tories Inc., New York). However, by comparing data obtained under maximal stimulation with both agents (Table) essentially similar results are obtained. It is of interest that the effect produced by hog gastrin persists longer than that induced by ICI 50123[17,18].

Résumé. L'action de la gastrine de porc a été étudiée chez des rats mâles munis de fistules gastriques. La gastrine était injectée par voie s.c. à des doses de 1–2 ml: 1 ml équivalant à l'activité de 10 g de muqueuse de porc. Le volume de suc gastrique, le volume de suc gastrique par 100 g, l'acidité totale et le débit d'acide accusèrent une pointe dans la première h, alors que la concentration en acide atteignit son maximum vers la troisième h. Le débit de la pepsine diminua entre la troisième et la cinquième h et augmenta légèrement entre la cinquième et la sixième h.

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Responses of Oculomotor Nucleus and Marginal Gyrus in Sleep

The role of several brainstem structures in the production of sleep characteristics has been under investigation in recent years employing mainly the lesion techniques. Because of the difficulties in recording with free-moving animals, there have not been many electrophysiological investigations on the particular areas. Evoked potential techniques have been used more commonly with the limitations implied. More reliability is possible if the degree of change of successive responses rather than the absolute values of amplitudes of potentials is considered. This method has been adapted here.

Rapid eye movements of sleep (REMS) occurring in the desynchronized state of sleep can be abolished by lesions of either the vestibular nuclei[1] or the superior colliculi[2]. It is not known whether the 2 structures play similar or distinct roles under influences of pontine reticular areas[3]. This is a report on the nature of recovery of responsiveness of oculomotor nucleus to stimulations of nucleus reticularis pontis oralis (RPO), medial vestibular nucleus (MVN) and superior colliculus (SCO) during sleep and wakefulness. The responsiveness of visual cortex (marginal gyrus) has also been simultaneously studied as lesions of the same were also shown to impair REMS[2]. The recovery was measured by calculating the ratio of amplitudes of potentials (late components), second (R2) to first (R1) in a pair evoked by a pair of stimuli[4]. Nineteen experiments were done on free-moving cats carrying electrodes implanted chronically for recording surface and depth electroencephalogram, electrooculogram and electromyogram, and for delivering stimuli as described before[5,6]. Recordings were made on a setup including a Grass 8 channel electroencephalograph, two Grass S-4 stimulators with isolation units coupled together and a Dumont oscilloscope. Stimulus intensity ranged from 1–6 V, set at a level that could evoke clear potentials without causing apparent changes in the on-going EEG or in the behaviour of the cat. Stimuli of a pair were of identical amplitude and of 0.3 msec duration, delivered in pairs with an inter-pulse interval of about 100 msec. The paired stimuli of set parameters were delivered at intervals throughout sleep-wakefulness cycles.

Responsiveness of oculomotor nucleus to stimulations of medial vestibular nucleus showed a characteristic decrease in sleep compared to wakefulness (Figure 1). Similar decrease of responsiveness was observed in the cortex also (Figure 2). It has, however, to be noted that the amplitudes of single potentials (R1) increased in sleep; only the succeeding responses (R2) decreased (Table). This suggests that following each response there is a prolonged inhibition. It was noted earlier[7] that discharges of vestibular nucleus produce brief bursts of activity followed by prolonged periods of silence in oculomotor nucleus. It was also reported that vestibular neurons discharge in bursts during REMS[8].

Responsiveness of oculomotor nucleus to collicular stimulations was not different in sleep from wakefulness

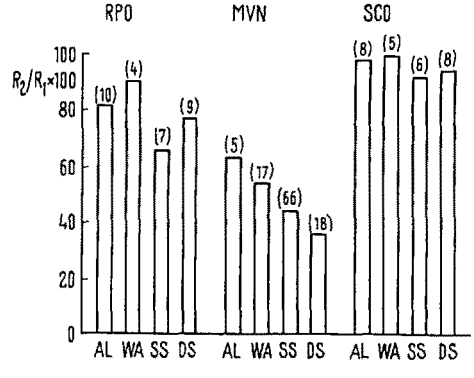

Fig. 1. Recovery of responsiveness of oculomotor nucleus to influences of RPO, MVN, and SCO during sleep and wakefulness. For abbreviations see the Table. Values in parenthesis indicate the number of pairs of responses averaged.

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Amplitudes (μV) of potentials (R1 and R2) evoked in pairs from oculomotor nucleus and marginal gyrus of cat during alert state (AL), relaxed wakefulness (WA), synchronized state of sleep (SS) and desynchronized state of sleep (DS). R1 and R2 are the first and second responses of a pair under consideration. Values of n in parenthesis follow each value of standard error

Area stimulated[a]	AL R1	AL R2	WA R1	WA R2	SS R1	SS R2	DS R1	DS R2
Responses of oculomotor nucleus								
RPO	252 ± 21.7 (10)	207 ± 24.0 (10)	345 ± 28.3 (4)	315 ± 50.8 (4)	357 ± 46.1 (7)	234 ± 26.1 (7)	209 ± 10.9 (9)	160 ± 14.8 (9)
MVN	96 ± 32.2 (6)	60 ± 28.0 (25)	209 ± 21.2 (17)	113 ± 8.5 (17)	269 ± 11.7 (66)	117 ± 9.6 (66)	212 ± 15.7 (18)	77 ± 15.0 (18)
SCO	593 ± 46.7 (8)	583 ± 42.6 (8)	654 ± 57.5 (5)	654 ± 57.5 (5)	657 ± 22.3 (6)	603 ± 35.0 (6)	787 ± 43.8 (8)	734 ± 21.1 (8)
Responses of marginal gyrus								
RPO	160 ± 6.1 (12)	133 ± 6.1 (12)	184 ± 8.4 (25)	159 ± 6.6 (25)	193 ± 8.9 (13)	189 ± 11.2 (13)	175 ± 6.8 (16)	161 ± 5.1 (16)
MVN	177 ± 1.0 (4)	177 ± 1.0 (4)	194 ± 7.7 (75)	145 ± 6.5 (75)	270 ± 12.3 (63)	118 ± 9.9 (63)	221 ± 27.0 (20)	60 ± 15.6 (20)
SCO			227 ± 9.2 (21)	200 ± 7.0 (21)	188 ± 37.0 (6)	150 ± 1.0 (6)		

[a] RPO, nucleus reticularis pontis oralis; MVN, medial vestibular nucleus; SCO, superior colliculus.

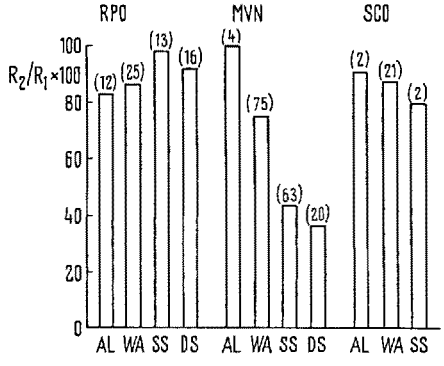

Fig. 2. Recovery of responsiveness of marginal gyrus during stimulations of RPO, MVN and SCO during sleep and wakefulness. For abbreviations see the Table.

(Figure 1). This indicates that collicular influences can be tonically effective on the oculomotor nucleus. Cortical responsiveness to collicular inputs is also not impaired in sleep (Figure 2). In view of colliculus playing a part in normal visual imagery[9], and in view of the nature of its influence on visual cortex observed here, it is likely to be involved not only in the production of REMS but also in the associated imagery. As it was reported[3] that the activity of nucleus reticularis pontis oralis controls desynchronized sleep involving REMS, effects of its stimulation were studied. No such studies on this area were made before. Single responses (R1) showed augmentation of amplitudes during sleep (Table) as observed before[6]. It is interesting that the succeeding responses (R2) are also augmented in amplitudes. The increased responses during sleep are an indication of increased recovery of responsiveness which remained at a level about that under wakefulness (Figures 1 and 2).

The present study of evoked focal potentials suggests firstly that the superior colliculus and medial vestibular nuclei play separate and distinct roles in sleep mechanisms in view of the full responsiveness for the former and diminished recovery of responsiveness for the latter inputs. It was reported that vestibular discharges cause only brief bursts of activity and long periods of silence in oculomotor nucleus[7]. Possibly, the vestibular influences are involved in the phasing of events while the influences of superior colliculus are tonic in generating effects related to REMS, under the influence of pontine triggering circuits involving nuclei reticularis pontis oralis and raphe. Secondly, the nucleus reticularis pontis oralis is actively involved in the sleep state, as suggested by lesion experiments[3], in view of its influences effective on cortex throughout sleep[10].

Résumé. Le rétablissement de la réactivité du noyau oculo-moteur et du gyrus marginal pendant le sommeil a été mesuré chez le chat non-immobilisé. Comme paramètre de ce rétablissement on a utilisé le rapport de l'amplitude du second potentiel à celle du premier potentiel induit par stimulation du noyau vestibulaire médian, du colliculus supérieur et du noyau réticulaire oral du pont. On a constaté que le rétablissement de la réactivité à la stimulation du noyau vestibulaire médian diminue pendant le sommeil, ce qui n'est pas le cas des réponses à la stimulation du colliculus supérieur et du noyau réticulaire pontique, ni celui des réponses obtenues pendant l'éveil. On en a conclu que le rôle du noyau vestibulaire médian et du colliculus supérieur dans le mécanisme responsable des mouvements oculaires rapides pendant le sommeil est différent.

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