44. The Changes of Experimental Seizure Discharges in the Neo-, Paleo-, and Archi-cortices during Natural Sleep in the Cat with Special Reference to the Activated Sleep

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The changes of experimental seizure discharge in the neocortex, the amygdala and the hippocampus produced by application of convulsant drugs such as strychnine and by local injection of alumina cream were observed in chronically implanted cats during various stages of natural sleep including the activated sleep.

As is shown schematically in Fig. 1 and 2, when the effect of strychnine was

		A	S1	S2	SA
NEO- CORTEX	(a)				
	(b)				
PALEO- ARCHI- CORTEX	(a)				
	(b)				

Fig. 1. A diagramatic representation of the relationship between the number of seizure discharge and the stage of sleep. A: arousal. S-1: spindle stage. S-2: spindle and slow wave stage. S-A: activated sleep. In this cat, typical application of strychnine on the surface of the right anterior suprasylvian gyrus and local injection of penicillin into the left dorsal hippocampus were performed at the same time. The vertical columns show the number in every 10 seconds of the neocortical spikes, the small (weak) and large (strong) hippocampal spikes respectively. Note the enhancement of the neocortical seizure discharge and suppression of the weaker hippocampal discharge during the S-A stage.

		E	A	S ₁	S ₂	S _A
NEOCORTEX	Strong					
	Intermediate					
	Weak	—	—			—
PALEO- & ARCHI-CORTICES	Strong					
	Weak	—	—			—

Fig. 2. A schematic diagram showing the change in the number of seizure discharges of different strength in the neo-, paleo- and archi-cortices in different stages of sleep. See text.

strong, the neocortical seizure discharge showed a slight enhancement during the S-1 (spindle) and S-2 (spindle and slow wave) stages and a marked augmentation during the S-A (activated sleep) stage. The enhancement of spikes was also observed when the animal was excited (E). When the effect of strychnine was intermediate, the change in the number of seizure discharge was less remarkable. The weak strychnine discharge was suppressed during both the arousal (A) and the S-A stages of sleep while it was enhanced during the S-1 and S-2 stages. The neocortical seizure discharge showed a marked enhancement concomitant with the occurrence of rapid eye movements during the activated sleep, and it sometimes showed a sustained burst during the activated sleep as well as in the arousal stage.

Seizure discharge in the amygdala and the hippocampus induced by convulsant drugs also showed a similar change to that in the neocortex during different stages of sleep.

Chronic focal seizure discharges induced by injection of alumina cream also showed a similar change. That is, the weak seizure discharge in the early stage of development of the alumina cream focus tended to be suppressed during the A and S-A stages, while the stronger ones in the later stage enhanced significantly during the same stages.