Multiple Organ System Interactions in Developmental Physiology

Warren Burggren

Sylvia Branum

Classically trained physiologists – whether from medical, comparative, developmental, evolutionary or environmental background – are taught to maintain as constant as possible all but the variable of interest constant, and then observe the resulting effects of environmental perturbation, for example, on how that variable is altered. In such a stable and relatively easily controlled environment, the involvement of a single physiological process produced by a single set of tissues or organ in a single organ system can often be clearly delineated. Yet, clearly, organs and organ systems do not operate in isolation. Consider the renal and cardiovascular systems, which are constantly “cross-communicating”, via chemical messengers such as the release of atrial natriuretic peptide or hormones of the renin-angiotensin system that affect the performance of each the renal system and cardiovascular system, respectively. Development is often characterized by an initial lack of intersystem communication, followed by the tentative first communications with other closely affiliated systems, followed by the full interactive communication characteristic of mature animals. Like so many other aspects of development, early developmental stages are often the most sensitive to the environment in which they develop. In this chapter, we will examine how interactions between multiple organ systems develop, respond, and are altered by environmental conditions.