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ORIGINAL PAPER

The level and distribution pattern of HP1β in the embryonic brain correspond to those of H3K9me1/me2 but not of H3K9me3

Eva Bártová[1] · Josef Večeřa[2] · Jana Krejčí[1] · Soňa Legartová[1] · Jiří Pacherník[2] · Stanislav Kozubek[1]

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Abstract We studied the histone signature of embryonic and adult brains to strengthen existing evidence of the importance of the histone code in mouse brain development. We analyzed the levels and distribution patterns of H3K9me1, H3K9me2, H3K9me3, and HP1β in both embryonic and adult brains. Western blotting showed that during mouse brain development, the levels of H3K9me1, H3K9me2, and HP1β exhibited almost identical trends, with the highest protein levels occurring at E15 stage. These trends differed from the relatively stable level of H3K9me3 at developmental stages E8, E13, E15, and E18. Compared with embryonic brains, adult brains were characterized by very low levels of H3K9me1/me2/me3 and HP1β. Manipulation of the embryonic epigenome through histone deacetylase inhibitor treatment did not affect the distribution patterns of the studied histone markers in embryonic ventricular ependyma. Similarly, *Hdac3* depletion in adult animals had no effect on histone methylation in the adult hippocampus. Our results indicate that the distribution of HP1β in the embryonic mouse brain is related to that of H3K9me1/me2 but not to that of H3K9me3. The unique status of H3K9me3 in the brain was confirmed by its pronounced accumulation in the granular layer of the adult olfactory bulb. Moreover, among the studied proteins, H3K9me3 was the only post-translational histone modification that was highly abundant at clusters of centromeric heterochromatin, called chromocenters. When we focused on the hippocampus, we found this region to be rich in H3K9me1 and H3K9me3, whereas H3K9me2 and HP1β were present at a very low level or even absent in the hippocampal blade. Taken together, these results revealed differences in the epigenome of the embryonic and adult mouse brain and showed that the adult hippocampus, the granular layer of the adult olfactory bulb, and the ventricular ependyma of the embryonic brain are colonized by specific epigenetic marks.

Keywords Brain sections · Epigenetics · Histones · Histone methylation · Hippocampus · Olfactory bulb