New Fever Virus So Deadly That Research Halts

Owen Wood, Yale University

Dr. Jordi Casals, left, virologist who contracted Lassa Fever during research, with colleagues, Dr. Sonja Buckley and Dr. Wilbur G. Downs, in the laboratory at Yale University.

Electron microphoto shows virus enlarged 69,000 times.

By LAWRENCE K. ALTMAN

American doctors have discovered a virus so virulent that they have stopped their research into its mysteries.

The virus, called Lassa Fever, killed three of the five Americans it infected during the last year. Those infected were three American missionary nurses, who contracted the disease in Nigeria, and two laboratory workers at Yale University. Two of the nurses and one of the laboratory workers died.

Scientists at Yale, collaborating with doctors at Columbia University and in West Africa, identified the virus last year from blood samples of the three nurses.

Blood tests show that none of the other laboratory or hospital personnel or family members got sick from Lassa Fever, although the virus possibly infected another American missionary in Guinea a few years ago, doctors at Yale and Columbia said in recent interviews.

The episode vividly illustrates the hazards of virology research, which has led to at least 2,700 cases and 107 deaths from laboratory acquired infections over the years. Most of these cases have occurred since 1950 as more researchers have tried to better understand viruses and have discovered new ones, almost as virulent as Lassa Fever, among the hundreds of viruses previously known.

Just as important, Lassa Fever demonstrates that disease is not restricted by geographic or political boundaries.

Lassa Fever infection can involve almost all the body's organs; symptoms may vary in the individual patient. The virus produces a fever as high as 107 degrees; mouth ulcers; a skin rash with tiny hemorrhages; pneumonia; infection of the heart leading to cardiac failure; kidney

Continued on Page 25, Column 1

Lassa Fever in York

It all started with a used bookstore and a blog post.

See, for years, my dream was to go to medical school. It didn't happen, but my interest in the field didn't change, and most of my reading (both fiction and nonfiction) is based around medical topics.

Sometime in 2012, I picked up an old book at a used book sale. It was "Fever: The Hunt for a New Killer Virus," published in 1974, a nonfiction look at the spread and diagnosis of Lassa fever in the United States from the late 1960s to the early 1970s.

So I'm reading and get to a passage about a man from New Haven, Connecticut, who went to visit family for Thanksgiving in 1969, got sick and had to be hospitalized, and then later died — at York Hospital.

The man, Juan Román, had what would later be diagnosed as Lassa fever, a disease known to have killed only four people in America. And one of those deaths took place here? What the actual?

Of course, I had to know more. I started doing some research, and in early 2013, I posted on my Only in York County blog, seeking information from anyone in the area who remembered Juan Román's case.

For almost two years, things were quiet. But in the fall of 2014, I got a phone call from Delma Rivera-Lytle of Seven Valleys.

"That man who died of Lassa fever… that was my uncle," she began.

I spent hours talking to Rivera-Lytle and to her cousin and Juan Román's daughter, Lily Román, as well as to experts on Lassa from the United States Army Medical Research Institute of Infectious Diseases.

Juan Román's life and death, and York's connection to this uncommon virus, were largely documented as footnotes to more famous cases. Thanks to Delma and Lily, I got the chance to tell the full story, which you can read in three parts below.

— Joan Concilio

Lassa Fever Took A York County Man As Its First US Victim 40 Years Ago. Here is the Family’s Untold Story.

By Joan Concilio | Special to the York Daily Record

Eleven-year-old Delma Rivera was excited. It was just before Thanksgiving 1969, and her favorite uncle — her tío — was coming from his home in Connecticut to visit the Rivera family at their York County home for the holiday.

Her uncle, Juan Román, would be bringing with him her aunt and her older cousin.

But he also brought with him something Delma had never heard of, something that had just been discovered earlier that year.

He brought a disease that was killing people in Africa.

And it had no cure.

Delma, now Delma Rivera-Lytle of Seven Valleys, didn’t know that. She was so excited to open the door.

And she remembers that moment: “He said, ‘No me siento bien’ — ‘I don’t feel well.’”

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When the Románs decided to come to York to celebrate Thanksgiving 1969, it was a much-needed break.

Juan and Doris Román, Delma’s godparents as well as her aunt and uncle, were both working in a science laboratory at Yale University.

Juan was a technician and Doris was an assistant, preparing equipment and samples for the techs. They were part of the Yale Arbovirus Research Unit, led by Dr. Jordi Casals-Ariet.

The family had been in New Haven, Connecticut, since 1964, relocating to Yale along with the lab itself from New York City.

During much of that time, their daughter, Doris Lillian “Lily” Román, went to school in Pennsylvania, living with Delma, her siblings and their parents, Dr. Edwin and Delma Rivera, until her high school graduation in June 1965. Then she moved in with her parents, attending college in New Haven.

Lily — now Doris Lillian Román-Milán of Aguadilla, Puerto Rico — remembers the drive to York on Nov. 26, 1969. She remembers her father vomiting repeatedly on the 6- or 7-hour trip, and she remembers what happened once they arrived.

Juan Román got sicker and sicker, and no one — not even his brother-in-law Edwin Rivera, a York physician — knew why.

Running out of options, Román's family and medical caregivers were forced to confront a frightening possibility: Could he have Lassa fever, a disease that had only been discovered earlier in 1969 at Yale, where the Románs worked?

Lassa's even-more-deadly cousin, the Ebola virus, would not be discovered for another seven years. Unlike the 2014 cases of Ebola that crossed the globe, there was no treatment plan, no quarantine protocol, for the Lassa virus.

It has come to United States soil from its native Africa only a handful of times since its discovery, and it's been fatal only four times.

There is no definitive cure for it now, and there was none decades ago.

Today, few have heard of Lassa — and at Thanksgiving 1969, it's almost certain that no one in York had ever heard the name.

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Juan and Doris were to stay in Delma's room during the visit, and Juan almost immediately went to bed.

The next day — Thursday, Nov. 29, 1969 — was Thanksgiving. The family, who lived on Detwiler Drive in the Out Door Country Club neighborhood in Manchester Township, intended to spend the holiday at the country club.

"Dad wasn't able to go," Lily Román said. "He was sick the whole weekend."

The family recalled Delma's father, Dr. Edwin Rivera, giving Juan an IV, hung from a hook on the top of Delma's canopy bed.

The Románs were supposed to return to New Haven on Sunday, Nov. 30, so Juan and Doris could return to work the next day.

"I went back by myself on Monday," Lily Román said. Her dad was getting worse, she recalled.

Edwin Rivera, meanwhile, had called Yale and explained Juan's illness, and then insisted that his brother-in-law go to York Hospital.

On Dec. 3, 1969, Juan Román was admitted. Clinical notes show that his temperature ranged from 101 to 105 degrees, and he was tested for Dengue fever, typhoid and any number of other diseases. “They discarded malaria, they discarded yellow fever,” Lily Román recalled. “They were going through all these diseases of third-world countries.”

In the clinical notes, Juan Román’s supervising physician “was inclined to believe that severe dengue is the best bet for the correct diagnosis.”

But nothing was working — despite tests, there was no conclusive diagnosis, and despite antibiotics, Juan wasn’t getting better.

That’s when Lily Román called her father’s boss, Casals, at Yale. “He said, ‘I’m going to come... and take some blood samples, and start working,’” she recalled.

Rivera-Lytle remembered her reaction: “At first, I don’t think Lassa was even something that was mentioned.” But, after the call to Dr. Casals, “that was when alarm bells started to go off.”

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The Yale Arbovirus lab was no stranger to Lassa fever; in fact, in many ways it was the disease’s American home.

What is now known as the Lassa virus came to America in February 1969. Lily “Penny” Pinneo, an American working as head nurse at a hospital in Jos, Nigeria, was flown to New York’s Columbia Presbyterian Hospital for treatment of a then-unknown illness. Two of Pinneo’s fellow American nurses, who had similar symptoms, had already died in Nigeria.

Doctors caring for Pinneo sent blood samples from her and her deceased colleagues to the Yale laboratory. There, researchers in Casals’ lab worked to show evidence of the virus, which produced a fever as high as 107 degrees, mouth ulcers, a skin rash with tiny hemorrhages, pneumonia and other problems. After months of testing, they confirmed it was a new virus.

Following the custom of virology, the disease was named for the place in which it was first seen. In this case, that was Lassa, the name of a Nigerian village south of the Sahara Desert.

The disease did not end its stay in America there, however.

On June 15, 1969, Casals himself was admitted to the isolation unit of Columbia Presbyterian Hospital with suspected Lassa fever.

Casals became critically ill, and no official treatment for the disease yet existed. But there was an option: a plasma transfusion from the blood of Penny Pinneo, who, as a survivor, had antibodies to the disease.

The treatment worked, and Casals later made a full recovery.

Lassa in the U.S.

February 1969: Nurse Lily "Penny" Pinneo, an American working as head nurse at a mission hospital in Jos, Nigeria, contracts what later becomes known as Lassa; she is flown to New York, treated at Columbia Presbyterian Hospital and recovers over the next several months.

Summer 1969: Laboratory workers at Yale University in New Haven, Connecticut, under the direction of Dr. Jordi Casals-Ariet, confirm that Penny Pinneo's virus is new and name it Lassa, after the Nigerian village where it first was noted.

June 15, 1969: Dr. Jordi Casals admitted to isolation unit of Columbia Presbyterian Hospital with suspected Lassa; he is treated with convalescent plasma from Penny Pinneo and recovers.

Just before Thanksgiving, 1969: Juan Román, a lab technician, leaves Yale Arbovirus laboratory with his family to visit his wife's family in York, Pa., for the holiday; he is feeling flu-like symptoms. He had not worked in the Lassa lab (he worked in a separate lab down the hall.)

Dec. 8, 1969: Juan Román dies at York Hospital.

Early 1970: Yale researchers halt all work on Lassa; all specimens shipped to CDC in Atlanta; on Feb. 10, The New York Times runs a front-page article with four-column headline "New Fever Virus So Deadly That Research Halts."

1973: Researchers discover that Lassa is spread from the multimammate rate to humans.

1975: A female American aid worker develops Lassa in Sierra Leone and is hospitalized and treated in the Washington, D.C., area; she survives.

1976: A Peace Corps worker returns to the Washington, D.C., area with Lassa fever after traveling to Liberia. She is hospitalized, treated and survives.

1989: An engineer dies of Lassa fever in the Chicago area after traveling from Nigeria back to the U.S.

2004: A businessman dies of Lassa fever in New Jersey after returning from Liberia to the U.S.

January 2010: A Liberian man, 47 years old, living in Pennsylvania, travels to Liberia and, upon returning home, seeks medical treatment in Philadelphia for a febrile illness. On Jan. 23, 2010, he is confirmed by lab tests to have Lassa. He is treated and survives. This is the only documented Lassa case in Pennsylvania outside of Juan Román's.

As Juan Román became inexplicably sicker in York Hospital, Casals flew into town on Saturday, Dec. 6, 1969.

“I picked him up at the Harrisburg airport,” Lily Román recalled. He came to York, spent the day taking samples, and then Lily Román took him back to the airport that night.

The thing was, Lily said, Casals and others were sure that her father’s mysterious illness wasn’t Lassa.

“They said he wasn’t working with the virus at all,” Lily Román said.

By everyone’s understanding, Juan Román’s work was in a separate lab down the hall, and Lassa had not shown evidence of any kind of airborne transmission.

And so, while Juan Román’s path brought him near Lassa, Rivera-Lytle said the family was confused. They were sure it wasn’t close enough.

“You’re asking as a kid what happened, and we’re hearing he had never worked directly with the virus,” she said.

Doctors, including Casals, agreed. The clinical summary of Juan Román’s care notes, “This illness was not considered the same as one experienced by other laboratory personnel” at Yale.

But in either case, his blood samples were safely at Yale, and on Monday morning, Dec. 8, 1969, the lab would begin its analysis.

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That morning, Lily Román, restless, awoke early.

She and her mother, Doris Román, headed right to the hospital.

“The elevator doors opened on the nurse’s station,” Lily Román said. “As soon as we stepped out of the elevator, I’ll never forget it, one of the nurses said, ‘Oh, there they are, there she is!’ They’re working on Mr. Román; he had a little setback; you can go to the lounge; we’ll be with you right away.’”

“I said to Mom, ‘This doesn’t strike me good,’” Lily Román recalled. “So we sat… and I think Edwin and Delma had already come in.”

The doctor approached the family. “Here in Puerto Rico, we try to smooth down things before we get through to the bad news,” Lily Román said. “But there … he walked right in and said, ‘We did everything we could.’

“It meant only one thing, you know? He’s gone. He’s gone.”

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The Románs and the Riveras needed time to grieve, but they also needed answers.

"We went in to see him," Lily Román recalled. "He was still on the hospital bed. He wasn't on a ventilator, but they had cleaned everything up, opened the windows. Mom closed his eyes."

The family returned to the hospital lounge and tried to decide what to do. First, they called Yale.

"They asked if Mom would consent to an autopsy; of course, she wanted to know," Lily Román said. Juan had been only 50 years old.

The autopsy was performed by Drs. McKeon and Escaro on the afternoon of Juan Román's death. The next day, Doris and Lily Román flew to Aguadilla, Puerto Rico, where the family had decided Juan Román would be laid to rest.

"The health department in Pennsylvania required that the coffin had to be sealed," Lily Román said. "But Mom wanted the family there to be able to view him... They built, like, a glass thing on top (of the coffin)," she said.

That took longer, so Juan Román's body did not travel back to Puerto Rico with his wife and daughter but instead arrived the next day, Wednesday, Dec. 10, 1969. The Puerto Rican custom at the time was to hold the viewing in a family home, which they did on Thursday at Lily Román's grandmother's house.

On Friday, Lily Román said, a car stopped in front of the house. It was an official from the Puerto Rican health department. "He had been notified by Yale University of the cause of death," she said.

And that's when they found out: "He had come to tell us that he (Juan Román) had died of Lassa fever, and that we had to get out of the house, that we were under quarantine," Lily Román said.

The health department officials picked up the Román family the next day and moved them to a house near San Juan. Lily Román's grandmother had to come too, and shut up her home.

"We took our clothes for a week; we didn't know how long we were going to stay," Lily Román recalled. "All the food was brought in, sanitary and disposable, breakfast, lunch and dinner all like that." The family didn't return home to Aguadilla until Christmas Eve, Dec. 24, 1969.

By mid-January, Lily Román had flown back to Pennsylvania, where the events of the past month had unfolded a bit differently.

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"My parents were never quarantined, we (kids) were never quarantined," Delma Rivera-Lytle said. "I don't know what precautions York Hospital took."

York Hospital officials did not respond to recent requests for comment. In a 1970 news article, an unnamed York Hospital spokesman said, “while there was a period of anxiety among those physicians concerned with the patient during the eight to 10-day incubation period, and for the two weeks following the death of the patient, there is now no danger for anyone to come down with this disease.”

The spokesman went on to say, “We felt we didn’t want to publicize the death since available information indicates that the virus can only be transmitted by blood contact,” adding that the hospital worked “very closely” with the U.S. Public Health and Education Communication Center in Atlanta, Georgia, the Pennsylvania Department of Health, and the Rockefeller Viral Research Center at Yale University.

York Hospital did, however, send people to the Riveras’ home to fumigate it, Juan Román’s family recalled.

“I remember them coming in with these white uniforms and, because my uncle had been staying in my room, we had to dispose of most of my furniture, all of my clothes,” Rivera-Lytle said.

Delma’s brother, Edwin “Eddie” Rivera, is an attorney living in Philadelphia. He remembers how he and his sister had tried to make their uncle feel better. “We gave him hugs and kisses... we made him this artwork, taped to the wall, and all that had to be destroyed,” Eddie Rivera said.

Their father, the older Edwin Rivera, had scratches from the family’s pet rabbit. He had an open wound while caring for Juan Román, and as a doctor, he was also caring for his own patients at the time. No one recalls him being told to do otherwise.

Eddie Rivera said, “I remember my mom checking me for a fever every day, but it was life as normal.”

Yet at a national level, Juan Román’s death proved that his case of Lassa fever was anything but normal.

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In February 1970, the New York Times published a front-page story headlined “New Fever Virus So Deadly That Research Halts.” The article, which Rivera-Lytle and Lily Román both have copies of, explains that once Juan Román was found to have died of Lassa, despite having no known contact, all research on the virus at Yale was halted immediately.

The lab’s specimens were shipped to the CDC hot lab in Atlanta, Georgia. Supplies in the Yale lab that had been used in Lassa research were immediately incinerated or thoroughly sterilized. Lab workers were told to immediately report any illness, no matter how trivial it seemed.

Today, researchers know that Lassa comes from an animal host in Africa, the multimammate rat. According to the Centers for Disease Control and Prevention, the disease is spread when people come into contact with the urine or droppings of an infected rat; when such rats are eaten; or when tiny particles in the air contaminated with infected rat urine or droppings are inhaled.

Rarely, the CDC reports, the virus can be spread by person-to-person transmission, when someone comes into contact with a sick person's blood or body fluids. Even then, Lassa attacks through the mucous membranes — the eyes, nose and mouth — or through open sores.

That's why Juan Román's death remains a mystery. He was the first of only four people to have died of Lassa fever in the United States to date. The other three victims had traveled to Nigeria or Liberia and contracted the disease there before returning to the U.S. Juan Román had not been to Africa. No one knows if he had a cut or some other kind of open sore, or whether he was ever in the Lassa lab.

And no one was sure how to diagnose the disease quickly enough in 1969.

That remains a problem now.

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Dr. Randal "Randy" Schoepp is a virologist at USAMRIID, the U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland.

Schoepp works with Lassa in the lab and in the field. Recently, he returned from Sierra Leone, one of the African countries where Lassa is endemic (along with Guinea and Liberia).

If those countries sound familiar, it might be that you know them from another disease. Ebola, like Lassa, is what's known as a hemorrhagic fever. In the most severe cases, patients with Lassa and Ebola can bleed profusely — from the eyes, the nose, the bowels, under the skin.

But that hemorrhagic fever moniker can be inaccurate. In many cases, the early stages of these diseases more closely resemble the flu. Patients might have a fever, a headache, some general malaise, vomiting, maybe some weakness, as Juan Román had when he arrived in York in 1969.

And therein lies the problem: There is no way to clinically diagnose Lassa (or Ebola) based on symptoms alone, Schoepp said. "The differential diagnosis is a long list... rickettsia, viruses, bacteria. It takes a very trained clinician to see those nuances in the presentation and say, 'Oh, this might be Lassa.'"

Usually, such diagnoses are, in effect, educated guesses, based on symptoms and where the patient lives and what he or she does.

In Juan Román's case, the disease was faster than the diagnostic process. His family already knew something had killed him; they needed to wait for his blood to be analyzed before they would know what.

And in African fieldwork, Schoepp fights to more quickly and accurately do the same thing for the hundreds of patients that come to the Lassa Diagnostic Hospital in Sierra Leone.

Right now, Schoepp said, reports claim 300,000 to 500,000 cases of Lassa fever a year, with about 5,000 of those leading to death.

"As we have better tools and can detect Lassa sooner and more easily, I think you're going to see that number grow. I think there's more Lassa in West Africa than the numbers show," Schoepp said.

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With no specific proven treatment, Lassa is still worked on using heavy biosafety precautions.

Schoepp said that at colleges, work involving Lassa is done by using "surrogates" — members of the same family, the arenaviruses, that are nonpathogenic to humans and act a lot like Lassa without the danger.

At RIID, like at the CDC, work on the live Lassa virus is done at Biosafety Level 4, the highest level possible. Workers take all the precautions that became familiar during the Ebola outbreak; they wear full "spacesuits" and undergo extensive decontamination before and after their time in the lab.

During Schoepp's fieldwork in Africa, such protective measures aren't available. Field labs there are Biosafety Level 2, and teams add extra safety by using personal protective equipment such as face masks.

And sometimes, as it did at Yale with both Dr. Jordi Casals and Juan Román, despite precautions, scary things happen.

Randy Schoepp remembers that, while in Africa, someone had used one of his team's cars as an ambulance. It wasn't cleaned out per standard procedures, and the next day, when Schoepp got in the car on the way to the lab, he put his hand down into a puddle.

It was fluid from the body of a 10-year-old girl who'd been taken to the hospital with suspected Lassa. Schoepp and the USAMRIID colleague he was with were both put on a 21-day "fever watch."

Schoepp knew that if he made it past 14 days without symptoms, it was unlikely he'd develop the disease.

Unlike Casals and Juan Román, Schoepp remained Lassa-free.

"But it was a long 14 days," he said.

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Time passed in a blur for the Román family following Juan's death. Doris Román never returned to her job at Yale. Lily Román packed up the family's New Haven home in early 1970, withdrew from college in Connecticut, and moved with her mother back to Aguadilla, Puerto Rico.

Lily Román said her mother never remarried. At Lily's own wedding, it was Delma's father, Dr. Edwin Rivera, who walked her down the aisle.

People asked why Lily Román and her mother didn't file a lawsuit against Yale.

"Mom didn't want to," Lily Román said. He'd worked with Dr. Casals for 20 years or so, and they were very close. And it didn't matter, anyway. "All the money in the world wouldn't bring Dad back."

Delma Rivera-Lytle wishes she hadn't had to open the door to Lassa. But she also wishes others knew more about it, both in 1969 and today.

"When you look up, you often see a lab technician died; sometimes you see his name; and you move on," Rivera-Lytle said.

"There's always a human story behind things... (I hope) my uncle's memory won't be lost in all of this. Because of this horrible virus, he died very young; he lost out on a lot of things."

Reporter’s Notebook: What? Lassa Was in York County?

For years, my dream was to go to medical school. The dream changed, but my interest in the field didn’t, and a lot of my reading (both fiction and nonfiction) is based around medical topics.

Sometime in 2012, I picked up an old book at a used book sale. It was “Fever: The Hunt for a New Killer Virus,” published in 1974, a nonfiction look at the spread and diagnosis of Lassa fever in the United States from the late 1960s to the early 1970s.

Well, imagine my “what?!” moment when I’m reading and get to a passage about a man from New Haven, Connecticut, who went to visit family for Thanksgiving in 1969, got sick and had to be hospitalized, and then later died — at York Hospital.

The man, Juan Román, had what would later be diagnosed as Lassa fever, a disease known to have killed only four people in America. And one of those deaths took place here?

Of course, I had to know more. I started doing some research, and in early 2013, I posted on my Only in York County blog, seeking information from anyone in the area who remembered Juan Román’s case.

For almost two years, things were quiet. But in the fall of 2014, I received a phone call from Delma Rivera-Lytle of Seven Valleys.

“That man who died of Lassa fever... that was my uncle,” she began.

I spent hours talking to Rivera-Lytle and to her cousin and Juan Román’s daughter, Lily Román, as well as to experts on Lassa from the United States Army Medical Research Institute of Infectious Diseases.

Juan Román’s life and death, and York’s connection to this uncommon virus, were largely documented as footnotes to more famous cases. Thanks to Delma and Lily, I am glad to have the chance to tell the fully story.

As I told Juan’s story, I relied on “Fever” and other books and articles about Lassa and virology in general. To help better tell Juan’s story, I don’t mention those sources each time I reference them in the text, but a full list of those resources is available with this article online, and I’d encourage anyone who is curious about Lassa to start there and dig deeper.

— Joan Concilio

Much work remains for Lassa, Ebola researchers

By Joan Concilio | Special to the York Daily Record

"Being a virologist is a lot like being a fireman. When a virologist hears 'outbreak' or 'virus,' they run toward it."

That's how Dr. Randal "Randy" Schoepp of the United States Army Medical Research Institute for Infectious Diseases — USAMRIID — describes his work.

Schoepp and colleague Dr. Kathleen "Kat" Cashman are two of a relatively small number of people worldwide researching Lassa fever, the disease that killed a man visiting family in York County at Thanksgiving 1969.

While Lassa is endemic in parts of Africa, it doesn't generally follow a "big outbreak" pattern as seen with Ebola in 2014, and its fatality rate is much lower.

That can certainly be good. But it can also make it hard to develop better diagnostic tests or develop an effective vaccine.

"Funding is an issue," said Cashman of her work with Lassa. "If we were doing Ebola research right now, funding is not an issue."

In fact, the same was true of Ebola before the recent outbreak that brought that disease — which, like Lassa, is a viral hemorrhagic fever — into the public eye.

"Lassa, Ebola and Marburg... are orphan diseases. They don't cause symptoms in large numbers in populated places, so pharmaceutical companies are not super excited to invest or develop them. It's left to the DoD (Department of Defense) and other government institutions to do the research," Cashman said.

DIAGNOSIS

Cashman was part of USAMRIID's task force to develop a lab test for Lassa to be used in African fieldwork. The test is called an ELISA, or enzyme-linked immunosorbent assay. It is a way to see if someone's body is producing antibodies in a manner that is consistent with a known case of Lassa fever, and most importantly, the test can be performed with accuracy in the conditions found in West Africa.

"It's really hard to do these types of diagnoses in the outbreak areas," Schoepp said. "They don't have centrifuges, it's hard to take samples in sterile condition." And, he added, it's hard to follow up after a suspected Lassa case is confirmed, since patients are often shunned by their families and communities.

While they wait for an effective cure, Schoepp and his colleagues in the field are trying to help prevent the spread and mortality of Lassa through education and hygiene practices.

For instance, at Kenema Government Hospital in Sierra Leone, an area that has the highest incidence of Lassa in the world, health professionals enacted safe burial procedures. Since the bodies of those with Lassa cannot be released back to the families as tradition would dictate, a trained team from the hospital conducts ritual burials while working to prevent the spread of body fluids from those infected.

“You’re seeing the same thing with Ebola now,” Schoepp noted. “It’s not the best situation, but it is certainly better than taking your relative away and placing them in an unmarked grave somewhere.”

Similarly, workers at Kenema and other Lassa facilities work to educate the community on symptoms to watch for. The goal is to get those with an undiagnosed febrile illness to a treatment center for testing; then, the challenge is to keep track of that person and get them treatment within a short time.

TREATMENT

Getting a Lassa diagnosis quickly is important, because the only known treatment, the antiviral drug Ribavirin, works best when given in the first days of infection, Cashman said.

More recently, she’s been working on a potential DNA-based Lassa vaccine. So far, it’s been tested successfully in guinea pigs and non-human primates, and Cashman has the funding to continue work on both how and when such a vaccine should be delivered.

Other possible treatments, including the off-label use of some FDA-approved drugs to treat Lassa, could be effective, but there’s no funding for the research, Cashman said.

In one the first known cases of Lassa fever, Dr. Jordi Casals survived after receiving an experimental treatment of a plasma transfusion from nurse Penny Pinneo, a Lassa survivor. But, Cashman said, “It seemed to work for some, but didn’t work for others.”

The dosing strategy — how much plasma to give, and when — was never worked out.

But one of Cashman’s goals is to work on transfers of immune serum created in different ways, looking at the differences between the serum from primates that survived infection, vaccinated primates that survived after exposure to infection and vaccinated primates that were never exposed but should have immune antibodies.

“I’m excited about that work,” she said.

WHAT'S AHEAD

While the rate of survival after a Lassa fever infection is good, more than 30 percent of those who survive face severe neurological consequences. The most common is deafness, but equilibrium problems are also common, Cashman noted.

One goal of the Lassa fieldwork is to survey those who are fully and partially deaf to see if they've been exposed to Lassa. Schoepp and Cashman believe the incidence of Lassa is much higher than reported, since only those with more severe symptoms are likely to seek medical care.

There are proposals in place to take much of the infrastructure that was put in place in Africa during the 2014 Ebola crisis — field treatment centers and laboratories — and put it to work for those with suspected and confirmed Lassa.

And, should Lassa or another hemorrhagic fever come to the United States again, "we're probably better prepared for an imported case of hemorrhagic disease than we've ever been in history," Schoepp said.

"I think it's very clear that in a modern society with modern medical facilities, that a disease such as Ebola or Lassa, if identified fairly quickly, and the people who do unfortunately get the disease are cared for, they can survive."

After Father’s Death, Gift Paid Forward

By Joan Concilio | Special to the York Daily Record

After the death of her father, Juan Román, to Lassa fever in December 1969, Lily Román withdrew from Southern Connecticut State University in New Haven, Connecticut, where she had been studying languages in the hopes of working for the United Nations.

She and her mother moved back to Aguadilla, Puerto Rico, where her parents were both from.

In Puerto Rico, Lily Román enrolled at InterAmerican University. She started in June 1970, but first, she returned to New Haven in May for a friend’s wedding.

While there, she went back to Yale, where her father worked and where he contracted the virus that caused his death.

“I went to the director’s office of the lab; this was Dr. Downs. ... I talked to Dr. Downs and said, ‘I want to continue my studies.’ I wondered if the university had some sort of financial help,” Lily Román recalled.

“He said to me, ‘You are going to send me the receipts of everything and I’ll take care of it. You’re going to tell me how much is tuition, how much are the books, how much is room and board.’”

And then, Dr. Downs sent her each of those amounts. “It wasn’t from Yale University. It was his personal checking account from Chase Manhattan Bank, Madison Avenue, Manhattan,” Lily Román said.

That continued for two summer sessions and three full semesters. To complete her degree in December 1971, Lily took 21 credits her final semester. “When I finished,” she said, “I went back and I said to him, as soon as I get a job, I’ll be paying back everything for the full amount.

“He said, ‘No you’re not. But I do want to ask you one thing — if you can ever do the same thing for someone, you do it.’”

Later, Lily Roman had gone through a divorce and lost her job at a government-run bank, a neighbor told her about a job in the financial aid office at a campus of the University of Puerto Rico. It wasn’t international relations, but her bilingual skills would be put to good use.

“I started in August of ‘82 and I retired from the University of Puerto Rico May 15, 2010,” Lily Román said. “I was financial aid director,” she said. And her goals came full-circle; through her job, she was able to travel to San Diego, St. Louis, Denver, Washington, Boston, Philadelphia and San Antonio.

“It goes back to what Dr. Downs says, if you ever can do this... and I did. Thousands of kids! It wasn’t my money, it was the government’s, but still!” she said.