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Cheyne-Stokes Breathing after Denervation of Carotid and Aortic Chemoreceptors and Sino-Aortic Pressoreceptors.* (23133)

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According to some theories concerning the mechanism of production of Cheyne-Stokes breathing oxygen-lack drive from chemoreceptors is a factor(1), while in other theories reflex drive is not mentioned(2). If Cheyne-Stokes breathing in any given instance is dependent upon a seesawing between the action of CO_2 on the respiratory center and oxygen lack drive exerted reflexly from chemoreceptors in the carotid and aortic bodies, it could not occur in animals having the chemoreceptors denervated, or if it should appear in an animal with IXth and Xth nerves intact it should be eliminated by denervation. In the course of studies on other aspects of control of respiration typical Cheyne-Stokes breathing was observed in 2 dogs having the sino-aortic zones denervated.

Methods and results. Each of the 2 dogs was anesthetized with sodium pentobarbital, 30 mg/kg, and had been bilaterally vagotomized at the upper cervical level. In the first experiment 500 ml of blood had been withdrawn from the dog which weighed 26 kg. Next, the region of the carotid bifurcation on each side was isolated by ligatures and excised. Shortly after this Cheyne-Stokes breathing developed. The respiratory record is shown in Fig. 1. Some of the apneic periods were as long as 40 seconds. The arrhythmia disappeared after a time to be replaced by rapid shallow breathing and returned after injection of an additional 5 mg of sodium pentobarbital per kg. The surgical procedures performed in this animal regularly result in elimination of the respiratory stimulation which is produced before denervation by 1 to 2 mg of NaCN injected intravenously; however, unfortunately, the cyanide test was not performed in this animal.

In the second dog (weighing 8 kg) the Cheyne-Stokes breathing appeared prior to isolation of the second one of the carotid zones. This animal showed a pronounced respiratory stimulation in response to 1 mg of NaCN, intravenously, before denervation. The carotid bodies and sinuses were isolated by means of ligatures placed on the appropriate arteries. The carotid arteries were cut open bilaterally to demonstrate that no blood supply to the bodies or sinuses remained. The Cheyne-Stokes respiration was a little more

FIG. 1. Cheyne-Stokes breathing in dog having the vagi sectioned and carotid sinuses and bodies excised bilaterally. *Above:* Record of respiration. Downstroke indicates inspiration. *Below:* Blood pressure from femoral artery.

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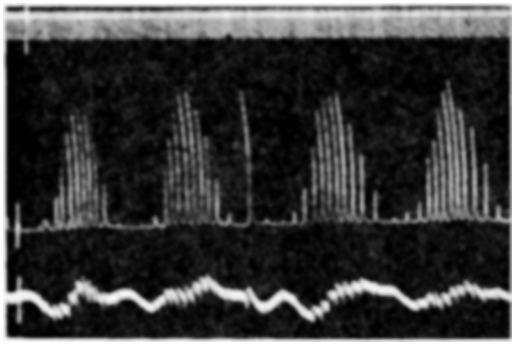

FIG. 2. Cheyne-Stokes breathing in dog after bilateral vagotomy and isolation of carotid sinuses and bodies. *Above:* Record of respiration. Upstroke indicates inspiration. *Below:* Blood pressure from femoral artery.

prominent after completion of the denervation. A record of the breathing at this stage is shown in Fig. 2. Shortly following this 1 mg of NaCN injected intravenously was found to have no effect on breathing. It must be concluded that oxygen-lack drive from the chemoreceptors was not a factor in the production of the Cheyne-Stokes breathing which developed under our conditions. Also, since sino-aortic pressoreceptors are isolated or denervated by the same procedures, rhythmic alterations in pressure in the sino-aortic zones are not concerned in the Cheyne-Stokes breathing observed.

Although the Cheyne-Stokes breathing illustrated here was independent of influences from carotid and aortic chemoreceptors and sino-aortic pressoreceptors, it still is possible that a similar type of irregularity can be produced by an imbalance of central and reflex drive. Several facts lead one to believe that Cheyne-Stokes breathing may be produced by 2 or more different mechanisms. For example, the mean arterial blood pressure shows a cyclic rise and fall during Cheyne-Stokes breathing, but in some instances the rise in blood pressure occurs during the apneic phase and in other instances the rise is during the hyperpneic phase. In both of the records shown here the latter type is seen. Possibly this type of periodic breathing has a purely central basis, while in the other type oxygen-lack drive from chemoreceptors may be a factor.

Summary. Typical Cheyne-Stokes breathing has been observed in 2 dogs having the vagi sectioned bilaterally at the upper cervical level (denervating aortic bodies and aortic pressoreceptors) and having the carotid bodies and sinuses isolated or excised bilaterally. Therefore, neither oxygen-lack drive from chemoreceptors nor reflex effects on breathing from rhythmic fluctuations in pressure in the sino-aortic zones are concerned invariably in the production of Cheyne-Stokes breathing.

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Effect of Beta-Aminopropionitrile on Reproduction of Chickens.* (23134)

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Diets containing *Lathyrus odoratus* seeds or beta-aminopropionitrile (BAPN) cause extreme abnormalities of the skeleton, hernias, dissecting aneurysms of the aorta and reproductive failure in rats(1-4). In turkeys, which are more sensitive to BAPN(5) than rats, nerve damage, internal hemorrhages and hock deformities are observed with only slight abnormality of the skeleton. Skeletal deformities were the outstanding effect observed in rats which indicates that BAPN interferes with calcium metabolism. The high level of calcium metabolism of the laying hen suggested a study of the susceptibility of this animal to BAPN toxicity.

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