

The Awesome Lysosome

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In the early 50s, Christian De Duve identified a new cellular structure, the lysosome, defined as the cell's "suicide bag" (de Duve, 2005). Sixty years later, it is clear that the lysosome greatly exceeded the expectations of its discoverer. Over 50 different types of lysosomal storage diseases have been identified, each due to the deficiency or malfunction of a specific lysosomal protein. In addition, an important role of the lysosome has been unveiled in several common human diseases, such as cancer, obesity, neurodegenerative diseases, and infection. Recent studies have led to the identification of lysosomal gene network that regulates cellular clearance and energy metabolism and of a lysosome-to-nucleus signaling pathway. These observations have opened a completely new field of research and changed our traditional view of the lysosome from a dead-end organelle to a control center that mediates the adaptive response of cell metabolism to the environment. An important challenge for the future will be to exploit these discoveries to identify modulators of lysosomal function that may be used to treat human diseases.