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Assignment : Pharmacology

Adrenaline

Adrenaline and noradrenaline are two separate but related hormones and neurotransmitters. They are produced in the centre (medulla) of the adrenal glands and in some neurons of the central nervous system. They are released into the bloodstream and serve as chemical mediators, and also convey the nerve impulses to various organs. Adrenaline has many different actions depending on the type of cells it is acting upon. However, the overall effect of adrenaline is to prepare the body for the 'fight or flight' response in times of stress, i.e. for vigorous and/or sudden action. Key actions of adrenaline include increasing the heart rate, increasing blood pressure, expanding the air passages of the lungs, enlarging the pupil in the eye (see photo), redistributing blood to the muscles and altering the body's metabolism, so as to maximise blood glucose levels (primarily for the brain). A closely related hormone, noradrenaline, is released mainly from the nerve endings of the sympathetic nervous system (as well as in relatively small amounts from the adrenal medulla). There is a continuous low level of activity of the sympathetic nervous system resulting in release of noradrenaline into the circulation, but adrenaline release is only increased at times of acute stress.

Overproduction of adrenaline is very common. Most people are exposed to stressful situations on occasion and so most of us are familiar with the typical symptoms of adrenaline release, such as: rapid heartbeat, high blood pressure, anxiety, weight loss, excessive sweating and palpitations. However, this is a normal response of the body which is intended to help us respond to a stressful situation; once the acute stress is over, the symptoms quickly disappear as adrenaline hyper-secretion stops. Some people with obesity and untreated obstructive sleep apnea may be exposed to high levels of noradrenaline/adrenaline each night as they struggle to breathe; this might play a role in the development of high blood pressure in such people.

Very rarely, overproduction of adrenaline/noradrenaline may be caused by an adrenal tumour called pheochromocytoma or a paraganglioma (if it is located outside the adrenal but along the nerves of sympathetic nervous system that run through the chest and abdomen). Such tumours may run in families as well. The symptoms can include the typical symptoms of adrenaline excess on an intermittent basis but, in some cases, the symptoms can be quite mild so as to be barely noticeable.

Suffering from too little adrenaline is very unusual, even if you have lost both adrenal glands through disease or surgery. Since 90% of the body's noradrenaline comes from the nervous system, the loss of 10% via the adrenal glands is not really significant. 'Adrenaline deficiency' therefore does not really show up as a medical

disorder except perhaps in exceedingly rare and unusual genetic catecholamine enzyme deficiencies.

Epinephrine

Epinephrine, more commonly known as adrenaline, is a hormone secreted by the medulla of the adrenal glands. Strong emotions such as fear or anger cause epinephrine to be released into the bloodstream, which causes an increase in heart rate, muscle strength, blood pressure, and sugar metabolism. This reaction, known as the “Flight or Fight Response” prepares the body for strenuous activity. In medicine epinephrine is used chiefly as a stimulant in cardiac arrest, as a vasoconstrictor in shock, and as a bronchodilator and antispasmodic in bronchial asthma. Epinephrine is found in small amounts in the body and is essential for maintaining cardiovascular homeostasis because of its ability to divert blood to tissues under stress.

During cardiac arrest the top priority is to maximize the amount of blood flow through the coronary artery. Epinephrine, when injected into an intravenous fluid solution, will increase the coronary artery pressure thereby promoting increased coronary blood flow. Increased doses of epinephrine quicken the response, but some studies have shown that brain and heart damage are some of the side effects.

Anaphylactic shock is caused whenever the heart is unable to pump enough blood throughout the body due to an allergic reaction, weakening of the heart muscle, or shrinking of the veins (vasodilation). Injection of epinephrine into the blood stream will cause an increase of blood flow throughout the body. The relief is only temporary due to the short half-life of adrenaline; therefore, immediate hospitalization is required to ensure safety to the individual.

Individuals who are prone to asthma attacks have lung passages that are more susceptible to inflammation and swelling. The swelling causes constriction of the muscles around the airway tubes and an increase in mucus. The combination of these three leads to the shortness of breath, coughing, or wheezing common to those who suffer from asthma. When inhaled in small doses, epinephrine causes short-term relief from the symptoms by widening the bronchial tubes allowing air to pass through. Once again epinephrine is not the best cure, but a temporary relief when an asthma inhaler is not present.