

Supplementary Data

Human brown adipose tissue [^{15}O]O₂ PET imaging in presence and absence of cold stimulus

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Methods

Production of tracers

Low-energy deuteron accelerator Cyclone 3 (Ion Beam Application Inc., Louvain-la-Neuve, Belgium) was used for the production of [^{15}O]O₂. [^{15}O] isotope was produced by the [^{14}N] (d,n) [^{15}O] nuclear reaction on natural nitrogen gas (1). Radiowater [^{15}O]H₂O was produced using Hidex Radiowater Generator (Hidex Oy, Turku, Finland). Production of [^{18}F]FTHA has been described by Saari et al., (2).

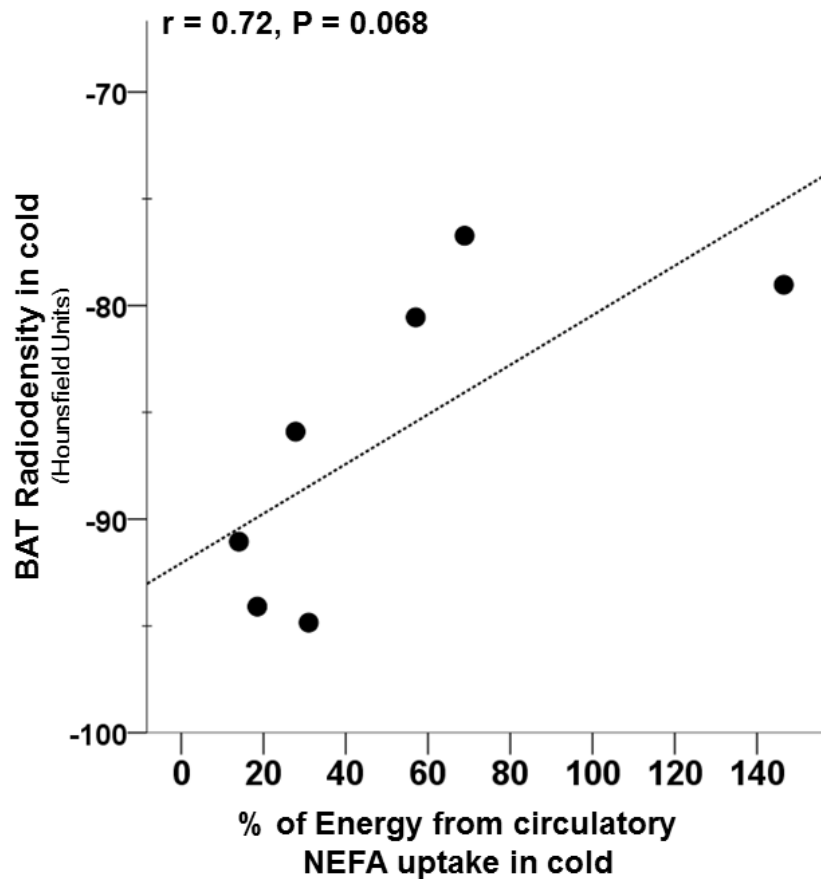
PET image reconstruction

All quantitative corrections were applied to PET image data, including detector normalization, dead-time, radioactive decay, randoms, attenuation and scatter. Images were reconstructed using iterative 3D-OSEM (GE Vue Point HD-S) reconstruction using 24 subsets and 2 iterations. All images were filtered using 6.4 mm Gaussian post-filter. Due to the presence of large in-FOV and out-FOV activity in the first frames in the [^{15}O]O₂ inhalation study, a clinically implemented scatter limit was applied (GE Quantitative Scatter Limit). The procedure is necessary to prevent scatter overestimation due to large in-FOV and out-FOV activity (3).

Supplementary Table 1.				
Study Subject	NEFA uptake rate (palmitic acid)	Energy Equivalent following complete circulatory NEFA oxidation*	DEE from MRO ₂	% of Energy from circulatory NEFA**
	μmol/100g/min	kcal/100g/day	kcal/100g/day	percentage
1	0.43	1.5	7.9	18.5
2	1.54	5.2	9.1	57.0
3	0.59	2.0	7.2	27.8
4	0.39	1.3	9.4	14.5
5	3.91	13.2	9.0	146.5
6	1.95	6.6	9.5	68.9
7	0.39	1.3	4.3	31.0

* Equation used for calculating energy equivalent
Energy Equivalent: palmitic acid (kcal/100g/day)
= NEFA uptake rate (μmol/100g/min)
× 1440 (min/day) × 9.4 (kcal/g) × 256.42 × 10⁻⁶ (g/μmol)

** Assuming complete oxidation of palmitic acid ([¹⁸F]FTHA is palmitic acid based radiotracer)



Supplementary Fig. 1 BAT with less radiodensity (possessing more stored lipids) uses less contribution of circulatory NEFA as energy substrate and vice versa ($r = 0.72$; $p = 0.068$).

Reference List

- (1) Strijckmans K, Vandecasteele C, Sambre J. Production and quality control of $^{15}\text{O}_2$ and C^{15}O_2 for medical use. *Int J Appl Radiat Isot.* 1985;36(4):279-283.
- (2) Saari T. Impaired brown adipose tissue fatty acid metabolism in obese subjects [abstract]. *Diabetologia.* 2014;57(Suppl1).
- (3) Hori Y, Hirano Y, Koshino K et al. Validity of using a 3-dimensional PET scanner during inhalation of ^{15}O -labeled oxygen for quantitative assessment of regional metabolic rate of oxygen in man. *Phys Med Biol.* 2014;59(18):5593-5609.