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A Comparative Analysis of Perinatal Development of Barrel Cortex in Rat, Mouse and Guinea Pig Using Acetylcholinesterase Histochemistry

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Abstract: The role of acetylcholinesterase (AChE) in the developing neocortex was reexamined by comparing its expression in rats, mice and guinea pigs, following the protocol for acetylcholinesterase histochemistry (described in Sendemir et al., 1996) in order to determine the suitability of the breeding colony at UludaÛ University for use as an animal model. A total of 103 pups as well as two adult animals of each species were used. In the rat pups, acetylcholinesterase-rich patches were distributed in a vibrissa-related array in the somatosensory cortex soon after birth, whereas regions of the cortex lying between individual patches and between rows of patches in the were depleted enzyme. Mice on postnatal day 3 and older mice revealed lightly stained, acetylcholinesterase positive spots in the center of barrel cores, while the barrel walls remained devoid of acetylcholinesterase; septae that divided the individual barrels were densely enzyme positive. The barrels in the guinea pigs formed before birth. Well-formed barrels were observed by postnatal day 0, and acetylcholinesterase activity gradually decreased by postnatal day 10 but did not fade away. The differential enzyme location in different rodents indicates that its role in the development of thalamocortical connectivity is distinctly different in rats as opposed to mice and guinea pigs.

Key Words: Thalamocortical development, barrel cortex, rodent, and acetylcholinesterase histochemistry.

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