The Influence of Barbiturates on Paroxysmal EEG Activity Induced by Hippocampal and/or Thalamic Cobalt Foci

E. Roldán*, T. Radiil-Weiss, and L. Chocholová

Institute of Physiology, Czechoslovak Academy of Sciences, Prague

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Abstract. Epileptiform 7—9/sec spike and wave and polyspike EEG discharges were induced in male albino rats by chronic cobalt-gelatine implantation into the dorsal hippocampus and/or non-specific thalamus.

Low doses of allobarbital and thiopental (10—20 mg/kg) markedly reduced the incidence of the epileptiform manifestations simultaneously with the appearance of slow-wave EEG activity. After desynchronization by reticular or sensory stimulation, the paroxysmal EEG patterns often reappeared. The presence of sleep cycles with alternation of slow-wave and paradoxical sleep phases made it difficult to measure the duration of the effect. Low doses of barbiturates seemed to influence the 7—9/sec spike and wave and polyspike discharges mainly indirectly by depressing the level of vigilance.

High doses (40—50 mg/kg) of the barbiturates caused an almost complete disappearance of the epileptiform manifestations lasting for several hours.

The frequency of spike and wave complexes or spikes within the epileptiform episodes (when present) slightly increased after barbiturate administration.

In the first 5 min after the injection of low doses of barbiturate a transitory facilitation of the incidence of the paroxysmal discharge was sometimes observed together with the disappearance of spontaneous movements. During the second half of anaesthesia after high doses reticular stimulation in some cases triggered polyspike or spike and wave discharges lasting for minutes.

Key-Words: Allobarbital — Thiopental — Cobalt Epilepsy.

Barbiturates are commonly used for the treatment of certain types of epilepsy (Livingston, 1966). It has been found in rats with cobalt-gelatine implants in the frontal cortex that the incidence of epileptiform electroencephalographic spikes appearing around the focus, increases after barbiturate administration and during slow-wave sleep (Chocholová and Radil-Weiss, 1970). On the other hand, the episodes of 7—9/sec spike and wave complexes or polyspikes generated over both cortices, hippocampi and the mesencephalic reticular formation, which develop
after cobalt-gelatine implantation into the dorsal hippocampus, non-specific thalamus, and in some cases also into the frontal cortex, occur mainly during relaxed wakefulness and sleep (Roldán et al., 1970c). It was also found that low doses (around 15 mg/kg) of thiopental could prevent the spontaneous incidence of these paroxysmal EEG manifestations. However, even if the animals are under the influence of this drug the spike and wave or polyspike episodes readily reappear after reticular stimulation (Roldán et al., 1970b).

This observation caused us to analyse in more details the influence of barbiturates on the incidence and pattern of the spike and wave or polyspike epileptiform EEG activity induced by cobalt-gelatine implantation into the dorsal hippocampus or non-specific thalamus or both.

**Methods**

The experiments were performed on a group of 31 Wistar rats (males) weighing 250–300 g. Bipolar stainless steel electrodes (insulated except at the tip, the tip distance being about 0.5 mm) were implanted into the sensory-motor cortex and the dorsal hippocampus bilaterally and into the mesencephalic reticular formation. Simultaneously, a minute cobalt-gelatine rod was implanted into the dorsal hippocampus and/or the thalamus unilaterally. Histological confirmation of the electrode sitings and cobalt lesion was carried out after completing the experiments. The lesion was in the dorsal hippocampus in 15, in the non-specific thalamus in 12 and in both structures in 4 rats.

Repeated recordings were made starting 24 h after the implantation, when the first signs of paroxysmal EEG activity appeared and continued for several days until the paroxysmal EEG phenomenon was fully developed. The EEG was recorded during waking and during different phases of sleep, and before and after the intraperitoneal injection of low (10–20 mg/kg i.p.) or high (anaesthetic, 40–50 mg/kg i.p.) doses of 5,5-diallybarbiturate acid (Allobarbital Spofa) or 5-ethyl-5(1-methylbutyl)thiobarbiturate sodium (Thiopental Spofa). The drugs were administered in varied doses to the same rats in repeated experiments, at intervals of several days. In some cases the mesencephalic reticular formation was stimulated by repetitive rectangular electrical pulses (0.5 msec, 50–300 Hz, 0.5–10 V).

**Results**

Low doses of allobarbital and thiopental depressed the spontaneous occurrence of 7–9/sec spike and wave and polyspike epileptiform episodes 10–15 min after the injection (Figs. 1, 2), simultaneously with the appearance of generalized slow-wave EEG activity. Sometimes, however,