Table 1. Adipokines with an impact on the HPG axis

Name	Expression cells/ tissues	Regulation by:	Target cells or tissues	Function	Population studies	KO mice, mutations	References
Adipokines							
Leptin	Adipocytes, gonadotrophs, thyreoidotrophs, somatotrophs	Circadian rhythm during menstrual cycle	Hypothalamus, pituitary, ovaries	↑GnRH, pSTAT3, LH, FSH, estradiol *Outcomes:* Sexual maturation, puberty, seasonal regulation of sexual behavior		ob/ob KO mice: *Characteristic:* Low kisspeptin transcript in the hypothalamus	7, 8, 21, 25, 27-33, 35, 36, 68, 102
		Energy homeostasis, adipose cell mass and number	Hypothalamus, brain stem, cortex	↓NPY, AgRP and ↑a-MSH/ POMC, CART *Outcomes:* Decreased appetite			103
Adiponectin	Adipocytes, pituitary, theca cells, cumulus cells, oocytes, Leydig cells, spermatozoa, epididymis	Estrous cycle, GnRH, LH, FSH	Pituitary	↑FSH, progesterone, insulin-induced LH, IGF-1-induced progesterone and E2		AdipoR1 or adipoR2 knockdown in human granulosa KGN cells affect survival and production of sex steroids	20, 26, 55, 57, 60-63, 68, 73, 75, 76, 102
		Energy homeostasis, adipose cell mass and number	Immune cells	↑M2 macrophages, ↑monocyte apoptosis, ↓NFkB signaling *Outcomes:* Local and systemic anti-inflammatory effects and protection of Leydig cells			55, 58, 100, 102
			Pancreas	↑Survival pancreatic β-cells *Outcomes:* Insulin-sensitizing effects			56
			Arcuate nucleus, adipose tissue	↑Fat oxidation, ↓local inflammatory response *Outcomes:* Energy balance			58
Visfatin	Adipocytes, human primary granulosa cells, human granulosa KGN cell line, human cumulus cells, oocytes	Obesity, type 2 diabetes, cardiovascular disease	Immune cells	↑TNFa, IL-6, IL-1β *Outcomes:* Monocyte chemotactic activity			78, 81
			Ovaries	↑Leydig cell steroidogenesis *Outcomes:* Ovarian function	↑Visfatin, ↑LH (women with PCOS)		79, 101
Resistin	Adipocytes, porcine ovaries	Gonadotrophins, gonadal steroids, IGF1	Ovaries	↓ Steroids *Outcomes:* Ovarian steroidogenesis	↑Adiponectin to resistin ratio, ↑FSH, ↑LH, ↓free androgen index (women with PCOS)		82, 84, 94, 102