Abstract:
Previous studies of the ferret visual cortex indicate that the development of direction selectivity requires visual experience. Here, we used two-photon calcium imaging to study the development of direction selectivity in layer 2/3 neurons of the mouse visual cortex in vivo. Surprisingly, just after eye opening nearly all orientation-selective neurons were also direction selective. During later development, the number of neurons responding to drifting gratings increased in parallel with the fraction of neurons that were orientation, but not direction, selective. Our experiments demonstrate that direction selectivity develops normally in dark-reared mice, indicating that the early development of direction selectivity is independent of visual experience. Furthermore, remarkable functional similarities exist between the development of direction selectivity in cortical neurons and the previously reported development of direction selectivity in the mouse retina. Together, these findings provide strong evidence that the development of orientation and direction selectivity in the mouse brain is distinctly different from that in ferrets.