Dimensions of a projection column and architecture of VPM and POm axons in rat vibrissal cortex.

Abstract:
This is the first article in a series of 3 studies that investigate the anatomical determinants of thalamocortical (TC) input to excitatory neurons in a cortical column of rat primary somatosensory cortex (S1). S1 receives 2 major types of TC inputs, lemniscal and paralemniscal. Lemiscal axons arise from the ventral posteromedial nucleus (VPM) of the thalamus, whereas paralemniscal fibers originate in the posteromedial nucleus (POm). While these 2 TC projections are largely complementary in L4, overlap in other cortical layers is still a matter of debate. VPM and POm axons were specifically labeled in the same rat by virus-mediated expression of different fluorescent proteins. We show that columnar and septal projection patterns are maintained throughout most of the cortical depth with a lower degree of separation in infragranular layers, where TC axons form bands along rows. Finally, we present anatomical dimensions of "TC projection domains" for a standard column in S1.