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A Comparison of Synchronous Experimental Changes in Respiratory and Cardiac Rhythm of the Dog.

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This study attempts to establish the degree of similarity of response of 2 rhythmically discharging systems to similar changes in environmental conditions with the tentative assumption that similar response is indicative of a similar fundamental mechanism operating in the pace setter of respiration and the pace setter of the heart. The subject of respiratory rhythm might thus be put on a more fundamental basis and become susceptible to a more direct analysis.

Lowered alveolar oxygen and intravenous injection of sodium cyanide and sodium sulphide augmented respiratory and cardiac rate in a comparable way. Comparable changes in rate were obtained after section of the vagus nerves and removal of the stellate ganglia.

Administration of carbon dioxide almost invariably slowed the heart. When administered in pure oxygen, though the magnitude of respiratory movements was always increased, there was either slight or no reduction in rate or slight acceleration. When carbon dioxide was administered in a gaseous mixture containing approximately 22% of oxygen respiratory rate was usually augmented. The results were similar after vagotomy and removal of the stellate ganglia.

In view of the similarity of action of lowered alveolar oxygen and of sodium cyanide and sulphide, and the common tendency towards retardation on the administration of carbon dioxide, it is tentatively assumed that there is a common mechanism of rhythmic discharge in the respiratory and cardiac rhythm centers. Granting that increased intracellular acidity is a controlling rhythm factor it is concluded that there are auxiliary factors as well. Since cyanide and sulphide may decrease the hydrogen ion concentrations of the immediate external environment and alter the state of oxidation of the neurone membrane they may so exert their effects. This agrees with suggestions offered in our electro-chemical hypothesis of respiratory control.¹

¹ Gesell, R., *Proc. Soc. Exp. Biol. and Med.*, 1926, xxiv, 263.