

## Hormones, Bariatric Surgery and Weight Loss

Although energy intake restriction plays an important role in post-surgical weight loss, other studies have suggested other complementary mechanisms that affect the long-term weight loss such as the role of hormones, particularly gastric hormones.

The incretin (gastrointestinal hormone) glucagon-like peptide-1 (GLP-1) is secreted and released by special endocrine cells in the gastrointestinal tract and pancreas (L-cells) in response to meal consumption (Ionut, Burch, Youdim, & Bergman, 2013). GLP-1 affects energy intake and satiety by modulating glucose homeostasis via enhancing insulin secretion, inhibiting glucagon secretion, and contributing to the "ileal break" phenomenon by slowing gastric emptying and intestinal motility (Ionut et al., 2013). Levels of GLP-1 were found to be increased as early as 2 days after Roux-en-Y bypass (RYGB) and 1 week after biliopancreatic diversion (BPD) (Ionut et al., 2013). No increases in postprandial GLP-1 were observed after gastric banding (Ionut et al., 2013).

Falken et al. (as cited in Ionut et al., 2013) found increased GLP-1 levels at 3 days, 2 months, and 1 year after gastric bypass (GB). Similarly, increased GLP-1 levels were found at 1, 3, and 6 months after RYGB (Ionut et al., 2013). In the studies, GLP-1 levels were positively correlated to decreased sense of hunger and increased sense of fullness/satiety (Ionut et al., 2013).

Peptide YY (PYY) is also released by L-cells. PYY inhibits gastric emptying and intestinal motility (and thus is a contributor to the "ileal break" phenomenon) (Ionut et al., 2013). Increased PYY levels were also found post RYGB and sleeve gastrectomy (SG) surgery (Ionut et al., 2013). Increased PYY levels were observed to correlate to greater weight loss.

Oxyntomodulin, co-secreted with GLP-1 and PYY, release by L-cells is stimulated by food consumption as well. Oxyntomodulin is an anorectic hormone inhibiting gastric acid secretion and gastric activity; it reduces food intake and may encourage energy expenditure (Ionut et al., 2013). Oxyntomodulin, GLP-1, and PYY have been described as the "L-cell triumvirate" when it comes to hormonal effects on weight loss (Ionut et al., 2013). Oxyntomodulin levels were likewise found to be higher post-surgery.

GLP-1 works with glucose-dependent insulinotropic polypeptide (GIP) (Ionut et al., 2013). GIP is secreted by K-cells of the duodenum and proximal jejunum (Ionut et al., 2013). GIP levels are stimulated by nutrient ingestion and possibly neurally stimulated as well (Ionut et al., 2013). GIP participates in glucose and lipid metabolism. Decreased levels of GIP were noticed after BPD and RYGB surgeries (Ionut et al., 2013). One reason is because of the decreased nutrients stimulating GIP in K-cells when bypassing the upper small intestine (Ionut et al., 2013).

Ghrelin and the role of the vagus nerve in weight loss post-surgery have been studied, but results are inconclusive. No doubt post-surgery, many systems in the body are affected and will learn to compensate over time. It is important to recognize that long-term effects are still not that well-studied especially those effects on seemingly "unrelated" systems. Bariatric surgery is a big deal, and one needs to weigh the long-term consequences.

## Reference

Ionut, V., Burch, M., Youdim, A., & Bergman, R. N. (2013). Gastrointestinal hormones and bariatric surgery-induced weight loss. *Obesity (Silver Spring, Md.)*, *21*(6), 1093-1103.  
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