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EEG changes after psilocybin in organic brain lesions

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The autor studied the effect of psilocybin in a mean dose of 0.16 mg/kg on the EEG picture in 54 subjects with organic brain lesions of various localisation and etiology, mostly verified neurosurgically.

Results: The most typical finding after psilocybin was a desynchronisation in 79.6% patients (in 100% of parietal lobe lesions, in 80% of frontal lobe lesions, in 75% of temporal lobe lesions and in 33.3% of occipital lobe lesions). — The desynchronisation after psilocybin was of a peculiar character in the EEG with focal and diffuse pathologic activity. The extensity and intensity of the slow activity was most suppressed in frontal and parietal lesions, and less in the temporal and occipital ones. — The psychotomimetic effects of psilocybin correlated with EEG desynchronication. The hallucinogenic effect failed in 90.9 cases without desynchronisation following psilocybin. The visual hallucinogenic effect and EEG desynchronisation (Kolařík et al. 1966) were least frequent in occipital lobe lesions. — In occipital lesions suppression of EEG reactivity was the largest (alpha blocking reaction and photostimulation). — Diffuse epileptic activity of subcortical origin was strongly suppressed by psilocybin, conversely, focal primary cortical epileptic activity increased in several recordings in dependence upon the degree of desynchronisation, especially in parieto-frontal lesions. — Dissociation was observed between the EEG and clinical picture.

Dubanský (1964) reported that psilocybin accentuated the slight or quite latent focal neurological symptomatology in 76.4% of patients. This phenomenon had no correlation in EEG where, on the contrary, a suppression of focal pathologic activity was recorded. — The reduction of the EEG response to hyperventilation may be attributed to the relative stability of the psilocybin induced EEG desynchronisation. — There were no EEG symptoms of vigilance oscillations in psychotoxic states induced by psilocybin even though such oscillations were observed in the behaviour of experimental subjects during the psilocybin induced state.

Four functional levels within the central nervous system are considered from which a generalised desynchronisation could be evoked: (1) The level of the pontine reticular formation whose significance is being emphasised in the studies of rhombencephalic sleep. Brodey et al. (1963) found the site of psilocybin action at this level. — (2) The level of the reticular ascendent activating system (RAAS). Most authors assume that hallucinogenic drugs act just on this level of the brain stem reticular formation. Monnier (1959) found that the desynchronisation reaction after psilocybin persists in the EEG after removal of the RAAS by intercollicular decerebration. — (3) The functional depression of the recruiting system at the level of the medial thalamus (Monnier 1959). — (4) Hyperexcitability of the cortical neurons after psilocybin.

The author attempts-on the basis of his experimental data to localise the effect of psilocybin at the level of the mediothalamic system and at the cortical level (Kolařík 1966, 1967). This conclusion is supported by Hopf's and Eckert's (1969, 1970) autoradiographic studies on the distribution patterns of 14 C-psilocybin in the brain of various animals. The highest values of psilocybin were found in the neocorte, thalamus and in certain layers of hippocampus, whilst the values were low in the hypothalamus, the nuclei of the so-called extrapyramidal motor system and in the reticular formation.

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„Dissociation" between EEG and spontaneous behaviour of rats after atropine

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The "dissociation" (Winkler 1952) between EEG and spontaneous behaviour after administration of atropine sulphate (sleeping high voltage slow activity in wakeful animals) was studied on 6 freely moving rats with chronically implanted electrodes in frontal cortex and dorsal hippocampus. EEG was recorded continously during the experiment as well as the following types of spontaneous activity: rearing, locomotion, sniffing while standing, cleaning, inactivity, sleep (closed eyes).

1. After saline solution low voltage fast activity was recorded in cortical EEG during all registered activities with the exception of sleep. The amplitude and frequency was visually nearly the same even during inactivity. A short higher cortical amplitude may appear from time to time in wakeful animals but only if the rats are well habituated and longer inactive. Roughly in the time of closing eyes the typical high voltage slow activity appeared. Exploratory motor behaviour (rearing, locomotion, sniffing) was accompanied almost always by regular "theta" rhythm in hippocampus. Differences between the duration of "theta" and exploration were not significant. During cleaning this rhythm occurred rarely

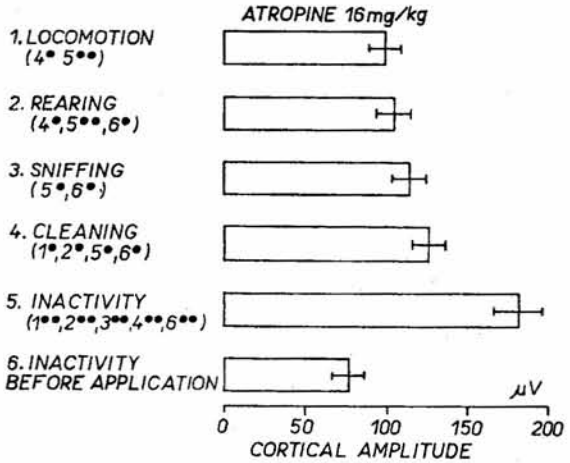

Fig. 1. Mean cortical amplitude (from 6 animals) after 16 mg/kg atropine during various types of spontaneous behaviour in wakeful rats (significant differences between the respective types of behaviour and other types, marked by their serial number, are denoted by asterisks * = $p < 0.05$, ** = $p < 0.01$)