

Autoradiographic Studies on the Distribution of ^3H -Mescaline in the Brain of the Marmoset, *Callithrix jacchus*

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Abstract. Autoradiographs of the brain of the marmoset, *Callithrix jacchus*, show a strong labeling of the hippocampus and the N. amygdalae 18 h after injection of ^3H -mescaline.

A similar characteristic autoradiographic pattern was previously found in the mouse brain, too.

Key words: Mescaline — Autoradiography — Brain distribution pattern — Hippocampus.

Introduction

In a previous study autoradiographs of the mouse brain obtained 6 h after i.p. or i.v. injection of ^3H -mescaline exhibited an intensive silver grain density in the hippocampus and the N. amygdalae (Korr *et al.*, 1969). If this characteristic distribution pattern of radioactivity is of general significance in pharmacology, it should also be possible to obtain similar autoradiographic patterns in the brains of other animals. Therefore, the distribution pattern of radioactivity in the brain of the marmoset, *C. jacchus*, was studied autoradiographically after injection of ^3H -mescaline.

Material and Methods

Six adult male marmosets, *C. jacchus* (about 300 g), received i.p. an injection of 8 mg 2,6- ^3H -mescaline · HCl (59 mCi/mM; cf. Seiler *et al.*, 1965) in 0.5 ml distilled water. One, 3, 6, 18, and 48 h after injection 1 marmoset (at 18 h, 2 animals) was decapitated. The brain was quickly removed and frozen by means of solid carbon dioxide. Series of transverse sections 10 μ thick were prepared in a cryostat (Dittes-Duspiva) at -18°C , freeze dried, and thereafter treated with gaseous formaldehyde (Korr *et al.*, 1970). Contact autoradiographs were prepared from these sections and also from inactive control sections according to Fischer and Werner (1971).

Results

The pattern of regional radioactivity distribution in the brain obtained in autoradiographs 1 h after injection of ^3H -mescaline (Fig. 1a) shows in general that neuron-rich layers and strongly vascularized areas

(e.g. the cerebral cortex or the lateral geniculate body) are more intensely labeled than fibrous zones (e.g. corpus callosum). Blood and blood vessels, the ependymal layer, and the choroid plexus are always strongly labeled. However, no particular brain area shows selective uptake of label 1 h after injection of ^3H -mescaline.

A similar pattern of radioactivity distribution was found 6 h after ^3H -mescaline injection (Fig. 1b). The cerebral cortex and the hippocampus exhibit a higher level of radioactivity now than other areas, e.g. the caudate nucleus.

However, 18 h after ^3H -mescaline injection the autoradiographs show clearly a strong labeling of the hippocampus and the N. amygdalae (Fig. 1c). No other area in the whole brain is labeled in this way. In the hippocampus the very intensive silver grain density was observed not only in the stratum pyramidale, but also in the other layers. The radioactivity in the granular layer of the fascia dentata is conspicuously lower.

Forty-eight hours after injection of ^3H -mescaline all parts of the brain are unlabeled although the exposure time of the autoradiographs was more than 1.5 years.

Discussion

This study shows basically a similar distribution pattern of radioactivity in the brain of the marmoset to that found in the mouse previously (Korr *et al.*, 1969). Although no biochemical results exist concerning the regional metabolism of mescaline in the brain of the marmoset, it is supposed that it is the same as in the mouse. The autoradiographic pattern found here is not usual for all drugs. A

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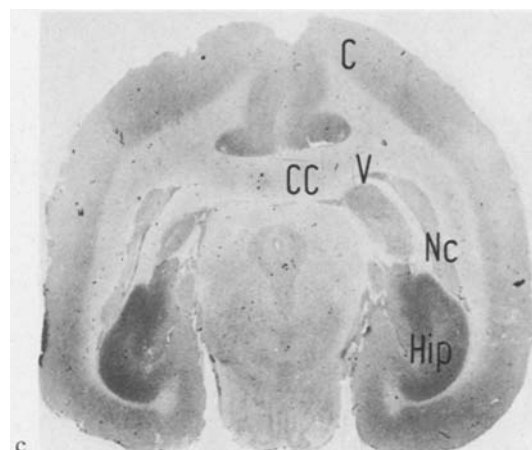
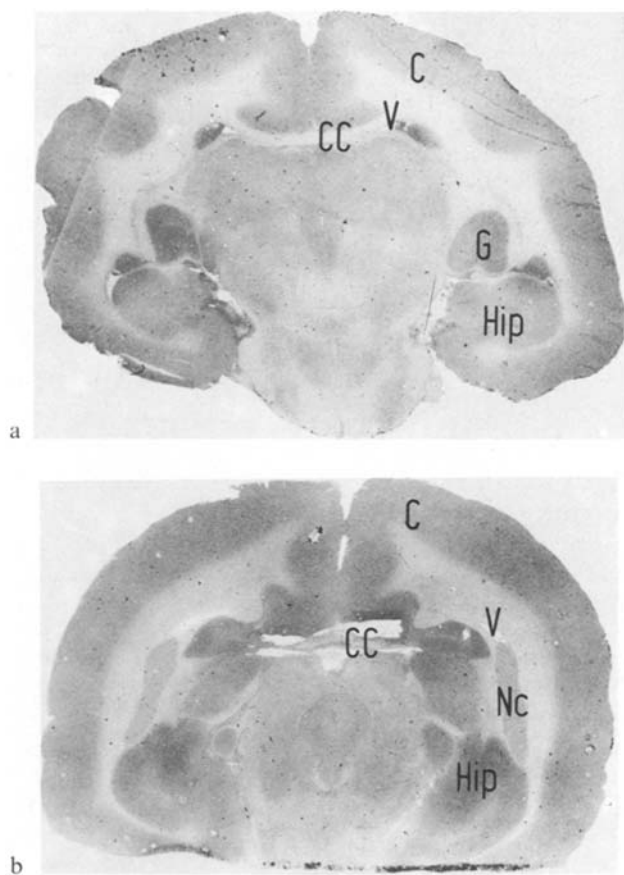


Fig. 1. Contact-autoradiographs from transverse cryostat sections of marmoset brain, *C. jacchus*. The animals were injected i.p. with 8 mg 2,6-³H-mescaline · HCl (1.9 mCi) 1 h (a), 6 h (b) or 18 h (c) before decapitation. Autoradiographic exposure, 8 weeks (a and b) and 60 weeks (c). Scale of autoradiographs, 6:1.

Abbreviations: C cortex cerebri; CC corpus callosum; G lateral geniculate body; Hip hippocampus; Nc caudate nucleus; V lateral ventricle

characteristic labeling of the hippocampus has only been reported for some psychotropic drugs, when the time after injection was more than 4 h, e.g. LSD in mice (Idänpään-Heikkilä and Schoolar, 1969); psilocin in rats (Hopf and Eckert, 1969); phenothiazines in mice, rats, and cats (Cassano *et al.*, 1965a,b,c; Sjöstrand *et al.*, 1965; Cassano and Hansson, 1966; Eckert and Hopf, 1970a); a hallucinogenic amphetamine in cats (Idänpään-Heikkilä *et al.*, 1969); oxypertine in mice and cats (Airaksinen and Idänpään-Heikkilä, 1967); thioxanthene derivatives in rats (Eckert and Hopf, 1970b), and isoniazid in cats (Barlow *et al.*, 1957).

It is remarkable that the autoradiographic distribution pattern in the mouse brain obtained after injection of ³H-2,3,4-trimethoxy- β -phenylethylamine (a structural isomer of mescaline, but nonhallucinogenic in man) shows no higher accumulation of radioactivity in the hippocampus than in other brain areas (Korr and Seiler, 1975). The fact, however, that the hippocampus is very intensely labeled after injection of some psychotropic drugs is not yet sufficiently explained (*cf.* Cassano, 1968; Eckert and Hopf, 1970a).

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