

In: Dentate Gyrus  
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Chapter 5

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## Dentate Gyrus Variation along Its Septo-Temporal Axis: Structure and Function in Health and Disease

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### Abstract

A bulk of evidence currently suggests that hippocampal formation is a heterogeneous brain structure. Most recent studies recognize a hippocampal pole (dorsal/septal or posterior in humans) which is primarily related with memory and learning processes, and another one (ventral/temporal or anterior in humans) which is linked with anxiety, affective or emotional processes. An intermediate region separating the two poles appears to have overlapping characteristics with its neighbors.

The present chapter summarizes previously reported differences between septal and temporal dentate gyrus, a key component of the hippocampal circuitry, and provides new information on the segmental variation of the dentate gyrus.

Data on the cellular (neuronal and glial) composition of the dentate gyrus are linked with the diverged embryonic origin and continuous cell generation capacity of the septal and temporal poles, septo-temporal molecular/genomic patterns are correlated with trends reported by connectivity (tracing) studies, and distinct characteristics of the two poles in the healthy and the diseased brain are examined together with their peculiar neurochemical and vascularization patterns in order to i. provide an explanatory framework for the understanding of the segmental hippocampal functional and behavioral specialization, and ii. highlight the need for thorough and detailed knowledge of all possible parameters which may allow unlocking of the hippocampal dysfunction.