Coronal sections through the forebrain of primate brain display a familiar view of the internal capsule separating the caudate and putamen. A cursory review of images from diverse species found in the website http://brainmuseum.org/sections/index.html, indicates that most mammals have this characteristic feature with the exception of animals such as rats and mice. The presence of a caudate separated by the internal capsule from the putamen does not appear to be a function of gyrencephaly or lissencephaly nor of mere size.

A further comparison of the different species leaves the impression that in some animals, such as dog, the caudate is much larger than the putamen, whereas in primate the two are more equitable. To determine if this difference was illusory or real, the ratio of the volumes of putamen and caudate were determined from sections from the brains of dog (Canis familiaris) and of a primate (African Green monkey, Chlorocebus sabaeus). The impression was confirmed and the study was extended to include other species as a better phylogenetic representation. Images of brain section images from the brainmuseum.org website for goat, cat, hyrax and pig were derived from NSAI slides.

Sections stained for nissl substance and myelin were used to delineate and measure the areas (Image J) of putamen and caudate in a series of uniformly spaced leaves from the rostral to caudal limits of both structures. Using Simpson’s approximation formulae putamen and caudate in a series of uniformly spaced slides from the rostral to caudal limits of both structures. Using Simpson’s approximation formulae the volumes for each structure were determined and ratios calculated.

The molecular based tree of the 4 clades of placental mammals is shown in different colors. The animals examined are representative of 3 of the 4 clades. Diminutive proportional size of the putamen to the caudate in cat and dog seems unique within this sampling even within the same clade. Laurasiatheria. Examination of other carnivores as well as other species across all clades should reveal the extent of this uniqueness. The opposite proportion of putamen greater than caudate occurs in hyrax and warrants further examination of other members of clade Afrotheria.


Phylogenetic Comparision of Volume Ratios of Caudate and Putamen


For a detailed account of the initial work and discussions on this topic, please refer to: W.I. Welker 1926-2007

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