FENS Forum 2010 - Amsterdam

- Posters: to be on display from 8:00 to 13:15 in the morning and from 13:30 to 18:45 in the afternoon. Poster sessions run from 09:30 to 13:15 in the morning and from 13:30 to 17:30 in the afternoon. A one hour time block is dedicated to discussion with the authors (authors should be in attendance at their posters as from the time indicated.)
- For other sessions, time indicates the beginning and end of the sessions.

First author Buchanan, Katherine Ann (poster)

Poster board B79 - Sun 04/07/2010, 12:15 - Hall 1
Session 014 - Synaptic plasticity 1
Abstract n° 014.2
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Title Differential expression of presynaptic NMDA receptors in neocortex

Text Postsynaptic NMDA receptors are ideally suited as detectors of coincident pre and postsynaptic activity. Recent evidence, however, suggests the existence of putatively presynaptic NMDA receptors (preNMDARs). To elucidate their functional role, we investigated the expression preNMDARs in several cell types in layer 5 (L5) of acute mouse visual cortex slices.

We used reduction in transmitter release after NMDAR blockade as an index of functional preNMDAR expression. D/L-APV (200 microM) reversibly suppressed mEPSC frequency (76±5%; $p<0.01$, n=10) in L5 pyramidal cells (PYs), but not amplitude ($p=0.3$) or rise time ($p=0.7$). APV also reversibly suppressed EPSPs evoked at 30 Hz in pairs or with extracellular stimulation (59%±4% of baseline, n=15; control 105%±8%, n=16; $p<0.001$). CV analysis suggested APV acted presynaptically ($p<0.01$).

PreNMDAR expression in L5 interneurons (INs) positive for parvalbumin (PV; JAX transgenic #007677) was heterogeneous and seemingly bimodal. Indeed, PV+ INs were readily clustered into two distinct types. APV caused a significant reversible suppression of mEPSC frequency in Type-1 PV+ INs (70±5%, $p<0.05$, n=4), but not in Type 2 (96±2%, $p=0.14$, n=7). In agreement, evoked EPSPs recorded in Type-1 INs showed a reversible APV-induced suppression (61%±4%, n=10; $p<0.01$) that was not apparent in Type-2 INs (91±4%, n=7; $p=0.35$). Morphological reconstructions showed that Type-1 axons arborize significantly more in supragranular layers than Type-2 axons ($p<0.05$).

In L5 INs positive for somatostatin (SOM; JAX #00371), APV supressed both mEPSC frequency (72±4%, n=9; $p<0.05$) and evoked EPSPs (53%±11%, n=5; controls 96%±5%, n=3; $p<0.05$), suggesting the existence of preNMDAR. SOM+ IN, reconstructions revealed an even greater supragranular axon arbour ($p<0.05$).

Our results show that neocortical L5 preNMDARs expression is differential and cell-specific. In conclusion, preNMDARs may specifically control information flow in local circuits.

Theme B - Excitability, synaptic transmission, network functions
Synaptic plasticity - Short-term plasticity