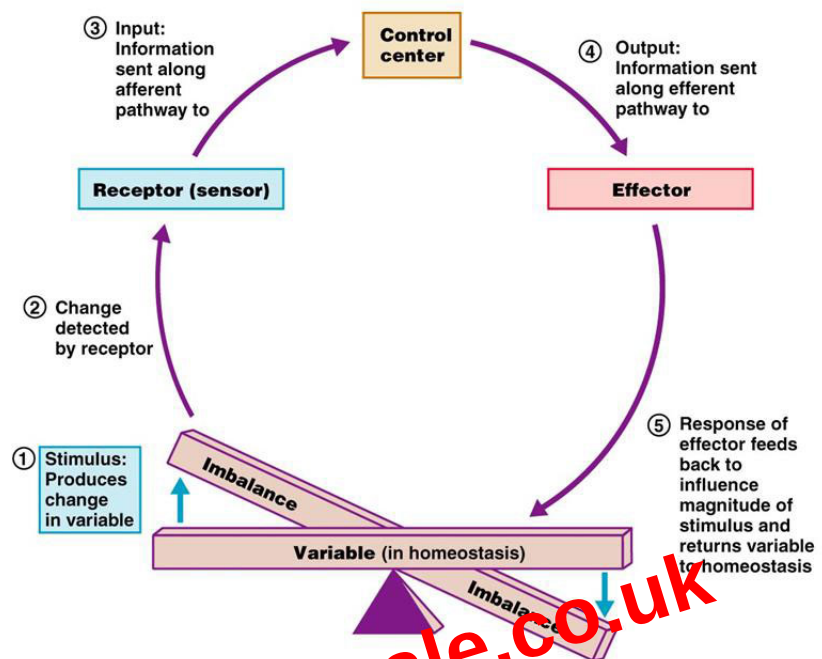


TOPIC: Keeping the balance

Case Study 1: Feedback loops and how they link within the body

Numerous of molecular and physiological processes in the body are controlled by what is known as a feedback loop. Feedback loops are a prominent feature in human biochemistry and physiology.

They work through a 'looping' process. Say for example, whilst working out, body temperature increases.



A stimulus produces a change in a variable within the body, the change is detected by the receptor. An input occurs where it sends the information along afferent pathways to the Control centre. Output then sends the information, along an efferent path, from the control centre to the effector where a response from the effector balances out the original stimulus to maintain homeostasis. [Anatomy & Physiology, 2016] This is represented in Figure 1.

In biology, there are two feedback loops. Negative feedback loops and Positive feedback loops. [NA/2016] Negative feedback is by far the most common of the two. Negative feedback works as a regulator. When a variable changes in the body to make the temperature rise or fall, or a change in persons blood glucose concentration, this triggers the process that then counteracts the body's change. Negative feedback loops control the rate of the process to later evade an increase of the upshot. For example, "When blood sugar rises, insulin sends a signal to the liver, muscles and other cells to store the excess glucose. Some is stored as body fat and other is stored as glycogen in the liver and muscles" [HCF, 2015] Positive feedback is the complete opposite. When certain variables in the body change, positive feedback loops acts to exacerbate and amplify it. Positive feedback loops tend to destabilize a system causing it to go to an extreme. Positive feedback commonly will occur during a women's pregnancy or the causes of a stroke.

CASE STUDY 3: Diabetes prevalence in Australia

Diabetes is a disorder in the metabolism, when the body cannot produce insulin in the pancreas. Without a sufficient amount of insulin, glucose builds up. There are three classifications of diabetes. Type 1 (insulin dependent), Type 2 (non insulin dependent) and Gestational Diabetes (occurs through pregnancy).

Diabetes is an international epidemic. Dr Lesley Russel, gave an insight to this epidemic stating "the Australian public needed to be made much more fearful of the consequences of obesity and diabetes." In 2013, 269 Australia adults aged over 25 develop diabetes everyday and approximately 1.5 million people in Australia had diabetes and 2 million had pre-diabetes. [Swannell, 2013]

Professor Paul Zimmet discussed that the current diabetes epidemic was at the equivalent of the cholera and typhoid epidemics of the 19th century, stating that 370 million people worldwide are diagnosed with diabetes [Swannell, 2013]

In 2015, it was discovered that 280 Australians develop diabetes every day.

That's estimated as one person every five minutes. Around 1.7 million Australians have diabetes. This includes all types of diagnosed diabetes (1.2 million known and registered) as well as silent, undiagnosed type 2 diabetes (up to 500,000 estimated). With this increasing rate of Diabetes, it is safe to say that this is a growing epidemic effecting every 1 in 15 people have been diagnosed with diabetes [static.diabetesaustralia/2015] The WHO projects that diabetes will be the 7th leading cause of death by 2030. [WHO,2015]

With diabetes, there are various ways to prevent and treat it. Taking into consideration the genetic predisposition of a person, the prevention techniques may differ for each person. Type 1 diabetes is an autoimmune process in which the body depends on insulin where as type 2 diabetes is a disease of relative rather than absolute insulin deficiency. [Polonsky,2001] In type 2 diabetes, the pancreatic cells become progressively less able to secrete sufficient insulin to maintain normal carbohydrate and lipid homeostasis. In addition, the strength of the genetic contribution to the cause of type 2 diabetes seems to be less than that for type 1 diabetes, with overall genetic risk ratio ranging from 2 to 4 [Weijnen, 2002]. Many studies show that lifestyle changes, such as losing weight, eating healthy and increasing physical activity can dramatically reduce the progression of type 2 diabetes and are important to controlling type 1 diabetes. These lifestyle changes can help minimize other risk factors as well, such as high blood pressure and blood cholesterol, which can have a tremendous impact on people with diabetes. [American Heart Association,2016] In many instances, lifestyle changes must be complemented by a regimen of medication to then control blood glucose levels, high blood pressure and cholesterol.