Alzheimer's disease

Many recent new discoveries and breakthroughs have been made in the area of Alzheimer's disease. One theory of how the disease works is that Alzheimer's sets in when amyloid proteins accumulate in the brain and form plaques, which microglia—the central nervous system's immune cells—surround, but cannot destroy. The resulting inflammation causes neuronal damage.

Canadian researchers, following that school of thought, have discovered a new potential treatment for Alzheimer's. A team at the Faculty of Medicine at Universite Laval and the research center at CHUQ (Centre hospitalier universitaire de Quebec) believe they have identified a natural defense mechanism the body already uses to resist nerve cell degeneration. Scientists Alain R. Simard, Denis Soulet, Genevieve Gowing, Jean-Pierre Julien, and Serge Rivest have described their major discovery in the February 16 issue of the scientific journal *Neuron*.

Their study shows that the brain's microglia is not properly equipped to deal with amyloid plaques; however, microglia taken from bone marrow stem cells is. By studying transgenic mouse models, investigators showed how easily microglia—derived from bone marrow—can infiltrate amyloid plaques and destroy them.

Anti-flammatory drugs, therefore, should not be prescribed to Alzheimer's patients since they may interfere with the body's natural defense system, says team member Dr. Serge Rivest. Instead, researchers need to concentrate on finding ways to stimulate the recruitment of bone marrow-derived microglia.

Ideally, stem cells for this procedure should be harvested directly from the patient to "limit the risks of both rejection and adverse effects," says Dr. Rivest. Genetic engineering could modify microglia, giving it the right properties to cling closer to plaque and the enzymes necessary to destroy it. "While this cellular therapy will not prevent Alzheimer's, by curbing plaque development, we believe it will help patients prolong their autonomy and cognitive capacity. We believe this is a new and powerful weapon in the fight to conquer Alzheimer's." Dr. Remi Quirion, Scientific Director of the INMHA concurs that this "is an important step towards a new therapeutic approach to Alzheimer's disease."

Up to 80% of Alzheimer's cases may have a genetic cause, according to a study published in the February issue of the *Archives of General Psychiatry*. Nearly 12,000 elderly members of the Swedish Twin Registry were studied to determine if both twins tend to get Alzheimer's or not—and they found a pretty high correlation, says William Thies, vice president for medical and scientific affairs of the Alzheimer's Association. Since identical twins share all their genes, if a disease has a strong genetic basis, the disease should be observed in both twins or neither. The researchers found that, out of **the 392 pairs of twins—where one or both had Alzheimer's—the estimated heritability of the disease was between 58% and 79%.**

The researchers also noticed a trend in the timing in which twins developed the disease. Identical twins were diagnosed with Alzheimer's on an average of three-and-a-half years apart. Fraternal twins, however, averaged eight years of separation between their onsets of the disease.

A third study on Alzheimer's shows that highly educated people tend to delay the onset of the disease, but then succumb quicker from the onset of the disease. This study was conducted by New York's Columbia University Medical Center and appears in the March issue of the *Journal of Neurology, Neurosurgery and Psychiatry*.

For more than five years, 312 New Yorkers—each 65 years or older and already diagnosed with the disease—were studied. During this time, the average patient's cognitive performance went down 9% per year. However, it was discovered that for each additional year of education patients had, their corresponding performance went down an extra .3% (on average) annually.

One explanation for these results is called the Cognitive Reserve theory. This idea postulates that people with more education have a larger cognitive reserve (larger number or more efficient brain cells, systems and networks). According to Dr. Nikolaos Scarmeas, lead author and assistant professor of neurology at Columbia, **"these people with higher educations have more redundancy or reserve so they can cope if part of the brain is destroyed."** Once they run out of reserve, "They go downhill faster," says Dr. Scarmeas, "they can't compensate anymore and they sort of crash."

Alzheimer's Disease Statistics:

1. On new case of Alzheimer's disease is diagnosed every seven seconds
2. There will be an estimated 42 million people living with Alzheimer's by 2020
3. Alzheimer's is the most common cause of dementia in people 65 and older

Avian Influenza H5N1 (Bird Flu)

While potentially the most deadly pandemic in history is knocking at our genetic door, there's no real progress to report. According to Sidney Taurel, CEO of Eli Lilly, "We don't have any vaccines or even antibiotics at this point that can be used directly."

So far, the H5N1 virus has proven resistant to amantadine and rimantadine, two common antiviral influenza medications. Meanwhile, two other antiviral medications, oseltamavir and zanamavir, may stop the virus, but require more study to determine their effectiveness. In October, **researchers reported that H5N1 shares features with the Spanish Flu of 1918-19, which killed between 40 – 100 million people worldwide.** As of this writing, Avian Influenza H5N1 has infected over 160 people worldwide and killed 91 of them, but has yet to become a global pandemic.

In an interview in the January issue of the *Smithsonian* magazine, Robert Webster, PhD, possibly the world's foremost expert on H5N1, described what was happening and what could happen. Apparently, the H5N1 strand surfaced in Hong Kong in 1997 but was thought to be extinguished after 1.5 million local birds were destroyed. However, it resurfaced in Thailand and Vietnam in 2003 and as of today been found in Asian, Africa, the Middle East, and is currently infiltrating Southeast and Central Europe.

At this point, people are not directly susceptible to Avian Influenza, unless they come in direct contact with infected chickens. However, Webster believes that the most dangerous creature alive is the duck. His research has shown that ducks transmit flu viruses to chickens very easily. And since most ducks don't get sick from the flu virus, they're free to fly to other parts of the world and spread the virus. "The duck is the Trojan horse," says Webster. He believes wild ducks carried the virus from Hong Kong to the mainland where it reshuffled its genetic makeup and resurfaced stronger than ever in 2003.

Our worst fear is that H5N1 will make the leap from poultry to people, initiating a disaster of epic proportions. According to global lodging mogul, J.W. Marriott Jr., "if a pandemic hits, its going to be very, very serious for the whole world—not only the deaths that will occur, but the world economy will tank. People will go and lock themselves in closets. They won't shop, they won't go to movies, they won't get on airplanes, they won't stay in hotels."

But how can "the bird flu" affect people? The answer is called genetic "reassortment." The flu virus has ten genes arranged on eight separate gene segments. If a person with the common human flu also becomes infected with the H5N1 strand, the genes of the two viruses can become reassorted into a new super-strain of flu virus, one that our immune system cannot fight off and is easily passed from person to person.

However, Webster theorizes that pigs, not people, are the "genetic mixing bowls" of pandemic flu. Since the pig's genome shares many characteristics with the human genome, pigs can actually become sick from the human flu. Since they live in close quarters with chickens, pigs are also susceptible to contracting avian flu strains. If a pig simultaneously contracts both the human and avian flu, then a pandemic could result.

Recent discoveries have resulted in the slaughter of 45,000 chickens on a Nigerian farm. However, due to a weak infrastructure, nearly a month passed before the discovery and confirmation of the strand. H5N1 is especially dangerous in Africa since the immune systems of many Africans are already seriously weakened by malnutrition and the AIDS/HIV epidemic. The wider the flu spreads among birds, the more likely that a deadly genetic reassortment will take place.

In the European Union, the virus has only been detected in wild birds so far; however, the number of dead birds submitted for H5N1 testing has risen to an average of 100 a day.

Dates	Name	Reported Deaths
1889-1890	Russian Flu	1 million
1918-1919	Spanish Flu	40 – 100 million
1957	Asian Flu	2 million
1968	Hong Kong Flu	1 million

Bio Defense

Researchers at the University of Texas Southwestern Medical Center have published a study that shows a genetically engineered vaccine against ricin—a deadly toxin made from castor oil beans—is safe and effective. The vaccine, RiVax, was licensed in 2002 from DOR BioPharma, Inc. (Miami, FL). It was tested in 15 healthy individuals and showed no adverse side effects beyond mild soreness at the site of injection. Researchers will continue to assess ideal dosage and formulation for maximum protection and longevity.

Ricin, for which there is no known antidote, can kill in very small doses, orally, injected, or even inhaled. It is fatal beyond a few hours after exposure, but symptoms often do not appear until treatment is too late. Pulmonary, liver, renal and immunological failure may ensue.

The research group were administered a vaccine dose that produced ricin-neutralizing antibodies in their blood. As with any vaccine, the purpose is to train the immune system to react and protect itself from ricin. The 15 individuals were divided into three groups and given high, medium and low doses of the vaccine. All five subjects in the highest vaccine dose group produced ricin-neutralizing antibodies in their blood, indicating their immune systems had responded. Four of five in the intermediate group produced antibodies, and only one of five in the lowest dose group did so.

Ricin has been classified by the US and UK governments as a potential bioterrorism threat because the source, castor oil beans, are grown easily over a large geographical area and isolation of the chemical is relatively simple.