hospitalizations. But remember, these figures represent only recognized outbreaks.

00:11:57 Nicole Marshall

That means there were likely many unreported cases, so the actual number of illnesses may be much higher.

00:12:04 Nicole Marshall

Now let's go back to that pastoral farm in Pennsylvania back in 2012.

00:12:09 Nicole Marshall

What is the state's role in producing raw milk?

00:12:12 Allison Longenberger

Each state has its own raw milk laws, but in Pennsylvania, there is a 1935 Pennsylvania law which allows the in-state sale of raw milk in retail stores and at farms.

00:12:30 Allison Longenberger

Now, the dairies do need to go through a certification process through the Pennsylvania Department of Agriculture. So this includes posting a consumer advisory at all points of sale. So you know, they need to let folks know that consuming raw milk could be potentially dangerous to their health.

00:12:50 Allison Longenberger

Undergo inspection, and they do have to undergo milk testing for Salmonella, Listeria, Campylobacter, and E coli, as well as somatic cell count testing.

00:13:00 Allison Longenberger

In Pennsylvania, only fluid milk and aged cheese, and those are by separate permits, can be sold. So it's not legal to sell a product, say, like ice cream that are made with raw milk. People who don't live in Pennsylvania can come into Pennsylvania; they can purchase raw milk for consumption in their own states. That's perfectly legal.

00:13:28 Nicole Marshall

In 2012, Dairy A was churning out almost 1,500 gallons of raw milk every week from a herd of about 200 cows.

00:13:38 Nicole Marshall

This milk has a relatively short shelf life, only 15 days.

00:13:42 Nicole Marshall

Milk from this dairy was made available through a variety of channels. There was an on-site store, home delivery services, a network of 12 retail markets, and 39 drop points scattered across the state. As investigators worked towards uncovering the source of the outbreak and what went wrong, pivotal clues to understanding it began to surface.

00:14:05 Nicole Marshall

When speaking with consumers affected by the outbreak, a significant number, 51 reported a key detail.

00:14:12 Nicole Marshall

They knew the best by date of the milk they had consumed, and astonishingly, out of these respondents, 84% confirmed that they had consumed the milk with a best by date of January 31st. Notably, there were also reports of individuals who had consumed milk with best by dates both before and after this critical date.

00:14:32 Allison Longenberger

And in this outbreak, we were really able to use a combination of factors to better understand the potential implicated milk lots. First, as I mentioned, the dairy owner was extremely cooperative. And so he was able to provide a timeline of bottling and sell-by dates as well as a milk distribution timeline. So based on that information, we could ask patients to provide a purchase date, which many people did know, instead of a sell by date, and that could have just help us narrow implicated lots.

00:15:07 Allison Longenberger

Many individuals also still had leftover milk or milk that they had frozen, and they were able to tell us the best buy date using the sticker on the container. The dairy sales were heavily based on delivery drop points.

00:15:25 Allison Longenberger

And then I think the fact that the dairy was so cooperative really helped with our interviews. People felt comfortable speaking with us because the the dairy had been forthcoming. The owner voluntarily recalled the milk and did provide messaging to their customers, so this might have reduced people's hesitancy to speak with our staff.

00:15:48 Nicole Marshall

Next, investigators visited the dairy in person to do some more digging.

00:15:53 Allison Longenberger

So the Pennsylvania Department of Agriculture visited the dairy, and they collected samples from the bulk tank.

00:16:00 Allison Longenberger

And the bulk tank is a large tank where all of the milk goes prior to being bottled, and they also collected unopened bottles from the dairies store and then a second regulatory sample was collected from the bulk tank and this was necessary to allow the dairy to return to raw milk sales because as I mentioned, they had previously been under a recall because of the sample that tested positive from Maryland.

00:16:34 Allison Longenberger

So actually this dairy was very compliant with PDA requirements and had few issues that were identified during inspection. The inspection did reveal that the bottle capper had broken, and staff were manually capping bottles. Staff were wearing gloves while capping bottles.

00:16:55 Allison Longenberger

The owner revealed that they had an issue with hot water tanks in early January 2012, the dairy had installed a monitoring system in late 2011, which was pretty impressive, actually. It had 40 different alerts, such as temperature monitoring for water, solution concentration monitoring, among other things, and they have received an alert indicating that the hot water rinse used for cleaning pipes, wasn't reaching the appropriate temperature, so at the time of the inspection by agriculture, they actually were in the process of replacing this hot water system.

00:17:40 Nicole Marshall

From there, the investigation turned towards the livestock living at the dairy farm, while the herd was thought to be the main source, the cows weren't actually tested for Campylobacter, making the source inconclusive. Other potential sources of bacterial

contamination that were considered by investigators were the chickens on the farm and the farm's well water, making it even harder to narrow down where the outbreak started.

00:18:03 Nicole Marshall

It's worth noting that this is not an uncommon ending to an outbreak. Oftentimes, we're unable to pinpoint an exact source, especially when there are multiple risk factors at play.

00:18:14 Allison Longenberger

So yeah, I think one thing is although we never determined the exact reason for the outbreak, the dairy owner suspected that the milk bottled on January 16th was the impacted lot, and it actually was during this bottling that the hot water washer had been broken and many patients did report consuming milk bottled on this date.

00:18:40 Allison Longenberger

So while the EPI supports this date, it can't be confirmed that the lack of hot water during this time contributed to the outbreak, and we never did identify the specific source of contamination, but that was one of the theories. And then finally, I want to note that it isn't always necessary to do fancy analytic studies during outbreak investigations. I think in our schooling, we get so excited to be able to do case-control studies and cohort studies. And while those are very helpful tools, they aren't always necessary.

00:19:14 Allison Longenberger

In this instance, we didn't do any formal statistical analysis. We did do some sequencing of the milk isolates using Pulsed Field Gel Electrophoresis or PFGE, and the two unopened consumer aliquots that were tested at the Maryland Department of Health did yield Campylobacter jejuni with an indistinguishable PFGE pattern to all clinical isolates, and that further solidified the milk as the source of the illness.

00:19:44 Allison Longenberger

So even in the absence of some sort of formal statistical study, we were able to use just really solid EPI and lab data to kind of nail down what was causing illness in these people. So, just something to keep in mind also for new EPIs who are just working for the first time in this field.

00:20:10 Nicole Marshall

As the outbreak came to an end, it left behind a total of 148 cases in 4 different states.

00:20:17 Nicole Marshall

Our expert Allison highlighted the major public health message at play.

00:20:21 Speaker 2

We know that good practices on farms can reduce contamination, but cannot guarantee safety from harmful germs. So really, the best way to prevent outbreaks and illness related to raw milk is to choose pasteurized milk and dairy products. Pasteurized milk offers the same nutritional benefits without the risks of raw milk consumption.

00:20:47 Nicole Marshall

Thank you for joining us on our journey through the Campylobacter raw milk outbreak of 2012. We would like to thank Allison Longenberger for sharing her expertise with us. Special thanks to the International Outbreak Museum for their partnership this season. I'm your host, Nicole Marshall. Foodborne is created and produced by Piper Brase and Nicole Marsha.

00:21:06 Nicole Marshall

Our producer and sound designer is Kevin DeVoss. This episode was researched and written by Shivani Paudel with support from Erika Ellis. Foodborne is brought to you by the Washington Integrated Food Safety Center of Excellence, which is a collaboration between the University of Washington, the Washington State Department of Health, and the Northwest Center for Public Health Practice. For more information about the sources used in this episode, check out our show notes or visit foodsafety.uw.edu/foodborne.