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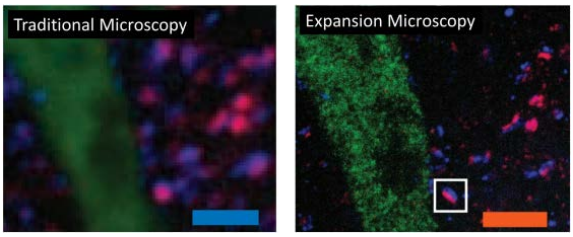
LabTV: Young Scientist on a Mission to Cure

Diaper Compound Brings Change to Cell Microscopy

Posted on March 26, 2015 by Dr. Francis Collins



Caption: *Mouse brain tissue as viewed by traditional microscopy (left) and expansion microscopy (right), which makes it possible to visualize individual synapses (example in white box). In both views, green indicates neurons; blue, pre-synaptic proteins; and red, post-synaptic proteins.*
Credit: *Ed Boyden, Fei Chen, Paul Tillberg, MIT*

Light microscopy has been a mainstay of neuroscience and many areas of biology for more than a century. But the resolution limit of light, based on immutable physical principles, has kept the fine details of many structures out of view. Scientists can't change the laws of physics—but NIH-supported researchers recently devised a highly cre way to see images that were previously out of reach, by expanding the contents of tissue

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About the NIH Director

Francis S. Collins, M.D., Ph.D., was officially sworn in on Monday, gust 17, 2009 as the 16th director of the National Institutes of

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To create such images, MIT neuroscientist Ed Boyden, along with graduate students Fei Chen and Paul Tillberg, start by labeling proteins of interest with fluorescent antibodies. The sample is then embedded within a 3D mesh of sodium polyacrylate, with the fluorescent molecules on the antibodies connecting to the sodium polyacrylate. The proteins are dissolved, leaving the fluorescent labels attached to the expandable polymer. The researchers then add water, and the polymer matrix swells evenly in three dimensions just as it does in a diaper. The final product is a neural landscape with greatly enlarged cell structures that also appear transparent, making them perfect for microscopy.

Expansion microscopy can be used to scan whole brain structures and show entire neural networks in 3D. To date, Boyden, who is a recipient of both the NIH Director's Pioneer and Transformative Research awards, has tested expansion microscopy on brain cells cultured in the lab and on slices of neural tissue from mice. Who knows where he'll take it from here?

References:

[1] Optical imaging. Expansion microscopy.

Tweets from the NIH Director

Jamie Gentile tells her amazing story of how NIH/Children's Inn saved her life 25 yrs ago from HIV. #EveningForHope http://t.co/d22Wcg93Ic 15 hours ago

Celebrating 25 yrs of the Children's Inn. Aishlinn (who's 12 yo) sang "A Place Like Home", the new theme song. Wow! http://t.co/8oInaFPCQN 16 hours ago

Leading #Alzheimer's & chronic disease experts came to #NIH to recommend a path to transform Alzheimer's research: 1.usa.gov/1zyJxIc 1 day ago

Neat controller switches mice behavior on&off-this #NIH #BRAINI research helps us understand brain circuit disorders 1.usa.gov/1QPl9XW 2 days ago

Next up on LabTV:

Chen F, Tillberg PW, Boyden ES. Science. 2015 Jan 30;347(6221):543-8.

[2] Microscopy. The superresolved brain. Dodt HU. Science. 2015 Jan 30;347(6221):474-5.

Links:

Video: Superabsorbent Diaper Compound May Soup Up Brain Cell Imaging (National Institute of Neurological Disorders and Stroke/NIH and McGovern Institute for Brain Research at MIT)

Synthetic Neurobiology Group, Ed Boyden, MIT, Cambridge, MA

NIH Director's Pioneer Award Program (Common Fund/NIH)

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