How the Burmese python grows and shrinks after it eats

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The Burmese python's body undergoes massive reconstruction followed by complete deconstruction every time it eats. Within three days of eating, its organs expand up to double in size and its metabolism and digestive processes increase 10- to 44-fold. Ten days after eating, the snake's meal is digested and these changes have reversed, allowing the body to shrink and return back to its pre-meal state. In a new study published in Physiological Genomics, a team of U.S. researchers tracked in detail how this extreme makeover is controlled by changes in gene expression.

The Burmese python's extreme physiology is fascinating to study because it gives unique insight into how vertebrates control organ growth

and function, the researchers wrote. Although the Burmese python's body shape is distinct from other vertebrates, including humans, its organs operate the same. This means findings from snakes can be applied to understanding the human body and potentially developing new therapies for human diseases, the researchers said.

In this study, the research team focused on the small intestine, which doubles in mass and nutrient-absorption rate during digestion. The researchers found that the expression of at least 2,000 genes changed after the snake ate. Surprisingly, most of the changes occurred soon after eating—within six hours. Genes that changed included those involved with the intestine's structure and nutrient absorption, cell division and cell death. The patterns of gene expression matched and often preceded physiological changes in the intestine, the researchers wrote. The gene expression patterns, like the structural changes, then returned to pre-eating state within 10 days after eating, "indicating a tight association between differential gene expression and the rapid and cyclic physiological remodeling of the intestine," the researchers said.

According to the researchers, this is the first study to link the extreme and rapid eating-induced changes of the Burmese python's intestines directly to changes in gene expression, and also the first to show how quickly gene expression changed. The study also found that some of the morphing genes in the python's intestine, notably those in a signaling pathway called WNT, were genes that were involved in intestinal and other cancers. This suggests that "the python intestine may represent a valuable model for studying the interactions of metabolism with the regulation of cell division/death and WNT signaling relevant to cancer," the researchers said.

The article "Rapid changes in gene expression direct rapid shifts in intestinal form and function in the Burmese python after feeding" is published in the May issue of *Physiological Genomics*, a journal of the American Physiological Society (APS).

More information: "Rapid changes in gene expression direct rapid shifts in intestinal form and function in the Burmese python after feeding." physiolgenomics.physiology.org … nt/47/5/147.full.pdf

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