Chapter 12: biosignaling

Science, Chemistry

Couse Chapter 12: Biosignaling The chapter 12 of the book Lehninger Principles of Biochemistry addresses the Biosignaling that is the ability of cells to receive and act on the received signals. The actions of these signals often take effects beyond the plasma membrane. Notably, the functions of these signals usually form the fundamental basis of life (Nelson, Lehninger, and Cox 422). According to the Biosignaling, the bacterial cells of receive constant signal input from the membrane proteins that are information receptors. These cells can be sampled and analyzed for PH, available food, oxygen, and light as well as osmotic pressure. Moreover, the cells can provide information regarding predators, noxious chemicals, and competitors for food. According to the reading of chapter 12, signals provide an appropriate response such as a motion to food thereby providing a way of detecting toxic substances or information that relates to dormant spores in a nutrient depleted medium. The chapter also highlights that plant cells or the multicellular hormones or organisms with different functions often exchange varied signals. Additionally, the plant cells usually respond to sunlight variation as well as to the growth hormones (Nelson, Lehninger, and Cox 428). Alternatively, animal cells often exchange information concerning the ion and glucose concentration in the extracellular fluids thereby facilitating the interpretation of the independent metabolic activities that take place at different parts of tissues. The same mechanisms (Nelson, Lehninger, and Cox 422) can also be used to examine the embryo and the correct placement of the cells during their development. In all the above cases, it is apparent that the vital function of the bio-signals is to present information that are detected by specific receptors and that are in turn converted to cellular

response (Nelson, Lehninger, and Cox 447). Notably, all these processes involve chemical processes. According to Biosignaling, the exchange of information in the cells involves chemical transfers, and it is referred to signal transduction that forms universal property of all living cells. In fact, different biological signals often translate to different and varied biological responses; however, organisms often use few evolutionary conserved mechanisms in detecting the extracellular signals that they in turn transduce into intracellular signals (Nelson, Lehninger, and Cox 452). Therefore, the main aim of this chapter is to examine the vital classes of signaling mechanisms of cells and analyzing and integrating specific biological functions of bio-signals. Some of the highlighted functions of the bio signals including nerve signal transmission, response to hormone and growth factors, they are responsible for sensing smell, taste, and smell as well as controlling the cell cycle (Nelson, Lehninger, and Cox 466). In most cases, the resultant signaling pathway is often defined with phosphorylation, which is formed few specific target cell proteins that usually changes activities thereby changing the activities of the cells. Article: Cell Communication and Signaling The related article in this discussion is a research article, “ NADPH oxidase 2-derived reactive oxygen species signal contributes to the bradykinin-induced matrix metalloproteinase-9 expression and cell migration in brain astrocytes.” This research was concern on the functionality of the brain in connection to pathological processes due to inflammation, neurodegeneration, and injuries (Lin 01). According to the research, matrix metalloproteinase-9 (MMP-9) often plays a significant role in the brain pathological processes described in this article. Additionally, the research

was concerned with the function of the bradykinin (BK) of reducing several inflammatory proteins expressions in the brain astrocytes. Some recent studies have indicated that increased oxidative stresses are often implicated in the brain injury and inflammation. Nonetheless, the functionality of the BK in reducing the MMP-9 expression implications of the brain through oxidative stress is not known (Lin 01). Therefore, the main aim of this research was to investigate the role of BK redox signals in reducing the MMP-9 expression in the rat's brain astrocytes or the RBA-1 cell. The results of the research (Lin 01) indicated that the reactive oxygen species (ROS) plays a vital in BK's role of reducing the MMP-9 expressions in the cultured brain in vitro as well as in the brain tissue, in vivo. The research also revealed that BK reduces MMP-9 expression through mediated Ca2+ and mediated PKC that links to the signaling pathway defined by p47phox/NADPH oxidase 2 (Nox2)/ROS (Lin 01). Notably, the Nox2 depends on the generation of ROS that leads to activation (Lin 01) and up a regulation of the transcriptional factor AP-1 of the downstream (or the c-Fos and c-Jun) that bound to MMP-9 promoter region. These relationships turn the transcription of the MMp-9 gene. Finally, the research reflected that the BK-induced MMP-9 expression's functions by elevating the astocytic migration. The migration is the function of the signal; thus, this research work relates well with chapter 12, biosignals discussed above. The main hypothesis of this paper was to determine the communication and signals in relation to metalloproteinase-9 expression and cell migration in brain astrocytes (Lin 01). The result of the research that revealed that the BK-induced MMP-9 expression's functions by elevating the astocytic migration proved the hypothesis (Lin 01) Questions and Answers 1.

Signals carrying hormones must eventually be terminated. Describe the mechanisms for the signal termination in the case of the cell migration in the brain astrocytes. A. In most cases, the extracellular enzymes can degrade hormones. In one instance, the GTP may bind to the G protein that can be hydrolyzed to GDP. Alternatively, a second messenger may be degenerated into cAMP and cGMP can be metabolized further into IP3, or they may be sequestered in Ca2+ in the endoplasmic reticulum (Lin 01). 2. How is the reactive oxygen species produced to generate signal carrier A. The radicals in the entire process are produced through various chemical and enzymatic processes or through direct inhaling of the desired radicals (Lin 01). All these answers are right since they involve metabolic reactions within the system of the living organisms. Works Cited Lin, Chih-Chung and et al. Research: NADPH oxidase 2-derived reactive oxygen species signal contributes to bradykinin-induced matrix metalloproteinase-9 expression and cell migration in brain astrocytes. 2012, retrieved December 11, 2012, web < http://www. biosignaling. com/content/10/1/35> Nelson, David L, Albert L. Lehninger, and Michael M. Cox. Lehninger Principles of Biochemistry. New York: W. H. Freeman, 2008. Print.