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FLIGHT OF THE 4th HORSEMAN: Avian Flu

BY CHARLES CAPALDI

From basements, cellars and sewers rats emerged in long wavering files into the light of day, swayed helplessly, then did a sort of pirouette and fell dead at the feet of the horrified onlookers. At night, in passages and alleys, their shrill little death-cries could be clearly heard. In the morning, their bodies were found lining the gutters, each with a gout of blood, like a red flower, on its tapering muzzle; ...

Albert Camus, "The Plague", Vintage International, p. 15

Since the dawn of civilization, humanity has been ravaged by epidemics and plagues that linger on in our collective memory. Biblical plagues swept across the ancient world. The Bubonic plague wiped out a third of the population in 14th century Europe. Smallpox ravaged the ancient Aztec empire. In the early 20th century, the Spanish Flu was responsible for the death of over 100 million people.

As we ring in the new millennium, diseases are emerging faster than at any other time in history. Starting with the Asian flu (1957) and the Hong Kong flu (1968), we've waded through SARS, West Nile Virus, Foot and Mouth Disease, Mad Cow, and now what the press has dubiously

called the "avian flu". It's a long list and it begs the question, "why so many new diseases?"

First and foremost, the speed of international transportation has accelerated. "No city on earth is now more than 24 hours away from any other."¹ This was certainly the single largest contributing factor in the SARS outbreak that made its way from Asia to Canada, comfortably nestled in the lungs and mucous membranes of international air travelers. The rate of global trade has multiplied exponentially, largely a result of the advent of capitalism and a reality which afforded communicable diseases an unrivalled opportunity to spread.

¹ The Economist, 2003

Then there is the not insignificant fact that the world population continues to rise – like rats in a cage.

The advent of avian flu is not entirely a surprise. Frankly, for the first time in history, we have had advance warning of an emerging threat. Nine years of advance warning, in fact. What has caught us by surprise is how deadly the highly pathogenic Influenza type A (H5N1) virus actually is. H5N1 is a “slate wiper²” for chickens – killing 100% of affected flocks, usually within 24 hours. Since 1997, it has proven that it can also kill humans who come into close contact with infected birds. Suddenly, governments and international health organizations are foaming at the mouth.



PHOTO COURTESY OF KARL LECK

Long before the veterinarian is called, long before the county extension agent is notified, long before the state epidemiologist is brought in, it's the farmer who stands alone at ground zero. We are the first line of defense against this virus and we will most likely be its first responders. If, and when it arrives on North American shores (and the experts predict that it *will* within 6 to 18 months), farmers, their families and poultry workers are likely to be its first victims.

Farmers on the Front Lines

The majority of H5N1 outbreaks have been associated with small rural flocks in countries with a tradition of subsistence farming and open-

² “Microbe: Are we ready for the next plague?”, Alan P. Zelicoff, M.D., 2005, American Management Association.

air live poultry markets. This may conjure up images of barefoot farmers tending flocks in wicker coops, suspended over a river, or a pig pen. In countries like Thailand, Cambodia and the Lao People's Republic, that's exactly what the commercial poultry industry looks like.

This is not a “third world” phenomenon. To be sure, here in the U.S., we have a highly regulated poultry industry alternately blessed or cursed with technology that borders on science fiction. The industry is also supported by a large contingent of lobbyist. But, how many of us keep a small laying flock, or raise a batch of broilers to fill the freezer each fall? And one more observation - the largest open-air live poultry market in the U.S. is located in ... downtown Manhattan.

There is plenty that we don't know about this virus. Why does it infect some people after being exposed, and not others? Will it mutate into a form that can be transmitted from person to person? And, if it does, will it be as lethal as the virus that infected 161 people in Asia?

What we do know is rather unsettling. The H5N1 virus that emerged in 1997 is “historically unprecedented in scale, geographic spread and economic consequences for the agricultural sector.”³ Migratory bird populations are the native hosts for all influenza type A viruses. The birds provide an ecological niche for the virus which they then spread in their feces, and through direct contact. Typically, only a small number of them die as a result. H5N1 is breaking all the rules and killing migratory birds in much larger numbers. Attempts to eradicate the virus in Asia, through vaccination, destruction of infected flocks and containment, have failed to slow its advance. According to the World Health Organization, “No effort has ever been made to alter a pandemic at its source⁴”, despite what the “made for TV” movies would like us to believe. Unfortunately, all the containment efforts have been for naught and the virus continues to spread.

The experts do agree on a few things. The risk of world epidemic has been greater since 2003 than at any time since the 1968 Hong Kong flu. Each time humans are exposed and infected by the H5N1 virus, the more likely it is to spread and to mutate. By controlling its spread in animals, we are much more likely to reduce the risk of human infection. And for obvious reasons, controlling the spread in animals is something that can only happen on a farm by farm basis.

³ “Relevé épidémiologique hebdomadaire”, World Health Organization – Geneva, No. 7. 204 79, 65-76.

⁴ “Responding to the avian influenza pandemic threat: Recommended Strategic Actions”
World Health Organization - Communicable Disease Surveillance and Response - Global Influenza Program

International health organizations recognize that farmers may be their best ally in this battle. A WHO Global Influenza Program report states that, “As the vast majority of human cases have occurred in rural areas, advice to farmers and their families on how to avoid exposure is a second way to reduce the risk that a pandemic virus will emerge.”⁵ FAO (the United Nations Food and Agriculture Organization) confirms that control of this disease in small rural flocks will be the greatest challenge and “*must be accompanied by risk communication to farmers.*”

Instead of listening to the experts, the current administration seems focused on stockpiling antiviral medications (that have never been proven effective against H5N1), developing new drugs to bolster our immune systems and rushing them through FDA approval, and developing a vaccine to stop the virus in its tracks. These are lofty ambitions to be sure. In fact they meet the criteria of how best to respond to a pandemic once it has started, but they are not likely to help prevent the spread of H5N1 during the pre-pandemic phase.



The History of Avian Flu

Since the 1997 Hong Kong outbreak, 4.1 million birds have been aggressively culled (or lost) to the highly pathogenic H5N1 strain of the avian flu virus. Despite these efforts to eradicate the virus at its source, the outbreak continued to spread and human infection soon followed. A virus that kills birds is a concern, but a virus that kills people suddenly takes on a broader dimension. To-date, 161 people (small farmers and their families in close contact with infected birds) have become infected with the H5N1 virus. As I write this in early February, 91 people have died from it.

⁵ “*Responding to the avian influenza pandemic threat: Recommended Strategic Actions*”
World Health Organization - Communicable Disease Surveillance and Response - Global Influenza Program

Not satisfied to languish in Asia, the virus hitched a ride on the wings of migrating waterfowl. It spread across Asia and can now be found in the Middle East, Africa and Europe. The more geographically widespread the virus is, the more likely it is to evolve and share genes with other viruses. Scientists are justifiably concerned that it will mutate into a form that can be spread from human to human. Since we have no pre-existing immunity to Influenza type A viruses, the probability of a global epidemic (a “pandemic”) is much higher.

Due to unusually cold weather in Russia and the Ukraine during early February, migrating swans detoured across parts of Western Europe. Within two weeks, the virus was causing the death of migratory waterfowl from Greece to France, an area that covers roughly the same distance from New York to Wyoming. Health officials across Europe started ordering poultry farmers to keep their flocks indoors.

These places may seem far away and the threat may appear remote – but according to every major world health organization, it isn’t. And while H5N1 is in the news today, there are other avian flus that are already having an impact on us in the U.S.

Europe and Mexico just banned imports of eggs and live poultry from the US, on the basis of the low pathogenic H7N2 strain of avian flu ...found not in some remote third world country, but in Texas! It might surprise you to learn that we’ve already faced outbreaks in Connecticut, Pennsylvania and Virginia, all of which were successfully – and by all accounts, quietly – contained. It comes as no small surprise that these outbreaks never made it to the front page of any national newspaper.

We’ve lost faith in the media to present a balanced picture, seemingly no matter what the topic – witness the ban on showing the flag draped coffins of returning soldiers. We’ve lost faith in our politicians to tell the truth – witness the weapons of mass destruction that “justified” the war in Iraq. And since hurricane Katrina, the residents of New Orleans aren’t the only ones who have lost faith in the government’s ability to protect us from emerging threats. What we are left with is science. In the face of an H5N1 avian flu pandemic, science may well be our only ace in the hole.

Virus & Influenza Basics

Influenza is the most common infectious disease known to humanity. As a nation, we name each flu strain that comes a’visitin’ during the annual November to April flu season. This year, we are calling it the “California” Flu. Seventy million Americans will be vaccinated against it, 114,000 people will be hospitalized due to related complications, and if the averages hold, 20,000 of them may well die from it.

Influenza, commonly called “the flu”, is a virus that is spread by respiratory droplets landing on or near the mouth, nose or eyes of another person, and it comes in three flavors:

Influenza A – the serious type with the most acute symptoms and usually the form of influenza commonly referred to as “the flu.” Outbreaks tend to happen every two to three years.

Influenza B – a less serious type of the virus with milder symptoms, and that tends to occur every four to five years.

Influenza C – the mildest type of influenza with symptoms that are similar to those of the common cold.

If you’ve got the flu, chances are that you’ll spread it without even knowing it. As long as a day before symptoms appear, a single sneeze can disperse a fine mist of viral droplets from three to seven feet across a room. The virus can live indefinitely in a frozen climate, and linger on doorknobs, banisters and steering wheels given the right conditions. You might think of it as a bug, lurking around the corner, waiting to infect the next person who comes along. But generally speaking, viruses don’t walk, fly, swim, breathe or think.

Since they are made of up a core of RNA or DNA surrounded by a layer of protein, they aren’t even considered to be “alive”. That doesn’t make them any less dangerous to humanity. As Nobel prize laureate Josh Lederburg said, “*The single biggest threat to man’s continued domination is the virus.*” The numbers seem to bear that out. While mankind has made amazing strides in the last 100 years, Dr. Paul Gibbs from the University of Florida claims that we have discovered less than 1% of the viruses in the world.

H5N1 - What’s in a name?

To make sense of such a vast universe of viruses, scientists like to name them with obscure acronyms - like H5N1. Luckily, there is a method to this madness, and a method well worth understanding.

Two different protein groups have been identified on the surface of avian influenza viruses – hemagglutinin (“H”) and neuraminidase (“N”). Each of these groups is further broken down into sub groups that are numbered sequentially. There are 16 types of hemagglutinin proteins, (respectively named H1, H2, H3...) and nine types of neuraminidase proteins (e.g. N1, N2, N3 ...).

A bit of simple math (16 hemagglutinin proteins x 9 neuraminidase proteins = 144 possible combinations of “H” and “N” proteins) in other words, 144 possible strains of avian influenza. Not all of these are killers. In fact, most of them are low

pathogenic strains which cause neither illness nor death in poultry. Only three strains of avian flu currently circulate in the human population – none of which are the H5N1 strain. It’s critically important to remember that whenever you see “avian flu” on the news or in your paper, it can be used to refer to any of the 144 possible types of avian influenza.

The virus responsible for Pennsylvania, Virginia, Connecticut and Texas outbreaks was the low pathogenic H7N2 - not the highly pathogenic H5N1 strain at the forefront of today’s news. The next time you see the words “avian flu”, remember to look for the letters that follow the name. If you don’t, it could lead to important misunderstandings. On February 21st, the New York Times published an editorial entitled “Playing Chicken with Bird Flu” which claimed that:

Avian flu can be controlled. In the past three years, bird flu broke out in Malaysia, Korea and Japan, and all three countries eradicated it, thanks to early warning and quick action that eliminated the flu by killing only a few thousand chickens.

This is a reassuring message, although grossly inaccurate. The editorial was about the H5N1 outbreak. The avian flu that was “controlled” in Malaysia, Japan and Korea was not the H5N1 virus.

Viral Sex, or the lack thereof

As we saw earlier, viruses are spread through respiratory droplets. They can’t reproduce without the help of a living cell – and just any cell won’t do. By their very nature, viruses are picky. Certain proteins on the virus must fit certain receptor sites on the surface of the host cell – something scientists call “the lock and key mechanism.”

Once the virus has attached to a cell, it injects its genetic material and uses the cell’s machinery to reproduce itself over and over again – a single infected cell can continue to pump out more of the virus, which in turn infects more cells. Each and every time a virus reproduces, there is the possibility of a mutation which can make it more or less lethal to its host. Hence, the difficulty of producing a vaccine.

By the time we have a vaccine against it, a virus may well have evolved into a new form. That’s part of the reason why the flu vaccine is new every year – and is our best effort at producing a vaccine for the three most common strains of influenza that happen to be circling the globe that year.

Contrary to the impression you might get from the “cold and flu remedy” aisle at your local pharmacy, cold and flu remedies only help to relieve the symptoms. In the end, your body has to mount its own defenses, and vaccines are a way to stimulate the body to do just that.

Luckily, not all new diseases live up to their pandemic potential. You'll recall the Swine Flu of 1976. The government swung into vaccine production, and over the course of less than two months administered 4 million doses. Swine flu was the "killer flu" that never arrived. No one died of it in the U.S. In fact, nobody even came down with the virus. The only casualties were the thousand or so people who experienced falling paralysis as a side effect of an aggressive vaccination program.

The West Nile virus continues its march westward across the continent, although it has never taken the toll on human life that was feared when it first appeared on the horizon. 80% of the people exposed to West Nile never come down with any symptoms whatsoever, and less than 1% of the people who contract it actually experience any serious illness.

SARS seems to have petered out, despite dire warnings and widespread concern about its chances of going pandemic. Some viruses fail to thrive because they pollute their environment (e.g. the host they infect). Others simply cannot mutate to a form that is transmissible from human to human.

Unfortunately, other emerging diseases not only live up to their potential, but far exceed it. AIDS, first considered a disease of gay men and intravenous drug users, is the single largest and most deadly virus to infect humankind in recorded history. It is running rampant across the African continent, and has made serious inroads into Eastern Europe.

Viruses are equal opportunity infectors. If a global virus outbreak occurs, its spread will have little to do with hygienic conditions, sanitation or socio-economic standing. Since late 2003, every major world health organization has independently assessed the risk of pandemic as being higher than at any time since 1968.⁶ The 1957 and 1968 influenza pandemic circumnavigated the globe in 6 to 9 months. There is little reason to believe that if H5N1 mutates to a form that allows human to human transmission, that it will be any different.

"I know of no safe depository of the ultimate powers of society but the people themselves, and if we think them not enlightened enough to exercise control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion."

Thomas Jefferson

⁶ "Responding to the avian influenza pandemic threat: Recommended Strategic Actions"
World Health Organization - Communicable Disease Surveillance and Response - Global Influenza Program

In an era where a single case of mad cow threatens the entire U.S. beef industry, understanding the threat we face, and the ability to put it into perspective is of paramount importance.

What should you do?

Ninety-nine percent of the press coverage devoted to avian flu in the U.S. is specifically targeted at people who have never seen a chicken up close. This, despite exhortations from WHO, FAO and the Centers for Disease Control that highlight the importance of helping farmers engage in fewer risky behaviors as a means to help prevent an epidemic. The "risky behaviors" to which they allude are staples of small poultry production around the world:

- home production;
- slaughter;
- consumption of domestic poultry.

Does any of this sound familiar?

At first blush, it would seem to imply that a chicken breast in the store is safer than a bird you raised yourself – something that most of us who read SFJ know to be false. Pastured poultry and organic producers are concerned that poultry lobbyists will use this opportunity to enact legislation intended to suppress the growth of pastured, range fed and organic poultry flocks. Their fears may not be unfounded – see the sidebar entitled "An Epidemic of Fear: The Fallout from Avian Flu".



Nevertheless, the science behind these statements is solid. The poverty in third world countries perpetuates the home slaughter and consumption of infected poultry. In Nigeria, diseased flocks have been culled, stuffed into plastic trash bags and buried in shallow pits. For the average Nigerian, the birds in that pit represent wasted food that could be used to feed her family. Many will wait for animal health workers to disperse before climbing into the pit and pulling out culled birds for dinner. In the process, they walk through piles of carcasses of infected birds, and potentially spread the virus as they return to their homes.

By cooking poultry to an internal temperature of 160°F, most common bacteria and viruses are destroyed. But what's the likelihood that an impoverished Nigerian family will have access to an accurate thermometer?

In general, farmers everywhere are at greater risk than the general population because we raise, slaughter and consume the birds in our flocks. Raising them implies close contact with the birds (known to be a significant factor in the transmission of H5N1 from bird to human). And of course, how many backyard flocks actually implement the same kind of stringent biosecurity measures used by the commercial poultry industry and by commercial hatcheries? In my experience, not many!

If we knew our flocks were infected with H5N1, or any other virus, most of us would take steps to prevent spreading the disease around. Unfortunately, domestic ducks can become infected with the virus, not show any symptoms, and excrete high volumes of pathogenic particles in their manure. This circumvents the early warning signs of an infection and makes it more likely that the farmer will be exposed before he or she knows there is anything going on. Eliot Coleman's beloved "Schmoo" suddenly finds himself typecast as the Typhoid Mary of the avian flu epidemic.

Use Footbaths

In the "Biosecurity for the Birds" sidebar that accompanies this article, the USDA recommends six steps you can take immediately to reduce the risk that your birds will contract any outside disease, not just the dreaded H5N1 avian influenza. During the 2002 Virginia outbreak of H7N2, 197 farms and 4.7 million birds were infected. Epidemiologists found that the spread of the disease was primarily due to the movement of people – and footbaths proved the most reliable means of controlling that exposure. For most of us with small farms and homesteads, the term "biosecurity" may seem extreme. But, a little bleach water in a footbath is a cheap solution that is easily within reach.

Admit that the footbath in front of my barn door is undoubtedly a source of untold mirth among my neighbors. Many will point out that diseases have

come and gone without killing millions of birds, or worse yet, people. Others will reassure me that epidemics occur only in poor and unsanitary countries. Still others will express blind faith that the government won't let it happen here. Some of them will undoubtedly jump over the footbath on their way through the door, not wanting to get their feet wet. A few may even get angry – angry that my footbath is a tangible sign of the risk we face. Every one of these reactions will provide an opportunity to set the record straight, explain the risks, and outline the options.

Build a Shelter for Your Flock

We can anticipate how the U.S. government will respond by looking at the response of European nations already faced with their first cases. In affected western European countries, all commercial flocks in "high risk regions" must be confined indoors. Farmyard, backyard and other small flocks must be registered, subject to the same biosecurity standards as commercial flocks, confined and systematically checked by a vet. It seems clear that the ability to confine your flock to an enclosed chicken coop, and to prevent any direct contact between your birds and migratory or domestic waterfowl will be of paramount importance – and may be the only way to safely keep a flock of poultry on your farm – at least until the immediate threat has passed. If you don't already have the capability of confining your birds, it may be something worth preparing for in advance. Inexpensive hoop houses, cobbled together chicken coops, even fenced in runs that keep domestic poultry from mixing with migratory birds will all serve the same purpose.



Likewise, hatching your own chicks, or buying eggs or day-old chicks from a reputable hatchery is a good way to ensure that you aren't bringing the disease into your flock. Most commercial hatcheries already implement standard

biosecurity measures that include disinfecting eggs, careful confinement, good management practices, and random testing. I've been ordering chicks from the Murray McMurray Hatchery in Webster City, Iowa since I was a kid.



Bud Wood from Murray McMurray kindly agreed to talk to me about the precautions they take to help prevent an outbreak. *“I like to remind people that good management practices greatly reduce your risk of exposure to any disease.”* he said. *“We’ve had footbaths in front of every door for as long as I can remember, and all of our breeding stock are inside, so they have no way of contracting the disease.”*

“... good management practices greatly reduce your risk of exposure to any disease.”

Bud Wood
Murray McMurray Hatcheries

The folks at Murray McMurray also send a representative sample of their eggs to a state certified laboratory. The embryos are tested for the H7N2 strain of the virus. He doesn't know if that test will also identify the presence of

H5N1. According to Mr. Wood, it is too early to tell if spring chick orders will be slower than usual, but I can tell you that my order is already in.

We'll raise broilers in a pastured poultry pen just as we always have. We'll keep our laying flock in a similar contraption. But this year, they won't be grazed anywhere near the pond. We'll keep an eye open for any signs of disease and infection. And yes, in order to get out to the poultry pastures, you'll have to walk through a footbath. But don't worry, I'll take your good natured ribbing in stride.

