WP 3:

*White fat, brown fat, neural and liver*

Jan Nedergaard - fat
Vilma Borutaite - neural
Zuzana Cervinkova - liver
Not all mitochondria are created equal!

Consider the physiology!
Energy of transmembrane potential could be used by UCP1 and released as heat and could be used by Fo-F1-ATP-synthase and released as ATP
Content of Fo-F1-ATP-synthase in brown fat mitochondria is remarkably low

Low amount of ATP synthase determined by low amount of mRNA for P1 isoform of subunit c.

Innate uncoupling
GDP Inhibition
Low phosphorylation
High oxidative capacity
UCP1(+/+)
UCP1(-/-)
GDP
Pyr
FCCP
0.8
1.0
1.2
1.4 µM
nmol O₂ • min⁻¹ • mg⁻¹
1 min
GDP

1 min
UCP1-dependent thermogenesis

Oxidative-phosphorylation activity

Maximal oxidative capacity – under these circumstances
Inguinal fat mitochondria from mice housed at 30 °C
Epididymal fat mitochondria

- No innate uncoupling
- No GDP Inhibition
- Normal phosphorylation
- Low oxidative capacity
Brite/beige adipocytes are recruited in inguinal white adipose tissue during cold adaptation.
Remember the half-life of mitochondria when you change the conditions!

Normally in brown fat, about 15 days; in the cold about 7 days.

So you will have a mixed population if you do an experiment after only one week!
IBAT and ingWAT, 4°C

IBAT 4°C

- Innate uncoupling
- GDP Inhibition
- Low phosphorylation
- High oxidative capacity

ingWAT 4°C

- Innate uncoupling
- GDP Inhibition
- Low phosphorylation
- Medium oxidative capacity

Brown mitochondria

- Innate uncoupling
- GDP Inhibition
- Low phosphorylation
- High oxidative capacity

BRITE mitochondria

- Innate uncoupling
- GDP Inhibition
- Low phosphorylation
- Medium oxidative capacity
Succinate is a poor substrate for both brown and brite fat mitochondria.
Glycerol-3-phosphate-supported oxygen consumption in recruited brite-fat mitochondria was 50% of the level in BAT.
The expression level of glycerol-3-phosphate dehydrogenase in recruited brite-fat was 50% of the level in BAT.

Limitation in transporting reducing equivalents from cytosol to mitochondria.
Consider carefully your experimental animal.

Remember its physiology.

Choose relevant substrates.