Does hippocampal estradiol play a role in the rapid estrogenic improvement of social learning?

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Social learning is an adaptive learning strategy in which animals acquire information from conspecifics, rather than through risky trial-and-error learning. In the social transmission of food preferences (STFP), an observer mouse interacts with a demonstrator mouse that has eaten a novel-flavoured food. When subsequently offered two novel foods, the observer prefers the food it smelled previously on the demonstrator’s breath. We found systemic administration of 17-estradiol to improve social learning on the STFP within 45min, when behavioural effects are likely due to estrogens acting through rapid cell signaling mechanisms rather than gene transcription. However, where estrogens exert these effects in the brain is currently unknown. The hippocampus is a possible candidate; systemic estradiol increases dendritic spine density in the CA1 hippocampus, intrahippocampal estradiol rapidly facilitates learning in nonsocial learning tasks, and hippocampal lesions impair the STFP. Hence, we implanted female ovariectomized mice with bilateral guide cannulae aimed at the CA1 hippocampus. We infused observer mice with 0.5μL (per side) of vehicle, 25nM, 50nM, or 100nM 17-estradiol 15min prior to a brief social interaction with the demonstrator. We measured food preference during the choice test at intervals of 30min and 2, 4, 6 and 8h; the first measurement was therefore 45min after treatment to focus on the rapid effects of estradiol. We also used an STFP paradigm that was difficult, in which control-treated observers showed no social learning, in order to better see any enhancing effects of estradiol. Preliminary results show that the hippocampus may not mediate estrogenic rapid regulation of social learning, suggesting that the brain regions involved in estrogens rapid effects on the STFP are different from those involved in non-social learning. We are therefore now assessing other regions of the “social brain”, such as the amygdala, that may be involved in the rapid estrogenic enhancements of social learning.