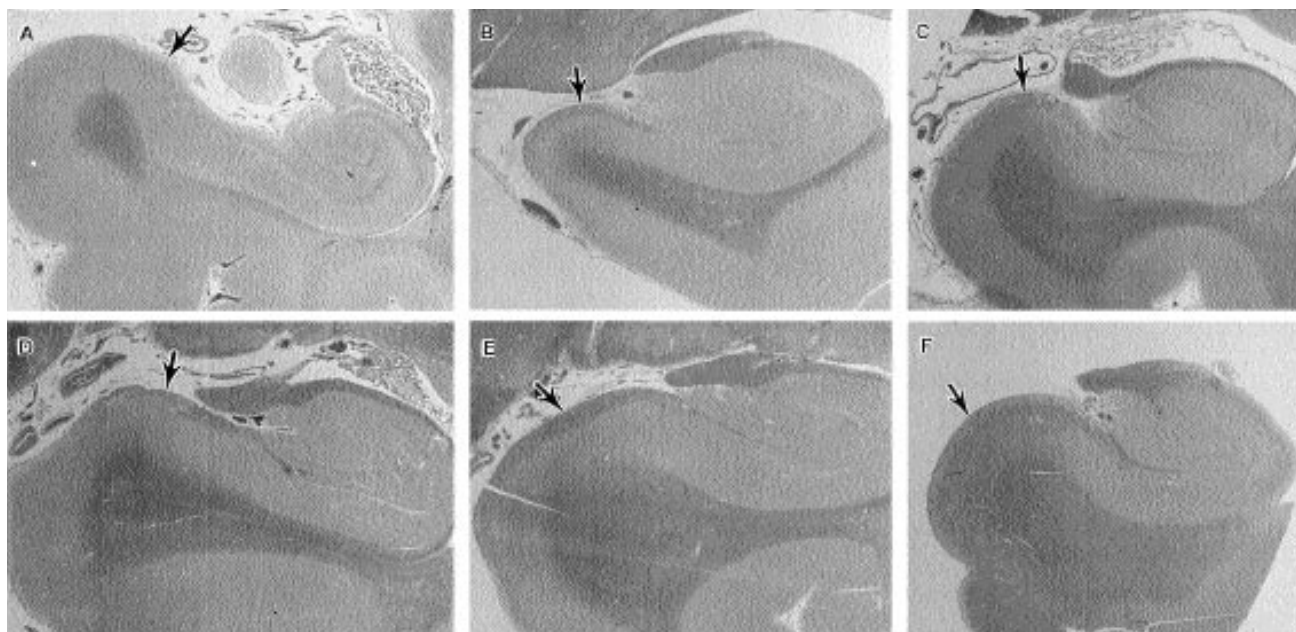


Images in Neuroscience

Carol A. Tamminga, M.D., Editor

Brain Development, VII



Increased myelin staining (arrows) of the superior medullary lamina in human hippocampus at birth (A) and ages 8 (B), 13 (C), 24 (D), 36 (E), and 57 (F) years.

Human Brain Growth Spans Decades

Growth and development of regions in the human brain occur not only in childhood but also much later during adolescent and adult years. The example shown here is the ongoing myelination of cells in the hippocampus, a region within the limbic system that is known to be involved in learning and memory. The figure illustrates the progressive increase in the myelination of the superior medullary lamina (SML) in the parahippocampal gyrus at birth and at 8, 13, 24, 36, and 57 years of age. Between the first and second decades, the myelination increased from a mean of 2.2 mm² (SD=0.3) to 4.3 mm² (SD=0.2) (a 95% increase); in the fifth decade (mean=5.6 mm², SD=0.8) and the sixth decade (mean=6.5, SD=0.5) the increases were 33% and 55%, respectively, compared to the second decade. Myelination represents one of the final stages in neuronal maturation where cells acquire a fatty lipid sheath around their axons, a change that increases the propagation of electrical signals from neuronal cell body to terminal areas. The neuronal axons in this area of the SML probably include those from the perforant pathway and cingulum bundle, which interconnects the entorhinal region and cingulate cortex, respectively, with the hippocampal formation. These axons might well play a role in the integration of emotional behaviors with cognitive processes, a putative function of the limbic cortex. Therefore, the functions influenced by this ongoing myelination may themselves “grow” and mature throughout adult life. Although pure cognitive development (e.g., the ability to abstract) is established by midadolescence, the development of the emotional component of cognition and behavior may last well into adulthood. This process is associated with a marked decrease in anxiety, affective intensity, and sociability during the midlife period. These changes in behavior may be mediated, in part, by the concrete anatomic changes identified here. In addition, between 6 and 29 years of age, myelination shows a gender effect, with a greater area of myelin being found in female subjects. This could contribute to the greater achievement in language skills and reading in young female subjects, the greater vulnerability of male subjects to various forms of childhood psychopathology, or both. These data illustrate the ongoing capacity of the older as well as the younger brain for growth and development.

FRANCINE M. BENES, M.D., PH.D.
Belmont, Mass.

Address reprint requests to Dr. Tamminga, Maryland Psychiatric Research Center, University of Maryland, P.O. Box 21247, Baltimore, MD 21228. Figure courtesy of Dr. Benes.