Interagency Collaborative to Advance Research on Epilepsy (ICARE): Epilepsy Research at NIH

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The National Institutes of Health (NIH) received a $3 billion, 8.3% increase to $37 billion.

The funding provides:

- $500 million for research related to opioid addiction,
- $414 million in additional funding for Alzheimer’s disease research, and
- $400 million for the BRAIN Initiative.

$496 million from the 21st Century Cures Act, which is a full release of the funds and contains specific investment for the BRAIN Initiative and other research efforts.

A $295 million increase for the National Science Foundation, totaling nearly $7.8 billion
FY 2017 NINDS Appropriation Budget Distribution

FY 2017 Operating Plan
$1,778,688

$1,476,131
83.0%

$73,491
4.1%

$56,451
3.2%

Estimated total for epilepsy Research = $161M

Dollars in Thousands

- Extramural
- Intramural
- Operations/Management
- Small Business
Active Clinical Studies

- Established Status Epilepticus Treatment Trial (ESETT)
- Maternal Outcomes and Neurodevelopmental Effects of Antiepileptic Drugs (MONEAD) – Supported by NINDS and NICHD
- Consequences of Prolonged Febrile Seizures (FEBSTAT) Study
- Preventing Epilepsy using Vigabatrin in Infants with Tuberous Sclerosis Complex (PREVeNT) Trial
NINDS continues to partner with NHLBI and the CDC to support the Sudden Death in Young (SDY) Registry

NINDS has approved continued funding for additional 5 years

Looking to expand number of states/jurisdictions funded through SDY

NHLBI and NINDS analyzing data from 2015 and 2016 to determine incidence for Sudden Cardiac Death and SUDEP

NHLBI-funded investigators will collaborate with Center for SUDEP Research investigators on genetic studies
Epilepsy Centers Without Walls for Collaborative Research in the Epilepsies

- **Epi4K**
  - International effort to analyze DNA from 4,000 people with epilepsy and their relatives to identify disease-causing genes

- **Center for SUDEP Research**
  - Increase our understanding of the mechanisms that lead to SUDEP and find biomarkers to identify those at risk for SUDEP

- **EpiBioS4Rx**
  - Human and animal studies investigating epilepsy that develops after traumatic brain injury

Centers Without Walls for Collaborative Research in the Epilepsies: Functional Evaluation of Human Genetic Variants (U54)

**Review Coming Soon**!
Benchmarks for Epilepsy Research: A joint effort between NINDS and AES

I. Understand the causes of the epilepsies and epilepsy-related neurologic, psychiatric, and somatic conditions

II. Prevent epilepsy and its progression

III. Improve treatment options for controlling seizures and epilepsy-related conditions without side effects

IV. Limit or prevent adverse consequences of seizures and their treatment across the lifespan

Next Curing the Epilepsies Conference
In 2020!
Recent Advances in Epilepsy Research

**Study finds genetic basis for drug response in childhood absence epilepsy**

*Tuesday, April 11, 2017*

*NIH-funded research suggests genes may help determine optimal treatments*

**International study suggests Nodding syndrome caused by response to parasitic protein**

*Wednesday, February 15, 2017*

*NIH-funded study also identifies potential new mechanism for some forms of epilepsy*

**Epilepsy drug discovered in fish model shows promise in small pediatric clinical trial**

*Friday, February 10, 2017*

*NIH-funded research suggests zebrafish models may be efficient resource for identifying drugs for clinical use*

**NIH scientists try to crack the brain’s memory codes**

*Thursday, June 1, 2017*

*Studies of epilepsy patients uncover clues to how the brain remembers*
• Significant growth in digital services for people with epilepsy (eg. alerting devices, therapy devices, self-management apps)
• Need for cross-talk between platforms
• CDEs can promote clinical and personal utility for people with epilepsy

Partial loss of mossy cells in dentate gyrus (DG) is a hallmark of temporal lobe epilepsy.

Theory: DG serves as a gated filter for information going to hippocampus.

Optogenetically silencing DG mossy cells impairs spatial memory and terminates seizures in TLE mouse model.
How to estimate seizure probability?

Intracranial EEGs from patients with drug-resistant focal epilepsy with/without cortical stimulation v. patients without seizures (implanted for refractory facial pain)

Spike rate and amplitude increased in seizure onset zone in patients with epilepsy

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Overall Support for Research Areas

- **Next generation human imaging technologies (phase 2 awards)**
- **Foundations of human imaging**
- **Noninvasive neuromodulation**
- **Next generation DBS devices for a range of disorders**
**Goal:** See the circuits in action to understand:

- How the brain moves, plans, executes
- How to monitor/manipulate circuits for improved function
- That disordered brain circuits cause neuro/mental/substance use disorders

**Long-term goal:** Make circuit abnormalities the basis of diagnostics, and normalization of circuit function the target of intervention
Improve the outcome of drug-resistant epilepsy patients using asynchronous electrical stimulation distributed across a multielectrode array.
**Anticipated outcomes**

- Essential knowledge on diverse cell types and their 3D organization
- Open-access 3D digital mouse brain cell reference atlas
- Comprehensive neural circuit diagram in mouse brain

**Interoperable Cell Type Brain Atlas**

- Geographic Information Systems
  - Customers
  - Streets
  - Parcels
  - Elevation
  - Land usage
  - Real world

- Brain Cell Census Information Systems
  - Molecular Signatures (FISH, RNAseq, Immunostaining, etc.)
  - Anatomy (cell location, size, morphology, cell type composition and ratio, etc.)
  - Neural Circuits (long distance projections, local circuits, etc.)
  - Functional Measures (electrophys, calcium imaging, etc.)
NINDS
Seeking Knowledge about the Brain . . .
Reducing the Burden of Disease
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