Effect of dopamine on glucose-stimulated insulin production in the equine pancreas *in vitro*.

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Background

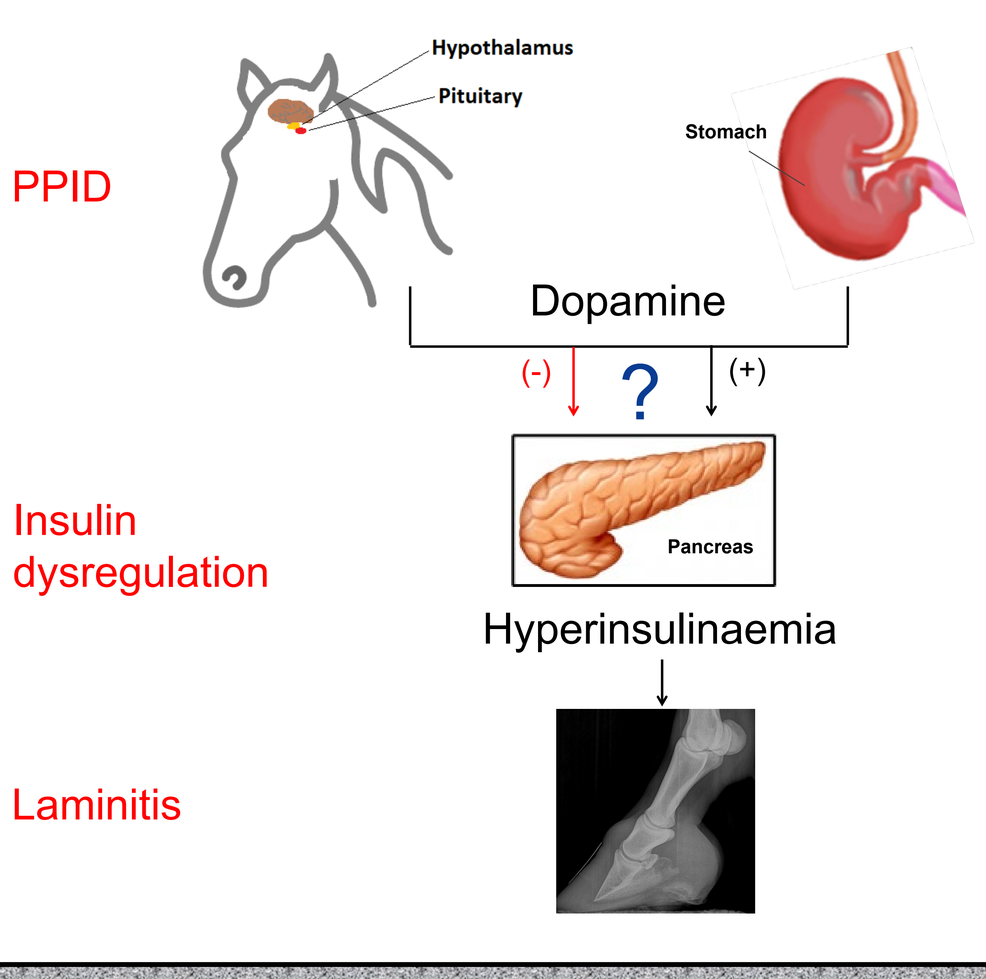
Dopamine is secreted from neuronal and extra-neuronal tissues including the equine hypothalamus, and parietal cells in the equine stomach, based on our recent research.

In other species, the pancreas responds to dopamine by decreasing or increasing insulin production, depending on the concentration and which dopamine receptors (D_2 or D_3) are activated.

Significance

A decline in dopamine production occurs in Pituitary pars intermedia dysfunction (PPID). This is often associated with insulin dysregulation (ID), and an increased risk of laminitis.

Excessive insulin secretion after a carbohydrate-rich meal, can be attenuated in horses with PPID and ID, using pergolide. However, the direct effects of dopamine on pancreatic tissue from healthy horses, have not been investigated.



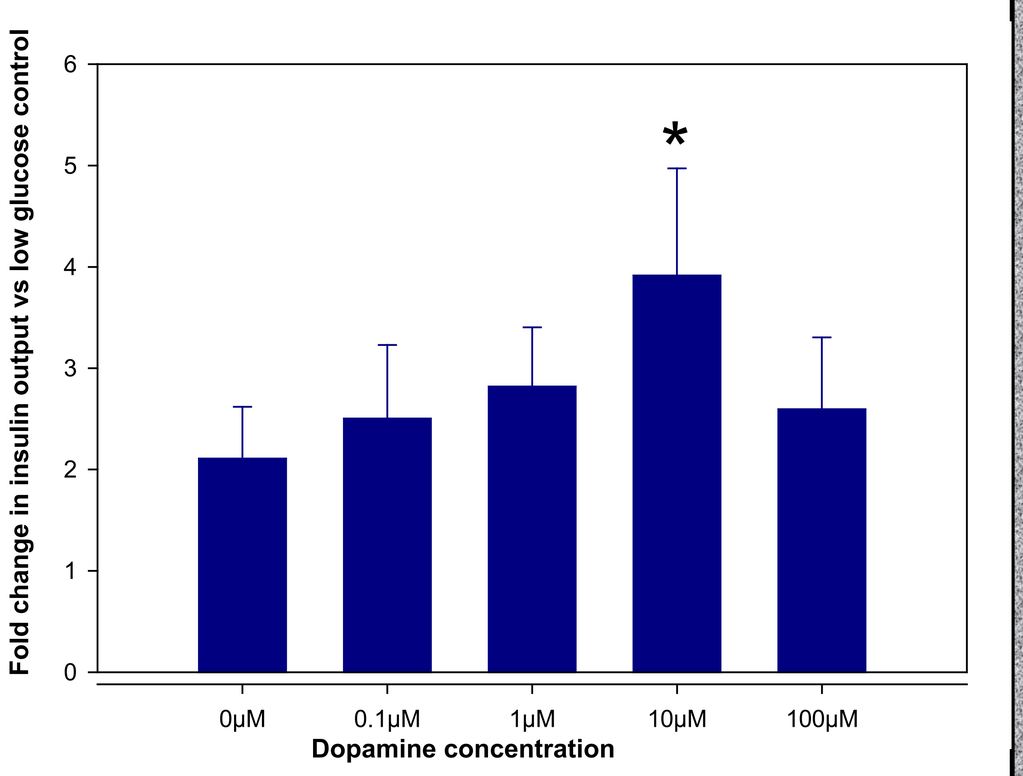
Aim and methods

This study aimed to measure the direct effect of dopamine on insulin secretion in equine pancreatic explants.

Samples from 12 healthy, mixed breed horses were obtained within 20 min of euthanasia at an abattoir. The samples were washed, cut into 3 mm^3 explants, and incubated for 1 h at ambient temperature in Kreb's buffer with either 2.5 mM glucose alone (low glucose control), or 10 mM glucose (high glucose) plus dopamine at 0, 0.1, 1, 10, or 100 µM. Insulin output was measured using a validated ELISA kit.

Results

Dopamine had a bi-phasic effect on glucose-stimulated insulin production. Compared with the high-glucose control explants, insulin output was doubled at 10 µM dopamine ($P < 0.05$), but no increase was seen at 100 µM dopamine.



Conclusions

Dopamine can augment glucose-stimulated insulin production in isolated pancreatic tissue from healthy horses. The effect is likely mediated via D_3 receptors, but is counteracted by high dopamine concentrations, suggesting the activation of D_2 receptors.

Clinical relevance

A better understanding of the interaction between dopamine and insulin production could lead to new insights into PPID and ID, and new approaches for the prevention of hyperinsulinaemia-associated laminitis.