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Newborn chicks, at a poultry farm in Burgos, northern Spain, might someday be carriers of a disease called bird flu.

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\$1 Billion
Award

An Integrated Curriculum For The Washington Post Newspaper In Education Program

Endemic, Epidemic or Pandemic?

Lesson: As individuals, companies, health officials and governments confront an outbreak of mumps and a potential virulent spread of the avian flu, students can explore public health, privacy rights and economic decisions. The concerns about avian flu also provide opportunity to teach students about the Spanish Flu that killed more than 50 million people around the world and to introduce students to careers in virology and epidemiology.

Level: Low to high

Subjects: Health, English, Language arts, History

Related Activity: Business, Economics

Many health issues provide stimulus for lessons in economics, privacy vs. public health concerns, illegal vs. legal transport of goods and medicines, laws and ethics. This guide focuses on the current news: an outbreak of mumps in the Midwest and the spread of the H5N1 strain of the influenza virus.

The following activities suggest the range of approaches that can be taken using Washington Post news articles, features, graphics and commentary.

Define the Terms

Use the etymologies of “outbreak,” “endemic,” “epidemic” and “pandemic” to form a foundation for discussion of current health issues. Give students “What Do We Call This?” In addition to clarifying the definitions, you may wish to discuss the connotations that are attached to each term.

For a little perspective, we provide this summary of information presented at PandemicFlu.gov:

- Seasonal (or common) flu kills thousands each year. It can be transmitted person to person, but most people have some immunity to it and a vaccine is available.
- The influenza viruses that cause avian (or bird) flu occur naturally among wild birds. The H5N1 variant is deadly to domestic fowl and can be transmitted from birds to humans. There is no human immunity and no vaccine is available.
- Pandemic flu is virulent human flu that causes a global outbreak of serious illness. Because there is little natural immunity, the disease can spread easily from person to person. Currently, there is no pandemic flu.

Explain Bird Flu

A May 2006 KidsPost article and sidebar provide the basics. Give students “Cause for Concern” and “Worldwide Scares.”

The excerpt from the *Sunday Magazine* article, “Can We Stop the Next Killer Flu?” by Joel Achenbach provides a more in-depth understanding of the avian flu and the work of scientists.

What are the symptoms of having the common flu? How do they compare and contrast with the symptoms of having the mumps?

Get Graphic

Graphics from The Post are provided. “Assessing Bird Flu” provides a world map where H5N1 has been detected and a bar graph representing the human toll. “How Does Bird Flu Spread?” presents a graphic of wild bird flyways as well as ways to stop the spread of

Health Watch

www.who.int/csr/disease/influenza/pandemic/en/

Epidemic and Pandemic Alert and Response (EPR)

World Health Organization provides background and preparedness plans, including the WHO global influenza preparedness plan. Latest information on situation in countries around the globe.

www.pandemicflu.gov/

PandemicFlu.gov

U.S. government avian and pandemic flu information, press releases, issues and monitoring, including maps and travel information. Review the “School Planning” section. Information on the National Vaccine Program also found on the U.S. Department of Health & Human Services Web site.

www.cdc.gov

Centers for Disease Control and Prevention

Up-to-date information on influenza, mumps and health and safety topics. Learn about the National Immunization Program, get local and international travel information and collect data and statistics.

www.dh.gov.uk/PolicyAndGuidance/EmergencyPlanning/PandemicFlu/fs/en

Pandemic Flu

Visit the United Kingdom Department of Health Web site. Travellers advice, pandemic contingency plan and command paper.

www.fao.org/ag/againfo/subjects/en/health/diseases-cards/special_avian.html

Animal Health/Avian Influenza

FAO (WHO Food and Agriculture Organization) Animal Production and Health Division bulletins, disease card, videos, safety measures, scientific reports.

www.whitehouse.gov/homeland/pandemic-influenza.html

National Strategy for Pandemic Influenza

Homeland Security provides strategy pillars: Preparedness and Communication, Surveillance and Detection, Response and Containment.

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flu among birds and to contain a human pandemic.

Give students “Global Graphics.” Questions require that they respond to the map, bar graph and information presented.

Meet the Scientists

Meet Jeffery Taubenberger, from his high school science project in Fairfax County to cutting edge research at the Armed Forces Institute of Pathology, and other scientists at work in an excerpt from the *Sunday Magazine* article, “Can We Stop the Next Killer Flu?” by Joel Achenbach. Gain perspective and appreciation for the study that has gone from observation and microscopes to electron microscopes and the 3132 Genetic Analyzer.

“Changes Cited in Bird Flu Virus” by David Brown can be found online in Special Reports in the Health section (www.washingtonpost.com/health). This Oct. 6, 2005, article provides background on the avian flu and the scientists’ study of mutations in its structure.

Replicate the Spanish Flu

This part of America’s history is often overlooked in history classes. The Influenza of 1918 followed the routes of trade and human travel. A severe outbreak in Spain gave it the name Spanish Flu, but early in 1918 in military camps in Kansas the flu had already made its appearance. No steps were taken in spring to face the spread of flu as those who survived entered battlefields in Europe and many soldiers began to die in Massachusetts. As the war ended, in some areas more had died of flu than bullets.

The Spanish Flu was responsible for the death of more than 40

million individuals in America and the world from late 1918 to spring 1919. Why would scientists want to revive this virus? Post writer David Brown states, “It may also prove to be unusually useful — not an elaborate biological parlor trick, but a vital service to global public health.” Give students “Resurrecting 1918 Flu Virus Took Many Turns.”

In addition to learning about the Spanish Flu, students will appreciate the work of different scientists, building on the work of previous scientists and using different approaches to reach a goal. This is also a lesson in the use of technology to benefit mankind.

Compare Approaches

How are influenza, avian flu, mumps and other contagious diseases affecting other countries? Read the articles and graphs in this guide to learn what has happened in 2005 and early 2006. Review current issues of The Post for more recent coverage of health concerns. Then review other news sources online to compare how health concerns are covered. What additional health information can you gain about other parts of the world by reading their “local” news online?

Connect the Dots

How does illness spread and become an epidemic or pandemic? Review the maps and wild bird flyways in “Assessing Bird Flu.” Do any of these coincide with the presence of the H5N1 strain?

Using a map of the United States, mark where the outbreak of mumps has been reported. From early cases in the Midwest how has the virus spread? Is there a

In the Media

www.washingtonpost.com/wp-dyn/content/linkset/2005/10/17/LI2005101700979.html

Focus on Bird Flu

Post Special Report: The latest developments in U.S. and the world, archived articles, maps and graphics, quick facts and key stories.

www.npr.org/templates/story/story.php?storyId=4949542&sourceCode=gaw

Health Officials Keep Close Watch on Bird Flu

The latest global information, news, interviews and historic perspective in the collection of features.

www.pbs.org/wgbh/amex/influenza/

Influenza 1918

“... the worst epidemic the United States has ever known” from a PBS American Experience program. Maps, graphs, program transcript, interviews, bibliography and teacher’s guide.

www.washingtonpost.com/wp-dyn/content/linkset/2005/10/11/LI2005101001030.html

Flu Basics

Post Health section Special Report on vaccines, symptoms and treatment of influenza.

www.newseum.org

Newseum

Daily new pages from across the U.S. and around the world

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pattern? After reviewing the map and reading articles about the outbreak of mumps, can students make a connection between the viruses being spread via migration patterns of people (flying around the country and world) and birds carrying the H5N1 virus with their own migration patterns as well as tainted meat being sent around the world?

The World Health Organization, the public health division of the United Nations, monitors disease outbreaks and assesses the performance of health systems. Use its Web site and others found in the sidebars in this guide to assist collecting data.

How is information about health precautions (vaccinations, washing hands, diet) disseminated to the public? Give students "What Do You Think? This activity sheet provides several options for student response and exploration.

Compare the Costs

The common influenza virus is the cause of death of thousands annually. More than 60 people have died in other countries from the H5N1 strain. In addition to this human toll, what other costs are involved in the spread of flu? The Animal Welfare Institute reports that "nearly a quarter of a billion birds have been killed" to contain the spread of the flu virus. What does this mean to farmers and factory workers whose income is dependent on poultry?

See Government's Role below for another perspective on the economics involved. Give students "\$1 Billion Awarded for Flu Vaccine" for a perspective on the cost of developing vaccines. Considerations include:

- Who is going to benefit from this contract? Impact on people getting the drugs, the companies developing the vaccines?
- Upon whom will this vaccine be tested for its efficacy?
- Would this be a good time to invest in one of the companies that received this contract?

The Post reported that federal health officials want airlines to collect personal information about domestic and international passengers to help track potential epidemics. In 2003 airlines cooperated by helping to locate passengers who might have been exposed to SARS and then traveled by air to another destination. Today many airlines are fighting bankruptcy. Give students the activity found on "What Do You Think?" More information can be found at http://ad.doubleclick.net/clk;29842043;13115100;n?http://h10010.www1.hp.com/wwpc/us/en/sm/WF05a/18972-236251-236268-15077-f51-446153.html?jumpid=ex_r295_link/kimIPGsm/2Q06Colorinoffice/L2600n/banner1/WashingtonPostNewsweek.

Go Human-to-Human vs. Bird-to-Bird

How scared should we be about the common flu and the avian flu? Compare your area or state to those in other countries where immunization does not take place.

The H5N1 strain has been detected in 30 countries. Ask students to conduct research to find out how many birds and humans have been identified carrying H5N1. How might the avian flu influence us?

Mumps is a human-to-human transmission. Why should

Vocabulary

Contagious: Capable of transmitting by direct or indirect contact; carrying a disease

Contaminate: To make unclean or impure by contact or mixing

Health: State of complete physical, mental and social well-being; not merely the absence of disease or infirmity (WHO Constitution)

Imminent: About to take place; impending

Influenza (flu): Viral respiratory infection. Symptoms include headaches, dry cough, muscle aches and fatigue.

Lethal: Fatal; causing death

Mutate: To change

Mutation: An alteration or change, as in nature, form or quality; the process by which a sudden structural change occurs, either through an alteration in the nucleotide sequence of the DNA coding for a gene or through a change in the physical arrangement of a chromosome

Pathology: Scientific study of the nature of disease and its causes, processes, development and consequences

Virulent: Extremely noxious, damaging, deleterious, disease-causing (pathogenic).

Virus: Ultramicroscopic infectious agent that replicates itself only within cells of living hosts; many are pathogenic; a piece of nucleic acid (DNA or RNA) wrapped in a thin coat of protein

Virologist: One who studies viruses

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children be immunized? How has this practice benefited American children?

What do students propose as a means to stop the spread of influenza? Carefully monitoring flu cases and any deaths, vaccination, limiting travel to certain areas, canceling school, concerts and other large gatherings of individuals might be some of their suggestions. How practical are these to implement? For what period of time? Give students "Too Much, Too Little, Just Right."

State an Opinion

Read "A Pandemic of Fear." You might ask the following questions:

- What credentials make Siegel a reliable source?
- Of whom is Siegel critical? Why does he dispute this individual's "broad speculation"?
- Have any individuals survived bird flu? Does his data correspond with that of the "Assessing Bird Flu" graphs?
- Allusion or reference to previous contagious health concerns is made. What can be learned from them?
- Do students agree with his definition of "pandemic"? His thesis?
- Does the author agree with President Roosevelt's adage from his first Inaugural Address, "the only thing we have to fear is fear itself"?

In addition to the prominent monitoring of wild bird flyways, some organizations are urging an examination of man-made paths that may be causing contamination and spawning H5N1. Read "When Animals

Suffer, So Do We" for one perspective on the need for proper care of animals. Ask students to examine the argument that Kelly Overton develops in this commentary. You might consider:

- What is the controlling idea of the lede?
- Which is her least effective argument? Why?
- What are her two most effective arguments? Why?
- Is the conclusion persuasive? Why or why not?

The World Watch Institute document

other countries. Write a persuasive paper based upon their findings.

Government's Role

To what extent do individuals want the government to be involved in public safety and health issues? You might frame the request for passenger information (See "What Do You Think?") in terms of privacy rights vs. public safety. Where is the balance?

For further study, augment current Post articles with lessons from the Post NIE online manual (www.washpost.com/nie) found in the

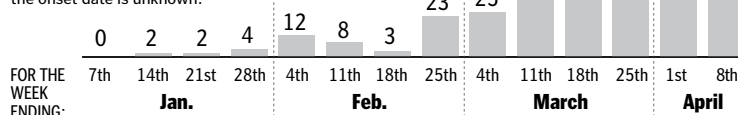
Business section. On page E43, "Government's Role in Health and Economic Decisions" begins with three lessons: When Health Concern Interrupts Supply and Demand, When Market Economy vs. Traditional Economy vs. Public Safety, and When Government and Public Health Face Disease. Avian flu, SARS and mad cow disease are included in the concerns facing citizens, businesses and governments. Articles from 2004 will provide some background perspective while the issues remain the same, included are "Fearing SARS, China Begins Mass Killing of Civet Cats" and "Bird Flu Upends Industry, Livelihoods in Thailand."

Iowa Outbreak

At least 515 people have contracted mumps during a recent outbreak in Iowa.

New cases of mumps in Iowa

Does not show 40 cases in which the onset date is unknown.



Mumps basics

How it spreads	The mumps virus spreads like the flu — primarily through the air when infected people cough or sneeze.
Symptoms	The most common symptoms are fever, sore throat, headache and swollen glands under the jaw.
Treatment	There is no way to treat the disease itself. Patients should drink lots of fluids and take aspirin and other painkillers to reduce the fever and alleviate the aches until their bodies can fight off the infection.
Complications	Most people recover in about a week. But in rare cases, victims, particularly adults, can develop severe complications, such as deafness or a dangerous swelling of the covering of the brain and spinal cord called meningitis. Pregnant women can have miscarriages. Men can develop a painful swelling of the testicles that can lead to sterility.

SOURCE: Iowa Department of Public Health

*Preliminary data still under review

THE WASHINGTON POST

stated, "Crowded, inhumane and unhygienic conditions on factory farms can sicken farm animals and create the perfect environment for the spread of diseases, including avian flu." Have students in teams conduct research on conditions that exist in the U.S. and

Inform Other Students

"What Do You Think?" provides several activities from which students select one. These require students to get informed, using the articles in this guide and additional sources, and then share their information and conclusions with others.

Cause for Concern?

Scientists Monitor Spread of Dangerous Virus

• Originally published May 11, 2006

When you think of the flu, you probably think of feeling miserable and missing school for a few days. But there's a kind of flu — called bird flu — that has been in the news a lot lately and is a lot more dangerous.

Bird flu is a disease that can kill birds and, sometimes, people. Bird flu doesn't transfer easily from birds to humans, and it can't be passed from person to person. Bird flu has not been found in the United States.

But viruses can change, and scientists are worried that bird flu could start spreading easily from person to person — with no birds involved. If that happened, the virus could spread all over the world. That would be a "pandemic," a term for lots and lots of people getting sick from just one illness in a short period of time.

The U.S. government, hospitals and even some schools are preparing for a possible outbreak of bird flu. KidsPost's **Margaret Webb Pressler** answers some basic questions about the virus.

What is bird flu?

What people are calling bird flu is an especially harmful bird virus, known as the H5N1 strain, discovered in China in 1996. It has spread around Asia and to birds in Europe, the Middle East and parts of Africa.

How do you catch it?

It's pretty difficult for humans to get bird flu. All of the people who have caught the disease had been in very close contact with sick birds, dead birds or the droppings of sick birds. The H5N1 strain kills most infected birds.

Of the 206 people who have caught the disease, at least 114 have died.

Is it safe to have pet birds or to eat chicken and eggs?

The flu virus is killed by heat, so it's highly unlikely you could get bird flu from fully cooked chicken or eggs.

Pet birds have a low risk of getting bird flu if they stay indoors.

What happens if the virus starts spreading among people, including here?

If the virus changes so that it can pass easily from person to person, through a sneeze or from germs left on a doorknob, your daily routine might change for a while. You would avoid crowded places such as movie theaters and grocery stores, and you might wear a doctor's face mask in public. Some schools might close and offer classes over the Internet so that children could learn at home. People would be told to wash their hands often — and that's a good idea anyway! This could last a few months, until the outbreak slows down.

When will this happen?

No one knows if bird flu will ever become more contagious. If it does, it could be next month or five years from now. It's also possible that the virus could change to become less dangerous.

Is there a vaccine for bird flu?

There are two drugs that might prevent an infection or make the virus less severe. But it's unclear if there would be enough of the medicine to go around during an outbreak. Doctors are developing new drugs.

Worldwide Scares

Pandemics — severe illnesses that break out quickly in large populations — are a normal part of world health cycles.

Thankfully, they don't happen that often. There have been three pandemics in the past 100 years — in 1918, 1957 and 1968. (The 1918 flu outbreak was by far the worst, killing 50 million people.)

Because it has been so long since the last pandemic, some experts think there will be another one within the next few years. The good news: We know a lot more about viruses and how they spread than we did during past pandemics. We know more about how to limit the spread of disease, and we have better science to help find a cure.

Here is information on the most recent pandemics:

1918 — Spanish Flu: Worldwide, affected 20 to 40 percent of the population.

1957 — Asian Flu: Started in Asia and spread worldwide. Affected old people the worst.

1968 — Hong Kong Flu: Similar to the 1957 strain, it was the mildest pandemic of the three.

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What Should We Call This?

More than 70,000 cases of mumps have been reported in the United Kingdom since 2004. The Centers for Disease Control and Prevention (CDC) in April 2006 reported an increase in mumps cases in Iowa and other states. All of these cases are genotype G mumps, the same strain that has been known globally for decades.

Collectively these cases are officially called an **outbreak**. The normal number of cases per year per country and state is established. A sudden increase, a bursting away from the inside or the norm, is classified as an “outbreak.”

Having a shared definition helps health officials to communicate their understanding of symptoms, number of cases and the seriousness of the disease and health conditions that are observed. Government officials, journalists and citizens need to know these definitions to avoid unnecessary concern and fear and also to know when action is required.

An illness that is present in a community at all times but in low frequency is said to be **endemic**. The prefix “*en-*” means “in.” Its root word is the same Greek word that gives us “democracy.” “*Demos*” means “people or population.” An endemic is in the people or prevalent in an area. Malaria in some parts of the world is an endemic. Neighborhoods that have experienced sustained dealing in illicit substances have an endemic drug problem.

When more than the expected number of cases of disease occurs in a community or region during a given period of time an **epidemic** is in the making. “*Epi-*” means “upon.” When combined with the root “*demos*,” the concept of something being placed upon people is conveyed. When disease spreads rapidly and extensively, is



CUSTOM MEDICAL STOCK PHOTO

The swollen cheeks of this boy indicate he is suffering from mumps.

a sudden, severe outbreak within a region or a group, it is classified as an “epidemic.” AIDS in Africa, for example, has reached epidemic proportions.

An epidemic that becomes very widespread and affects a whole region, a continent, or the world is classified as a **pandemic**. The word “pandemic” comes from the Greek “*pan-*,” meaning “all,” combined with “*demos*” so a “pandemos” affects all (or nearly all) the people.

The Latin language also had a word for the threat of disease upon a population — “*pestis*” Our word **pestilence** comes from this Latin word which means “plague” or “fatal disease.” The 14th-century English poet Geoffrey Chaucer wrote of “pestilence” in “The Pardoner’s Tale.” This was the bubonic plague that devastated populations on land and sea. Six centuries later Albert Camus wrote *La Peste* (*The Plague*), a novel set in an

Algerian community facing a deadly epidemic of the plague.

Terms such as “wide-spread,” “public health concern,” “public health crisis,” “highly contagious” and “virulent” might be used to describe different stages of an outbreak.

Virulent emphasizes the rapid and malignant course of disease. The “virulence” of a microorganism is a measure of the severity of the disease it causes. The Latin word “*virus*” means “poison.” **Virology** is the study of viruses

Epidemiologists study populations in order to determine the frequency and distribution of disease and measure the risks to others. These are the public health officials who gather information to establish the expected and alert society when disease is taking an unexpected course.

Source of definitions: MedicineNet.com, PandemicFlu.gov, and *American Heritage Dictionary of the English Language*

Assessing Bird Flu

An outbreak of highly contagious avian influenza that began in Southeast Asia three years ago has now reached Europe, the Middle East and West Africa. More than 200 million domestic birds have been killed to halt the advance of the virus, called H5N1. Ninety-eight people, who probably contracted the disease through contact with domestic fowl, have died. Many scientists believe the virus could evolve and acquire characteristics that would make it easily transmissible among humans, causing a global influenza epidemic. But they cannot predict when, or if, that will occur.

What is bird flu?

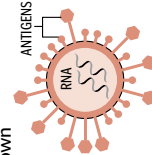
Bird flu is the popular name for the illness caused by the H5N1 virus, one of hundreds of types of avian influenza viruses. Many wild birds carry flu viruses that cause them no illness. These viruses sometimes mix and exchange genes, creating new strains. One group of viruses rapidly kills domestic chickens and some species of wild birds. H5N1 is in this group.

Where did H5N1 start?

It emerged in China in 1996 and caused an outbreak in Hong Kong in 1997 that killed six people. Scientists believe genetic mutations of H5N1 have allowed easier infection of mammals. Nearly all human victims of H5N1 had contact with birds, and so far H5N1 does not pass easily from person to person.

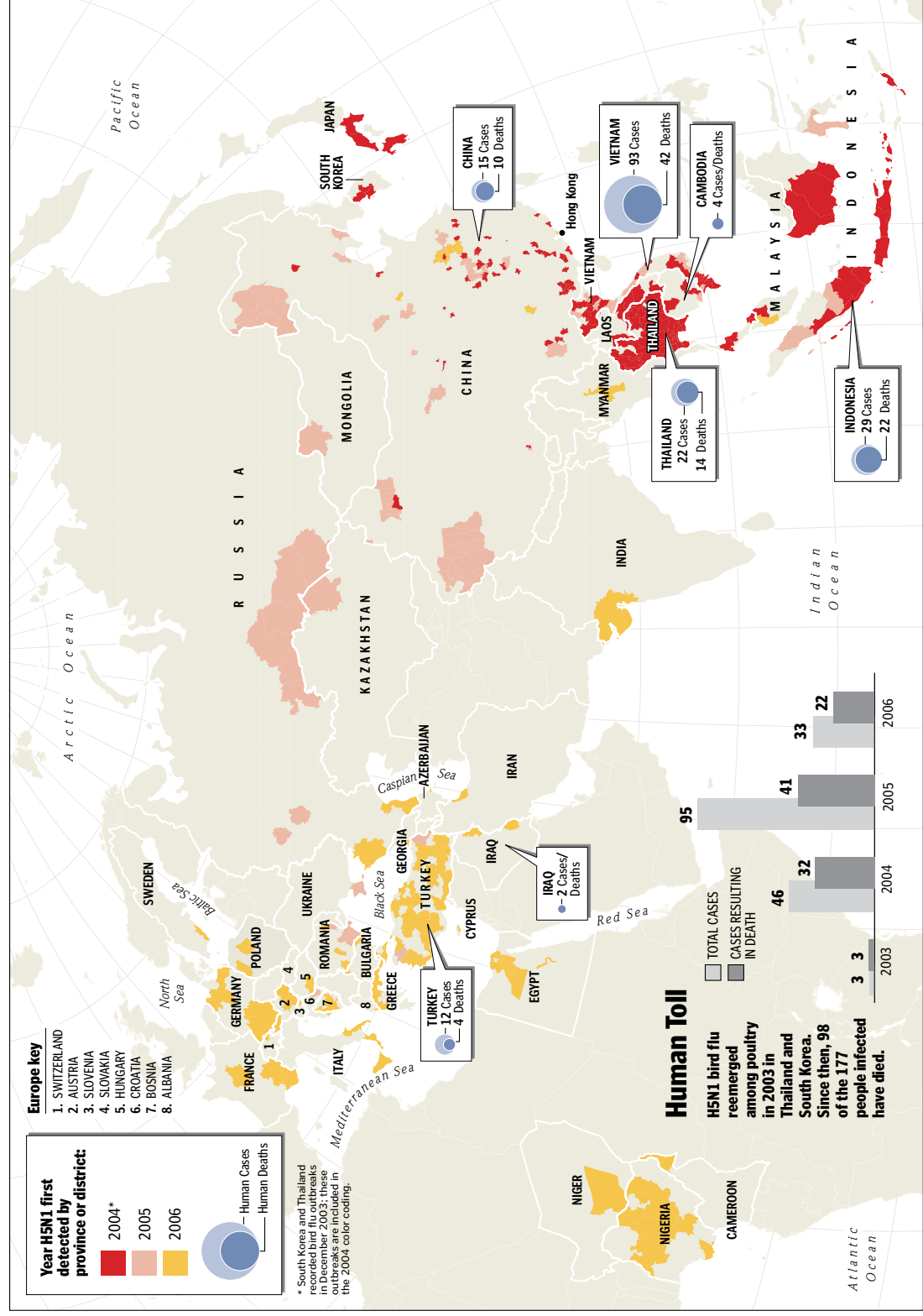
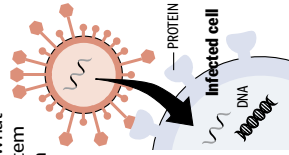
How flu viruses work

Each flu virus has two proteins, known collectively as "antigens," that stud its surface. They help the virus penetrate cells, initiating infection.



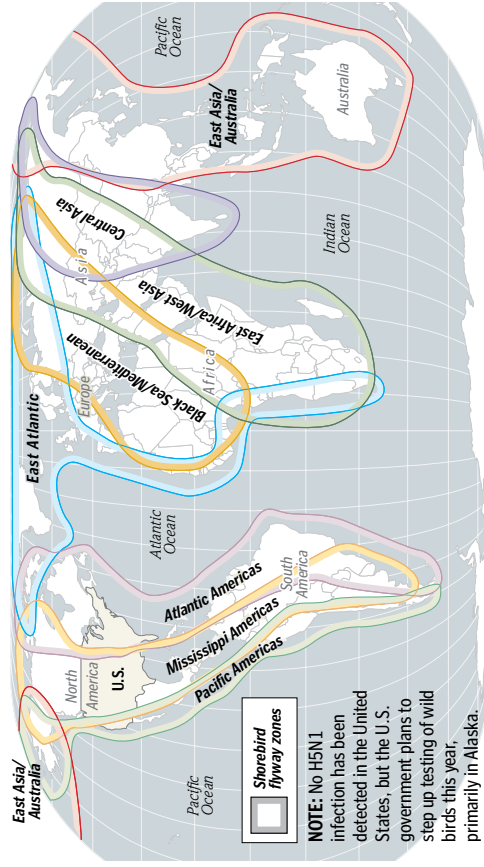
The proteins are what the immune system recognizes when it mounts a

defense. Variations in the shape of the proteins, determined by the virus's genes, give each flu strain its particular identity.



How does bird flu spread?

AMONG BIRDS



TO HUMANS



- Some observed symptoms in humans**
- Incubation period: 2 to 8 days
 - Initially high fever
 - Sometimes blood-tinted diarrhea
 - Almost always viral pneumonia, not treatable with antibiotics.
 - Respiratory distress, 4 to 13 days after onset of symptoms.
 - In the most severe cases, multiple organ dysfunction, including kidneys and heart, leading to death.



MIGRATION

Scientists fear that the spring migration could further spread H5N1. They believe the outbreaks among poultry in France, Germany and northern Europe were most likely caused by wild birds. Their droppings can contaminate farms or ponds, where domestic fowl can pick up the virus.

LIVE POULTRY MARKETS

The virus can spread in crowded, often unsanitary live poultry markets, which are common in Asia, or through trade among farms. Importation by Nigeria of live chicks from China probably caused the first outbreak in Africa.

FEED AND BEDDING

The virus is excreted in bird feces. It can be spread by bedding straw, cages and feathers.

HUMAN MOVEMENT

People can spread the virus beyond an infected area on the soles of their shoes or the tires of cars.



OTHER CONTACT

In some cases in Indonesia, children may have contracted the disease while playing in yards contaminated by bird feces. Swimming in or drinking contaminated water may also cause infection.



HANDLING INFECTED BIRDS

All evidence indicates that close contact with infected birds is the principal source of H5N1 in human infections. Risky activities include slaughtering, plucking and preparing infected chickens.



EATING CHICKEN MEAT

The World Health Organization and the World Health Organization for Animal Health say people are not likely to contract bird flu from fully cooked chicken meat or eggs.

NO INDICATION OF RISK

Stopping the spread among birds

- Culling, or killing in large numbers, infected or exposed birds.
- Keeping farm chickens indoors and restricting the movement of live poultry.
- Establishing quarantine zones around infected farms and disinfecting enclosures.
- Disinfecting cars and people and restricting movement in and out of infected areas.
- Vaccinating domestic poultry, which remains controversial.

Preventing or containing a human pandemic

- Scientists are developing experimental vaccines.
- Two drugs, Tamiflu and Relenza, may prevent infection, or reduce its severity.
- The U.S. government is providing guidance to states and cities on how to help prevent or lessen the effects of a pandemic.
- Congress has approved \$3.8 billion. President Bush has requested an additional \$2.3 billion for fiscal 2007.

Name _____

Date _____

Global Graphics

Use the "Assessing Bird Flu" map, bar graph, key and other resources to answer the following questions.

1. In what part of the world did the avian flu first appear?
2. How many countries on each continent have reported cases of the avian flu? List them on the back of this sheet by continent.
3. On how many continents have no cases of bird flu been recorded?
4. What is the percentage of countries that have been affected in each continent? State your answer on the back next to the continent headings.
5. In how many countries have humans been infected with the H5N1 virus? In which year did most of these cases occur?
6. Note the countries that have confirmed the presence of the H5N1 strain of flu. On your own paper, create a bar graph that illustrates the countries that have had the most confirmed human cases of avian flu.
7. The most human deaths as a result of H5N1 virus have occurred in which country?
8. Which country has had the highest percent of death resulting from known cases of avian flu? State the country and the percent. If there is more than one, list all.
9. Given that this information is accurate and scientists believe that birds carry the H5N1 strain, study the bird flyways. If the avian flu is conveyed in this manner, where might the next cases appear? Which U.S. state is the closest to identified cases of avian flu?
10. Given the information that is provided, create a possible scenario and illustrate it with a bar graph on a topic of your own choice. For example, Turkey has had 12 human cases of the bird flu confirmed; of those, four have been fatal. What countries that border Turkey have already had avian flu detected and which bordering countries are likely to have cases?

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Mumps Watch

Parents Are Urged To Verify Child Immunizations as Outbreak Spreads

• Originally published May 9, 2006

By AUDREY EDWARDS

Washington Post staff writer

As an outbreak of mumps that began in the Midwest spreads east, area parents have been asking pediatricians what they should do to protect their kids.

The basic advice is this, said Thomas T. Rubio, professor of pediatrics in the infectious disease division at Georgetown University Hospital: Verify that children have received two MMR (measles, mumps, rubella) vaccinations. He also said most adults who have not had both injections should consider getting one now.

One more thing: Don't panic.

As of Thursday, the Centers for Disease Control and Prevention (CDC) reported 2,869 confirmed, probable and suspected cases tied to the mumps outbreak in 13 states, including 1,552 in Iowa. Another 1,305 cases are in Nebraska, Kansas, Illinois, Wisconsin, Missouri, Pennsylvania and South Dakota. Twelve isolated, sporadic cases related to travel to the eight states were reported from Colorado, Minnesota, Mississippi, Arkansas and New York.

CDC spokeswoman Lola Russell said that 35 patients had been hospitalized so far for complications from mumps or conditions that may have been caused by mumps.

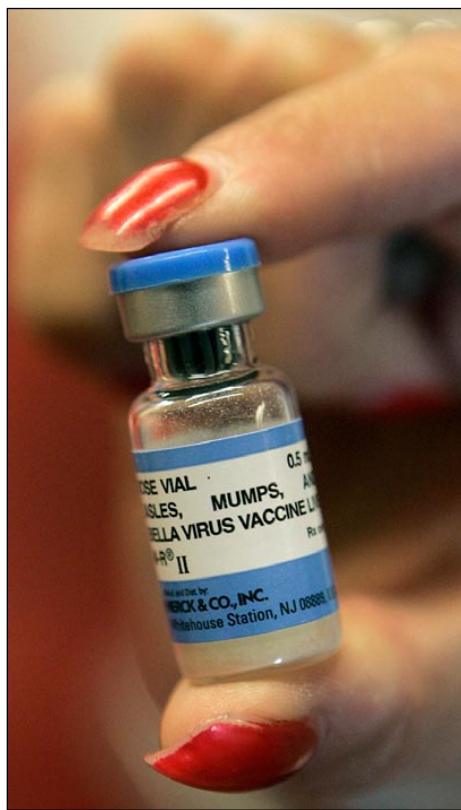
CDC director Julie Gerberding said last week that the outbreak, which she described as the worst in the United States in 20 years, is expected to continue spreading.

She said that the best protection against the virus was vaccination, despite what she said was "a confusion" about whether the outbreak is related to problems with the vaccine. Gerberding said there was no current information to suggest a problem with the vaccine.

The District was free of mumps cases as of Thursday, according to the city's Department of Health.

Maryland, which normally has five to 10 cases of mumps annually, has had seven confirmed cases

this year, according to John Hammond, a spokesman for the state's Department of Health and Mental Hygiene. He said



BY CHARLIE NEIBERGALL — ASSOCIATED PRESS

A nurse holds a vial of mumps vaccine at Iowa State University.

A Mumps To-Do List

For Young Children

- Verify that your children aged 4 or older have had two MMR (measles, mumps, rubella) vaccinations. If your child has not or there are no records to verify it, discuss getting an immunization with your doctor.
- If your child is 6 months old or younger, he or she has not been immunized but may have antibody protection from the mother. In this case, avoid sick people, especially if your baby is less than a month old.

For Teens and Young Adults

- Parents of young adults should review their immunization records. If the young adult has received only a single dose of MMR, ask your doctor about getting a booster.

For Adults

- People born after 1957 who have not received both immunizations should receive at least one injection of MMR vaccine. Those born in 1957 or before are considered naturally immune due to wide circulation of mumps prior to 1958. There is no danger (or benefit) to most people who receive a third injection.

Answers on Mumps

What's the proper mumps vaccination schedule? Should it change due to the national outbreak?

Even if the disease continues to spread, immunizations should proceed under the schedule recommended by the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics. The first dose of MMR vaccine is given at 12 to 15 months of age, the second at 4 to 6 years. For details, visit the CDC Web site (<http://www.cdc.gov/>).

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these cases appear unrelated to the Midwest outbreak.

As of Friday, Virginia reported nine cases for the year. Department of Health spokeswoman Shannon N. Marshall said the cases were sporadic and unrelated to the Midwest outbreak.

Rubio said it was surprising the outbreak had not yet reached Washington, considering the large number of people who travel to the capital daily. He warned that mumps could reach the area by summer, although spring is the most common time for the virus to spread.

Gerberding said that about 10 percent of individuals who get both MMR shots are still susceptible to the mumps. Many of the Iowa cases occurred in college students, some of whom did not receive both doses of the vaccine.

Mumps can spread through sneezing and coughing. Symptoms include fatigue, loss of appetite, fever, headache and muscle aches. These signs are followed by swollen and tender salivary glands under the ears. More severe effects are rare.

Francis Palumbo, a District pediatrician, said parents in his practice were mainly inquiring to determine whether their children had been given both MMR shots.

Renee Green, a mother of three who lives in Southeast Washington, said she feared for her youngest son, Joshua, age 6, who has asthma.

"He's up-to-date with his immunization. So are my other children," said the 36-year-old Green, a tax examiner. "But the problem is, I wouldn't know if other children or parents are sick. And he is really vulnerable to catch infections."

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What if I don't know whether my children or I have had both shots?

First, check with your doctor's office. If that fails to produce proof, consider two options, in consultation with your doctor: getting the vaccination or getting a blood test to determine immunity.

I have three kids between 2 and 15. We live in a busy area and use public transportation. If the outbreak spreads to Washington, should I restrict their activities?

Properly immunized children are well protected from the virus and need no restrictions on their activities. As for young adults living in dormitories and around college campuses, public health authorities may issue advisories because many in this age group may not have received both MMR shots. People who are 49 or older are considered naturally immune because mumps was common prior to the widespread availability of the vaccine starting in 1957.

What if the outbreak spreads among adults?

A few adult cases are no cause for alarm, but a more extensive outbreak could lead public health officials to

recommend restricting gatherings at college campuses, camps and other group facilities. Mass immunization of adults is an option, but this would be a huge logistical — and political — challenge.

Suppose someone in my family gets the mumps. What's best case, worst case?

Best case is something like a mild case of flu lasting up to two weeks, with minimal glandular swelling. Many cases involve more swelling, fever and discomfort; in adult men, there can be swelling of the testes. In rare cases, sterility in both men and women occurs. Deaths are possible but extraordinarily rare.

If the outbreak reaches Washington, what do I do?

Make sure your family's vaccinations are up-to-date. Practice good hygiene: Wash your hands and avoid sick people. Mumps is contagious for several days before symptoms appear and up to more than a week afterward, so if a local outbreak is severe, it might be prudent to avoid crowds. But if your vaccinations are current, you have little to worry about.

— Audrey Edwards



BY CHARLIE NEIBERGALL — ASSOCIATED PRESS

Drake University student Mandi McClue gets a mumps immunization shot.

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Resurrecting 1918 Flu Virus Took Many Turns

• Originally published October 10, 2005

By DAVID BROWN

Washington Post Staff Writer

It took a lot of digging to bring back to life the Spanish influenza virus of 1918. Some was done with invisible molecular primers in a PCR machine in Rockville. Some was done with pick and shovel in the frozen ground of Alaska.

Either way, it was a huge amount of work on a project whose chance of success at the start seemed very, very slim. Now, it will go down as one of the most astonishing technical feats in the history of science — the viral equivalent of bringing dinosaurs back in the fictional *Jurassic Park*.

It may also prove to be unusually useful — not an elaborate biological parlor trick, but a vital service to global public health.

The Spanish flu killed at least 50 million people around the world in slightly more than a year — late winter 1918 into the spring of 1919. Researchers have never figured out what made the virus so lethal, in part because there were no samples to study. Although viruses had been discovered by 1918, the flu virus was not isolated until 1933.

With the genome of 13,600 nucleotides known and published in the journals *Science* and *Nature*, the 1918 virus is already shedding light on its own history. It was a bird virus that appears to have become a human virus through the slow accumulation of mutations, not through the sudden trading of genes with another flu strain.

It is also illuminating the possible future of viruses that are worrying flu experts now. Some of the H5N1 “bird flu” strains seen recently in 10 Asian countries carry a few of the mutations seen in the 1918 virus, suggesting that they, too, may be slowly adapting to human hosts.



ARMED FORCES INSTITUTE OF PATHOLOGY

Scientists have reconstructed the 1918 flu virus, shown above, that killed some 50 million people.

With more work, scientists will probably be able to figure out why the 1918 strain was so dangerous. Experiments with the reborn virus began in August at the Centers for Disease Control and Prevention in Atlanta and have already answered some questions, which may lead to better vaccines and drugs.

The story of how this feat came about has several beginnings. In hindsight, it is clear that perhaps the crucial one occurred 55 years ago with Johan Hultin.

Searching in Permafrost

Hultin had taken a break from medical studies in his native Sweden to study for a doctorate in microbiology at the University of Iowa. At a departmental lunch in 1950, he heard a professor make a passing reference to the idea that intact samples of the infamous 1918 strain might still exist in bodies frozen in the Arctic. Hultin was looking for a dissertation project. He proposed to his

adviser that he try to recover the virus for use in a vaccine. The idea was approved.

While the percentage of people who became ill and died of the 1918 flu — the “case-fatality rate” — was 2 percent to 5 percent in the United States and Europe, it was more than 50 percent in some isolated native groups. In Alaska, some villages were virtually wiped out.

Hultin had spent the summer of 1949 in Alaska, helping a paleontologist named Otto Geist perform excavations. He had driven up on the newly opened Alaska Highway, which he said “was itself a great adventure.” He figured there were mass graves from the 1918 pandemic there. He wrote Geist and asked him to contact missionaries working in Inuit villages. Specifically, he wanted to know whether there were records of epidemic deaths in 1918 or 1919, and if so, what the symptoms were.

Hultin heard from seven or eight missionaries. They sent him notes copied from mission record books, often in Norwegian, which he could read. He got a map that showed the extent of permafrost — land where the ground never thaws. He chose three villages in the permafrost zone that had mass graves containing corpses from an epidemic that sounded like influenza.

The young graduate student surveyed the sites, all on the Seward Peninsula, which stretches westward into the Bering Sea. In one, a river had changed course, disturbing the permafrost. In another, a beach had eroded, exposing the grave. But the third, a place called Teller Mission, looked good.

Seventy-two of 80 residents of Teller Mission died between Nov. 15 and 20, 1918. The Army buried the victims with a steam-powered excavator used by miners.

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ARMED FORCES INSTITUTE OF PATHOLOGY

Glass slides of lung tissue taken from a soldier who died of the 1918 Spanish flu.

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Hultin went to the village, whose name has since been changed to Brevig Mission, and requested permission to excavate the grave. Through a translator, he emphasized the benefit of making a vaccine. The villagers had been vaccinated against smallpox, so they knew what he was talking about. And at the meeting were three of the eight survivors from 1918.

"They told us their terrible story about all the other people in the village dying. That convinced the rest of them to let me help," Hultin recalled recently.

On June 25, 1951, he, two Iowa professors and the paleontologist went to work. They dug through three feet of tundra and gravel, and then three feet

of permafrost. They wore masks. There were no observers or reporters. They sampled four bodies; all had evidence of pulmonary hemorrhage, the hallmark of rapid death from influenza alone. They took blocks of tissue from various organs and quickly put them into steel containers that were then sealed in steel boxes.

"Preserving the specimens and getting them safely and quickly to their medical laboratories in Iowa City was now the problem," wrote a Washington Post reporter three months later in a brief account.

"A wild storm whipped the bay to waves of almost impassable heights. Dry ice, brought from the States to refrigerate the specimens, had evaporated . . . In the emergency, the scientists used a fire extinguisher whose foamy carbon dioxide

contents, spurting from its nozzle, formed dry ice. With native help, the expedition members detoured the hazardous bay crossing, made their way overland to a narrow strip of the bay, and got back to the town of Teller," wrote the reporter, N.S. Haseltine.

Back in Iowa, Hultin thawed the tissue and tried to recover the virus. He exposed ferrets — the species whose response to influenza is most like people's — to tissue extracts. The animals did not get sick. None of his experiments succeeded. He concluded there was no live virus in the Inuit corpses.

Hultin believes he could have gotten a doctoral dissertation out of this

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meticulous but failed effort. But he never got around to writing it. Soon after his many months of experiments had proved fruitless, he was invited to enter medical school at the University of Iowa. He accepted the offer, became a pathologist and spent much of his career at a hospital in California. Now retired, he turned 81 on [Oct. 7].

No scientific publications came out of Hultin's project. But it was not entirely lost to history. A historian named Alfred Crosby mentioned it briefly in his 1989 book, *America's Forgotten Pandemic: The Influenza of 1918*.

As it happened, Hultin was not the only person who attempted to get the Spanish flu virus out of the ice. The same year he tried, U.S. Army researchers did also. They excavated a mass grave near Nome, Alaska, finding only skeletons. Hultin had been there three weeks earlier and had rejected the site.

Four decades later, however, the Army returned to the story.

A Key Institution

One of Washington's more obscure but important institutions is the Armed Forces Institute of Pathology in Rockville. It provides pathology services for the military, including autopsies of war dead. It also functions as a kind of Supreme Court for difficult cases. Pathologists unsure of a diagnosis, for a small fee, can consult its experts and send them microscopic slides or other samples for review. Part of the institute's value lies in its pathological specimens dating to 1862 — 3 million pieces of preserved human tissue.

Jeffery K. Taubenberger is a civilian pathologist who heads the institute's division of molecular pathology. His laboratory is one of the few in the country with expertise in rescuing and restoring genetic material from

damaged or decayed tissue. In 1995, Taubenberger wondered whether it might be possible to get the 1918 virus out of dried and fixed tissue from the Spanish flu pandemic. "I really wanted to see if there was some way we could make use of this vast, wonderful collection for this," he recalled.

He and his colleagues reviewed slides of lung tissue from 78 soldiers who had died in the pandemic. They narrowed the search to 10 slides in which the microscopic appearance showed that the men died only of viral pneumonia, not of a secondary bacterial infection that was more often the cause of death.

They tested preserved, leftover pieces of lung tissue from all 10. Two came up positive for influenza A, the broad family that includes Spanish flu. One was from a 21-year-old private who died in South Carolina on Sept. 26, 1918. The other was from a 30-year-old private who died in Upstate New York on the same day.

Using polymerase chain reaction (PCR) technology to amplify the genetic material, and primers — short, important stretches of genetic material — from human, animal and bird viruses, Taubenberger, Ann H. Reid and Thomas G. Fanning fished out fragments of the 1918 microbe. There were multiple copies of the virus in the sample, but they had broken into small pieces. Matching the overlapping ends of the fragments, the researchers reassembled the fragments in the right order.

The first gene they recovered, called NS, was virtually identical in the two cases.

Influenza A has eight gene segments. When Taubenberger published the report on the first one, Hultin read it. He realized, at long last, that there might be value in dead Spanish flu virus — and he thought he might still have a source. He contacted Taubenberger and asked if he would be interested in frozen organs of 1918 victims, should

any still exist. Taubenberger said yes. Hultin set off two weeks later.

He returned to Brevig Mission and again sought permission from the village council to dig. "I said that the virus was dead in 1951 and was even dead now," he recalled.

The village leaders talked a long time in Inupiat, the local language. They were worried about the release of evil spirits, not contagion, Hultin said. Then someone recalled that the victims had received Christian burials, which were supposed to have chased away the evil spirits. Permission was granted.

On Aug. 20, 1997, Hultin and a local crew opened the grave. The four bodies he had sampled in 1951 were decomposed. But he found one that had been missed the first time. It was of a woman in her thirties who was very fat. All that was left of her clothes was a row of bone buttons lying on her chest. But her body was intact and frozen, apparently insulated by the fat from the occasional brief thaws. "I sat on an upside-down pail and I looked at this, and I got the flash in my mind," Hultin said. "Maybe this is where I can find it."

With only gloves and a face shield for protection, Hultin removed her lungs and sampled her spleen, liver and heart. He cut the tissue into one-inch cubes and put them in a preservative solution. The grave was closed for a final time.

Hultin and Taubenberger hoped the Alaska material would contain virus material that was more nearly intact than the material from the soldiers. It did not. In fact, it was a bit more fragmented. The longest strands of RNA — flu's genetic material — in the institute's slides were about 130 nucleotides, or letters, long. In Hultin's material, the longest was 110.

Nevertheless, Hultin had provided Taubenberger with all the material he would need to reconstruct the 1918 virus. Eight years later, it was done.

What Do You Think?

Washington in Brief

Government Ads Aim To Calm Bird Flu Fears

Hoping to prevent a scare over the deadly bird flu, the government is distributing television and radio commercials assuring people that chicken is safe to eat.

"Mmm, that chicken looks great. But what about bird flu?" a man asks in one of the ads.

His wife says she read that bird flu is unlikely to reach dinner plates.

An announcer lists four steps for food safety: Clean hands and cooking surfaces. Separate raw and cooked foods. Cook poultry to at least 165 degrees. Chill leftovers promptly.

— From staff writer Bill Brubaker and news services

Write a PSA for your school's PA announcements, TV or radio station. Or you may write a PSA for The Washington Post's radio station, WTWP, that you know will convey information and catch the attention of listeners who are your age. The objective is to communicate information about the avian flu, the mumps outbreak or another health issue that will be of importance to your school's students.

Newspapers, radio and television broadcasts and Internet sites report information about health. It might be the growing obesity in children, Bono visiting Africa to promote AIDS/HIV awareness or an outbreak of mumps in the U.S. **Write an article for your school newspaper to localize a health or hygiene issue. What do your students need to know?**

The Post reported that federal health officials want airlines to collect personal information about domestic and international passengers to help track potential epidemics. In 2003 airlines cooperated by helping to locate passengers who might have been exposed to SARS and then traveled by air to another destination. With many airlines fighting bankruptcy today, their spokespersons question the cost, technological difficulties, time expenditure and privacy issues.

This proposal presents an interesting intersecting of business, public health, privacy rights and government interests. Form groups to represent the following parties. What are the goals of each in this situation? What might they want to take place? Present each perspective to your class. Discuss and then take a class vote on whether you would support airlines being required to report information on travelers to the CDC.

Center for Disease Control and Prevention
Transportation Security Administration
Air Transport Association
American Civil Liberties Union
Individual who takes a vacation to Thailand
Businessperson who travels often to China

Migratory birds flying over the U.S. are not the only concern of government officials. Smuggling of wild animals, pets and animal parts into this country is increasing. Why worry? A Thai passenger in 2004 tried to smuggle two Crested Hawk-Eagles into Belgium in his hand luggage. Both birds tested positive for the H5N1 strain. No humans became ill.

Assignment

It's a billion dollar business. Find out more about the global trade —legal and illegal — in wildlife and animal parts. From which countries has the U.S. banned imports of birds, bird parts and bird products? Write a report or pair with classmates to debate the means to import healthy animals and to stop the illegal trade in animals.

Name _____

Date _____

Too Much, Too Little or Just Right?

What is okay or what is not okay? A new strain of flu is traveling around the world, and the U.S. government is concerned about preventing an outbreak in the United States. Examine the following actions that the government might take. Decide if it is too much, too little or just right. Check the blank with your response and in the space below each proposed action, tell why you think this way.

A. Government sends out warning about possible epidemics of deadly flu in certain countries. Warns Americans to travel to these countries with caution.

_____ Too much _____ Too little _____ Just right

B. Government asks airlines for the names of all passengers flying on flights to affected countries. Government monitors these people via e-mail and telephone calls.

_____ Too much _____ Too little _____ Just right

C. Government obtains all medical information of passengers flying to and from these affected countries. Does not inform passengers that this is taking place.

_____ Too much _____ Too little _____ Just right

D. Government quarantines all passengers coming from the affected countries for 72 hours, the time of incubation of the deadly flu virus.

_____ Too much _____ Too little _____ Just right

E. Government prevents any travel to affected countries and prevents anyone traveling from these countries to enter the United States.

_____ Too much _____ Too little _____ Just right

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A Pandemic of Fear

• Originally published March 26, 2006

By MARC SIEGEL

Fear is a deeply rooted emotion — one that can serve as a lifesaving response to imminent danger. But because we humans often magnify risk, fear can also cause us to overreact to remote threats, such as bird flu.

According to a significant study published in the prestigious British journal *Nature* recently, the H5N1 bird flu virus is at least two large mutations and two small mutations away from being the next human pandemic virus. This virus attaches deep in the lungs of birds but cannot adhere to the upper respiratory tract of humans. Since we can't transmit the virus to each other, it poses little immediate threat to us.

So why did the “flu hunter,” world-renowned Tennessee virologist Robert Webster, say of bird flu on ABC that there are “about even odds at this time for the virus to learn how to transmit human to human,” and that “society just can't accept the idea that 50 percent of the population could die . . . I'm sorry if I'm making people a little frightened, but I feel it's my role.”

I'm sorry, Dr. Webster, but your role is to track influenza in the test tube, not to enter into broad speculation on national television. By your way of thinking, we should all be either building an escape rocket ship or killing every bird we see before it can kill us.

Fear causes the public to blur the distinction between birds and people, and so, as the H5N1 virus infects flocks of birds in Pakistan and Israel, nightly news watchers track the path to the United States. The poultry industry cringes as migratory birds that may be carrying H5N1 make their way closer to the northern shores of North America.

But though this bird flu appears to be quite deadly in many species of birds, killing 10 out of 10 chick embryos in

test-tube conditions, we humans are a different matter. In 1997 in Hong Kong, for example, where there were 18 human cases of bird flu and six deaths, thousands of people were screened, and 16 percent developed antibodies but never got sick. There appears to be a spectrum of disease in humans, not nearly as deadly as many media reports have supposed.

Even if the H5N1 virus does mutate enough to spread easily among the upper breathing tracts of humans, there are multiple scenarios in which it would not cause the next massive pandemic. In fact, the Spanish flu of 1918 made the jump to humans before killing a large number of birds. Not only do we have vaccinations, antibiotics, antiviral drugs, public information networks, steroids and heart treatments that were lacking in 1918 to treat victims of the flu; in addition, the growing worldwide immunity to H5N1 may lessen the outbreak in humans even if the dreaded mutation does occur.

Even as the virus spreads in birds, the chances of a mutation occurring over time appear to be less likely. For every doomsayer who declares that “it's not a matter of if, but when,” there is a sober scientist who says that H5N1 may well dead-end in animals and not be the next pandemic virus.

If H5N1 spreads in pigs (a soup of viruses) and exchanges genetic material with another human flu virus before passing to humans, the result is likely to be far less deadly. The swine flu fiasco of 1976 is an example of the damage that can be done by fear of a mutated virus that never quite lives up to 1918 expectations. About 1,000 cases of ascending paralysis occurred from a rushed vaccine given to more than 40 million people in response to a feared pandemic that never arrived.

Even the word “pandemic” scares us unnecessarily. The word simply means a new strain of a virus appearing in several areas of the world at one time and causing illness. The last flu pandemic, in 1968, killed 33,800 Americans — slightly less than the number who usually die here of the flu in an average year. We certainly don't need to think in end-of-the-world terms for that kind of pandemic.

Cooking a chicken or turkey kills any influenza virus 100 percent of the time, yet the fear of H5N1 bird flu is already so rampant in Europe that poultry consumption is down 70 percent in Italy and 20 percent in France. In Britain people are giving away their parrots after a single parrot got the disease, and in Germany a cat died of H5N1 and the public was told to keep cats indoors. Forty-six countries outside the European Union banned French poultry exports after a single flock of turkeys was found to be infected. France, fourth in the world in poultry exports, is already hemorrhaging more than \$40 million a month.

In this country I have heard from more than one farmer and several poultry companies that the price of poultry has already dropped 50 percent in some places. Imagine what will happen if a bird in the United States gets H5N1 bird flu. Our fear is growing at such a rate that our own poultry industry, No. 1 in the world, is likely to be destroyed. We are already petrified by fear of mad cow disease, another case where a species barrier protects us.

Flu changes its shape and size and is a killer worthy of respect and attention. But the most contagious virus among humans is our fear.

The writer is an associate professor at the New York University School of Medicine and the author of *Bird Flu: Everything You Need to Know About the Next Pandemic*

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When Animals Suffer, So Do We

• Originally published April 12, 2006

By KELLY OVERTON

Do the animal rights nuts know something we don't?

As we observe the growing number of avian flu cases worldwide, bide time until the eventual large-scale outbreak of mad cow disease in the United States and hope what the world experienced in 2004 wasn't just a dress rehearsal for SARS, the time has come to reconsider humanity's treatment of nonhuman animals — if only for the repercussions to our own health.

In past decades we have removed animals from pastures, sunshine and fresh air to stack them on top of each other in petri-dish-like buildings. As wild animals lose more and more of their habitats, they are forced to live on the perimeters of cities and towns and in a proximity to humans that increasingly appears to be detrimental not only to their health but also to ours.

Our health is being put at risk by our demand for low food prices. In the past decade consumers have chosen low prices over quality in the products and services we purchase — but animals aren't products that can be endlessly manipulated for lower food costs. As a society it is time to ask ourselves if we are willing to trade our health and the health of our land, air and water in return for cheap milk, eggs and meat.

Because factory farms are legally recognized as farms — not the industrial sites they are — they are exempt from many of our most important environmental laws. The communities surrounding most factory

farms have become wastelands from the constant flow of toxic emissions and waste polluting the air, ground and water. Inside the farms, safety and human health also take a back seat to profit. Animals too sick or diseased to stand are dragged or bulldozed to slaughter and into our food supply. Mad cow disease was born of such recklessness and greed — a desire by corporations to minimize financial losses by using the remains of diseased animals to feed the animals that enter our food supply.

Animals raised on a diet high in antibiotics ensure human consumption of antibiotics, decreasing their effectiveness when we need them to fight infection. The presence of antibiotics in our food and water also encourages the emergence of drug-resistant illnesses. In fact, an increasing number of public health issues are linked to our mistreatment of nonhuman animals — including the growing human resistance to antibiotics and the many health consequences of global warming.

Meanwhile, the change from a nation whose food was once supplied by thousands of small to medium-size farms spread across the country to a nation now dependent on just a few factory farms in specific areas is inviting disaster. This new concentration of meat and food production in specific geographic corridors allows for one incident of accidental contamination, sabotage or terrorist activity to cripple our food supply.

Creutzfeldt-Jakob disease, or CJD, the human version of bovine

spongiform encephalopathy (mad cow disease), can lie dormant for up to 40 years. Once discovered it is too late — the disease has proved fatal in every human case to date. The repercussions to human health from factory farming and habitat destruction may not be known for decades, or they may immediately fly into our daily lives via an avian flu pandemic.

It is ironic that animal-borne diseases may very well achieve what human activism has failed to do — guarantee nonhuman animals more humane lives by making animal welfare synonymous with human welfare. Regardless of how our society arrives at the conclusion, it is time to end one of the most inhumane and shameful chapters in our nation's history.

We humans remain only one species in what has always been a global ecosystem — an interlinked web of life where the health of one species depends on the health of others. Whether through reckless factory farming, the pollution of waters and the poisoning of the species within them, or the continued rampant destruction of forests and nonhuman habitat, our blatant mistreatment of other species for the benefit of our own is not inviting disaster, it's guaranteeing it. It is time to end the treatment of God's living creatures as products and to begin treating all life forms with respect and reverence before the health repercussions to the human species are irreparable.

The writer is executive director of People Protecting Animals and Their Habitats.

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\$1 Billion Awarded For Flu Vaccine

5 Companies Get Federal Contract

• Originally published May 5, 2006

By DAVID BROWN

Washington Post Staff Writer

The federal government yesterday awarded \$1 billion in contracts to five pharmaceutical companies to help them develop modern methods of producing influenza vaccine that would replace the current slow, laborious and unpredictable technique.

The awards mark a huge step forward in the Bush administration's \$7.1 billion effort to plan for an influenza pandemic, which many experts believe is likely in the next decade.

"The capacity simply does not exist in the United States to produce vaccine of sufficient quantity to vaccinate everybody. But that's about to change," Michael O. Leavitt, secretary of health and human services, said at a signing ceremony.

Two local companies won contracts: MedImmune Inc., a Gaithersburg biotech firm, was awarded \$169 million; and DynPort Vaccine Co. of Frederick received \$41 million. The rest of the funding will be split by companies in Belgium, Switzerland and Britain.

The companies each agreed to build or expand a vaccine plant in this country. Each will seek to grow flu vaccine virus in cell cultures rather than in fertilized chicken eggs and apply for Food and Drug Administration approval for its vaccine. Each company is also investing large amounts of its own money — some have done so already — although few executives yesterday were willing to say how much.

In five years, if all goes as planned, the companies together should be able to make about 300 million doses of vaccine in six months — enough to immunize every U.S. resident.



ASSOCIATED PRESS

A MedImmune employee inspects FluMist.

For MedImmune, the government's contract is the latest bit of good news for FluMist, a product that had a disastrous launch. Unlike flu vaccines that contain killed virus, MedImmune's product is a live, weakened strain of influenza. It is squirted into the nose and stimulates a more natural and broader immune response than the conventional flu shot.

MedImmune plans to use the award money in part to convert to cell-based vaccine production a factory in Frederick. It now makes a drug to treat a form of viral pneumonia seen in premature infants and people with immune disorders. That drug will be made in a new plant.

MedImmune now grows its vaccine virus in Liverpool, England, and finishes the product in Philadelphia. Its annual capacity is 90 million doses; the new plant should be able to make 150 million doses in six months, said David M. Mott, chief executive of MedImmune.

The huge U.S. investment does not buy the government a single dose of vaccine or ensure that future purchases will come at a favorable price. Instead, it is an effort to induce the pharmaceutical industry to direct time,

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manpower and money toward a goal it might not otherwise pursue.

The executives said after the signing ceremony that they plan no price or other concessions in exchange for the government largesse.

"The concession is that we are going to do this in the U.S. That is the big concession," said David M. Stout, pharmaceutical operations president of GlaxoSmithKline PLC, which was awarded \$275 million. The company's headquarters is in Brentford, England, near London. The flu vaccine it sells in the United States is made in Dresden, Germany.

Solvay Pharmaceuticals, based in Belgium, received \$299 million, and the Swiss drugmaker Novartis AG was awarded \$221 million.

MedImmune's Mott said the payback for the U.S. taxpayer is more rapid achievement of a high-priority goal set of the president's pandemic plan. "We have clearly sped up by years this conversion from egg-based to cell-based manufacturing," he said. "We would not be able to do that without collaborating with the government."

MedImmune's FluMist never caught on in the market despite a \$25 million ad campaign. Patients balked at the high price. Doctors did not like the requirement that FluMist be stored in a freezer instead of a refrigerator, as flu shots are stored. The product also was approved for only healthy people ages 5 to 49, leaving out a key market — infants and very young children.

But MedImmune stood by the product, confident that its novel mechanism made it better than the standard flu shot. It set out to win approval for a new refrigerated version and to show once and for all that it was better than a flu shot. Earlier this year, MedImmune announced results from a large study showing that the vaccine was 55 percent better at preventing



ASSOCIATED PRESS

Sitting on her mother's lap, a 5-year-old gets a dose of FluMist

the flu in children ages 6 months to 59 months.

In the past 15 years, vaccine companies have slowly dropped out of the U.S. flu market. Most of the ones that remain make their vaccine outside the country.

In addition to GSK and MedImmune, the other companies that made flu vaccine for the U.S. market this year were California-based Chiron, which recently was bought by Novartis, and Sanofi Aventis, with headquarters in Paris. Chiron's production plant was in Liverpool, near MedImmune's. Only Sanofi made flu vaccine in the United States — in Swiftwater, Pa.

The conversion to cell-culture gives vaccine makers far more flexibility than they have now.

In cell culture, virus grows in large tanks that contain cells floating in a nutrient broth. It is somewhat like brewing beer, and capacity can be added with relative ease. In the current method, virus is injected into the living tissue of fertilized eggs, where it grows and from which it must be harvested. Adding capacity requires getting more eggs, among other things.

To create "surge capacity" for flu vaccine, the Health and Human Services Department in 2004 paid Sanofi \$10 million to add more egg farmers to its supply chain. Maintenance of the enlarged egg supply through 2008 may cost \$41 million.

A chief goal of Bush's pandemic plan is to increase the country's baseline capacity for making seasonal flu vaccine. That could then be switched immediately to pandemic vaccine if a new strain, such as the H5N1 bird flu virus circulating in Asia and Europe, started to spread easily in human populations.

The amount of seasonal flu vaccine in the United States increased to 88 million doses last year from 77 million doses in 1999. It could be as high as 120 million doses next season.

Seasonal flu vaccine contains three virus strains, each grown separately and then blended. During a pandemic, factories would grow only the pandemic strain. Consequently, their production capacity would be three times that of the seasonal vaccine.

Staff writer Michael Rosenwald contributed to this report.

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Can We Stop the Next Killer Flu?

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By JOEL ACHENBACH

Scientists like Jeffery Taubenberger aren't just going to sit there waiting for a pandemic. They're gearing up for the war between bugs and humans.

Jeffery Taubenberger, virus hunter, goes to work in a bland building overlooking I-270 in Rockville. It's the Armed Forces Institute of Pathology, and it is scheduled to be "disestablished" as part of the broader plan to close military bases around the country. Taubenberger doesn't know for sure what he'll be doing in a year or so. For now, he's still walking past the fluttering flags every day, down a flight of steps to a windowless office, where he's trying to save the world from a mysterious germ.

Doom and Gloom Talk Will Be Limited to 30 Minutes Daily, reads a sign on his bookshelf. I ask if that's a reference to the avian flu. No, he says, that's about the base closings.

The office is small and cluttered, with multiple stacks of documents, suggesting a man who is struggling to impose order on an overly busy life. His phone keeps ringing — everyone wants a piece of him. You can't pick up a newspaper without seeing a story about the possible plague of avian flu, also known as bird flu or, to be scientifically correct, influenza A/H5N1. Millions could die, the stories say. Or tens of millions. Or hundreds of millions. Avian flu has reached a cultural and media tipping point, a kind of celebrity as the premier biological menace to civilization.

Avian flu is certainly a frightening virus. It kills birds, can infect human beings and has been lethal in about half of the documented cases so far in Asia and Indonesia. More than 60 people have died already. But so far it hasn't become easily transmissible from one human to another, unlike the



ARMED FORCES INSTITUTE OF PATHOLOGY

Dr. Jeffery Taubenberger examines DNA from 1918 Spanish flu lung samples.

common influenza virus that circulates every winter. Avian flu is still just that — a bird flu, not a human flu. Every article about this flu has a boilerplate paragraph, as if mandated by law, stating that scientists fear the virus will mutate, become highly contagious in humans, and create a pandemic that will rival the catastrophe of the Spanish influenza of 1918.

Taubenberger is doing his part to keep that from happening. He wants to understand the various types of flu viruses at the most essential level — tunneling deep into their genetic mysteries. What kind of mutation could turn avian flu into a pandemic pathogen? What genetic improvisations in these little nodules of RNA and protein — these things so small and spare they hardly deserve the grandiose label of "microbe" — can turn an ordinary flu into a cold-blooded killer?

He'll pause at some point to get a flu shot. "I'm susceptible to respiratory

infections," he says. Taubenberger is something of an alpha nerd. Modest of stature, rather boyish at 44, quick of speech, he keeps on his desk a prop from his 10th-grade science fair project at Robert E. Lee High School in Springfield, the one that merited the grand prize for Fairfax County. It's a homemade model of the double helix, the structure of the DNA molecule. When discussing the genome of the flu virus, he will touch parts of the double helix and give a quick lecture on how life works: The adenine always binds to the thymine, the guanine to the cytosine . . .

The only flu in the room, as far as anyone can tell, is on a shelf. It's a stuffed, fuzzy influenza virus with plastic eyeballs, a joke flu from a company called Giant Microbes. It's just a blob. That's scientifically accurate, because flu virus has an unremarkable appearance.

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In an electron microscope, you see a knobby little ball.

The effects of flu are more dramatic. Taubenberger keeps autopsy samples of lung tissue from a soldier who died of the 1918 virus. These are thin sections of lung, cut and stained, and preserved in paraffin on a glass slide. He puts a slide under his microscope. First we look at healthy tissue: Clearly visible are the air sacs, ready to breathe, with a scattering of red blood cells. Then we look at diseased tissue. They're filled, completely choked, with little red circles. Blood cells.

"You don't see any open air sacs anywhere. They're all filled with blood. This person drowned in his own blood," Taubenberger says. "This is not good, to use a highly technical medical term."

The 1918 flu killed more people in a short period of time than any other plague in human history. Taubenberger and his scientific collaborators hope that the virus will serve as a Rosetta stone for understanding avian flu. They have literally rebuilt the 1918 virus and brought it back to life. Taubenberger has come to the conclusion that there was something very weird about this germ. It was a bird flu that jumped to humans, but the fine print of its genetic code is noticeably different from that of other bird flus.

As he works on the mystery, one thing is clear: This is a scientific drama that involves not only disease but also evolution, the process by which organisms mutate and adapt to changing conditions. And it's evolution in real time, at a frantic pace, happening as we speak, here at the start of the flu season. There is much debate these days about whether evolution explains life on Earth, but in the real world, on the ground, among living things, evolution is not only real — it's dangerous.

A Long War

Man vs. microbe is an old narrative. The plot's been twisting. A few decades ago, medical science sensed that it had the germs in full retreat. Antibiotics saved lives once lost to the most routine infections. It's hard to remember, but people used to die of strep throat, a small cut, a hacking cough gone bad. Vaccines turned the tide; germs stopped killing babies in their cribs; smallpox disappeared outright.

And then the tide turned back. Drug-resistant bacteria began flourishing. HIV became pandemic. Scientists began talking of "emerging" diseases. They come from the rain forest, from the dark recesses of tropical caves, from foul duck ponds and fetid chicken coops. They take advantage of a world of abundant human and animal meat. It would appear from the unfolding concern over avian flu, and from recent outbreaks of panic over other pathogens — SARS, for example — that civilization is increasingly vulnerable to pandemics, and that the human face of the future will be covered with a mask.

By overcrowding the planet, by ravaging our environment, by jetting promiscuously around the world with all manner of microbes in tow, by overprescribing antibiotics and helping breed superbugs, we've set ourselves up for a plague. That's the basic argument.

But here's another possibility: That we're at a turning point in the war between people and germs. That we've learned, just in the past half-century or so, how to read the code of life. That we've developed techniques, just in the past two decades, to discern the complete genetic code of an organism. That, just in the last few years, we've started to figure out the innermost secrets of microbes and what turns some of them into pathogens.

Jeffrey Gordon, who studies intestinal bacteria at Washington University in St. Louis, says: "We have the tools in the year 2005 to define the genetic evolution

of a lot of these pathogens, particularly in the case of viruses like flu. It's a race between our society, our politics, our societal will and the viruses."

No one knows how the race will turn out, but the advantage at the moment is not necessarily on the side of the microbes. We're on to their game. Or, to use a more appropriate metaphor, we're not a bunch of sitting ducks.

The Secret of Life

Taubenberger became inspired in 1995 by a story of human eyeballs floating in a jar. They belonged to John Dalton, the pioneering chemist. Dalton died in 1844, but his eyeballs stuck around. He was colorblind, and he saw his defective vision as an experiment waiting to happen.

He hypothesized that a fluid in the eye (the vitreous humor) would, upon close examination, prove to be blue, filtering out the normal hues. He instructed his assistant to pluck out his eyes upon his death. After the great man died, the assistant examined one of the eyes and saw no blue fluid. He nicked the other one in the rear and looked through it — literally looked at the world through John Dalton's eye. The world appeared normal. The colorblindness was thus neurological, a problem rooted in Dalton's brain.

In 1995, researchers reported that they had taken the Dalton case a step further. Genetic testing — a relatively new analytical tool unthinkable in the day of Dalton — showed that he had an inherited colorblindness gene.

Taubenberger loved that. How very cool, he thought, to solve an old mystery through some aging tissue sitting in someone's lab. "Everything about life is interesting, when you start to get into the details of how things work," he says. Taubenberger, the head of the molecular pathology department at his institute, wondered: What could I do that would

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be really nifty, but also of significance to the world? A mentor once told him, “Work on an important problem.”

He considered studying the yellow fever that killed so many people in the 1800s. But then he seized upon the Spanish influenza of 1918. It was wildly infectious, and virtually everyone on the planet was exposed. About 2.5 percent of those who became sick died, which seems like a modest level of lethality until you realize that it added up to more than 600,000 American deaths in just a matter of months and something like 40 million deaths worldwide. Taubenberger knew that the institute had millions of autopsy specimens from soldiers dating to the Civil War. If he could retrieve even a few genetic scraps of that virus, perhaps he could figure out why it was so contagious and virulent.

Ten years later, his project is still going, centered in the rather ordinary laboratory directly next to his office (he has collaborators in labs around the country). Taubenberger doesn’t do a lot of bench work these days, what with giving interviews, taking meetings, trying to get things published, but he has assistants busily at work, filling tiny vials with fluids containing DNA, sequencing genes, tapping on computers, accessing databanks and doing all the highly detailed work of decoding the 1918 influenza virus. Taubenberger also has a new project in collaboration with the National Institutes of Health and a nearby genomics institute, to find the genetic codes of many thousands of different strains of viruses harvested from people and wild birds.

The overarching goal for both projects is to learn how these viruses evolve and which mutations might make them more or less likely to become adapted to humans and develop into potential killers. By removing from influenza some of its element of surprise, we might be able to forecast likely outbreaks, in the same way that we can forecast which tropical depression is going to turn into a

hurricane. It’s a sweeping plan, using all the hardware Taubenberger can round up.

If you take a left out of his lab, go through another lab (more vials, bottles, jars, tubes, refrigerators) and cross another hallway, you’ll reach the room with the automated sequencers. There’s a big one from Applied Biosystems, the 3132 Genetic Analyzer. Somehow, this thing can read the language of a genome, letter by letter.

Life on Earth operates on a genetic system that, at its core, is remarkably simple, considering that it gives rise to creatures as diverse as sea urchins, praying mantises and humans. The genome is written out on a very, very long molecule called deoxyribonucleic acid — DNA.

Molecular biology is to some extent the study of architecture. It’s all about structure. Proteins — which do most of the heavy lifting in the body, such as building cells and tissues — have many ways of folding themselves in three dimensions. Their structure determines their function. They roam the body in search of a correctly shaped receptor. They just want to fit in somewhere.

When Francis Crick and James Watson rocked the scientific world in 1953, it wasn’t by discovering DNA. Rather, they found the structure of the molecule, and proved that it was the source of genetic information. “We’ve found the secret of life,” Crick exulted that winter day to friends at the Eagle pub in Cambridge, England, and the secret, it turned out, wasn’t some special juice, some exotic energy source, but just a well-framed, two-stranded, ladderlike molecule with rungs in all the right places and a nifty ability to make copies of itself.

A gene is historically defined as a segment of DNA with instructions for making a single protein, though the one-gene, one-protein rule is pretty loose. Humans have upwards of 30,000 genes. The flu virus has just 11.

The code of a gene is written in the form of tiny chemicals called

nucleotides, more commonly referred to as the “bases” or “letters” of the genome. Life uses a very short alphabet. There are only four bases used by living things: adenine, cytosine, guanine and thymine, or A, C, G and T.

DNA sequencing, the process of finding the order of the letters, isn’t terribly new. As far back as 1977, Fred Sanger and colleagues managed to piece together all 5,386 letters of a tiny organism called phi-X174. In the mid-1980s, Kary Mullis developed a technique still used in Taubenberger’s lab, called polymerase chain reaction, which amplifies pieces of DNA and makes them easier to study.

Automated sequencing machines came online only in the past decade or so. They’re like reverse vending machines. You open a door, place a tray of DNA samples in a slot, watch it recede into the interior of the machine, and wait. Inside the machine, needles descend into the DNA vials and pull the fluid through a tiny glass tube, known as a fiber-optic capillary. The machine examines the thin stream of fluid with laser light; the nucleotides, the bases, go slipping through the laser beam one by one, guanines glowing differently from cytosines, and so on. Soon, the results flash on an adjacent computer screen: the letters. The code. The process is hardly push-button simple — the machines can examine only short segments of genes at one time, and scientists are often working with scraps to begin with. But it’s definitely a scientific marvel.

“There’s this kind of voodoo part,” Taubenberger says. “Nothing you do can be seen. It’s all invisible. It’s all magic.” But, he adds, in homage to the requirements of the scientific method, “it’s reproducible magic.”

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