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Integrative properties of the pontine nuclei: exploring the architecture of pathways from somatosensory cortex to the cerebellum with use of a database application

The database 'Functional Anatomy of the Cerebro-Cerebellar System' (FACCS) is available via The Rodent Brain Workbench (rbwb.org). This database holds data from a large number of axonal tracer injections in the cerebral cortex and cerebellar cortex, contributed by multiple laboratories. Lower level data from the pontine nuclei (the nuclei intercalated in the cerebro-cerebellar projections) are mapped onto a common spatial framework. The common framework and database allow re-use of the data in novel combinations following initial publication. The present study is a re-analysis of aspects of brain map transformations from the 2-D somatotopic maps in SI cerebral cortex to the complex 3-D maps in the pontine nuclei. Inspection of illustrations from the original papers and their associated data repository (www.nesys.uio.no/Database) suggested somatotopic order and close spatial relationships between SI whisker projections and projections from SI upper lip and trunk representations. Using the FACCS search engine, we identified the relevant data sets (altogether 40 injection sites from a large number of animals). Tools included in the database application were used to identify the expected complementary labeling patterns, and several locations with close neighboring relationships between the projections were seen, suggesting that integration of signals arising from upper-lip related, whisker, and trunk representations in SI may occur in the pontine nuclei. Similar investigations of other data combinations revealed other opportunities for overlap of projections from remotely located cortical sites of origin. Further validation of these observations will require dual tracing experiments that can be optimized with use of the database. Mapping the nature of such new relationships may elucidate possible integrative or filtering properties of the pontine nuclei, similar to combinational maps described in the basal ganglia. Supported by The Research Council of Norway and EC.