

NIH: Steward of Medical and Behavioral Research for the United States



“Science in pursuit of **fundamental knowledge** about the nature and behavior of living systems ... and the **application of that knowledge** to extend healthy life and reduce illness and disability.”



NIH:

World's Largest Supporter of Biomedical Research

- Conducts research in its own laboratories
- Supports research of non-Federal scientists
 - Universities, medical schools, hospitals, research institutions, etc.
- Helps train research investigators
- Fosters communication of medical information
- 158 NIH-supported researchers have become Nobel Laureates

2019 Nobel Prize in Physiology or Medicine



Ill. Niklas Elmedhed. © Nobel Media.
William G. Kaelin Jr

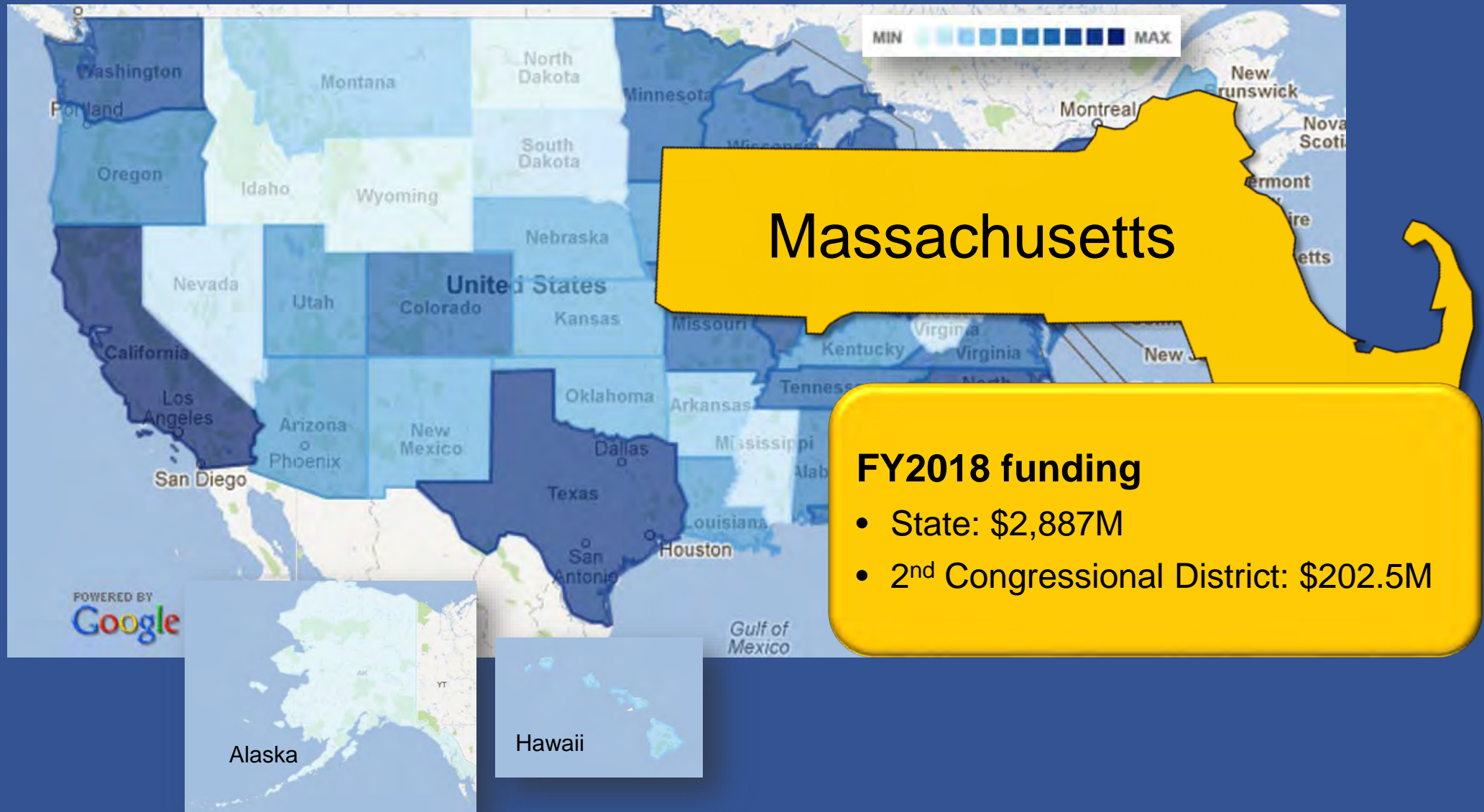


Ill. Niklas Elmedhed. © Nobel Media.
Sir Peter J. Ratcliffe



Ill. Niklas Elmedhed. © Nobel Media.
Gregg L. Semenza

NIH Funds Scientists Across U.S.



NIH's Impact on U.S. Health and Medicine

U.S. Life Expectancy



- Cardiovascular disease death rates have fallen more than 70% in the last 60 years
- Cancer death rates now falling more than 1% per year
 - Dropping by ~26% from 1991 to 2015
- HIV therapies enable people in their 20s to live to age 70+

Economic Value of NIH-Supported Research

- NIH funding supports >433,000 high quality jobs across the US
 - Producing ~\$74 billion in new economic activity
- Every \$1 of NIH investment → ↑ in R&D investment:
 - Basic science → \$8.38 ↑ in 8 years
 - Public clinical research → \$2.35 ↑ after 3 years
- *Example: Human Genome Project (1990–2003)*
 - Cost: \$3.8B (on time & under budget!)
 - 1988–2012: → ~\$1 trillion ↑ in economic growth
 - 178-fold return on investment



Hope Through Biomedicine

Traveling Into the Future....

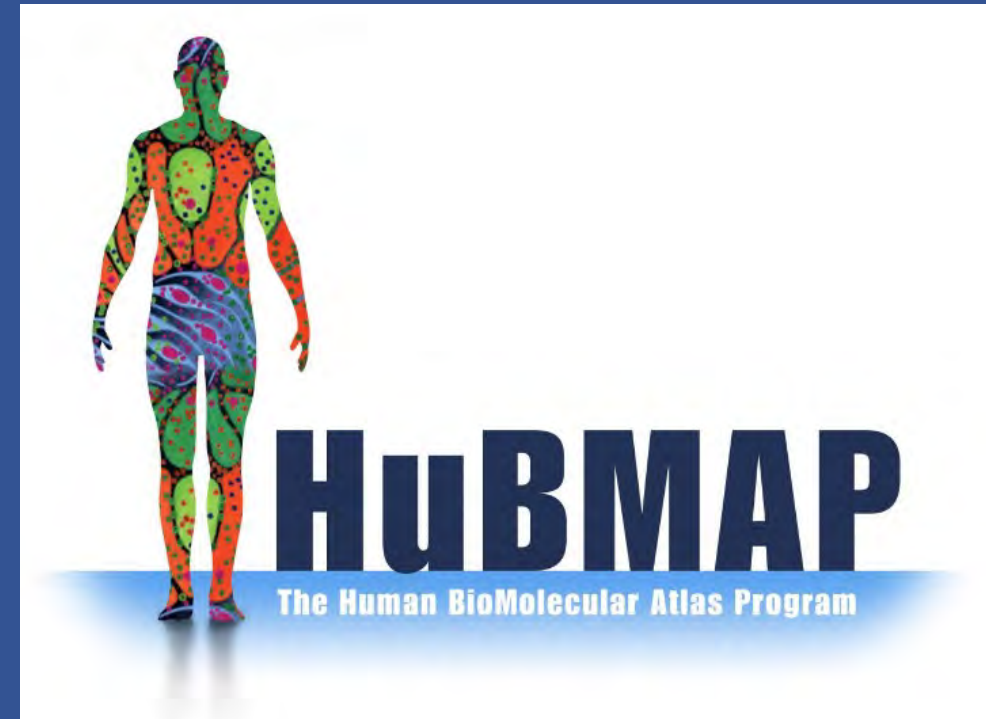
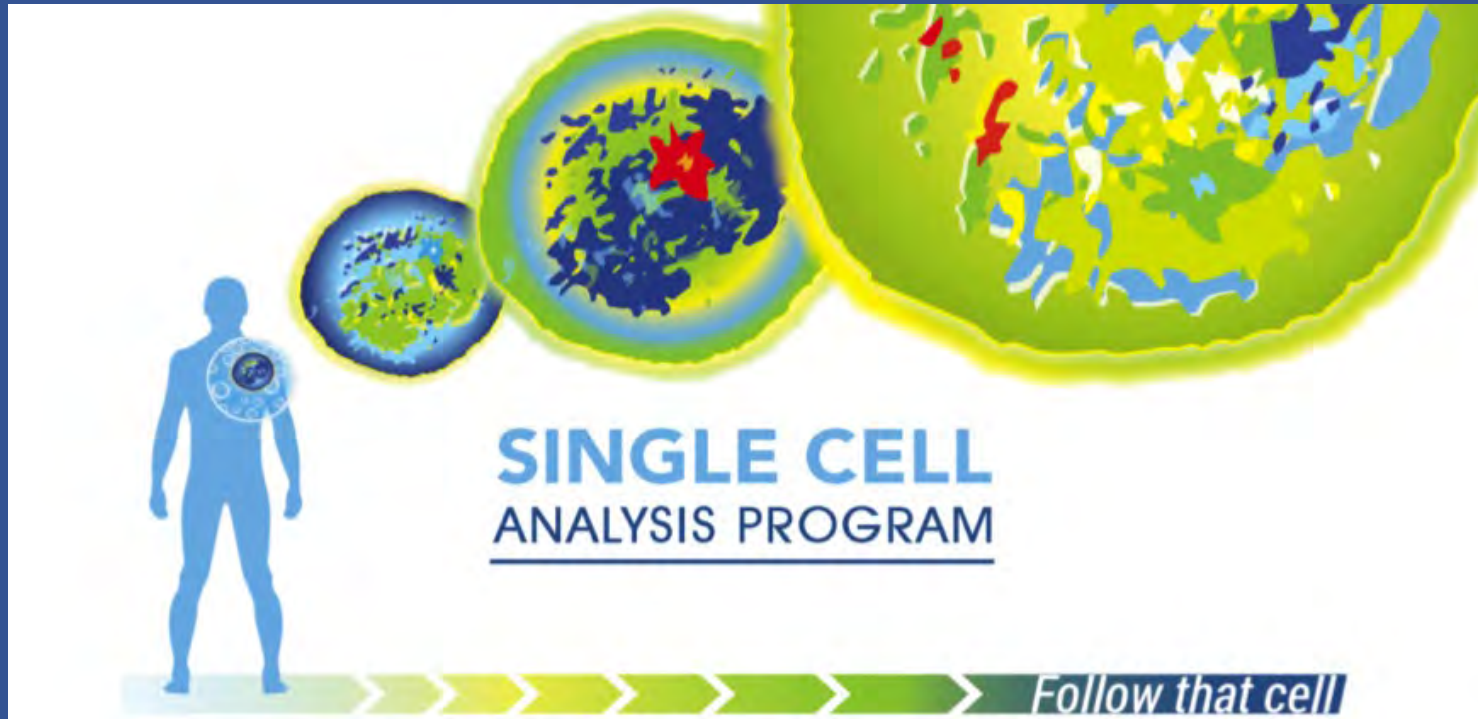


10 Biomedical Advances in 10 Years

In 10 Years, We Will Have...

Dramatically advanced our analysis of individual human cells

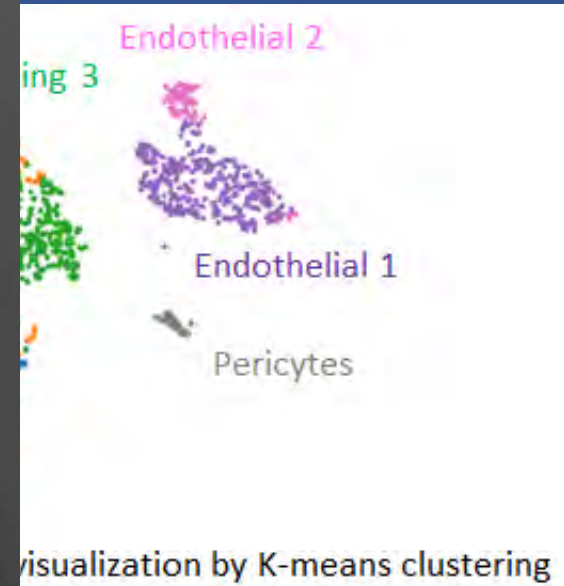
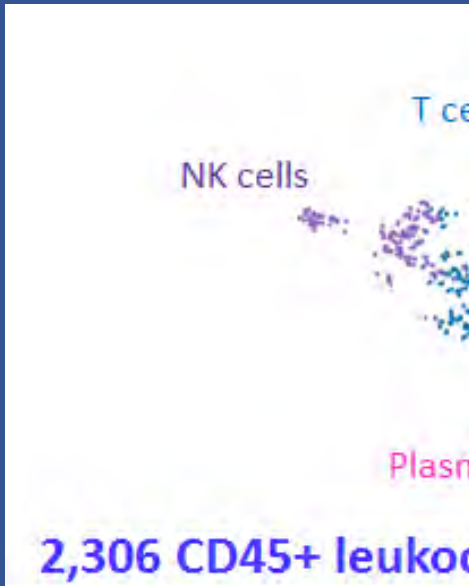
1



In 10 Years, We Will Have...

Dramatically advanced our analysis of individual human cells

1



Increasing our understanding of many disorders, including autoimmune conditions like rheumatoid arthritis

In 10 Years, We Will Have...

Developed tools to identify new brain cell types, circuits

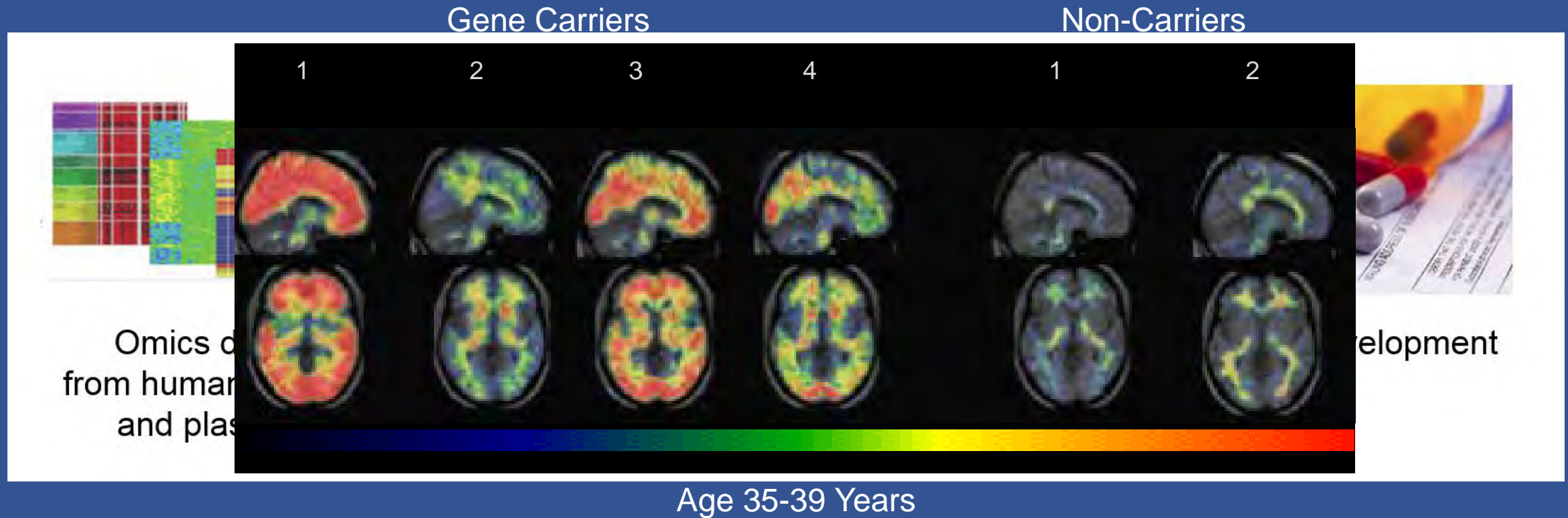
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Improving diagnosis, treatment, and prevention of autism, schizophrenia, Parkinson's, other neurological conditions

In 10 Years, We Will Have...

Implemented targeted therapies for Alzheimer's *before* signs appear

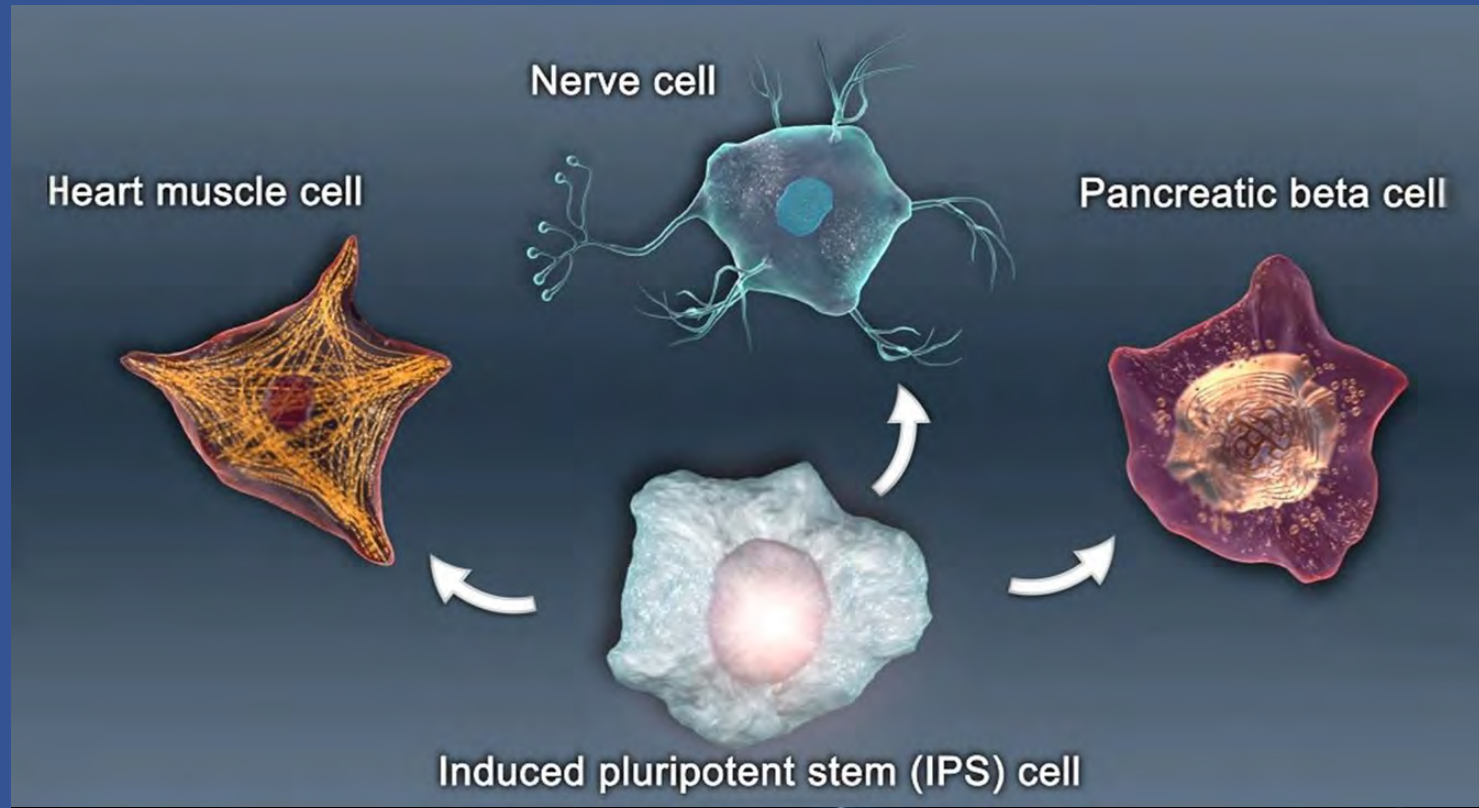


Slowing or even preventing the disease

In 10 Years, We Will Have...

4

Deepened our understanding and application of iPS cells



Allowing us to build "YOU on a biochip" and generate matched transplantable organs

In 10 Years, We Will Have...

5

Expanded our concept of our “self” to include our microbiome

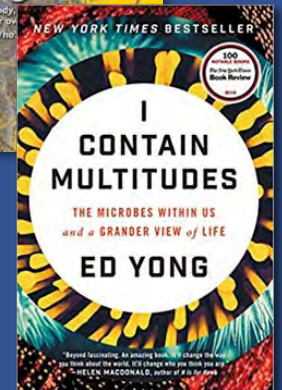
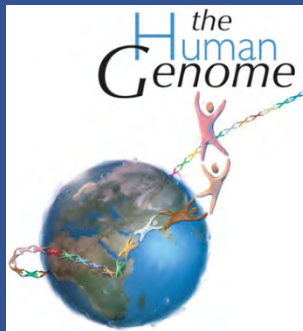
- First-gen DNA sequencing
- DNA sequencing broadens possibilities for study of humans *and* microbes
- NIH launches Human Microbiome Project
- Sequences **3,000 reference strains** from human body
- International Human Microbiome Project deepens understanding of microbiome-associated conditions

1970s

1990s

2008-2013

2014-2018



In 10 Years, We Will Have...

5

Expanded our concept of our “self” to include our microbiome

NIH Director's Blog

Expanding Our View of the Human Microbiome

Posted on September 26th, 2017 by Dr. Francis Collins

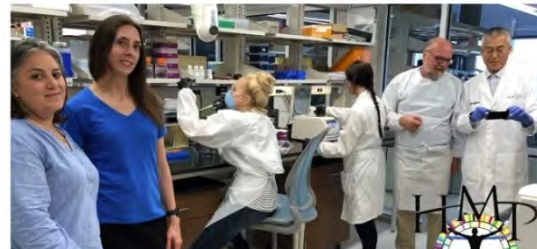


Many people still regard bacteria and other microbes just as disease-causing germs. But it's a lot more complicated than that. In fact, it's becoming increasingly clear that the healthy human body is teeming with trillions of microbial cells—and that these microbes play a central role in our health. (HMP), a quest

NIH Director's Blog

Fundamental Knowledge of Microbes Shedding New Light on Human Health

Posted on May 29th, 2019 by Dr. Francis Collins



NIH Director's Blog

Targeting the Microbiome to Treat Malnutrition

Posted on July 23rd, 2019 by Dr. Francis Collins



NIH Director's Blog

You Won't Believe What's In These Pills

Posted on October 21st, 2014 by Dr. Francis Collins

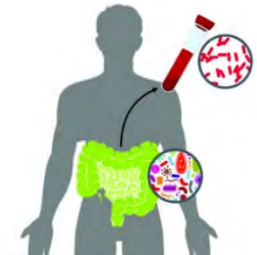


Clostridium difficile, or more commonly “*C. diff*” is a nasty bacterium that claims the lives of 14,000 people each year. Most at risk are people with conditions requiring prolonged use of antibiotics, which have the effect of wiping out the natural, good bacteria in the colon—thus allowing bad bugs like *C. difficile* to take over. In many folks, *C. diff* infects the colon and causes diarrhea. But for some people, it can be fatal.

NIH Director's Blog

Some ‘Hospital-Acquired’ Infections Traced to Patient’s Own Microbiome

Posted on October 23rd, 2018 by Dr. Francis Collins



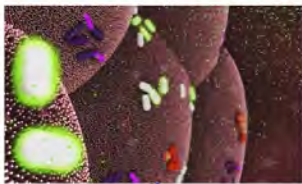
Source: *Journal of Hospital Infection*, 2018, 185: 100-105. DOI: 10.1016/j.jhin.2018.05.014. © 2018 Elsevier Ltd. All rights reserved.

Some people develop potentially life-threatening infections with microbes lurking on medical equipment. It's often true. But now an NIH-funded study shows that some “hospital-acquired” infections may actually stem from a patient's own microbiome.

NIH Director's Blog

Manipulating Microbes: New Toolbox for Better Health?

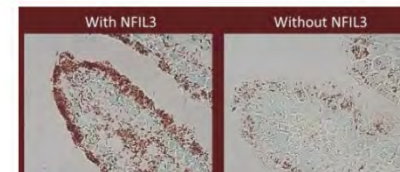
Posted on July 14th, 2015 by Dr. Francis Collins



NIH Director's Blog

Protein Links Gut Microbes, Biological Clocks, and Weight Gain

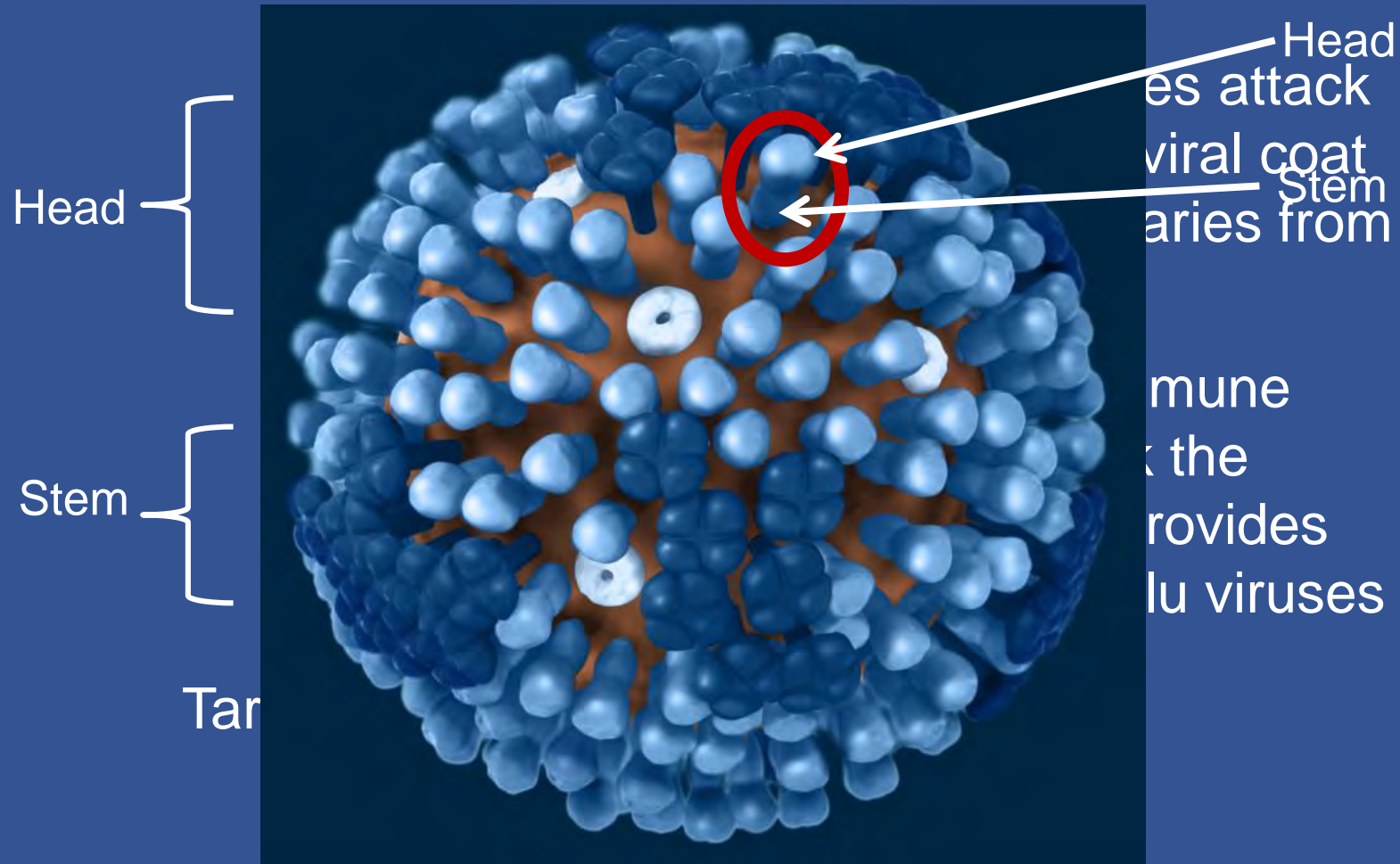
Posted on September 12th, 2017 by Dr. Francis Collins



With profound implications for our approaches to sickness and health

In 10 Years, We Will Have...

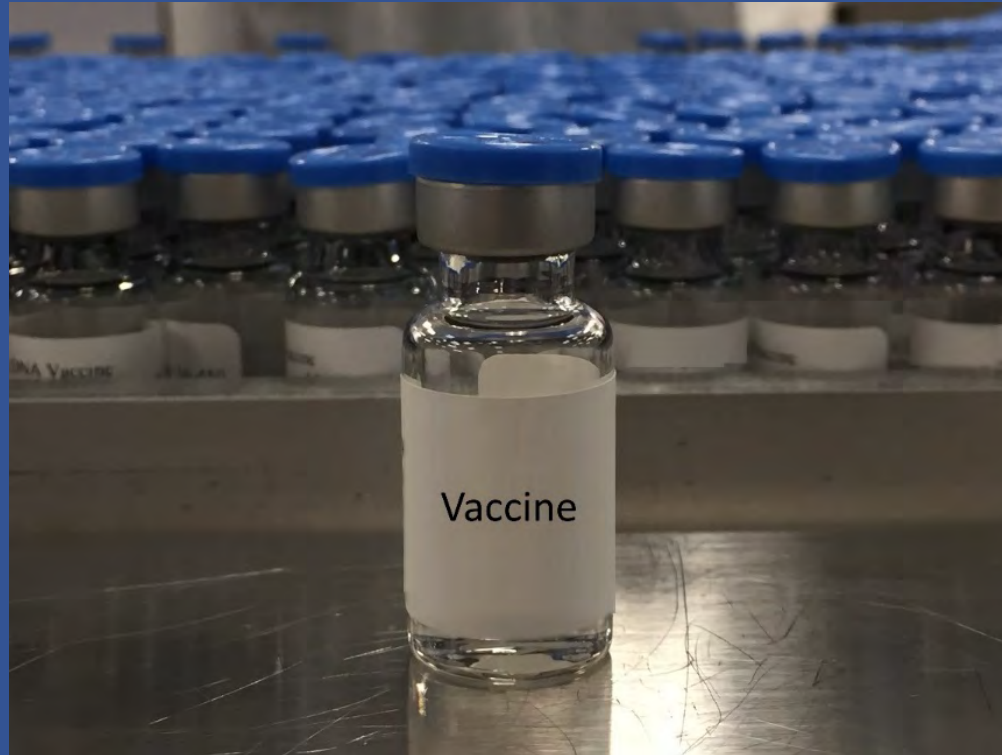
Created a universal influenza vaccine



In 10 Years, We Will Have...

6

Created a universal influenza vaccine



Protecting against all strains of flu, seasonal and pandemic

In 10 Years, We Will Have...

7

Deployed genomics, neuroscience, structural biology to uncover new targets for addiction prevention, treatment of pain



In 10 Years, We Will Have...

7

Deployed genomics, neuroscience, structural biology to uncover new targets for addiction prevention, treatment of pain



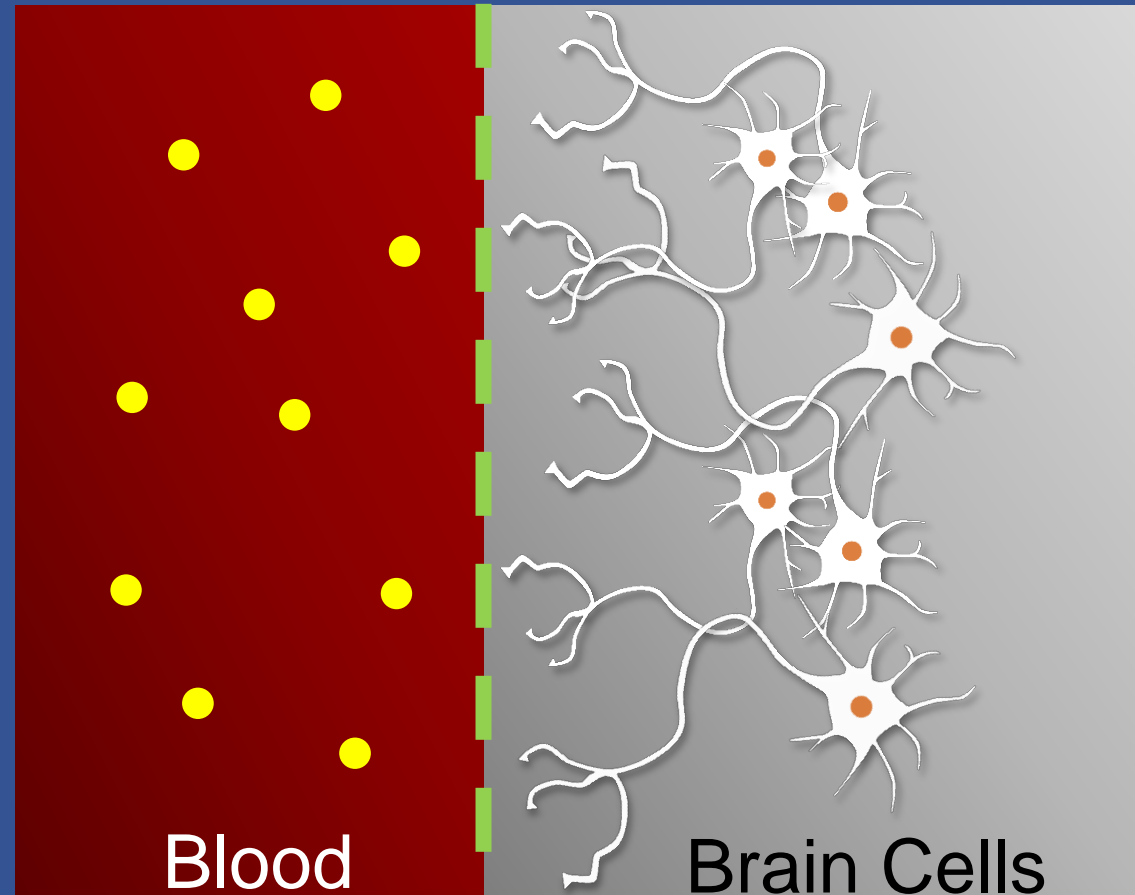
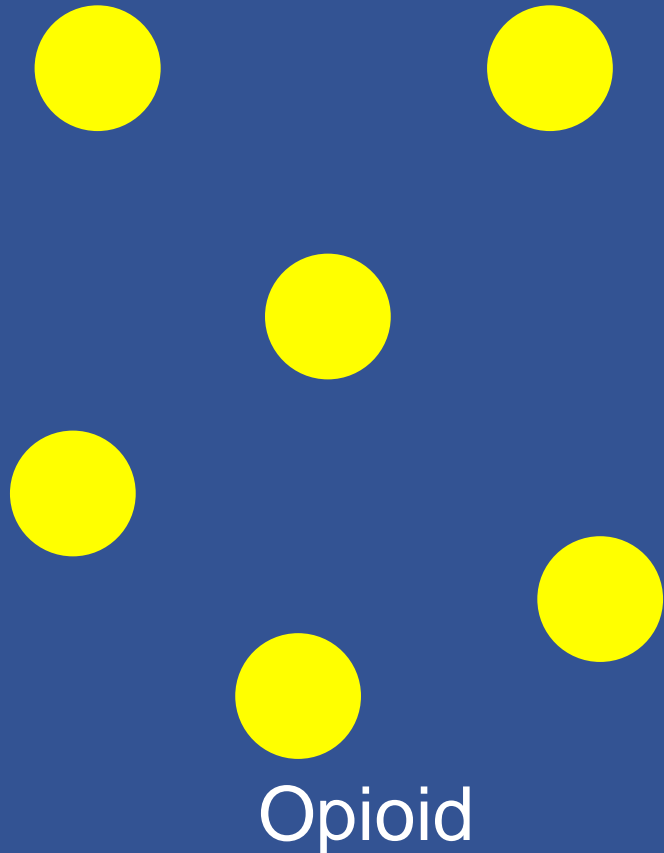
- NIH-led research initiative to:
 - Improve prevention and treatment of opioid misuse, addiction
 - Enhance pain management
- ~\$945M (FY19) in research funding
 - ~375 awards – in 41 states
- Coordinated effort across sectors: from government agencies to local communities

www.nih.gov/heal-initiative

In 10 Years, We Will Have...

7

Deployed genomics, neuroscience, structural biology to uncover new targets for addiction prevention, treatment of pain

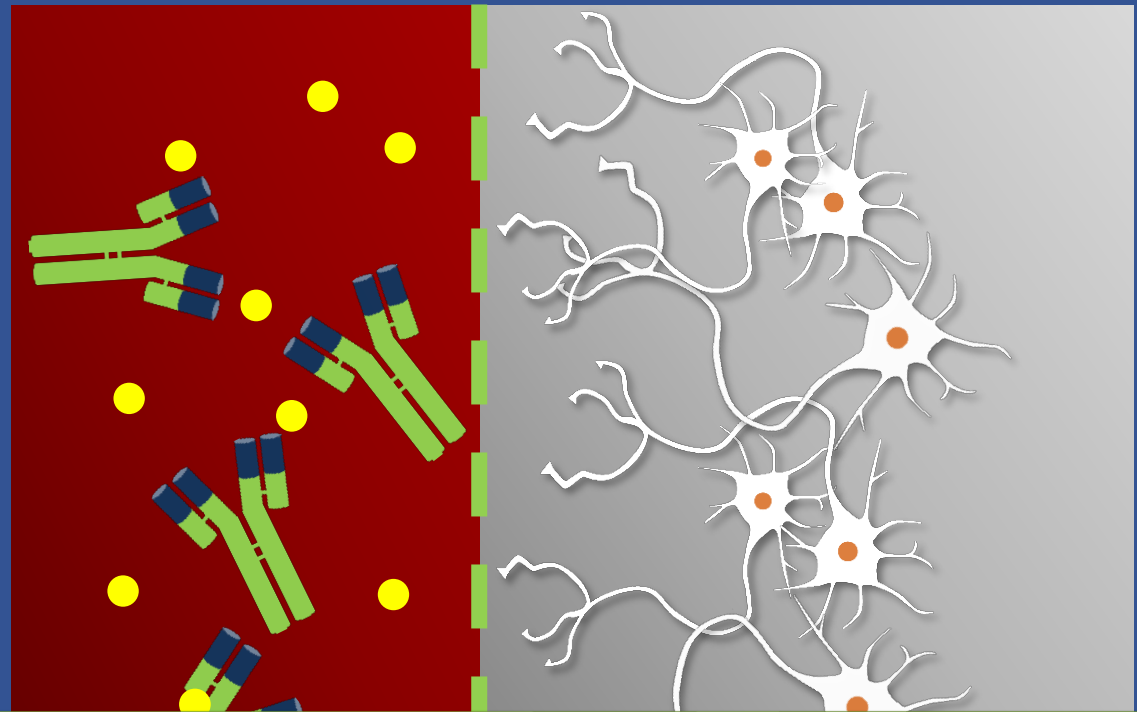
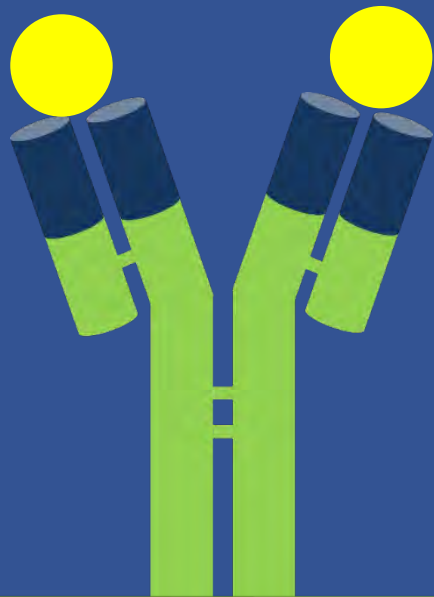


In 10 Years, We Will Have...

7

Deployed genomics, neuroscience, structural biology to uncover new targets for addiction prevention, treatment of pain

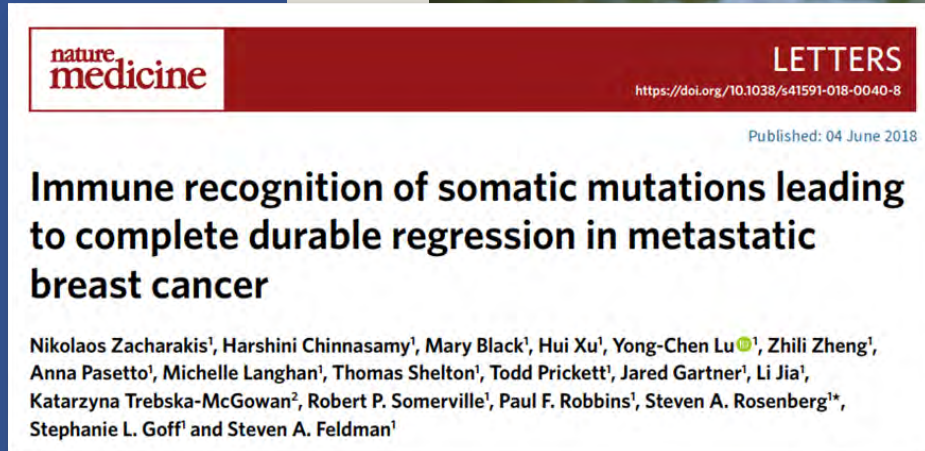
Opioid



Strategies that will end the opioid crisis – and lessen patients' pain

In 10 Years, We Will Have...

Accelerated immunotherapy, other advances through the Cancer MoonshotSM



nature
medicine

LETTERS

<https://doi.org/10.1038/s41591-018-0040-8>

Published: 04 June 2018

Immune recognition of somatic mutations leading to complete durable regression in metastatic breast cancer

Nikolaos Zacharakis¹, Harshini Chinnasamy¹, Mary Black¹, Hui Xu¹, Yong-Chen Lu¹, Zhili Zheng¹, Anna Pasetto¹, Michelle Langan¹, Thomas Shelton¹, Todd Prickett¹, Jared Gartner¹, Li Jia¹, Katarzyna Trebska-McGowan², Robert P. Somerville¹, Paul F. Robbins¹, Steven A. Rosenberg^{1*}, Stephanie L. Goff¹ and Steven A. Feldman¹



Expanding the reach of immunotherapy to provide cures for solid tumors

In 10 Years, We Will Have...

Actualized the potential of precision medicine through the *All of Us* Research Program



Patient Partnerships



Electronic Health Records



Technologies



Genomics



Data Science

In 10 Years, We Will Have...

9

Actualized the potential of precision medicine through the *All of Us* Research Program



All of Us | The Future of Health Begins With You
RESEARCH PROGRAM

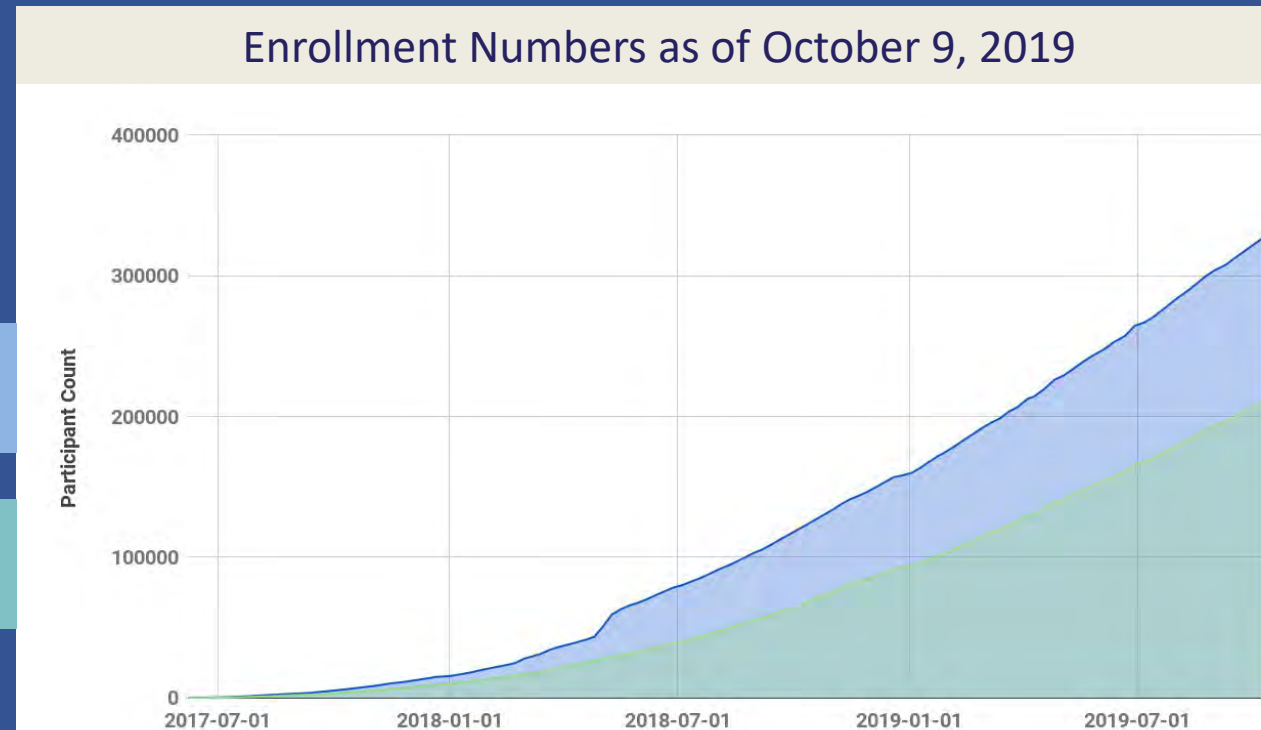
In 10 Years, We Will Have...

Actualized the potential of precision medicine through the *All of Us* Research Program

www.joinallofus.org

326,976
Started enrollment

209,518
Completed all steps

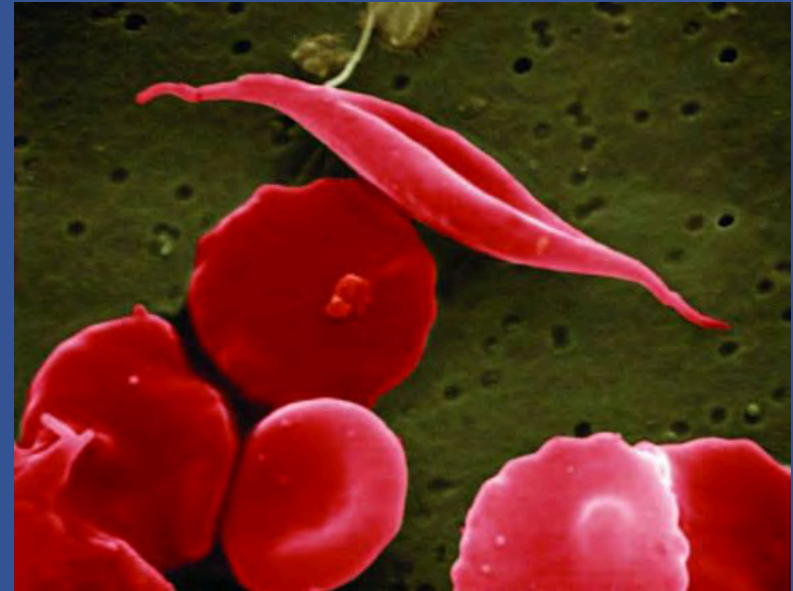


*Advancing individualized prevention, treatment, and care –
and YOU TOO can be One in a Million!*

In 10 Years, We Will Have...

10

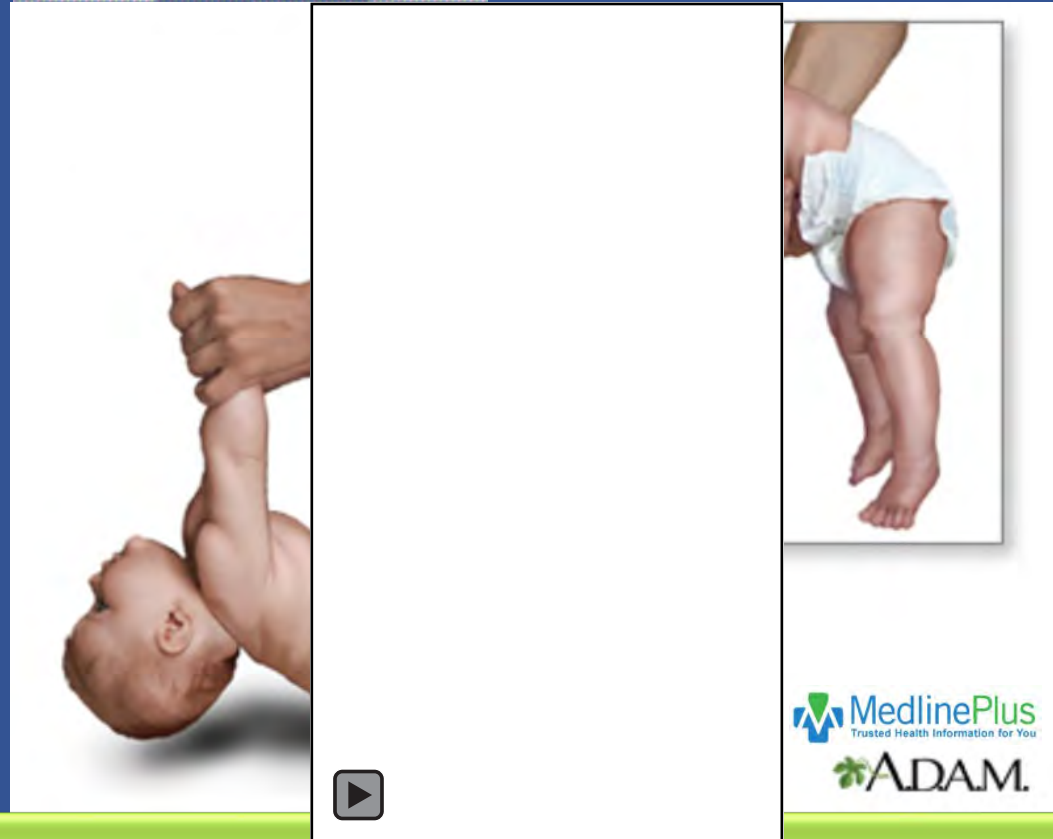
Harnessed the power of CRISPR-Cas and other gene editing tools



In 10 Years, We Will Have...

10

Harnessed the power of CRISPR-Cas and other gene editing tools



Preventing loss of motor function from SMA and other related inherited diseases

Gene Therapy for Sickle Cell Disease

10



60 MINUTES

COULD GENE THERAPY CURE SICKLE CELL ANEMIA?


An NIH clinical trial is ushering in a genetic revolution as an innovative type of gene therapy is used to attempt to cure sickle cell anemia.

2019
MAR 10

CORRESPONDENT
JONATHAN LAPOOK



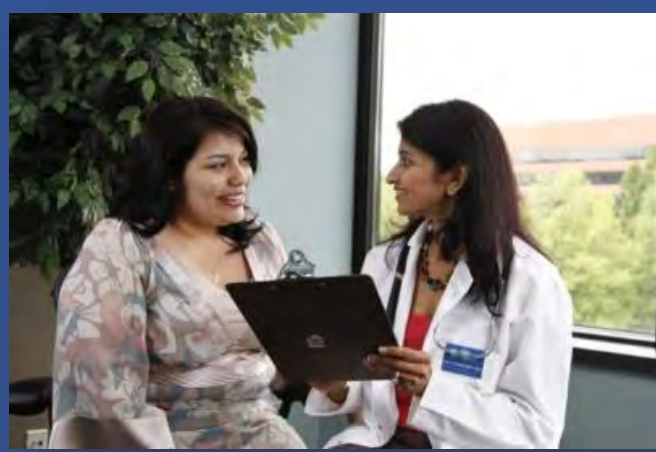
Offering effective cures for all individuals with SCD



Hope in every sphere of
life is a privilege that
attaches to action.
No action, no hope.

~ Peter Levi





NIH... *Turning Discovery Into Health*

www.nih.gov/hope

directorsblog.nih.gov

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