

1. Feedback Control Regulation of a hormone in terms of requirement is best accomplished through feedback from the blood concentration of the hormone concerned (hormone–hormone) or some result of action of the hormone (substrate–hormone). Feedback control is of two types:

- Negative feedback control and
- Positive feedback control.

Negative Feedback Control. Generally, the influence of blood concentration of the hormone concerned or its effect is to inhibit further secretion of the hormone and is called negative feedback control (Fig. 8.1-2A).

Positive Feedback Control. This is less common and acts to amplify the initial biological effects of the hormone (Fig. 8.1-2B).

Depending upon the product involved, the feedback mechanism may be:

- Hormone–hormone feedback,
- Substrate–hormone feedback and
- Mineral–hormone feedback.

i. Hormone–Hormone Feedback Control. The best example of hormone–hormone negative feedback control is regulation of hormone secretions by hypothalamus and pituitary, which involves three loops (Fig. 8.1-3):

- **Long-loop feedback** (Fig. 8.1-3A). The peripheral gland hormone (e.g. thyroid, adrenocortical and gonads) can exert long-loop negative feedback control on both the hypothalamus and the anterior lobe of pituitary.
- **Short-loop feedback** (Fig. 8.1-3B). The pituitary trophic hormones decrease the secretion of hypophysiotrophic hormone (e.g. GHRH, GHIH, TRH, GnRH, etc.) by short-loop feedback.
- **Ultrashort-loop feedback** (Fig. 8.1-3C). The hypophysiotrophic hormones may inhibit their own synthesis and secretion via an ultrashort-loop feedback mechanism.

ii. Substrate–Hormone Feedback Control. The best example of substrate–hormone feedback control is regulation of insulin secretion from pancreatic beta cells of islets of Langerhans and glucagon secretion from alpha

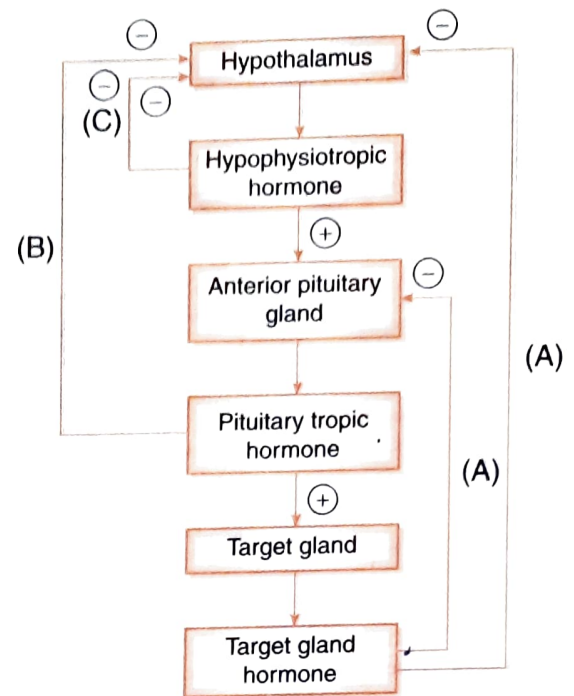


FIGURE 8.1-3 Hormone–hormone negative feedback control by hypothalamus and pituitary: A, long loop feedback; B, short loop feedback; and C, ultrashort loop feedback.

cells by blood glucose levels. A rise in blood glucose level promotes the secretion of insulin, while a fall in blood glucose promotes secretion of glucagon. These responses keep the blood glucose level within narrow limits in spite of variation in carbohydrate intake in diet.

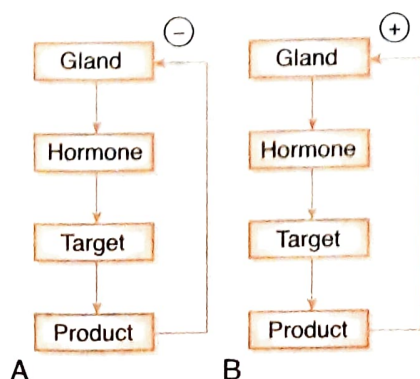


FIGURE 8.1-2 Hormonal regulation by feedback control mechanism: A, negative feedback; and B, positive feedback.