O5.4: Effects of intermittent hypoxia on chemoreception

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Obstructive sleep apnea (OSA) occurring in humans is a complex entity conformed by at least the following elements: sleep-related repetitive episodes of airways obstruction and arterial blood hypoxia and hypercapnia, identical number of episodes of inspiratory efforts that cause important hemodynamic changes and obstruction related arousals that diminish the restoring capacity of the sleep. As commonly applied, intermittent hypoxia (IH) consists in a repetitive cycling of the composition of the atmosphere where the animals are housed. IH is usually applied during 6-8 hours (to match standard human sleeping time). The frequency of cycling between control and hypoxic atmospheres and the severity of hypoxia varies, aiming to mimic OSA of different intensities. The hypothesis behind the development of IH models was that the hypoxic episodes and concurrent carotid body (CB) stimulations are important elements in the genesis of the pathology associated to OSA (hypertension, acute cardiovascular accidents, metabolic alterations, etc.) which as a whole define the obstructive sleep apnea syndrome (OSAS). The hypothesis proved to be correct because IH animals developed hypertension and CB denervation prevented it. It was further found that the sympathetic nervous system was involved in the genesis of IH-generated hypertension being proposed a reflex loop in which the repetitive stimulation of the CB during the nocturnal hypoxic episodes caused a permanent augmentation of the sympathetic tone and hypertension. Consistent with those proposals more recent experiments have demonstrated that IH causes a sensitization of the CB chemoreceptors evidenced by augmented carotid sinus nerve responses to acute hypoxic tests and exaggerated chemoreceptor cells release of dopamine in response to acute hypoxia. Potential mechanisms leading to this sensitization of the CB function as well as explanations for some discrepancies to the model present in the literature will be discussed.

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