

## Boosting Neurogenesis with Synchrotron Microbeams

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## Abstract

Radiotherapy of brain tumors and metastases is associated with cognitive deficits and dementia, mainly due to alterations of hippocampal neurogenesis. Synchrotron-generated microbeams are emerging as a novel promising strategy for the treatment of brain cancers and drug resistant epilepsy. A series of experiment was performed to evaluate if the use of microbeams could avoid the disruption of neurogenesis typically associated with broad beam irradiation of the hippocampal region. Irradiation of both dorsal hippocampal regions with microbeams delivering peak doses of 300 Gray (Gy) on healthy rats showed a surprising finding: 11 months after irradiation neurogenesis was not only preserved but also slightly increased. Histological analysis showed structural integrity of all irradiated brain regions with cell death observed only along the microbeam passage. Integrity of microvessels was shown along the irradiation path 11 months after 300 or 600 Gy microbeam irradiation. These data shed light on the long-term radiobiology of microbeams on the central nervous system and provide further ground toward the possibility to treat a variety of brain disorders with microbeam radiosurgery. Of special interest remains the findings of preserved and even enhanced neurogenesis following hippocampal microbeam irradiation. Further studies are being carried to better assess the neurogenesis reaction to microbeam irradiation and to compare it with conventional broad beam irradiation.

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#### Abstract

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