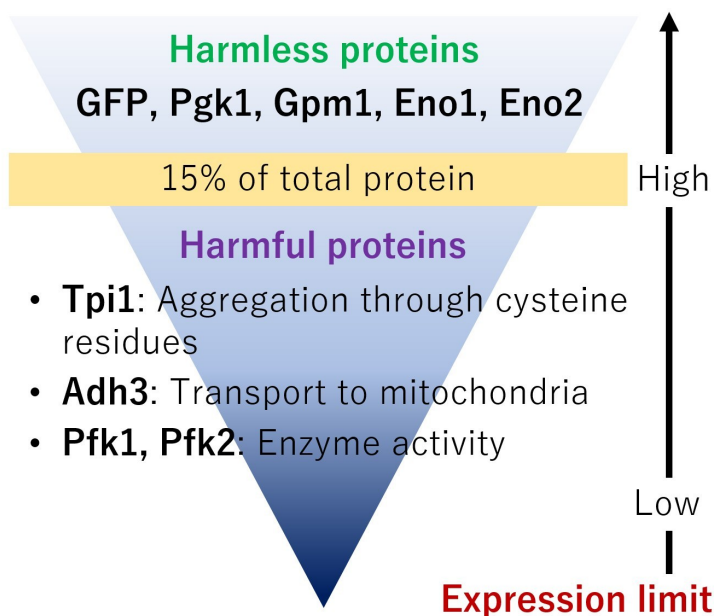


## Researchers estimate appropriate protein intake

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In a recent study published in eLife, scientists at Okayama show how proteins can hamper an organism's growth

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The theory behind this phenomenon, also known as the protein burden, is that accumulation of excessive protein within the cell will deplete the cell of resources, such as energy. The limit required to reach this burden though, is not the same for all proteins. Green fluorescent protein (GFP) is a harmless protein artificially introduced into cells for visualizing the insides of the cell.

When GFP levels were increased within yeast cells, they found that GFP up to 15% of total protein content was harmless to the cells. Using this measure as a standard, Associate Professor Hisao Moriya's team set out to estimate the burden limit of functional proteins in the cells. 29 proteins essential for energy production were subsequently over-produced.

While many of these proteins also had limits close to 15%, suggestive of their harmless nature, some of the proteins showed growth retardation and other unpleasant effects at lower levels. One such protein was found to accumulate within the

mitochondria. Clogging the mitochondria prevents cells from producing oxygen.

Another protein was found to undergo structural changes and aggregate into big pieces. Another reason for some of these proteins having a low burden limit, was due to metabolic disturbances induced when they were produced even slightly higher than usual. When these proteins were inactivated by mutations, their burden limit increased. Lastly, the researchers also found that certain proteins showed growth retardation, even at very low levels. Further investigation revealed that such proteins are programmed to remain at inherently low levels. Therefore, even small changes to their concentrations can be dangerous.

This study paved a framework for biologists to make distinctions between proteins based on how toxic they are when present in abnormal amounts. These differences could be attributed to the function, structure or genetic programming for that protein.

Scientists can hope to use this framework to investigate proteins that are associated with diseases such as Alzheimer's disease or Parkinson's disease.