The myth of immortality has always been central in our human culture. Over the centuries it has shaped the legends of the fountain of youth, the elixir or life or the philosopher’s stone. Still, we do not yet understand how an organism maximum life span is determined and why this differs so much in the different living beings on the planet. What we start understanding, however, is how genes and molecules regulate aging. Specific genetic mutations determine a several fold life span increase in mice, worms and flies; novel molecular mechanisms link oxygen metabolism with aging; cellular content renewal by cell self-eating maintains organs young and healthy; young stem cells can rejuvenate old organs. Finally, and most relevant, caloric restriction (namely, undernutrition without malnutrition) promotes longevity in all the investigates species, from flies to monkeys. While these novel discoveries appear truly exciting, the possibility of effectively modifying human life span inevitably raises very alarming societal and ethical issues.

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