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Virus's Tangled Genes Straddle Continents, Raising a Mystery About Its Origins

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[The flu](#) that is moving through humans appears to have a combination of genes from two normally separate sets of pigs, those from the Americas and from Eurasia, scientists say.

However, it is unknown how those pigs met, and there is not yet any genetic proof that this particular [flu](#) was ever in a pig.

And, despite current fears, some geneticists feel this strain may not be very deadly. As it circulates in humans, however, especially in the Southern Hemisphere winter, it could pick up dangerous human flu genes.

The only way to be sure, they say, is to wait and see. But world health authorities hope to have a vaccine soon that will put a stop to the flu's circulation.

The first conundrum — a swine-type virus that has not yet been found in swine — is readily explained, scientists said. It was first identified in humans just last week, when Canadian and American authorities realized that the flus they had sequenced from sick people in California, Texas and Mexico were the same. No one ever tested pigs for it before, and those tests are just getting under way.

Such quirks are common in disease [genetics](#). In the 1980s, for example, it was not known that the [AIDS](#) virus was sweeping Africa because the illness

was first found in a few gay men in California, and it took years to find the source virus in chimpanzees.

Now, scientists say, the hunt is on for what is jokingly being called Pig Zero.

“No one that I’m aware of has swabbed pigs for this yet,” Dr. Juan Lubroth, chief of veterinary investigations for the [United Nations](#) Food and Agricultural Organization, said Wednesday.

An international team, including Dr. Lubroth’s investigators and some from the World Organization for Animal Health, is in Mexico, planning to go to La Gloria, the location of the first known case involving a human, 5-year-old Édgar Hernández.

Mexican investigators have already visually inspected herds of pigs at the vast factory farms there, Dr. Lubroth said. But a flu strain that sickens humans may not bother pigs, just as the H5N1 avian flu kills chickens but usually not ducks.

It will take some time to swab the pigs’ snouts, fly the samples to a world-class laboratory and sequence it. And even then, Dr. Lubroth said, the La Gloria pigs may not be the key, so his team will scour Mexico’s library of routine swine swabs for matches. The only viral sequences on public databases thus far are human.

The federal [Centers for Disease Control and Prevention](#) announced last week that the new virus had pieces of North American swine, bird and human flus and of Eurasian [swine flu](#). Although rumors questioning that are circulating on the Internet, most geneticists believe it is correct.

It is essentially a blend of Eurasian swine flu and North American swine flu, but Western hemisphere strains have had an avian segment on the PB2 gene for at least 10 years and a human component on the PB1 gene since 1993, said Henry L. Niman, a biochemist who tracks flu mutations. “The original report is correct,” Dr. Niman said of the C.D.C.’s analysis. The rumors, he added in an e-mail message, stem from “someone who really doesn’t know how to analyze sequences (or is being misquoted.)”

It presumably is in pigs somewhere, perhaps in Mexico. The 1918 human H1N1 established itself in pigs by 1930. But, as Dr. Niman pointed out, it could be only in humans now — or even in a ferret.

The next question, said Dr. Robert G. Webster, a virologist at St. Jude Children's Research Hospital, is: "How did this virus get in? Is Mexico importing swine from Europe?"

While movement of live pigs between Canada, the United States and Mexico for fattening and slaughter is routine, legal movement of pigs across oceans is rare. Pigs carry many diseases, so importation requires expensive tests and quarantines. The only reason to bother would be for breeding, not meat.

Even pig semen is restricted, said Kent Parker, swine facility manager at the University of California, Davis. "The boars have to be tested and the facility they live in has to be authorized," Mr. Parker said. Frozen semen can transmit blue-ear pig disease, he said. It cannot transmit flu, said a spokeswoman for the National Pork Board.

Peter Daszak, president of the Wildlife Trust, found records showing that Mexico imported two pigs from France in 2007, the United States imported a few from Britain and Ireland, and Canada imported hundreds from Europe. "And surely this isn't the whole truth," he said. "There must be a hidden illegal trade."

While some scientists looking at the virus genome debated its origin, Peter Palese, chairman of microbiology at Mt. Sinai School of Medicine, found cause for optimism about the future. All the pandemic viruses of the last century — the 1918, 1957 and 1968 flus — had a mutation in the gene coding for a protein known as PB1-F2 that is thought to make a virus more lethal. The mutation, he said, is not in the new strain.

Dr. Niman, looking at the same sequences, saw a mutation that, at the same position in H5N1, appeared to speed the virus's spread in Egypt.

Gardiner Harris contributed reporting from Washington.