

Protein Synthesis

READ RETRIEVE CONNECT & USE

Next Generation Sunshine State Standard

SC.912.L.16.5: Explain the basic processes of transcription and translation, and how they result in the expression of genes.

Common Core Scientific Literacy Standard

Analyze the structure of the relationships among the concepts in a text, including the relationship among key terms.

Lift Weights, Eat Mustard, Build Muscles?

ScienceDaily (Sep. 29, 2011) — If you are looking to lean out, add muscle mass, and get ripped, a new research report published in *The FASEB Journal* suggests that you might want to look to your garden for a little help. That's because scientists have found that when a specific plant steroid was given orally to rats, it triggered a response similar to anabolic steroids, with minimal side effects. In addition, the research found that the stimulatory effect of homobrassinolide (a type of brassinosteroid found in plants such as mustards) on protein synthesis in muscle cells led to increases in lean body mass, muscle mass and physical performance.

"We hope that one day brassinosteroids may provide an effective, natural, and safe alternative for age- and disease-associated muscle loss, or be used to improve endurance and physical performance," said Slavko Komarnytsky, Ph.D., a researcher involved in the work from the Plants for Human Health Institute, FBNS at North Carolina State University in Kannapolis, N.C. "Because some plants we eat contain these compounds, like mustards, in the future we may be able to breed or engineer these plants for higher brassinosteroid content, thus producing functional foods that can treat or prevent diseases and increase physical performance."

To make this discovery, Komarnytsky and colleagues exposed rat skeletal muscle cells to different amounts of homobrassinolide and measured protein synthesis in cell culture. The result was increased protein synthesis and decreased protein degradation in these cells. Healthy rats then received oral administration of homobrassinolide daily for 24 days. Changes in body weight, food consumption, and body composition were measured. Rats receiving homobrassinolide gained more weight and slightly increased their food intake. Body composition was measured using dual-emission X-ray absorptiometry analysis and showed increased lean body mass in treated animals over those who were not treated. This study was repeated in rats fed high protein diet and similar results were observed. Additionally, researchers used surgically castrated peri-pubertal rat models to examine the ability of homobrassinolide to restore androgen-dependent tissues after androgen deprivation following castration. Results showed increased grip strength and an increase in the number and size of muscle fibers crucial for increased physical performance.

"The temptation is to see this discovery as another quick fix to help you go from fat to fit," said Gerald Weissmann, M.D., Editor-in-Chief of *The FASEB Journal*, "and to a very small degree, this may be true. In reality, however, this study identifies an important drug target for a wide range of conditions that cause muscle wasting."

D. Esposito, S. Komarnytsky, S. Shapses, I. Raskin. **Anabolic effect of plant brassinosteroid.** *The FASEB Journal*, 2011; 25 (10): 3708
DOI: [10.1096/fj.11-181271](https://doi.org/10.1096/fj.11-181271)

COPYRIGHT NOTICE: REPRODUCED
FOR EDUCATIONAL PURPOSES UNDER
FAIR USE GUIDELINES – DO NOT COPY
WITHOUT PERMISSION

NAME: _____ DATE: _____ PER: _____

BIOLOGY

1. Read the article, "Lift weights, eat mustard, build muscles?" After reading the article (5-10 minutes), write down everything you can remember in the box below. The process of recalling the information is important, so do not return to the article at this point.

2. Return to the article if necessary and answer the following questions. You may also need to draw from your knowledge of biology and you should feel free to use your text or other resource.

a) What are the two main steps of protein synthesis and where in the cell do they take place?

b) What is the role of amino acids in translation?

c) Explain the relationship of transcription and translation to gene expression.

d) Based on the article, what were the independent and dependent variables in the study?
