Significance of the brain barrier system

Author name

Affiliations

The brain is precious and needs significant protection. It is protected and encased in the skull. The skull protects it from traumatic injury. Moreover, with this protection, it also requires nutrients and oxygen, which are supplied by the blood. However, it can get damaged as a result of toxins and infections that might get into the brain via blood (Serlin, Shelef, Knyazer, & Friedman, 2015). Therefore, it is further protected with a layer of specialized membranes and cell processes that make the blood-brain barrier. In addition, the brain needs to have a stable internal environment; ionic composition, in order to perform its functions. Furthermore, it must also have the correct supply of different nutrients such as glucose, amino acids, monocarboxylates, and vitamins (Serlin et al., 2015). This blood-brain barrier (BBB) is made by brain endothelial cells that line the cerebral microvasculature. It is important for the normal functioning and development of the brain. This barrier is an important mechanism for protecting the brain as it does not allow undesirable substances to get into the tissues of the brain.

The blood-brain barrier is actually blood vessels that vascularize the central nervous system (CNS). These vessels have a function to regulate the movement of ions and molecules between the blood and the brain. The key structure of the blood-brain barrier is the "endothelial tight junction" which is formed as a result of extremely close packing of endothelial cells. This tight gap does not allow specific molecules such as fat-soluble molecules, and some gases to get into brain tissue. Additionally, this CNS homeostasis thus does not allow toxins and pathogens to enter the brain.

However, in case of any damage to this blood-brain barrier, the normal neuronal activity of the brain is damaged. For example, in the case of multiple sclerosis, there is a defective blood-brain barrier. Therefore, white blood cells penetrate the brain resulting in disturbance in brain functions.

References

Serlin, Y., Shelef, I., Knyazer, B., & Friedman, A. (2015). Anatomy and physiology of the blood-brain barrier. *Seminars in Cell & Developmental Biology*, *38*, 2–6. Elsevier.