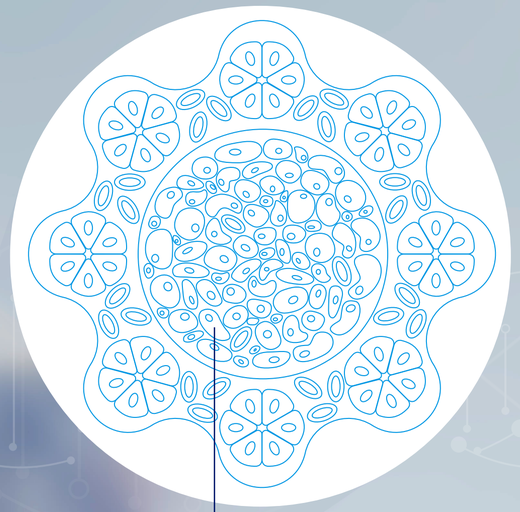
The role of Amylin in appetite regulation and food intake

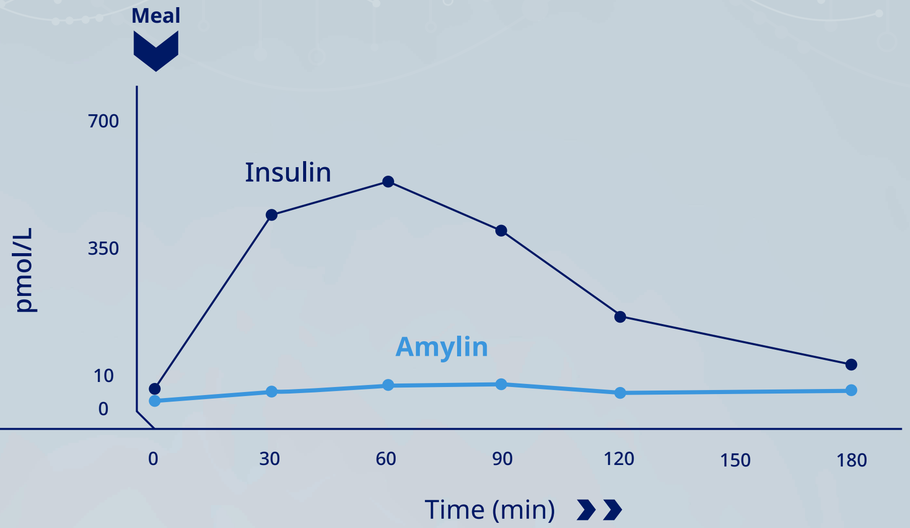
START

Date of preparation: October 2025



β cell

Amylin and insulin are co-secreted from pancreatic β cells, and postprandial plasma levels of both hormones increase rapidly after food intake[1,2]



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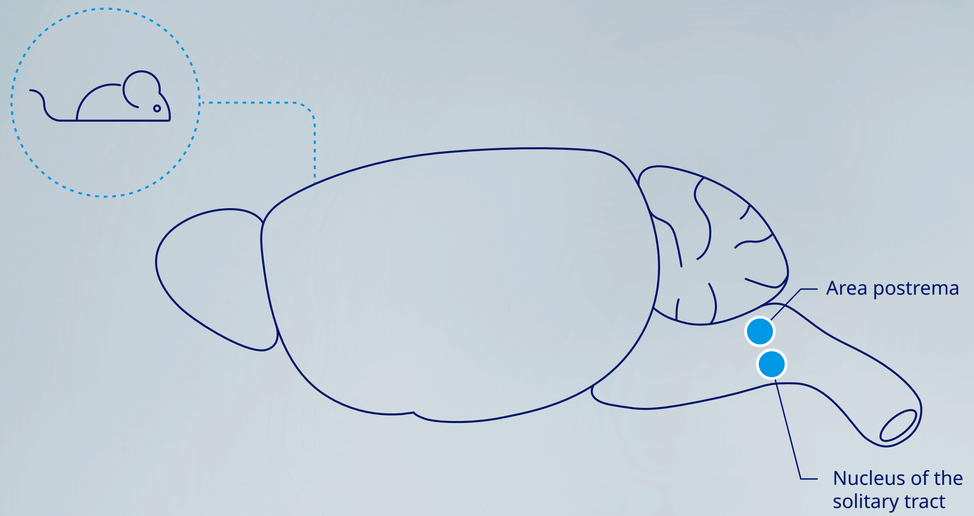

In rodents, amylin rapidly binds to neurons in the area postrema in the hindbrain.[3–5] The area postrema integrates neural signals from the body via the nucleus of solitary tract, modulating the effects of amylin[4,5]

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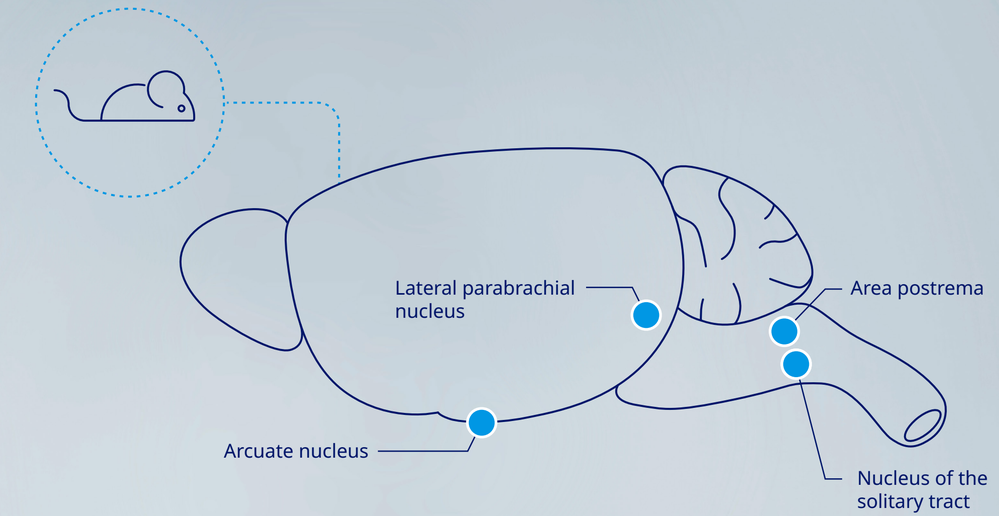

By targeting specific neurons in the hindbrain and the hypothalamus, and through subsequent downstream signaling in additional brain regions, amylin increases satiety and reduces food intake[4–11]

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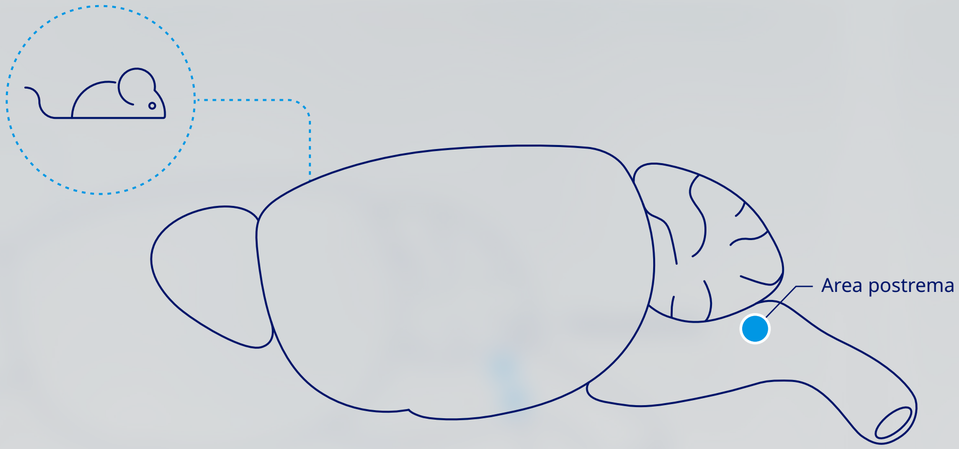
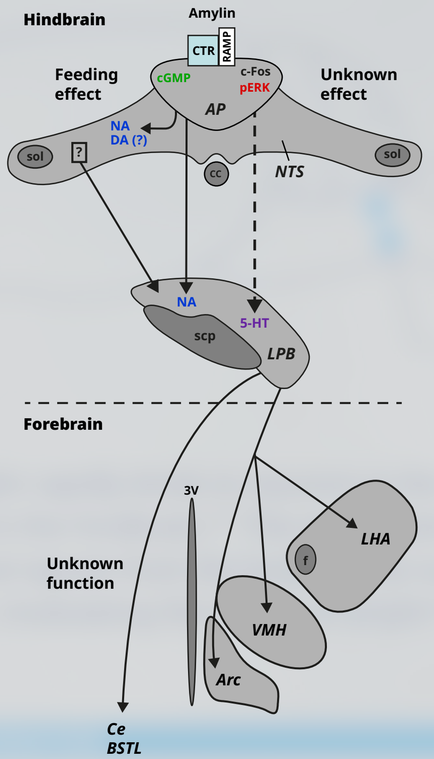


Functional studies using animal models have shown that the area postrema has the primary role in mediating the effect of amylin on central appetite regulation.[4,5] The lack of a blood–brain barrier around the area postrema allows amylin to rapidly bind receptors on neurons and induce a fast response upon food intake[4,5]

However, different types of binding studies have shown that peripheral amylin may bind other brain regions,[4,5] and that amylin-induced signaling in the hypothalamus may occur directly[6–8]

Rat brain from apical view



Preclinical studies in animal models have demonstrated that neurons activated by amylin in the area postrema are mostly noradrenergic, with a minor proportion co-expressing serotonin, and that noradrenaline plays an important role in downstream amylin signaling[4,5]

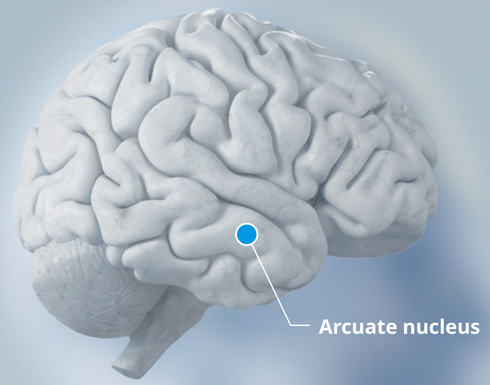
Other neurons in the area postrema and nucleus of solitary tract, such as glutamatergic and dopaminergic neurons, may modulate downstream amylin-induced signaling[4,5]

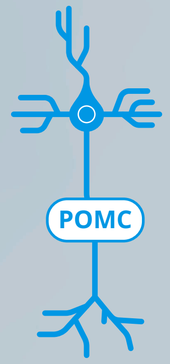
3V, third ventricle; 5-HT, serotonin; Arc, arcuate nucleus; AP, area postrema, BSTL, bed nucleus of the stria terminalis; Ce, central nucleus of the amygdala; cc, central canal; cGMP, cyclic guanosine monophosphate; c-Fos, Fos proto-oncogene (activator protein-1 transcription factor subunit); CTR, calcitonin receptor; DA, dopamine; f, fornix; LHA, lateral hypothalamus; LPB, lateral parabrachial nucleus; NA, noradrenaline; NTS, nucleus of solitary tract; pERK, phosphorylated extracellular signal-regulated kinase; RAMP, receptor activity-modifying protein; scp, superior cerebellar peduncle; sol, solitary tract; VMH, ventromedial nucleus of the hypothalamus.

Amylin regulates food intake via two processes:[5,9–11]
1. **homeostatic**, or regulation of energy intake
2. **hedonic**, or reward and pleasure-associated eating

Homeostatic processes

Hedonic processes





Where:	**Where:**	**Where:**
Physiological function:	**Physiological function:**	**Physiological function:**
Amylin effect:	**Amylin effect:**	**Amylin effect:**

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AGRP, agouti-related peptide; NPY, neuropeptide Y; POMC, pro-opiomelanocortin.

BACK

Amylin regulates food intake via two processes:[5,9–11]
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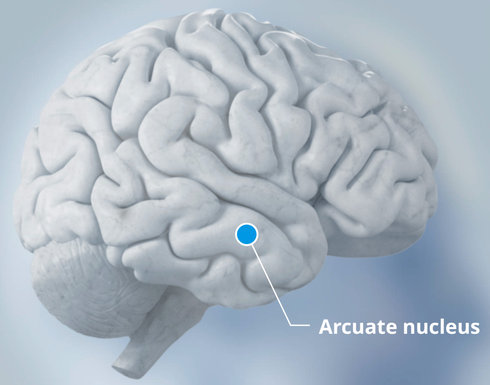
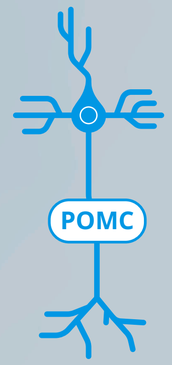
Homeostatic processes

Hedonic processes





Where: arcuate nucleus	**Where:** arcuate nucleus	**Where:** arcuate nucleus
Physiological function:	**Physiological function:**	**Physiological function:**
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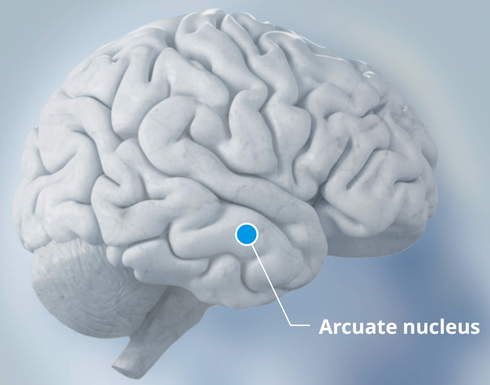

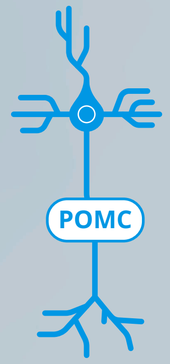

	Where:	**Where:**	**Where:**
−	**Physiological function:** stimulate food intake, acting on paraventricular nucleus, ventromedial hypothalamus, and lateral hypothalamic area	**Physiological function:** stimulate food intake, via inhibition within paraventricular nucleus	**Physiological function:** inhibit food intake, plus regulating energy expenditure and internal heat production
	Amylin effect:	**Amylin effect:**	**Amylin effect:**

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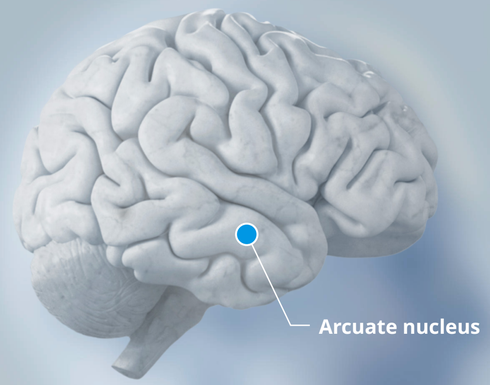

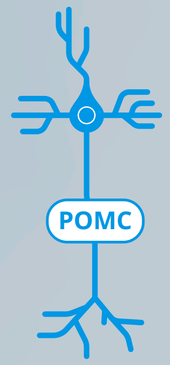

Where:	**Where:**	**Where:**
Physiological function:	**Physiological function:**	**Physiological function:**
Amylin effect: inhibition	**Amylin effect:** inhibition	**Amylin effect:** stimulation

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AGRP, agouti-related peptide; NPY, neuropeptide Y; POMC, pro-opiomelanocortin.

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For further reading about the anatomy of the homeostatic and hedonic processes, how neural processes in the homeostatic and hedonic regulatory pathways respond differently to high-fat, high-carbohydrate, high-fat and high-sugar, or high-protein diets, and how homeostatic and hedonic processes are dysregulated in obesity, the review by Tulloch AJ et al. 2015 is recommended.[9] This article distinguishes evidence based on preclinical or clinical studies

Amylin regulates food intake via two processes:[5,9–11]
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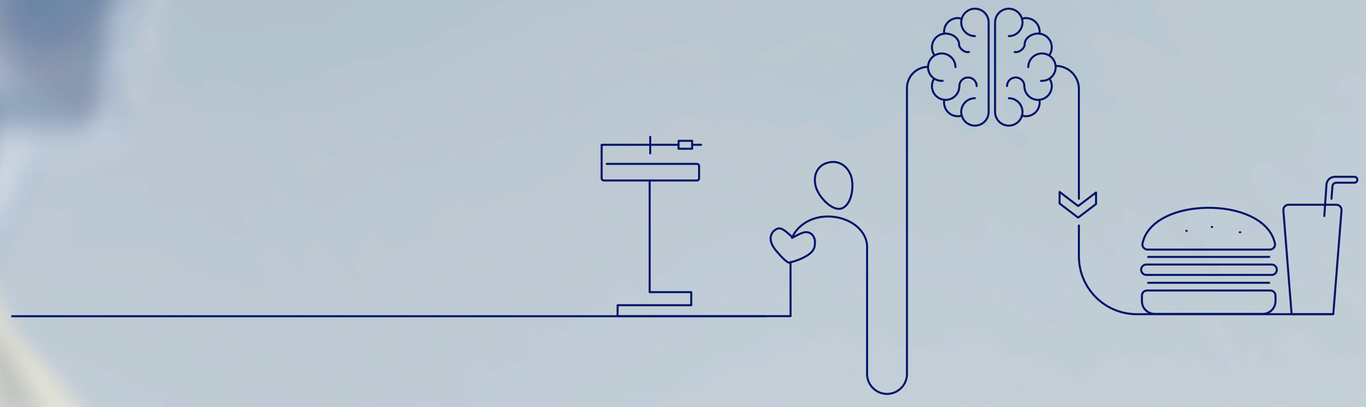
Homeostatic processes

Hedonic processes

Amylin may also modulate hedonic processes, or reward and pleasure-associated eating, via central brain regions such as hypothalamic nuclei and the limbic system



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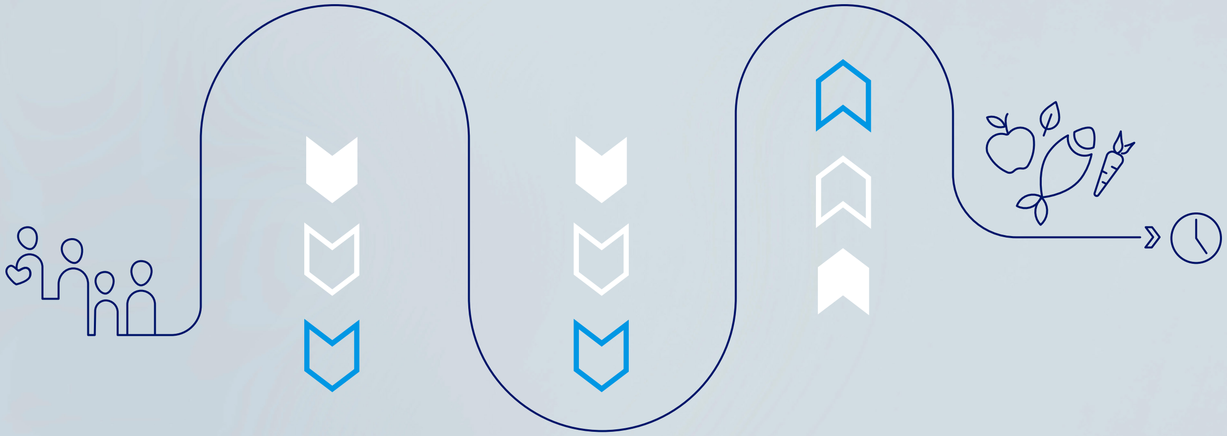
The central appetite regulatory pathways induced by amylin lead to increased **satiety** (feeling of fullness *between* food intake) and **satiation** (feeling of fullness *during* food intake)[12–15]

In humans, increased plasma levels of amylin are correlated with:[12]



Hunger
r = –0.37

Desire to eat
r = –0.40

Satiety
r = 0.38

Increased time to next meal

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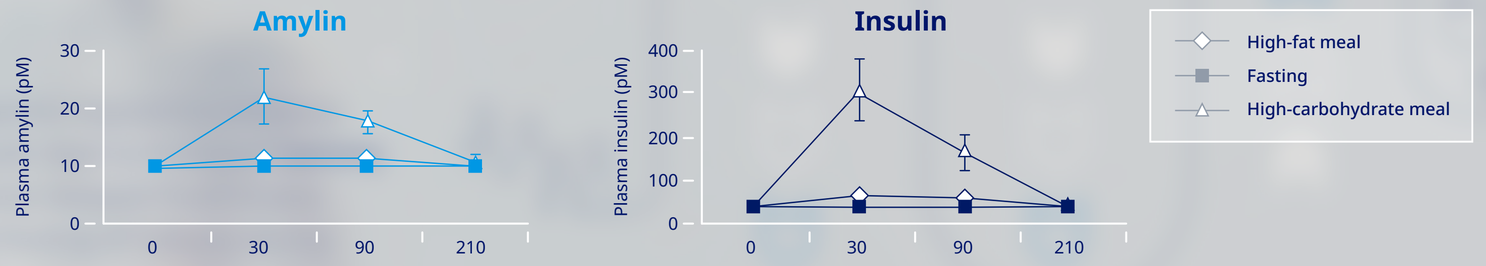
REFERENCES

A randomized, crossover study demonstrated that the secretion of amylin and other hormones after food intake is different depending on the composition of the meal.[12] The plasma levels of amylin and insulin were significantly higher immediately after intake of high-carbohydrate meals versus high-fat meals or fasting (Figure).[12] Conversely, the plasma levels of glucagon-like peptide-1 and leptin remained stable regardless of meal composition

Despite the differential hormone secretion, intake of either high-carbohydrate or high-fat meals led to similar ratings of satiety, hunger, and desire to eat[12]



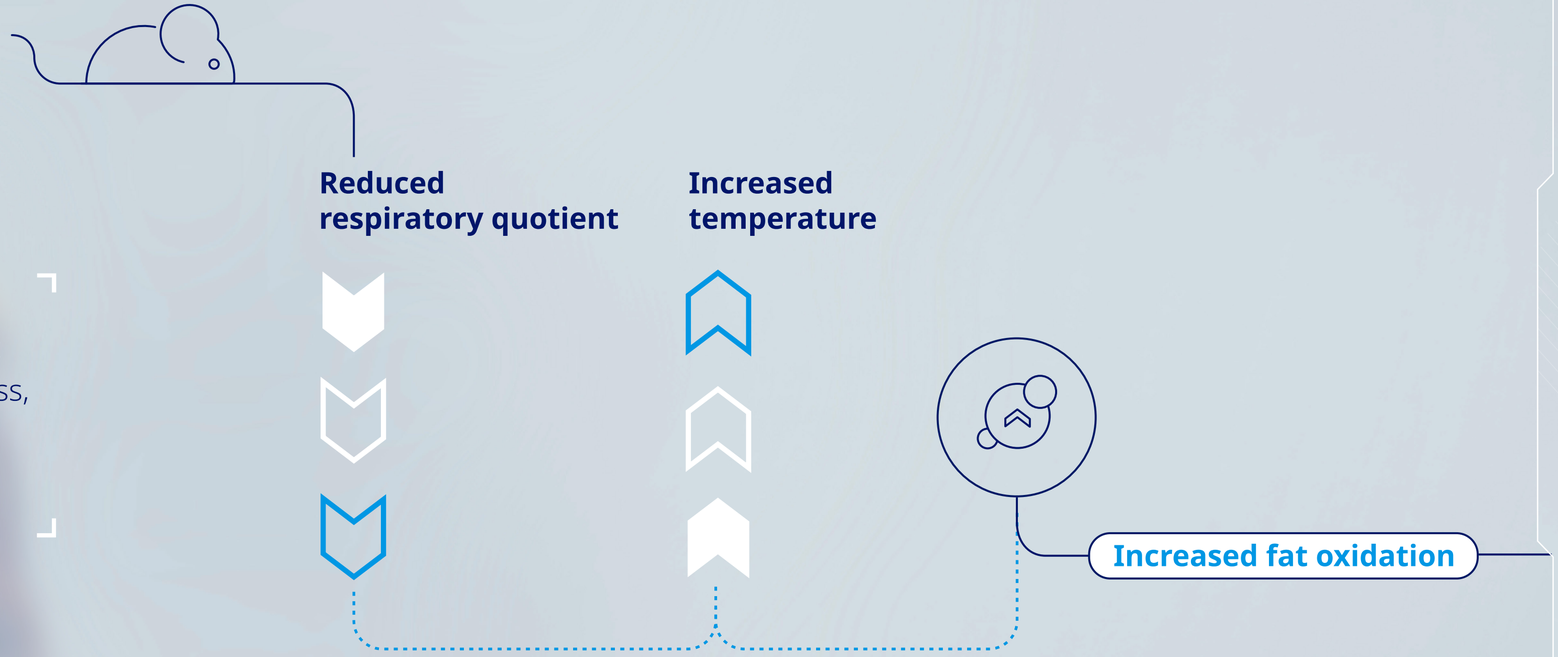
Preclinical experiments in rats have shown that the regulation of food intake by amylin may be modulated by other hormones.[16] The hormone ghrelin, which stimulates food intake, reduced but did not fully reverse the inhibited food intake induced by amylin. Injection of either leptin or insulin together with amylin synergistically reduced food intake. Consequently, central appetite regulation by amylin may be modulated by other peripheral signals that regulate adipose tissue or function

In rats, amylin infusion reduces meal size and duration in a dose-dependent manner[13,14]

REFERENCES

BACK

In rats, amylin signaling is important for reduced body weight and fat mass, with relative preservation of lean body mass[17,18]



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Lean body mass plays an important role in metabolism.[19,20] The metabolic rate differs between organs within the fat-free mass compartment, and obesity and/or changes in body weight are conditions that are known to change the metabolic rate[20]

Preclinical study data with diet-induced obesity-prone rats showed that amylin may reduce respiratory quotient, and preserve lean body mass[17]

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