Stroke Priorities for the 21st Century

National Institute of Neurological Disorders and Stroke

During the Presidentially designated Decade of the Brain—1990 to 2000—scientists made outstanding progress in improving our understanding of stroke, also called "brain attack." Stroke is the third leading cause of death in the United States, a major cause of long-term disability, and a significant burden on public health worldwide.

Research on stroke is among the top priorities of the National Institute of Neurological Disorders and Stroke, a component of the Federal government's National Institutes of Health in Bethesda, Maryland. One of the ways NIH addresses knowledge gaps is to convene Progress Review Groups, in which leaders in a promising area of research, as well as representatives of industry and patient communities, meet to identify current challenges and opportunities in that field. The goal is to identify priorities that address our most pressing scientific needs, and take advantage of scientific opportunities that both stimulate and help guide future research.

A survey of progress in stroke research over the last several decades makes readily apparent the need for a 21st century research plan. Highlights of research achievements include a number of successful large-scale clinical trials that resulted in effective therapies for reducing the risk of stroke, preventing recurrent stroke, and reducing brain damage in the first minutes after a stroke. Sophisticated new imaging techniques now enable doctors to diagnose stroke more rapidly and precisely. In addition, scientists have made substantial progress in unraveling the complex cascade of chemical changes that occur in the brain after an ischemic stroke, the most common type of brain attack.[1] And other scientists are improving our understanding of differences in stroke incidence and outcome among various populations, stimulating innovative research to learn how genetic makeup, behavior, and lifestyle affect these epidemiologic trends.

While acknowledging this progress, the health care and research communities are keenly aware that the challenge to understand stroke is more urgent than ever. With the aging of the population, the absolute number of stroke patients in the United States is likely to grow substantially in the near future. Our knowledge about the inherited basis of human disease is increasing dramatically, but the energy and focus of genetic research has yet to be applied fully to stroke. And despite years of laboratory and clinical research, assessing each person's individual risk of stroke remains imprecise. Moreover, stroke is still difficult for non-specialists to diagnose, it is complicated to treat, and there are far too few therapies available. More medical graduates must be recruited to the field of stroke research in order to conduct the work needed to fill in the gaps in our understanding of this common disorder.

In early 2001, leaders at the National Institute of Neurological Disorders and Stroke identified 15 primary stroke research areas and invited experts in those areas to a Stroke Progress Review Group (SPRG) roundtable meeting in July 2001. The resulting 15 breakout groups met to identify their top three scientific priorities and the resources needed to carry out research related to these priorities. After reviewing the conclusions of the 15 groups, SPRG leaders identified five overall Research and Scientific Priorities, as well as seven overall Resource Priorities.

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[1] During an ischemic attack, a clot, most often in one of the arteries leading to the brain, cuts off the supply of blood and nutrients to the brain causing cells to die. The other primary type of stroke is a hemorrhagic stroke in which an artery in the brain bursts, allowing blood to flood surrounding tissue. This upsets the blood supply and interferes with the chemical balance of the brain.

The five **Scientific Priorities** are to:

- Identify genes that predispose individuals to stroke and improve our understanding of the proteins produced by these genes.
- Define more completely the interactions between brain cells, blood vessel walls, and circulating blood elements in the healthy brain and before, during, and after stroke.
- Improve our understanding of normal and abnormal blood flow in the brain and how to safely re-establish blood flow after stroke.
- Develop effective combinations of therapies for stroke patients, especially those patients who cannot be treated with currently available clot-busting drugs.
- Clarify the cellular and molecular events that help the brain recover from stroke, and, using this information, develop new treatments to help restore function to patients.

Stroke Research Areas

Cerebrovascular biology

Neuro/cerebrovascular degeneration

Healing process of stroke

Neurovascular protective mechanisms

CNS thrombosis and hemorrhage

Vascular dementia

Genetics

Epidemiology and risk factors

Defining disease I (genomics/proteomics)

Defining disease II (imaging)

Prevention of first and recurrent stroke

Acute stroke treatment

Clinical trials

Recovery and rehabilitation

Health services implementation

The seven **Resource Priorities** are to:

- Make better use of new microsystems for analyzing genes and their actions, with the goal of improving our understanding of what happens on a molecular level during a stroke.
- Develop large and small animal models that reflect the complexity and diversity of the human brain and its responses during a stroke.
- Take advantage of the revolution in brain imaging to understand stroke at both the tissue and molecular levels.
- Create innovative approaches for designing and conducting clinical trials of stroke treatments and preventions.
- Develop regional stroke center networks that will improve information-sharing and collaboration among health care providers, both regionally and nationally.
- Promote national stroke surveillance databases that would, among other things, identify underserved populations and those at highest risk for stroke.
- Expand physician education about modern stroke treatment, imaging, and rehabilitation.

These priorities provide a research blueprint for academic, industry, and government researchers, as well as patient advocates, all of whom seek creative solutions to prevent, diagnose, and treat stroke.

The full report of the SPRG, including the individual priorities of the 15 breakout groups, is available on the National Institute of Neurological Disorders and Stroke website at www.ninds.nih.gov/strokeprg.