NEURONEWS NEURONEWS NEURONEWS NEURONEWS NEURONEWS NEURONEWS

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NP Faculty: Erik Jorgensen
Nerve cells are 'ultrafast' recyclers

By Lindsay Whitehurst | The Salt Lake Tribune
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New research at the University of Utah indicates a key part of the communication between nerve cells can happen much faster than previously thought.

The discovery could one day help treat degenerative diseases such as Lou Gehrig's and Alzheimer's.

Researchers examined how cells recycle tiny, bubble-like vesicles that move neurotransmitters between synapses. Vesicles are formed in cell nuclei, and after they deliver their cargo, they melt back into the cell's outer plasma membrane, a little like a soup bubble releasing steam and popping.

The process happens hundreds of times per second, and it's how the brain gets messages like, the stove is hot! or move your finger now!

Vesicles are a hot topic in neuroscience — other research on how they're formed and function won a Nobel prize this year.

In the new study published Wednesday in the journal Nature, U. scientists and German biologists studied how vesicles are recycled to make new ones. The researchers found the process can happen in one-tenth of a second — much faster than previous hypotheses of 1 to 20 seconds.

"If you are sending vesicles formed in the nuclei to the synapse, every time you use one it takes forever, so you have to locally regenerate the vesicles," said Shigeki Watanabe, a postdoctoral fellow in biology and first author on the paper.

The process is called ultrafast endocytosis. U. biology professor and senior author Erik Jorgensen says it's a little like Whac-a-Mole.

"One vesicle goes down (fuses and unloads) and another pops up someplace else," he said in a statement.

Each cell has a supply of 300 to 400 of these little messengers at any one time. They're used and recycled so fast that a single cell can use several hundred per second.

"Without recycling these containers ... you could move once and stop, think one thought and stop, take one step and stop, and speak one word and stop," Jorgensen said.

The researchers set up a unique method to study the process. They bred mice with an algae gene that caused their brain cells to fire up when exposed to light. Researchers removed some of those cells, cultured them and then flash-froze the cells with a blast of liquid nitrogen in the act of turning on.

"We found a way to look at this process on a timescale that no one ever looked at before," Watanabe said in a statement. The researchers studied the frozen neurons under an electron microscope.

The scientists will now look at how often the cells use ultrafast endocytosis — Jorgensen believes it's more common than previously identified methods, called kiss-and-run endocytosis and clathrin-mediated endocytosis.

The new method may also help protect neurons from disease, so understanding it better could also help treat neurodegenerative disorders.

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READ MORE: University of Utah press release: http://unews.utah.edu/news_releases/how-our-nerves-keep-firing/

****Postdoctoral Position****

We are looking for a post-doctoral student interested in angiogenesis and retinal diseases as well as neurovascular relations in development and disease. We want someone very interested in and comfortable with molecular biology techniques and strategies. Comfortable working with animals. I'm copying Haibo too so she can be involved in this. Let us know what other information you need.

Mary Elizabeth Hartnett, MD
Professor of Ophthalmology
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From the Recruitment Committee Chair- Megan Williams

The fall is a busy time for the recruitment committee! This year two students were selected to return to their undergraduate alma mater to give a research seminar, discuss the Neuroscience program, and recruit future students. Many thanks for a job well done!

Adam McPherson: Clark University
Daniel Ryskamp: University of Idaho

The Neuroscience program was also well represented at several fall recruitment events including the 3rd annual ENDURE (Enhancing Neuroscience Diversity through Undergraduate Research Education) meeting and the Graduate School Fair at the SFN meeting in San Diego.

The recruitment committee is looking forward to putting Utah's Neuroscience Program on the map to even more outstanding prospective students next year and is looking for **graduate student volunteers to join the committee.** If you are interested, please email Megan Williams.

Megan Williams (Neurobiology & Anatomy): also visited her alma mater Juniata College and gave a seminar.

****Other Important Dates****

Feb. 14: Neuroscience Program Recruitment. Our annual reception devoted to recruiting student candidates for the upcoming academic year will be held at the Jewish Community Center, 2 North Medical Drive, Friday, February 14th from 5:00-9:00pm. There will be, of course, the usual amounts of food and drink **AND chocolate fountain!**

March 10-15: National Brain Awareness Week. Judd Cahoon, Tiffanie Dahl and Sarah Redmon are co-chairs of the committee this year.

May 14: Annual Neuroscience Student Symposium
Student organizer: Becca Pfeiffer

Oct. 24: Annual Snowbird Symposium
Student organizers: Maryam Bijanzadeh and Punitha Subramaniam

****SEMINAR SERIES 2011-2012****

January 21: Lisa Boulanger, Ph.D., Princeton U
February 18: Ilya Bezprozvanny, Ph.D., D. Sci., U TX Southwestern Medical Center
March 18: Susan Ferguson, Ph.D., U Washington
April 15: Beth Stevens, Ph.D., Harvard, Boston Children's Hospital

see more details at:
http://neuroscience.med.utah.edu/Meetings.html

****STUDENT AWARDS****

Elissa Pastuzyn was selected for and attended the Learning and Memory course at Cold Spring Harbour Laboratory this summer. One of 15 students selected world wide to attend. http://meetings.cshl.edu/courses/2013/c-memo13.shtml

Elissa has also been appointed to the Developmental Biology Training Grant as a postdoc.

ACADEMIC DEFENSES

Since the last issue of NeuroNews, the Neuroscience Program congratulates the following students on successfully defending their dissertations: **Eric Bend (Jorgensen lab), Vernon Twede (Olivera lab).**

Also, since the last issue of NeuroNews, the Neuroscience Program congratulates the following students on successfully passing their dissertation proposals: **Leo Parra (Jorgensen lab)**, and **Jeff Yarch (Angelucci lab).**

****BAW NEWS****

Brain Awareness Week (BAW):

The BAW committee would like to invite the entire neuro community to participate in Brain Awareness Week, March 10-15. Here are three ways in which you can help out. 1) Suggest a theme. Perhaps you can remember t-shirts from years past that did a great job of expressing our themes. Get your Brain in Gear and Making Waves are just the two most recent examples. If you have a great idea, share it with us (judd.cahoon@hsc.utah.edu) and it just may live forever on a t-shirt. 2) Suggest a Logo. Any creative design aficionados are welcome to submit their logos to us. 3) Volunteer. Plan on sparing a morning or two to help out during Spring Break.

Our reputation as strong, exciting, and fun community educators has been built over years of great leadership. Currently, we have schools contacting us wanting to get in on the action. This will require your help and the NeuroCommunity has always stepped up to the challenge and delivered. So plan on a few mornings or afternoons the week of Brain Awareness (again March 10-15) and keep the great tradition alive.

Stay posted for more opportunities to get involved, including training sessions as BAW approaches.

Brain Awareness Week Co-chairs:

Judd Cahoon, Tiffanie Dahl, and **Sarah Redmon**

From the Admissions Committee Chair - Jeanne Frederick

The Neuroscience Program sincerely appreciates the leadership and enthusiasm of past chair, **Ning Tian, MD PhD** (Ophthalmology & Visual Sciences) as record-size classes were admitted over the past 3 years. Going forward, the committee consists of returning members **Drs. Chris Gregg** and **Jason Shepherd** (Neurobiology and Anatomy); **Jeanne Frederick, Yingbin Fu** and **David Krizaj** (Ophthalmology & Visual Sciences); **Karen Wilcox** (Pharmacology and Toxicology) and **Julie Korenberg** (Pediatrics, Integrated Neuroscience and Human Behavior-The Brain Institute). New members include **Drs. Michael Deans** (Otolaryngology), **Chuck Alan Dorval** (Bioengineering) and **Ayako Yamaguchi** (Biology). Recruiting weekend commences on February 14th (Valentine's Day) with interviews throughout that Friday, followed by an evening JCC reception. We encourage current students to recall their interview experience, and graciously host their potential incoming colleagues!

****ALUMNI NEWS****

Tim Simeone: Simeone, K.A., Matthews, S.A., Samson, K.K., and **Simeone TA.** (2013) Targeting deficiencies in mitochondrial respiratory complex I and functional uncoupling exerts anti-seizure effects in a genetic model of temporal lobe epilepsy and in a model of acute temporal lobe seizures. *Exp Neurol.,* Nov 20. doi:pii: S0014-4886(13)00329-4. 10.1016/j.expneurol.2013.11.005. [Epub ahead of print] PMID: 24270080

Andrea Schwager: has started her postdoc at the University of Iowa in the lab of Ryan LaLumiere.

Benedict C. Albensi: received tenure at the University of Manitoba, Faculty of Medicine, Dept of Pharmacology & Therapeutics in November 2013.

Snow, W.M., Stoesz, B.M., Kelly, D.M., and **Albensi, B.C.** (2013) Roles for NF-κB and Gene Targets of NF-κB in Synaptic Plasticity, Memory, and Navigation. *Mol Neurobiol.*, Oct 13. [Epub ahead of print] PMID:24122352 [PubMed - as supplied by publisher]

Kastyak-Ibrahim, M.Z., Di Curzio, D.L., Buist, R., Herrera, S.L., **Albensi, B.C.**, Del Bigio, M.R., and Martin M. (2013) Neurofibrillary tangles and plaques are not accompanied by white matter pathology in aged triple transgenic-Alzheimer disease mice. *Magn Reson Imaging*, Nov;31(9):1515-21. doi: 10.1016/j.mri.2013.06.013. Epub 2013 Aug 29. PMID:23993791 [PubMed - in process]

Arie Mobley: Mobley, A.S., Rodriguez-Gil, D.J., Imamura, F., Greer, C.A. (2013) Aging in the olfactory system. *Trends in Neurosciences,* DOI information: 10.1016/j.tins.2013.11.004

Katherine Zukor: Zukor, K., Belin, S., Wang, C., Keelan, N., Wang, X., and He, Z. (2013) Short hairpin RNA against PTEN enhances regenerative growth of corticospinal tract axons after spinal cord injury. *J Neuroscience,* 33:15350.

****NEW FACULTY****

Since the last issue of NeuroNews we have added the following new faculty:

Michael Deans, Ph.D., Assistant Professor of Otolaryngology. Research: Mechanisms of sensory system development and cellular morphogenesis

****RECENTLY PUBLISHED****

Anderson, J.S., **Nielsen, J.A.**, Ferguson, M.A., Burback, M.C., Cox, E.T., Dai, L., Gerig, G., Edgin, J.O., & **Korenberg, J.R.** (2013) Abnormal brain synchrony in Down Syndrome. *Neuroimage Clin*, 2:703-715. PMCID: 3778249

Cahoon, J.M., Miya, T.R., Olson, P.R., Bankhead, P., McGeown, G., Curtis, T., and **Ambati, B.K.** Acridine orange leukocyte fluorography in mice. *Experimental Eye Research*, Accepted December 2013

Gibbons, M.B., Smeal, R.M., **Takahashi, D.K.**, Vargas, J.R., and **Wilcox, K.S.** (2012) Contributions of Astrocytes to Epileptogenesis Following Status Epilepticus: Opportunities for Preventive Therapy? *Neurochemistry International. Special Issue: Glial cells and epilepsy*. PMID: 23266599

Kalita, M., Balivada, S., Swarup, V.P., **Mencio, C.P.**, Raman,K., Desai, UR., Troyer, DL & **Kuberan, B.** (2013) A nanosensor for the ultrasensitive detection of oversulfated chondroitin sulfate contaminant in heparin. *Journal of the American Chemical Society*. [epub ahead of print] Oct 15. Pubmed ID: 24127748

Krizaj, D., Ryskamp, D. A., Tian, N., Tezel, G., Mitchell, C. H., Slepak, V. Z., & Shestopalov, V. I. (2013) From Mechanosensitivity to Inflammatory Responses: New Players in the Pathology of Glaucoma. *Current eye research*, (0), 1-15.

Lopez-Larson, M., King, J.B., McGlade, E., Bueler, E., Stoeckel, A., **Epstein, D.J.**, and **Yurgelun-Todd, D.** (2013) Enlarged Thalamic Volumes and Increased Fractional Anisotropy in the Thalamic Radiations in Veterans with Suicidal Behaviors. *Front Psychiatry*, Aug 2013; 4:83.

Mansour, S.L., Li, C., and Urness, L.D. (2013) Genetic rescue of Muenke syndrome model hearing loss reveals prolonged FGF-dependent plasticity in cochlear supporting cell fates. *Genes Dev.*, Nov 1;27(21):2320-2331.

Morris, A.M., **Curtis, B.J.**, Churchwell, J.C., Maasberg, D.W., and **Kesner, R.P.** (2013) Temporal associations for spatial events: The role of the dentate gyrus. *Behavioral Brain Research*, Vol 256, p. 250-256. PMID: 23973766

Nielsen, J.A., Zielinski, B.A., Ferguson, M.A., **Lainhart, J.E.**, & **Anderson, J.S.** (2013) An evaluation of the left-brain vs. right-brain hypothesis with resting state functional connectivity magnetic resonance imaging. *PLoS One*, 8(8): e71275. PMCID: 3743825

Pastuzyn, E.P., and **Keefe, K.A.** (2013) Changes in neural circuitry regulating response reversal learning and Arc-mediated consolidation of learning in rats with methamphetamine-induced partial monoamine loss. *Neuropsychopharmacology,* advance online publication 20 November 2013; doi: 10.1038/npp.2013.296.

Smith, G.K., Kesner, R.P. and **Korenberg, J.R.** (2013) Dentate gyrus mediates cognitive function in the Ts65Dn/DnJ mouse model of down syndrome. *Hippocampus*, in press. doi: 10.1002/hipo.22229

Swarup, V., **Mencio, C.**, Hlady, V. & **Kuberan, B.** (2013) Sugar glues for broken neurons. *Biomolecular Concepts*, 4(3):233-257.

Umpierre, A.D., **Remigio, G.J.**, Dahle, E.J., Bradford, K., Alex, A.B., Smith, M.D., **West, P.J.**, **White, H.S.**, and **Wilcox, K.S.** Impaired cognitive ability and anxiety-like behavior following acute seizures in the Theiler's virus model of temporal lobe epilepsy. Neurobiology of Disease, accepted.

Watanabe, S., Rost, B.R., Camacho-Pérez, M., Davis, M.W., Söhl-Kielczynski, B., Rosenmund, C., and **Jorgensen, E.M**. (2013) Ultrafast endocytosis at mouse hippocampal synapses. *Nature,* Dec 12;504(7479):242-7. doi: 10.1038/nature12809. Epub 2013 Dec 4. PMID: 24305055 [PubMed - in process]

West, P.J., Saunders, G.W., **Remigio, G.J.**, **Wilcox, K.S.**, and **White, H.S.** Antiseizure Drugs Differentially Modulate Theta-Burst Induced Long-Term Potentiation in C57BL/6 Mice. *Epilepsia*, in press.

Do you have something to submit in the next issue of NeuroNews?
Send your information to: Tracy Marble, Program in Neuroscience
401 MREB, FAX: 581-4233, or e-mail: tracy.marble@hsc.utah.edu