

POSTER PRESENTATION

Open Access

Leader neurons drive spontaneous and evoked activation patterns in cortical networks

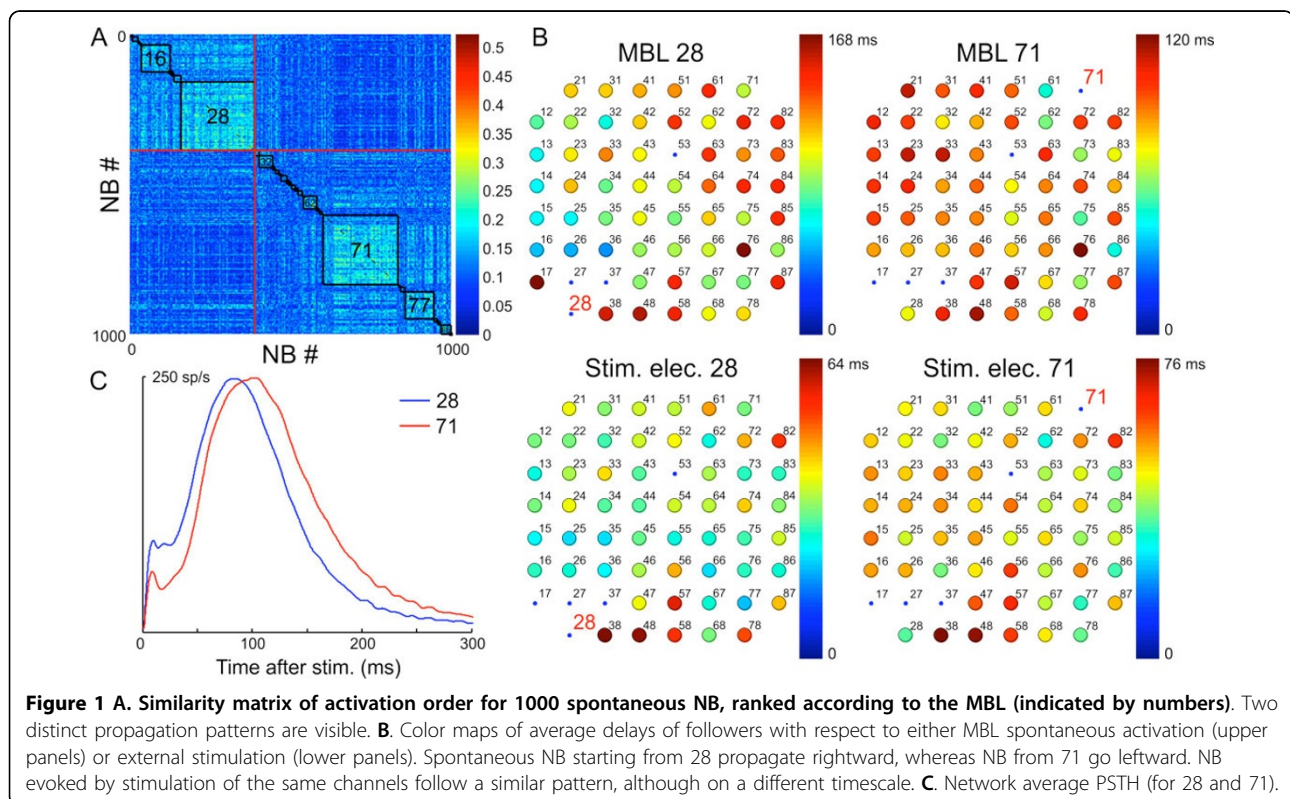
Valentina Pasquale^{1*}, Sergio Martinoia^{2,1}, Michela Chiappalone¹

From Twenty Second Annual Computational Neuroscience Meeting: CNS*2013
Paris, France. 13-18 July 2013

Recent studies about the generation and propagation of coordinated activity in cultured neuronal networks reported the existence of privileged neurons that consistently fire earlier than others at the onset of synchronized bursting events (or network bursts, NB), which have been termed major burst leaders (MBL) [1]. At the same time, by stimulating the network from different

channels one can obtain very different responses, not only in size and delay but also in the activation order of the responding neurons [2].

We electrically stimulated rat cortical networks cultured on micro-electrode arrays from different locations, either MBL or non-MBL. We evaluated the intensity and the delay of responses from either MBL or non-MBL and we



* Correspondence: valentina.pasquale@iit.it

¹Department of Neuroscience and Brain Technologies - NTECH, Istituto Italiano di Tecnologia, Via Morego 30, Genova 16163, Italy

also compared the spontaneous and the evoked activation patterns.

By comparing the responses obtained by stimulating either MBL or non-MBL, we found that the stimulation from MBL induces on average earlier responses. By comparing the responses of MBL and non-MBL, we found that MBL respond better and more rapidly to the stimulation coming from any other site in the network. Some networks showed different spontaneous propagation patterns within synchronized bursts depending on the identity of the corresponding MBL (Figure 1). In these cases the evoked propagation patterns correlate with the spontaneous ones and also depend on the spatial location of the stimulating site with respect to MBL.

To summarize, we demonstrated that MBLs do not only drive the propagation of coordinated spontaneous activations, but also play a special role in coordinating and driving the evoked bursts of activity.

Acknowledgements

The research leading to these results has received funding from the European Union's Seventh Framework Program (ICT-FET FP7/2007-2013, FET Young Explorers scheme) under grant agreement n° 284772 BRAINBOW.

Author details

¹Department of Neuroscience and Brain Technologies - NTECH, Istituto Italiano di Tecnologia, Via Morego 30, Genova 16163, Italy. ²Department of Informatics, Bioengineering, Robotics, System Engineering (DIBRIS), University of Genova, Genova 16145, Italy.

Published: 8 July 2013

References

1. Ham MI, Bettencourt LM, McDaniel FD, Gross GW: **Spontaneous coordinated activity in cultured networks: analysis of multiple ignition sites, primary circuits, and burst phase delay distributions.** *J Comput Neurosci* 2008, **24**(3):346-357.
2. Shahaf G, Eytan D, Gal A, Kermany E, Lyakhov V, Zrenner C, Marom S: **Order-based representation in random networks of cortical neurons.** *PLoS Comput Biol* 2008, **4**(11):e1000228.

doi:10.1186/1471-2202-14-S1-P64

Cite this article as: Pasquale *et al.*: Leader neurons drive spontaneous and evoked activation patterns in cortical networks. *BMC Neuroscience* 2013 **14**(Suppl 1):P64.

**Submit your next manuscript to BioMed Central
and take full advantage of:**

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

