

Increased Energy Efficiency/Conservation

Energy Expensive Trade-offs
1) Humans ability to safely store subcutaneous fat at expense of En consuming muscle, freeing En for brain

2) Neonates born fat with reserve for brain that uses >80% of body En, & human young grow/develop slowly

3) Human gut is simplified & short, thus using less En & able to redirect En to brain

The NRF2 system co-opts highly varied plant chemicals → increase antioxidant, antitoxicant cell protection, possibly for energy efficiency + increased cell life (longevity) & stability (low degeneration & cancer risk)

Increased Energy Uptake

Technologies – agriculture: animal/plant domestication, breeding, mass-mechanised farming & food production, synthetic chemical use, transport, megastructures, electricity, trade, city living, electronic communication

Technologies – prehensile forelimb/bipedalism → dig, trap, cook, store food

Omnivory → more energy ie animal fat brain muscle + micronutrient (mineral) + fruit sugars/seed oils

Expansion of brain Cortico-Limbic-Striatal reward, motivation and fine motor coordination for energy dense food procurement



Homo sapiens sapiens



Homo sapiens sapiens
Homo sapiens neanderthalensis



Homo sapiens neanderthalensis



Homo erectus



Homo habilis



Australopithecus

Sahelanthropus

Last common Primate ancestor with Apes →

Sahelanthropus

Orrorin?

Australopithecus

Homo habilis

Hominins →

Millions of years ago

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1.7 -1.7 -0.7 0

Cranial capacity

1500 cm³

1000 cm³

500 cm³