The direct relationship between inhibitory currents and local field potentials.

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Supplementary figure. Developmental considerations. (A) The data from figure 6B is replotted and colour-coded according to age. Although the data set sampled only a limited age range, it is still worth examining this limited range because other published work suggests that the interneuronal population, and particularly basket cells, are nearing the adult state in this 3rd – 4th postnatal week in mice. Both gabaergic and glutamatergic synaptic densities are mature at P15 (Micheva and Beaulieu, 1996), the numbers of GABAergic neurons rose steeply until P10, but only very slowly thereafter (Micheva and Beaulieu, 1995), and the relative numbers of gabaergic and glutamatergic synapses are adultlike at P16, although there is continued synaptogenesis of both (De Felipe et al., 1997). In addition, there are detailed data of developmental changes in functional properties of basket cells in hippocampus (Doischer et al., 2008), although not neocortex, which also suggest that these cells are close to mature above ~P18 - there is minimal change, if any, after this stage in all the following: total membrane capacitance, input resistance, membrane time constant, spike properties (although a higher maximum firing rate is achieved by P22 compared with P18), synaptic latency, probability of synaptic failures and synaptic current decay time constants. Consistent with these studies of development, there was no difference between results recorded at postnatal day 16-17 (P16-17) from those recorded at P20-23.


1. Test for differences in slopes
   P16-17; b = -0.00223; n = 50
   P20-23; b = -0.00248; n = 49
   F_s = 0.053 (not significant, F_{α[1,99]})

2. Test for adjusted means
   F_s = 3.41 (not significant, F_{α[1,100]})

(B) Average (+/- s.e.m, n > 8 events per slice) data from individual brain slices, colour-coded by age. This is the data set shown in Figure 6Ai. (C) Similar colour-coded replotting of the data shown in Figure 6Aii.

While these plots are far from being a comprehensive assay of developmental changes, importantly they do assess the period at the end of the main period of change for the cell class I propose to be central to these rhythms: the basket cell population. Two other points are relevant. Firstly, these plots show the correlation between two recordings, and are thus relatively immune to small changes in kinetics of currents or changes in frequency that might occur with any ongoing developmental changes. Secondly, there is strong evidence that the distinctive pattern of epileptiform activity under consideration in this paper is also seen in other preparations in older animals. Thus adult Guinea pig brain slices show similarly delayed propagation of ictal discharges (Wong and Prince, 1990), with comparable structure of extracellular recordings to those seen in juvenile mice. And identical patterns of current clamp recordings have been made by Steriade and Timofeev (Timofeev and Steriade, 2004)
done in adult cat, with many cycles of rhythmic depolarization without firing, a pattern that is inverted by chloride loading (and thus making $E_{GABA}$ depolarizing) (Timofeev et al., 2002).

A. Intra-extracellular correlations

B. Intra-extracellular correlations

C. Extracellular correlations

Trevelyan, Supplementary figure