



The BRAINet SYNAPSE

BRAINet is a friends group of the OHSU Brain Institute (OBI) that helps build community awareness, interest, and support for neuroscience research at OHSU.

BRAINet Synapse Newsletter

March 2017

President's Message

*By Helen Richardson,
BRAINet President*

Dear BRAINet Members,

What a wonderful time for those of us intrigued with learning about the brain! We have the three Brain Awareness Lectures - *The Criminal Brain*; *Touch: The Science of Hand, Heart and Mind*; and *Sleep, Memory and Dreams: Putting it all together*. In addition, the Teacher Workshop and Brain Fair at OMSI present additional opportunities for targeted learning by educators and hands-on experiences for everyone. I hope you are able to participate in many if not all of these opportunities. I hope to see you at some of them.

Best regards,
Helen Richardson, President



February Lecture Luncheon On the Brain Blog

In February we were honored to hear from Dr. Peter Spencer about neurotoxicity around the globe, specifically Nodding Syndrome in East Africa. Below you will find a blog post summarizing his and his colleagues' research.



Fatal fits and nods affect us all

A child with intractable seizures is heartbreaking for family, friends and the neurologist who searches for effective therapy. But a child with intractable seizures who lives in dire poverty, who is malnourished, who cannot obtain medications, and who is rejected by government, by school and eventually by a desperate family is utterly devastating to anyone with compassion for humanity.

This is precisely the situation today for thousands of children affected by **Nodding Syndrome** in northern Uganda and South Sudan. A child with this illness visibly nods their head up and down when stimulated by food or cold. The child may develop mental and behavioral problems, develop generalized seizures, have lapses in consciousness, fall into fires or drown in a river. It can affect multiple children in a single family, which itself seeks to survive with meager food, dirty water and no social support. They resort to tying their sick children to trees to stop them wandering but,

eventually, neglect sets in as they turn their attention to survival of the fittest: themselves and their remaining healthy children.

How did this happen? What is the cause? How can it be prevented?

The setting is one of prolonged politics-driven human conflict, civil unrest, population migration to internal displacement camps and the provision of emergency food supplies.

In Uganda, an important component was the war between

the separatist movement known as the Lord's Resistance Army (LRA) and the Ugandan government, which resulted in LRA recruitment of large numbers of child soldiers who were required to perform unspeakable acts of violence on their own families and communities. Yet, none of these children are known to have developed Nodding Syndrome.

In South Sudan, the children of cattle herders were spared, the epidemic falling on sessile subsistence farmers who grew crops for their own use with leftover sold at market. Families who lived by fast-flowing rivers where black flies breed had children more at risk for Nodding Syndrome, and a nematode parasite transmitted from insect to child was prominent in children with the brain disease. Some thought this parasite, which causes **River Blindness**, also causes Nodding Syndrome but it now seems likely this is a secondary infection because of a compromised immune system.

Peter Spencer, Ph.D., a professor of Neurology at OHSU, together with **Valerie Palmer**, OHSU Instructor of Neurology, has researched Nodding Syndrome in the three affected countries: South Sudan, Tanzania and Uganda.

Spencer participated in a **World Health Organization** outbreak investigation team in then-southern Sudan that first defined the illness. In Tanzania, Spencer and Palmer surveyed the high-incidence focus of Nodding Syndrome and, with original clinical notes dating from 1960, demonstrated that head



nodding was recorded as early as 1934. Then, in Uganda, they worked with OHSU students to show the relationship between civil war, population internment, and the outbreak of Nodding Syndrome. In 2014, with dedicated NIH grant support, they joined with OHSU, OSU, and Ugandan researchers to carry out a case-control study of Nodding Syndrome in the devastated community described above.

They announced their preliminary findings at an international conference on Nodding Syndrome in northern Uganda and recently published in the *Journal of Neurological Sciences*, an official journal of the World Federation of Neurology.

The case-control study revealed that children with Nodding Syndrome had a significantly higher history of measles infection in Internal Displacement Camps, where population density was high, immunization was unavailable and food in very short supply such that affected families relied more on moldy maize.

Drawing on publicly available data, they showed that a measles epidemic had preceded the Nodding Syndrome by several years, a temporal relationship similar to that of measles and a devastating neurodegenerative disease called subacute sclerosing panencephalitis (SSPE).

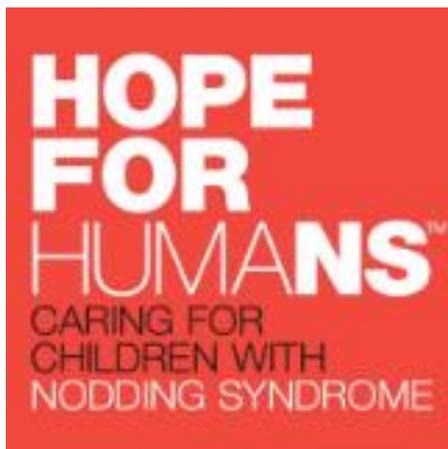
They pointed out the similar clinical features of Nodding Syndrome and SSPE and called for detailed neuropathological studies to prove or disprove the relationship between measles and Nodding Syndrome. The CDC had found crystalline structures in the brains of three affected children but the results had been uncertain and never published. However, cellular crystalline structures are found in SSPE and correspond to huge numbers of measles virus nucleocapsids that migrate to and then hide in the brain after the initial infant illness. What causes their release from the brain years later is unknown, but Spencer and colleagues raise the possibility that immunosuppressive fungal toxins in moldy food may be key.

Nodding Syndrome is a devastating degenerative disease of the brain that nevertheless can be stabilized with the anti-

seizure medication and proper nutrition. This has been demonstrated by the remarkable successes of a U.S. charity, **Hope for Humans**, that has cared and nurtured affected children in Uganda. However, their successes have not been widely recognized and their activities in Uganda are now threatened by financial shortages and lack of government support.

Hope for Humans partners with Dr. Spencer's team in their effort to understand and prevent Nodding Syndrome, but this dreadful illness will not be overcome unless public support is forthcoming. While Hope for Humans seeks your support, Dr. Spencer's international team continues to seek NIH support to test their hypothesis that Nodding Syndrome is a paramyxovirus disorder that can be prevented by proper infant vaccination.

If true, this is an important lesson for all societies, our own included, to ensure that all infants receive recommended vaccinations not only to prevent childhood illnesses but also the devastating consequences later in life. Measles is just one of many so-called neurotropic viruses that can hide in the brain for years or decades before they reactivate and cause neurodegenerative disease.



www.hopeforhumans.org

March Lecture Luncheon



Our lecture luncheon will be on **Monday, March 20, at 11:30 a.m.** at the Multnomah

Athletic Club. Dr. Vijayshree Yadav will present *"MS and the diet buzz – an update"*.

Dr. Yadav is a board certified neurologist who received her medical degree in 1995 from SN Medical College in Agra, India. Dr. Yadav's research interests include complementary and alternative treatment options for multiple sclerosis including dietary and life style changes as well as supplements such as lipoic acid.

11:30 Registration and Lunch Served

12:00-1:00 Lecture

To register and pre-pay to secure your reservation (you can renew your membership at the same time!), please visit:

<https://goo.gl/FdGndM>

Registration will close at midnight on Wednesday, March 15.

This month we will be served Forest Mushroom Risotto.

Brain in the News:

Warm-Sensitive Brain Cells

by George Ivan Smith, BRAINet member

Long-sought 'Warm-Sensitive' brain cells were identified by UCSF researchers, said Zachary Knight, PhD, in a 7-8-2016 online issue of *Cell* as reported 7-8-16 in *Brain in the News* article.

Results challenge accepted explanations of how mammals cool off when too warm.

Experiments dating back 80 years pointed to the preoptic hypothalamus (POA) a tiny area that governs sleep, hunger and sex., making it hard to pinpoint which cells and synapses detect and respond to warmth.

In the new study, Chan Lek Tan, PhD, led the team using a tool called phospho TRAP to see which genes were most selectively expressed in the POA cells active when they placed mice in warm environments. They found genes known as PACAP and BDNF were expressed in neurons activated in warmth.

The group used genetic tools to place fluorescent markers in POA cells expressing either PACAP or BDNF. They found a high level of overlap, suggesting these might be the warmth-sensing cells, so they again used genetic tools to engineer this cell population for monitoring with fiber optics. Mice placed in chambers built to allow rapid temperature changes showed PACP/ BDNF cells became active with temperature increases.

The response was within seconds, indicating that the PACAP/BDNF cells get input from thermal sensors in the skin. This result sharply contrasts with prevailing models that propose POA cells somehow detect subtle changes in the body's core temperature. This finding goes against most textbooks.

When the researchers flipped their methodology, using optogenetic techniques, they saw robust and immediate behavior response. After light stimulation of PACP/BDNF cells mice sought a cooler spot immediately on a track with continuously varying temperature.

[http://www.cell.com/cell/pdf/S0092-8674\(16\)31079-0.pdf](http://www.cell.com/cell/pdf/S0092-8674(16)31079-0.pdf)

Upcoming Brain Awareness Season Events

Click on the text for more information

- [Brain Fair, March 11](#)
- [Teacher Workshop, March 18](#)
- [Brain Awareness Season Lecture Series](#)
 - March 20: [Octavio Choi, M.D., Ph.D.— *The Criminal Brain*](#)
 - March 27: [David Linden, Ph.D.— *Touch: The Science of Hand, Heart and Mind*](#)
 - April 4: [Robert Stickgold, Ph.D.— *Sleep, Memory and Dreams: Putting it all Together*](#)

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