INSTITUTO FEDERAL
Rio de Janeiro

Processo Seletivo para os Cursos de Mestrado e Doutorado dos Programas de Pós-Graduação *Stricto Sensu* - Editais Nº 49, 50 e 51/2025

CADERNO DE QUESTÕES

EXAME DE SUFICIÊNCIA EM LÍNGUA ESTRANGEIRA
LÍNGUA INGLESA

ATENÇÃO!

Não abra este caderno antes de ser autorizado pelo fiscal.

Você está recebendo um **CADERNO DE QUESTÕES** e um **CADERNO DE RESPOSTAS.**

O **CADERNO DE QUESTÕES** consta de **4 (quatro) páginas**, numeradas sequencialmente, incluindo espaço para rascunho.

O **CADERNO DE RESPOSTAS** consta de **3 (três) páginas** numeradas sequencialmente.

A resposta deverá ser escrita na folha destinada a cada questão.

Esta é uma prova dissertativa com o valor máximo de **10 (dez) pontos**.

TODAS AS QUESTÕES DEVEM SER RESPONDIDAS EM PORTUGUÊS.

INSTRUÇÕES

1 Ao receber autorização para abrir este caderno, verifique se a impressão, a paginação e a numeração das questões estão corretas. **Caso ocorra qualquer erro, notifique o fiscal**.

2 Para qualquer tipo de rascunho, somente será permitida a utilização das folhas constantes do **CADERNO DE QUESTÕES**. Não é permitido ao candidato destacar qualquer folha deste caderno.

3 O desenvolvimento das questões só será considerado se transcrito a caneta esferográfica de tinta azul ou preta, para o espaço destinado à resposta de cada questão no **CADERNO DE RESPOSTAS**.

4 **NÃO** será permitido ao candidato nenhum tipo de consulta, exceto o uso do dicionário português–inglês, inglês-português.

5 Evite rasuras no **CADERNO DE RESPOSTAS**.

6 Você dispõe de 3 (três) horas para fazer esta prova.

7 Você só poderá sair do local de realização da prova decorridos 60 (sessenta) minutos do seu início.

8 Os 3 (três) últimos candidatos permanecerão sentados até que todos concluam a prova ou que termine o seu tempo de duração, devendo retirar-se juntos.

9 Ao término da prova, entregue ao fiscal o **CADERNO DE RESPOSTAS** e o **CADERNO DE QUESTÕES**.

10 Você só poderá levar o **CADERNO DE QUESTÕES** se sair do local de realização da prova nos 30 minutos que antecedem o seu término.

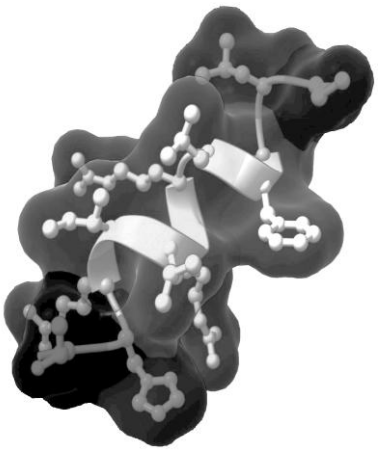
Leia o texto a seguir e responda, em português, às questões propostas:

Naturally occurring molecule rivals Ozempic in weight loss, sidesteps side effects

By Krista Conger

A Stanford Medicine study taps artificial intelligence to find a naturally occurring molecule called a peptide that suppressed appetite and led to weight loss in mice and pigs.

March 05, 2025



The 12-amino-acid BRP peptide (spheres are atoms and sticks are bonds) suppresses appetite and reduces weight gain in mice and pigs without causing nausea or food aversion. Katrin Svensson

A naturally occurring molecule identified by Stanford Medicine researchers appears similar to semaglutide — also known as Ozempic — in suppressing appetite and reducing body weight. Notably, testing in animals also showed that it worked without some of the drug's side effects such as nausea, constipation and significant loss of muscle mass.

The newly discovered molecule, BRP, acts through a separate but similar metabolic pathway and activates different neurons in the brain — seemingly offering a more targeted approach to body weight reduction.

"The receptors targeted by semaglutide are found in the brain but also in the gut, pancreas and other tissues," said assistant professor of pathology Katrin Svensson, PhD. "That's why Ozempic has widespread effects including slowing the movement of food through the digestive tract and lowering blood sugar levels. In contrast, BRP appears to act specifically in the hypothalamus, which controls appetite and metabolism." [...]

Svensson is the senior author of the research, which was published March 5 in *Nature*. Senior research scientist Laetitia Coassolo, PhD, is the lead author of the study. The study would not have been possible without the use of artificial intelligence to weed through dozens of proteins in a class called prohormones. [...] But with traditional methods of protein isolation, it's difficult to pick peptide hormones (which are relatively rare) out of the biological soup of the much more numerous natural byproducts of protein degradation and processing.

The researchers focused on the prohormone convertase 1/3, which separates prohormones at specific amino acid sequences and is known to be involved in human obesity. One of the peptide products is glucagon-like peptide 1, or GLP-1, which regulates appetite and blood sugar levels; semaglutide works by mimicking the effect of GLP-1 in the body. The team turned to artificial intelligence to help them identify other peptides involved in energy metabolism.

Instead of manually isolating proteins and peptides from tissues and using techniques like mass spectrometry to identify hundreds of thousands of peptides, the researchers designed a computer algorithm they named Peptide Predictor to identify typical prohormone convertase cleavage sites in all 20,000 human protein-coding genes. They then focused on genes that encode proteins that are secreted outside the cell — a key characteristic of hormones — and that have four or more possible cleavage sites. Doing so narrowed down the search to 373 prohormones, a manageable number to screen for their biological effects. [...]

"The algorithm was absolutely key to our findings," Svensson said. Peptide Predictor predicted that prohormone convertase 1/3 would generate 2,683 unique peptides from the 373 proteins. Coassolo and Svensson focused on sequences likely to be biologically active in the brain. They screened 100 peptides, including GLP-1, for their ability to activate lab-grown neuronal cells. As expected, the GLP-1 peptide had a robust effect on the neuronal cells, increasing their activity threefold over control cells. But a small peptide made up of just 12 amino acids bumped up the cells' activity tenfold over controls. The researchers named this peptide BRP [...].

When the researchers tested the effect of BRP on lean mice and minipigs (which more closely mirror human metabolism and eating patterns than mice do) they found that an intramuscular injection of BRP prior to feeding reduced food intake over the next hour by up to 50% in both animal models. Obese mice treated with daily injections of BRP for 14 days lost an average of 3 grams — due almost entirely to fat loss — while control

animals gained about 3 grams over the same period. The mice also demonstrated improved glucose and insulin tolerance.

Behavioral studies of the mice and pigs found no differences in the treated animals' movements, water intake, anxiety-like behavior or fecal production. And further studies of physiological and brain activity showed that BRP activates metabolic and neuronal pathways separate from those activated by GLP-1 or semaglutide.

The researchers hope to identify the cell-surface receptors that bind BRP and to further dissect the pathways of its action. They are also investigating how to help the peptide's effects last longer in the body to allow a more convenient dosing schedule if the peptide proves to be effective in regulating human body weight.

"The lack of effective drugs to treat obesity in humans has been a problem for decades," Svensson said. "Nothing we've tested before has compared to semaglutide's ability to decrease appetite and body weight. We are very eager to learn if it is safe and effective in humans."

Adapted from: https://med.stanford.edu/news/all-news/2025/03/ozempic-rival.html

Questão 01 (2,5 pontos)

De acordo com o texto, a molécula BRP demonstrou ter benefícios importantes em comparação com a semaglutida (Ozempic). Qual é a principal diferença entre o funcionamento da molécula BRP e da semaglutida? Explique como essa diferença pode afetar os efeitos colaterais.

Questão 02 (2 pontos)

O texto descreve os efeitos do peptídeo BRP quando testado em modelos animais (camundongos e porcos). Descreva qual foi o impacto da injeção de BRP na ingestão de alimentos e no peso corporal dos animais, de acordo com os resultados apresentados no estudo.

Questão 03 (3 pontos)

Sobre o uso da inteligência artificial na pesquisa da Stanford Medicine:

a) Por que os métodos tradicionais eram insuficientes para descobrir novos peptídeos como o BRP? (1 ponto)

b) Como a inteligência artificial foi usada pelos pesquisadores e o que ela permitiu descobrir? (2 pontos)

Questão 04 (2,5 pontos)

Com base no texto, como a pesquisa dos cientistas de Stanford pode representar um avanço para a ciência, a tecnologia e os tratamentos de saúde no futuro? Na sua resposta, mencione: a integração de diferentes áreas do conhecimento, a inovação para superar limitações e o impacto potencial de novos medicamentos para problemas globais.