

# Cerebral cortex and claustrum/ endopiriform complex

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## Summary

Both the platypus and echidnas have a six-layered isocortex like all therian mammals, but the two groups of living monotremes have very different cortical morphology: lissencephalic (smooth) and thick in the platypus, and gyrencephalic (folded) and thinner in the echidnas. The two major groups also have a very different distribution of sensory fields across the cortex: an extraordinary enlargement of the bill representation in the platypus primary somatosensory cortex, and a shift of the sensory areas for vision, touch and hearing towards the caudal half of the cortex in the echidnas. Anatomical indicators of cerebral metabolism suggest that the echidna cortex has a similar pattern of vascularisation and mitochondrial spatial density to that in marsupial and placental mammals. Synaptic morphology and distribution in

the echidna somatosensory cortex are also much like the same region in therians, but the pyramidal neurons of the echidna cortex appear to include more atypical forms than in therians. Development of the isocortex in the monotremes depends on similar proliferative populations in the embryonic pallium to those found in therians, but with an unusual subcortical zone that may combine the properties of the subventricular and subplate regions of the developing cortex of therians. Much of the cortical development in monotremes occurs after hatching, in a protracted tempo similar to that seen in marsupials.

## Cognitive abilities of the monotremes

Apart from its role in processing sensory information and controlling movement, the cerebral cortex is a