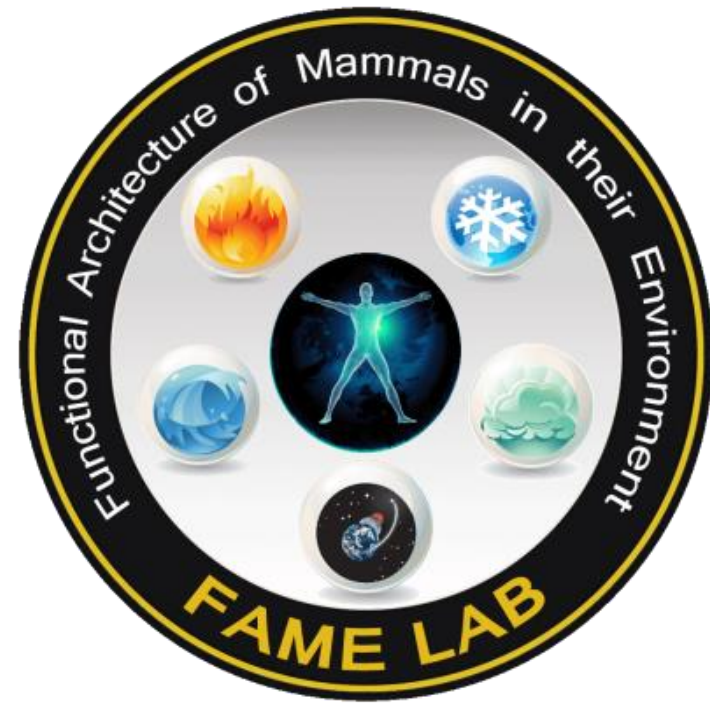


ADMINISTRATION OF L-MENTHOL RESULTS IN INCREASED METABOLIC HEAT PRODUCTION IN HUMANS

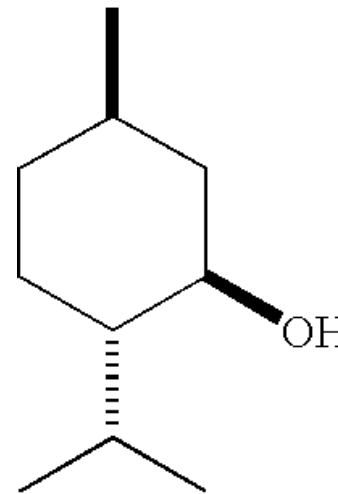
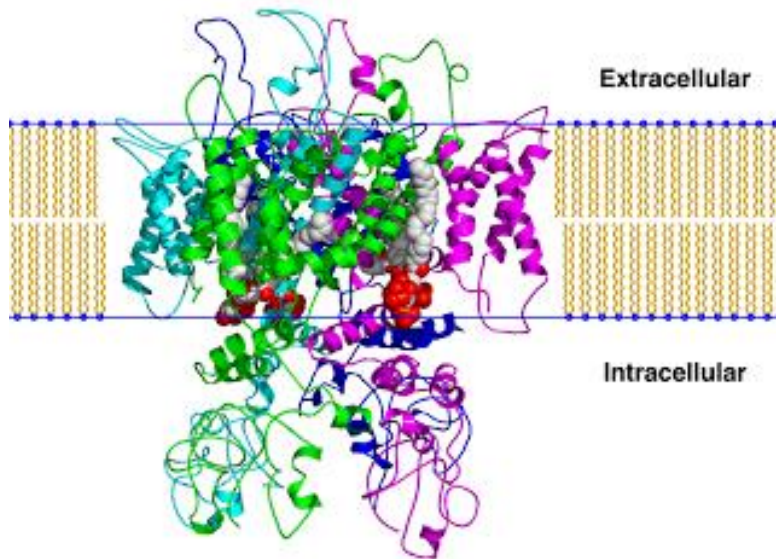
**Angelica Valente,
Athanasios Z. Jamurtas,
Yiannis Koutedakis,
and Andreas D. Flouris**



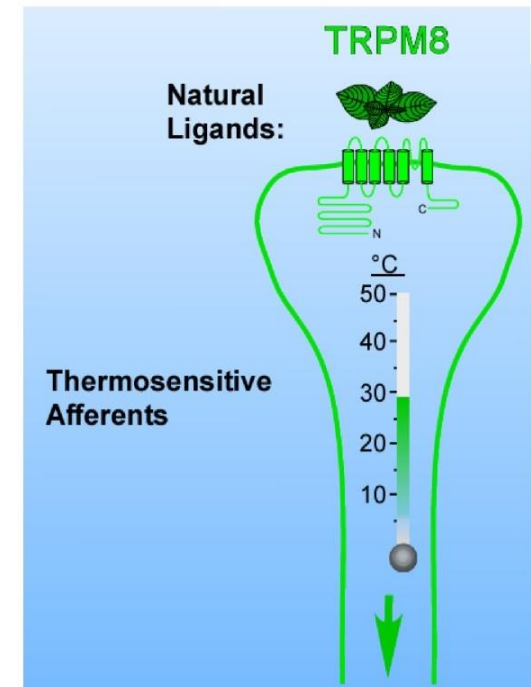
**FAME Laboratory, Centre for Research and Technology Hellas, Trikala, Greece
Department of Exercise Sciences, University of Thessaly, Trikala, Greece
School of Sport, Performing Arts and Leisure, University of Wolverhampton, UK**

TRPM8 and L-menthol

- Transient receptor potential cation channel subfamily M member 8 (TRPM8) is receptor for cold sensation
- located on the cell membrane of sensory neurons

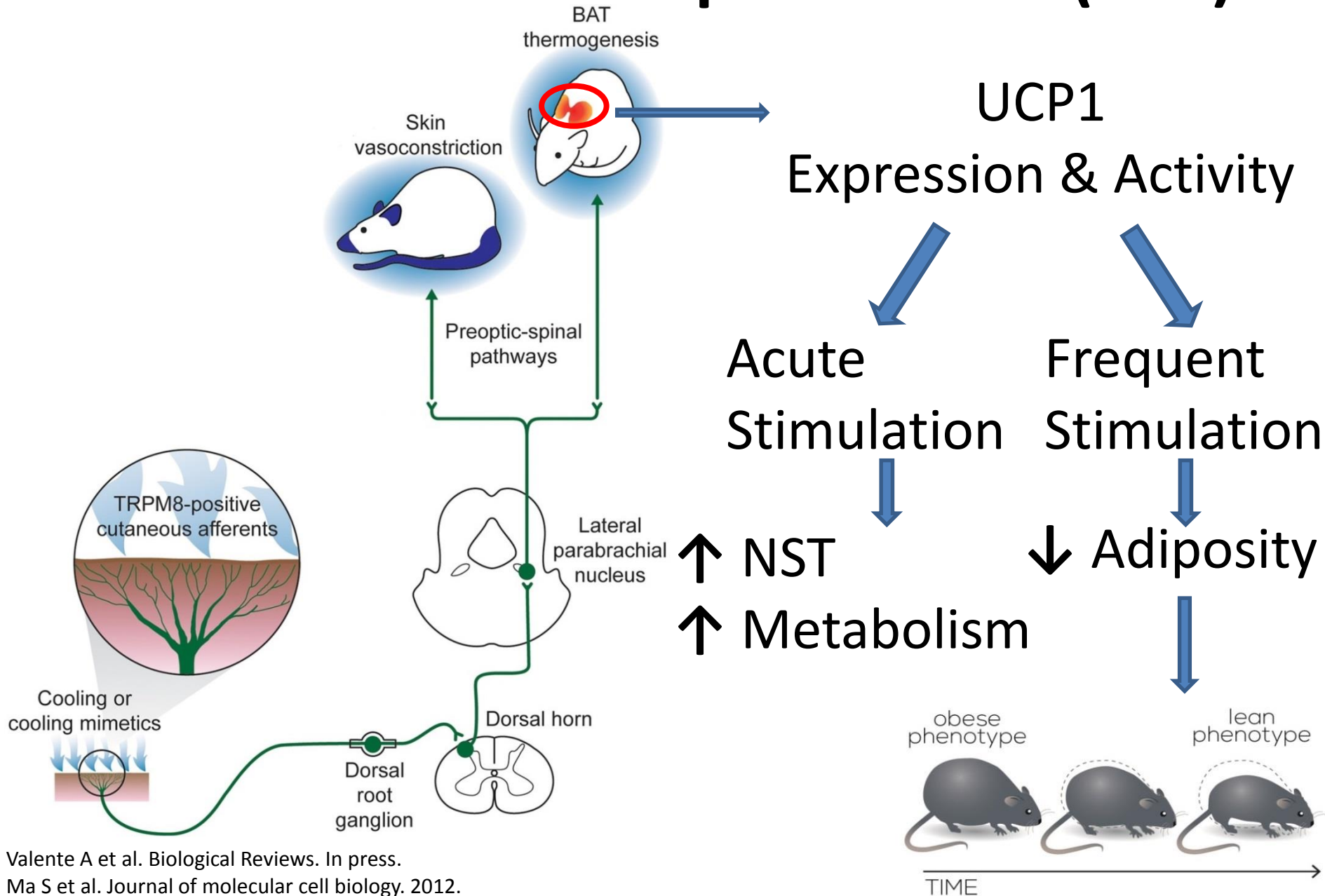


L-Menthol



- activated by both cold and L-menthol

TRPM8 and Brown Adipose Tissue (BAT)

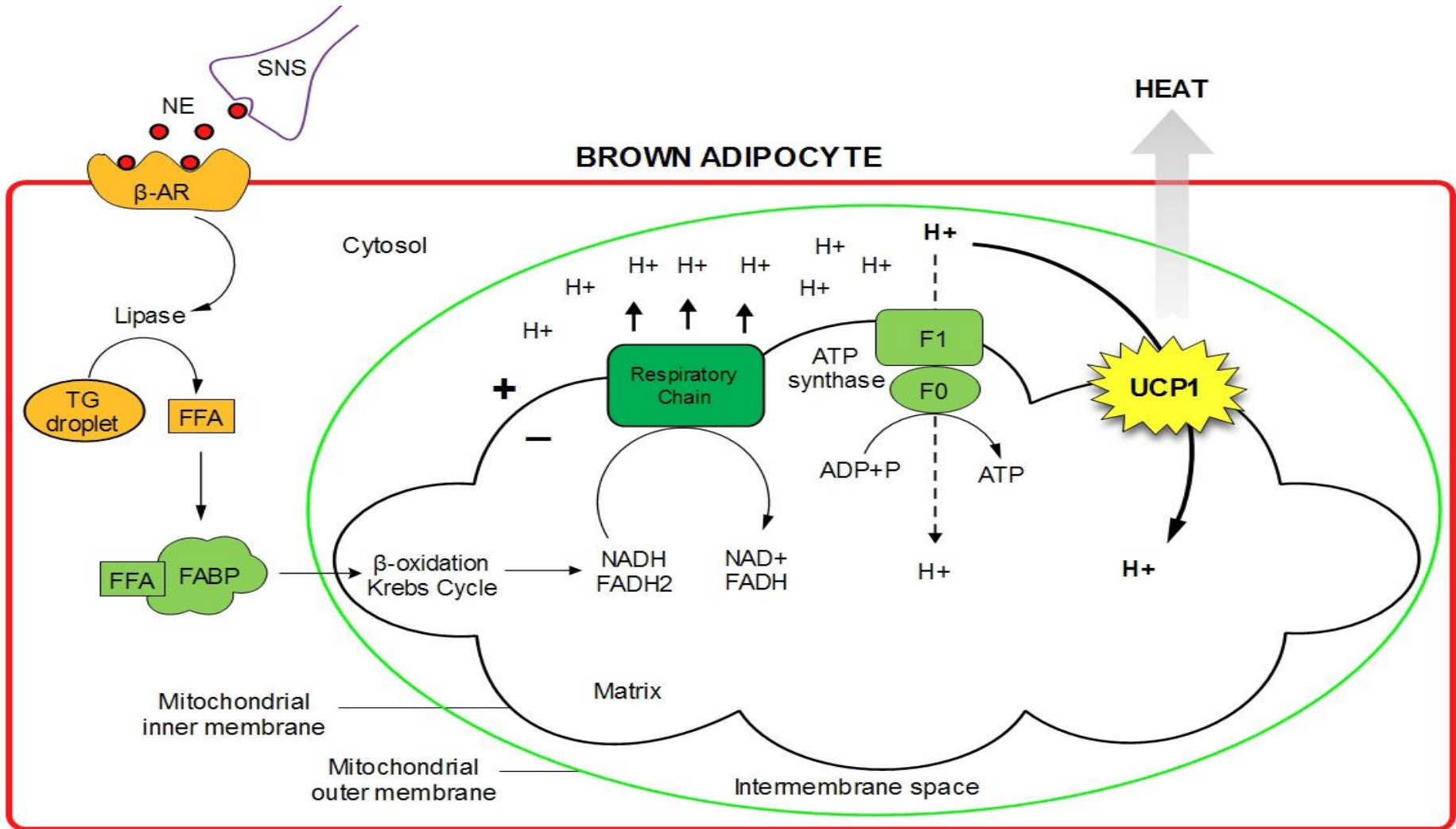


Valente A et al. Biological Reviews. In press.

Ma S et al. Journal of molecular cell biology. 2012.

Tajino K et al. Am J Physiol Regul Integr Comp Physiol. 2007.

Non-Shivering Thermogenesis (NST)



BAT in mammals

- **RODENTS**



- **HUMANS**



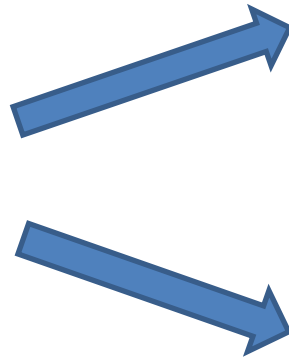
(PET-CT)

Purpose of the study

The aim of the present study was to examine, for the first time, the effect of TRPM8 activation by L-menthol skin and diet treatments on metabolism and thermoregulation in adult male participants.

Methodology

- Nine healthy male volunteers



Skin Group
(ST; n=4)

Diet Group
(DT; n=5)

Cristal L-menthol

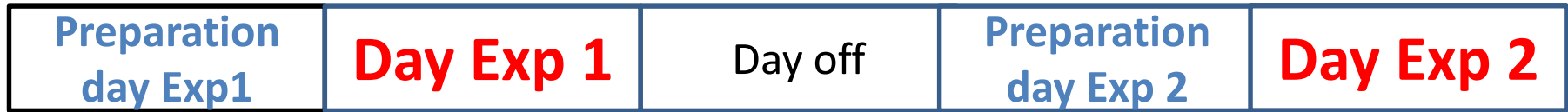


Cristal L-menthol

Fresh Promotions

- 10 mg/kg BW L-menthol
- placebo (ST: water; DT: lactose capsule)
- SKIN group: cream on neck, right arm and leg

Experimental Plan:



Preparation days:

- Dietary Questionnaire and Pedometer
- No excessive stressors, alcohol, coffee, passive smoke 24 hours prior to each assessment



Assessment day

- 12-hour fasted participants wearing the same clothing on both assessment days
- 24-25°C laboratory environment and 40-50% relative humidity
- no food consumption during data collection

Measurements



Rectal Temperature

a thin and flexible core temperature thermistor

Body Heat Storage and Skin Temperature

partitioned calorimetric techniques

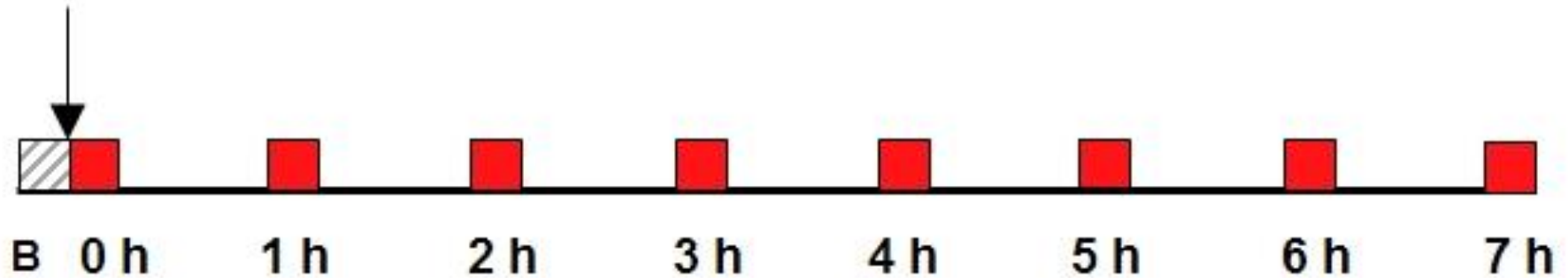


Metabolic Rate

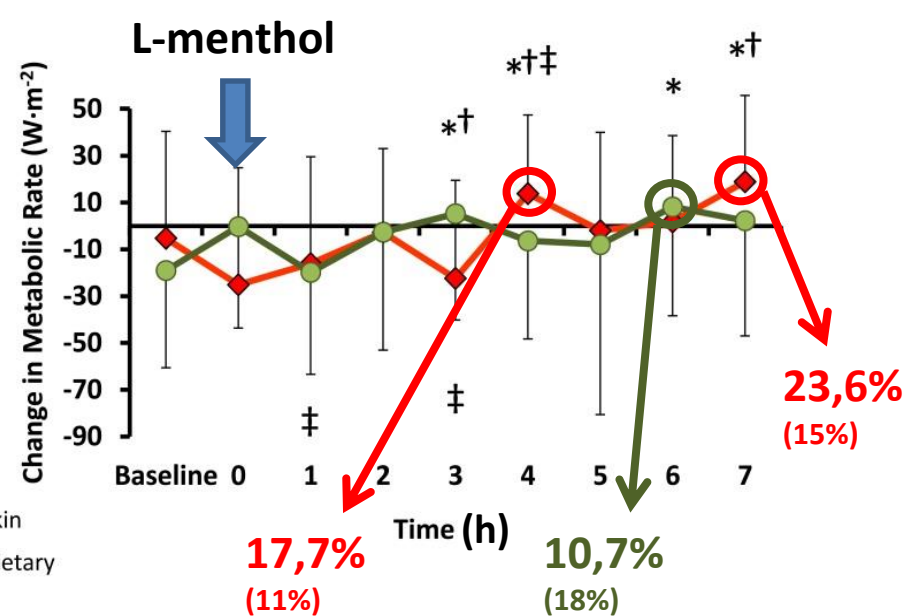
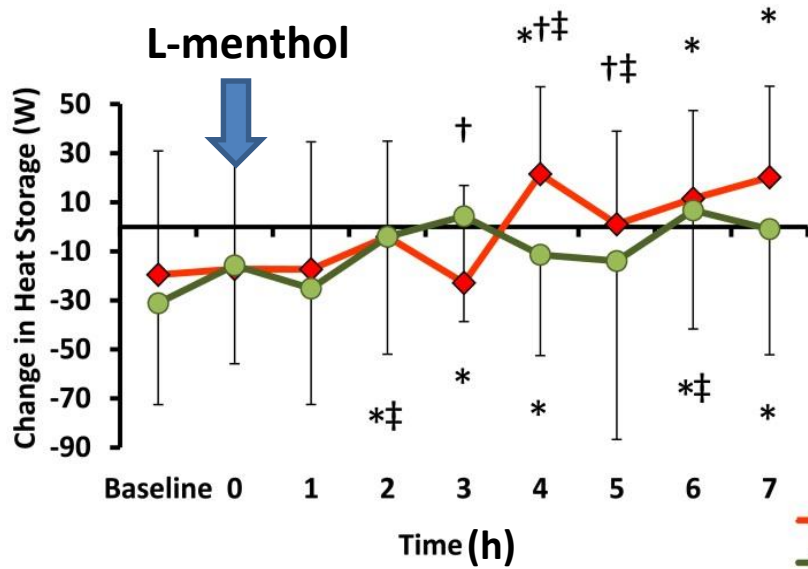
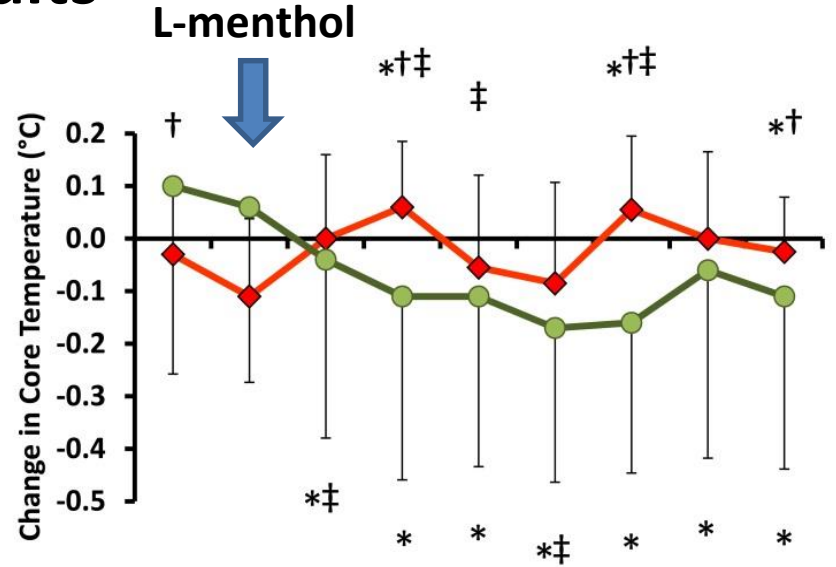
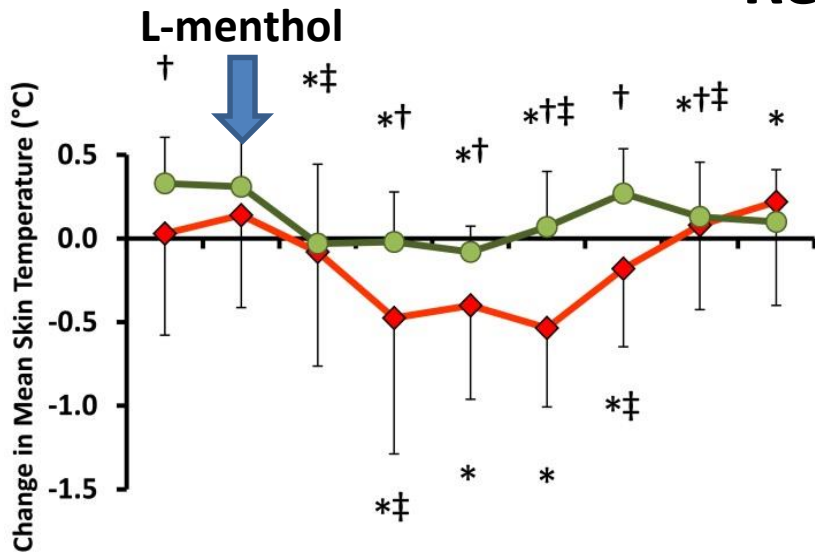
indirect calorimetry using portable gas analyser to assess oxygen uptake and respiratory quotient

Measurements Time

treatment



Results



* = difference from baseline for the same treatment
 ‡ = difference from the previous time-point for the same treatment
 † = difference between treatments for the same time-point

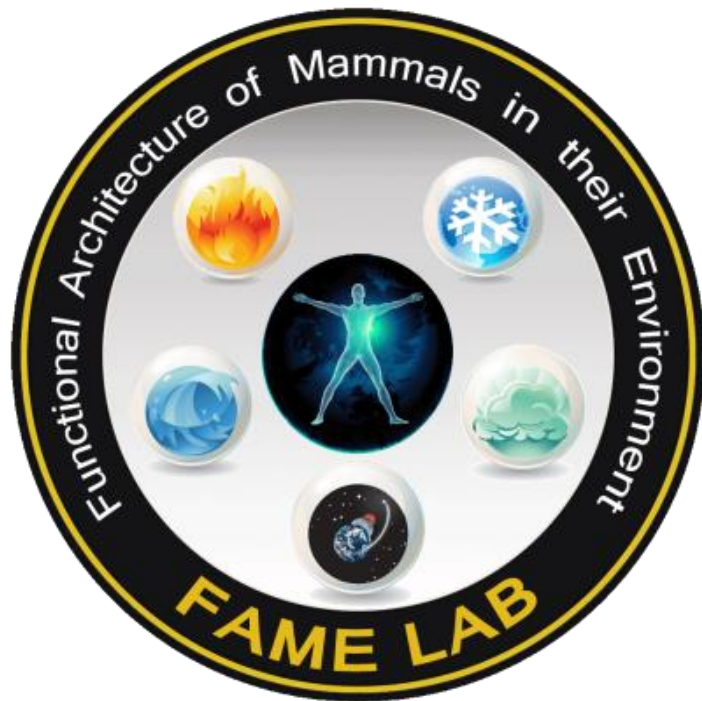
Discussion & Conclusion

- In humans TRPM8 activation via L-menthol Skin and Diet treatments results in cutaneous vasoconstriction and increased metabolic heat production
- The effects produced by Skin treatment appear to be stronger, as compared to those of Diet treatment

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