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Habilitation en PHYSIOLOGIE MEDICALE - Date : 05.11.2018

Titre et résumé de la thèse - Title and abstract of the thesis

The beauty of integrative physiology - From changing the posture to obliging your desire for sweet beverages: The point of view of cardiovascular homeostasis

In an attempt to delineate and describe my scientific achievements prior to and after my PhD, I used for every chapter an integrative physiological approach in order to present my research in the context of the current scientific knowledge. In doing so, I have chosen with changes in posture and ingestion of sugar-sweetened beverages two examples, which challenge cardiovascular homeostasis on multiple levels. My journey started with the introduction of basic molecular contributors involved in blood pressure regulation (epinephrine, norepinephrine, and acetylcholine along with its receptors and cellular regulations) in order to lay the fundament of understanding principles of blood pressure regulation on a cellular level. This was followed by the introduction of the baroreflex concept and its role for blood pressure regulation, which built on the former introduced molecular mechanisms. Moreover, because cardiovascular homeostasis mostly concerns blood pressure regulation, this chapter was discussed in detail on multiple levels ranging from clinical to methodological implications but always in an integrative fashion. The subsequent chapters, which concerned my research with the intention to discuss my findings in a broader context of current scientific knowledge, extended the introduced concepts by its application. In this context, changing the posture, as a model for challenging the cardiovascular system, comprises of the functional integration of (i) certain cortex areas, (ii) brainstem centers for autonomous activity and breathing patterns, (iii) the baroreflex arc, and (iv) blood volume redistribution by changing vessel diameters. Although on a different level and due to another cause, ingestion of sucrose-sweetened beverages affect similar brainstem areas and induce an increase in sympathetic nervous tone, too, but peripheral resistance, as in opposition to active standing, is decreasing. Therefore, blood pressure homeostasis can be achieved by opposing effects on total peripheral resistance and cardiac output where one begets the other. However, if one of the former major cardiovascular components fail to elicit effects, which are appropriate according to the situation, then blood pressure homeostasis becomes compromised with subsequent development of either hypertension or, in case of a vasovagal attack, hypotension.

Moreover, these two examples, i.e. changing the posture and ingestion of sugar-sweetened beverages, do suit excellently for teaching cardiovascular physiology in an integrative manner on multiple angles. Indeed, my current teaching, which encompasses various levels from practical courses to lectures over almost 300 hours a year, take advantage from my broad scientific experience, which was presented and discussed in detail in this thesis, and strives always to give students a deeper understanding of the treated topic. Based on my teaching experience, students gain a broader knowledge when using an integrative teaching approach and are more motivated to dig deeper into a topic. Therefore, and although integrative physiology almost disappeared from most of the medical school's curriculum, it is still the message of the 'beauty' of integrative physiology, which makes students engaged in their learning.

(cf. suite page suivante)

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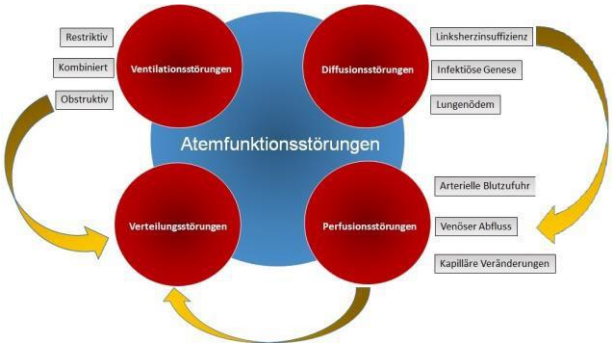
Titre et résumé de la leçon d'essai - Title and abstract of the inaugural lecture

Pathophysiologie des respiratorischen Systems– Störungen der Atemfunktion

Aufgrund der physiologischen Haupteigenschaften der Lunge, die sich grundsätzlich in Ventilation, Diffusion und Perfusion unterteilen, kann man vier pathophysiologische Prinzipien von Atemfunktionsstörungen unterscheiden: (1) Ventilationsstörungen, (2) Diffusionsstörungen, (3) Perfusionsstörungen und (4) Verteilungsstörungen. In diesem Zusammenhang sind für angehende Medizinerinnen und Mediziner besonders obstruktive Ventilationsstörungen von Bedeutung, da diese Veränderungen sehr häufig auftreten (~90% aller Atemfunktionsstörungen)



Eine weitere, sehr wichtige klinische Kompetenz für angehende Mediziner und Medizinerinnen ist die Unterscheidung der verschiedenen Formen einer Hypoxämie aufgrund ihrer Ursache (d.h. hypoxisch, anämisch und toxisch), wobei in dieser Vorlesung ein Sonderfall einer hypoxischen Hypoxämie, d.h. ein Aufenthalt in Höhenlagen (high altitude), besondere Erwähnung findet.