Emerging Concepts of the Neuronal Cytoskeleton III
Workshop Report

Aims

The Emerging Concepts of the Neuronal Cytoskeleton Workshop was born from the idea that scientists working in the same field need to gather and interact on a regular basis. There are quite a few big congresses which Latin American scientists attend each year to meet with top researchers in the neurochemistry, neuroscience and cell biology fields. However, small meetings, focused on a specific issue, are hard to find and attend.

This report summarizes activities held during the third workshop in this series, which started in 2011. This year this workshop again provided a great opportunity for Latin American scientists to meet with and share science with leading researchers on the neuronal cytoskeleton coming from North America, Europe and Asia. The workshop also offered a close and friendly environment that helped to stimulate interaction and collaboration amongst the attendees. Most importantly, this workshop brought together students and speakers, in order to have an even greater impact on Latin American training and education. All the students and applicants were eligible to receive a fellowship covering the cost of the workshop. In order to be accepted to participate in the workshop, they had to present their own research in a poster session. This activity allowed them to interact with speakers, providing the opportunity to improve their own research, and to establish contacts for future rotations or visits to foreign laboratories.

The goals defined for our workshop series are: 1) to bring top US and European researchers to Latin American together in a stimulating environment to discuss the neuronal cytoskeleton, a central research area in cell biology that is very important for local researchers; 2) to further the training and education of Latin American students by providing them with a valuable opportunity to interact with leading scientists in this field; 3) to provide an opportunity for the formation of new collaborations between Latin American and foreign scientists; and 4) to offer Latin American students the opportunity to make the connections necessary to arrange rotations, research visits, and postdoctoral fellowships in leading foreign laboratories.

The organizing committee was formed by Dr. Anthony Brown (Ohio State University) and Dr. Christian Gonzalez-Billault (Universidad de Chile, Chile).

Attendees and demographics

The workshop took place at Hotel Patagonico, Puerto Varas, Chile during March 22-26th, 2013. We had 82 attendees from Latin America, US, Europe and Asia. The nationality of the participants was as follows: Chile (25), USA (17), Argentina (3), Colombia (3), France (3), Canada (1), India (1), Brazil (3), Portugal (2), Germany (4), Japan (3), Norway (4), Netherlands (4), Italy (2), Israel (2), Belgium (1), Spain (1) and UK (2).

The scientific program

The workshop was organized in seven scientific sessions, one plenary lecture, 6 short-talks given by postdocs and young PIs and two poster sessions **(Appendix 1. Program and Abstracts Book)**.

Keynote lecture

The workshop started with the Keynote Lecture by Prof. Richard Vallee, where he addressed the contribution of microtubule-based motors to the migration of neurons during corticogenesis.

Session 1: Neuronal polarity

The first session focused on new developments in our understanding of how neuronal processes become polarized into distinct axonal and dendritic compartments. The session began with a discussion of how extracellular millieu regulated acquisition of neuronal polarity both in vitro and in vivo. Then, the role for actin microfilaments and myosin motors during neuronal polarization was presented. A graduate student, presented during this session his discovery of a novel MAP protein that contributes to the maintenance of uniform microtubule polarity in axons during neuronal polarization. Finally, the role for actin patches at the axonal initial segment and its regulatory mechanisms were discussed by a second graduate student.

Session 2: Transport and trafficking

The second session, which was devoted to transport and trafficking in neuronal cells, started with a talk in which the transport, annealing and severing of neurofilaments was discussed; emphasizing mechanisms regulating those processes. Then, the importance of microtubule movements inside neurons was discussed in the context of the organization of the axonal microtubule array in different neuronal sub-cellular domains. Finally, the coupling of neurotrophin receptor endocytosis and endosome trafficking was addressed as part of the cellular mechanisms involved in dendrite development.

Short talks from young researchers

The next session was dedicated to short talks from young researchers. It started with a presentation showing how the coupling of presynaptic neuronal functions and postsynaptic muscle cells can be studied in vitro using micro-compartimentalized chambers. It was followed by an interesting study showing how human mutations related to an autistic syndrome disorder affect the actin cytoskeleton and protein translation. Finally, the dynamic behavior of filopodia in response to repulsive extracellular cues was presented, showing that repulsive responses are preceded by active changes in filopodia dynamics.

Session 3: Cytoskeleton in disease and injury

In the third session the role of cytoskeleton in disease and injury was discussed. The first talk addressed the role of actin rods in neurodegeneration, showing that the production of reactive oxygen species derived from different sources is necessary to promote rod formation. The next talk addressed how astrocyte plasticity provides neuroprotection in response to excitotoxicity by a mechanism involving actin regulators and neurotrophin secretion. The third talk addressed the contribution of neuronal protein kinases to the phosphorylation of key

elements regulating microtubule stabilization and their potential role in psychiatric disorders. Finally, recovery from spinal cord injury was evaluated in the context of microtubule promoting functions in vivo, suggesting that targeting cytoskeleton may be a suitable therapeutic approach to ameliorate neurotrauma.

Session 4: Cytoskeleton in synapses and spines

The fourth session was devoted to the role of the cytoskeleton in synapses and dendritic spines. The first speaker discussed how phosphoinositide 3-kinase regulates dendritic spine assembly by targeting an actin binding protein. The second talk addressed the role of a microtubule-associated protein at the pre- and postsynaptic terminal during neurotransmission. In the third talk, another microtubule-associated protein was presented as an important regulator of dendritic spine function. Finally, the role of cell-adhesion molecules in synapse function was discussed, emphasizing its involvement in memory and learning.

Session 5: RNA trafficking and protein synthesis

Session five was related to the role of the cytoskeleton in RNA trafficking and protein synthesis. The first talk addressed the role of a protein involved in spinal motor atrophy in the context of mRNP complex transport in axons. Next, the role of a highly abundant brain protein was discussed in the context of protein translation in neurons. Finally, a novel mechanism of exosome-mediated vesicle transfer of proteins and RNAs from glia to axons was discussed.

Session 6: Actin dynamics

The sixth session was devoted to understand basic aspects for actin dynamics in neurons. It started with an analysis of redox regulation upon actin dynamics. A mechanism was presented involving reversible direct actin oxidation by enzymes downstream of cellular responses to extracellular cues. Next, novel assembly dynamics of actin filaments in axons were reported, suggesting a mechanism by which actin may be supplied to presynaptic boutons. This work was complemented by the next talk, which described the importance of actin binding proteins in regulating the organization of the cortical actin rings in axons. The fourth talk addressed the changes in actin organization that accompany the maturation of filopodia into mushroom-type mature dendritic spines. Finally, a post-doc presented a short talk on the role of a centrosome-associated protein during neuronal migration.

Session 7: Microtubule and motors

The last session started with a talk addressing the contribution of post-translational modifications (PTMs) of tubulin in neuronal function, including in neurodegenerative diseases. In the next talk, microtubule dynamics was evaluated in the context of a novel +TIP protein which is responsible for axonal guidance during development. The third talk described a novel hypothesis for the mechanism by which mutations in a specific microtubule-associated protein lead to defects in brain development due to perturbations in vesicle transport along microtubules. In the final talk, novel in vitro and in vivo functions for microtubule motors were presented, revealing differential roles for motor proteins in neuronal morphology, microtubule polymerization and pathology.

Participant survey. Conclusions and Opportunities

On the last evening we held a business meeting to discuss future plans for the workshop, to complete a survey **(Appendix 2),** and to get some ideas to keep attendees in contact after the workshop. The location was very favorably received so it was decided that the fourth Emerging Concepts of the Neuronal Cytoskeleton Workshop will be held again in **Puerto Varas, Chile during March-May 2017**. It was also decided that the organizers in conjunction with some of the meeting participants would edit a special issue of the journal Cytoskeleton, with articles and reviews from the attendees to the workshop. A goal was set to increase the cap on attendance at the meeting by 20% if sufficient funding can be obtained. It was agreed to continue to require that speakers pay their flight costs in order to keep costs down and channel limited resources towards attracting students and young researchers. It was also agreed to continue to ensure that all the participants share hotel and meals throughout the whole meeting, to maximize opportunities for interactions with the speakers.

For the next workshop it was agree to have some beverages and hors d'oeuvre during poster sessions and also a data blitz session after one of the dinners to promote informal interactions between participants.

Financial Report

ISN funds

Most of the money received from the ISN was used to support graduate students and postdoctoral researchers. The amount allocated covered full lodging and meals (4 days), off-site lunch, visit to Frutillar Museum, transports from and to airport on arrival and departure. The names, origin and amount allocated on each case are listed below:

1.- Amr Abou-Elezz, postdoctoral researcher
University of Helsinski,
Finland
US$850

2.- Sam van Beuningen, PhD student
University of Utrecht
Netherlands
US$850

3.- Elizabeth Bearce, postdoctoral researcher
Boston College,
USA
US$850

4.- Gaia Berto, PhD student
University of Torino
Italy
US$850

5.- Sebastian Alvarez, Master student
Universidad de Chile
Chile
US$850

6.- Matheus Fonseca, PhD Student
Universidade General de Minas Gerais
Brazil
US$850

7.- Xiaqin Fu, postdoctoral researcher
George Washington University
USA
US$850

8.- Johanna Gutierrez-Vargas, PhD Student
Universidad de Antioquia
Colombia
US$850

9.- Gloria Arriagada, Young PI
Universidad Andres Bello
Chile
US$850

10.- Edmila Montezani, postdoctoral researcher
DAPX
Brazil
US$850

11.- Gabriela Otero, PhD student
Universidad de Buenos Aires
Argentina
US$850

12.- Pramod Pullarkat,Young PI
Raman Research Institute
India
US$1,250

13.- Victoria Rozés, PhD Student
Instituto Mercedes y Martin Ferreyra
Argentina
US$850

14.- Laura Sayas, Young PI
Universidad de La Laguna
Spain
US$1,250

15.- Tetsuya Takano, postdoctoral researcher
Nagoya University
Japan
US$850

16.- Shin-ichi Hisanaga, PI
Tokyo Metropolitan University
Japan
US$1,250

17.- Peter Baas, PI
Drexel College of Medicine
USA
US$1,250

18.- Felipe Court, PI
Pontificia Universidad Catolica de Chile
Chile
US$1,250

19.- Mariano Bisbal, Young PI
Instituto Mercedes y Martin Ferreyra
Argentina
US$ 200 (partial support)