

## The Story of TOR

Many years ago a protein and its genetic blueprint called TOR was isolated in yeast. Subsequently, the same protein was identified in mammals mTOR. This protein has recently become of great interest to researchers because among other things TOR appears to be involved in the process that makes cells less sensitive to insulin.

TOR production ramps up when one is well nourished and stimulates cell division or growth. When one is under nourished, TOR production decreases and cell division and growth are inhibited. When TOR decreases autophagy ramps up and begins to clean out defective components, such as dysfunctional mitochondria, and uses the byproducts of this process to generate energy. When one again becomes well nourished the TOR prompted activity declines.

It has also been found that the signaling pathways for TOR and insulin are intertwined. Insulin signals cells to take up glucose from the blood stream and to use it for energy. Because insulin is a growth factor it helps stimulate TOR activity and cell division. The TOR insulin interaction creates a negative feedback loop, which makes cells less sensitive insulin. Persistent overeating will over stimulate TOR and make cells resistant to insulin's signals. Insulin resistance leads to high blood sugar levels. Excess glucose in the blood stimulates fatty acid synthesis, which results in the production of triglycerides that are stored in your fat cells. Thus, TOR plays a role in obesity, diabetes, heart disease and other disorders many of which are associated with aging.

See "On A Clear November Morning in 1964" in *Scientific American*, January 2012, pp. 34-39.