

Hibernation in arctic mammals.

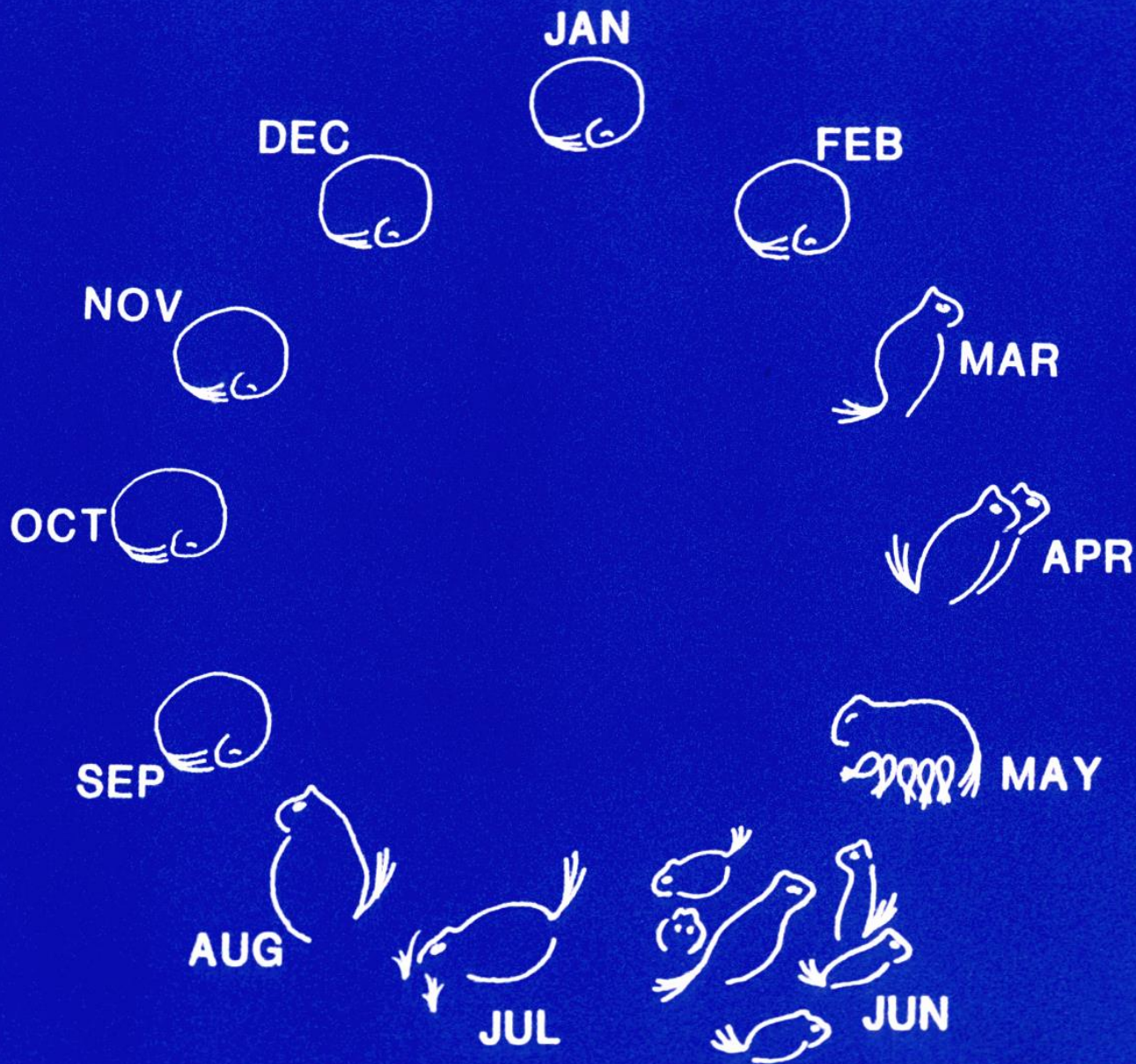
Kelly Drew

Brian Barnes

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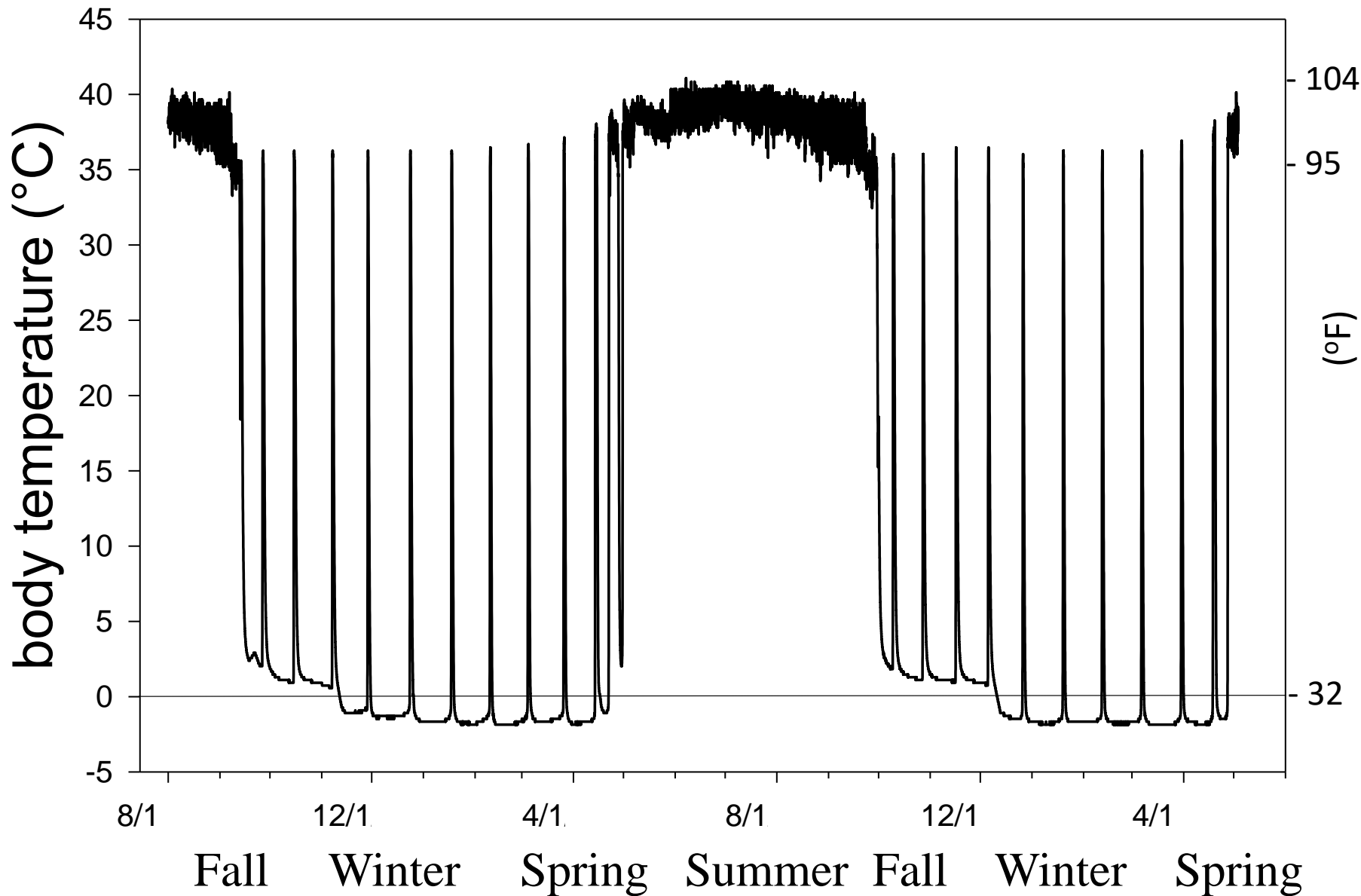
arctic ground squirrel
(*Urocitellus parryii*)



Arctic ground squirrels supercool their body fluids during hibernation.

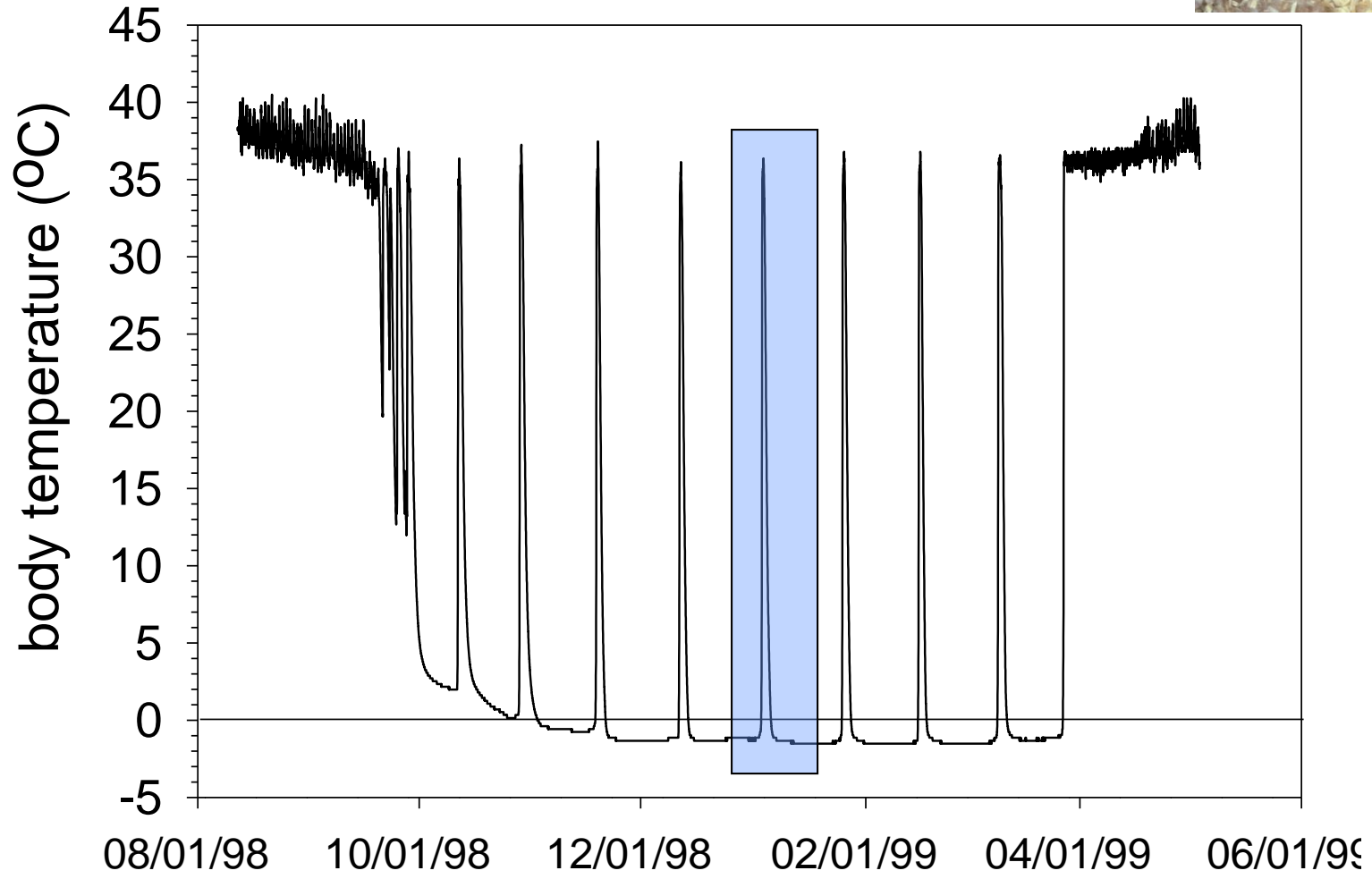


Two year record of core body temperature of a free-living arctic ground squirrel in northern Alaska.

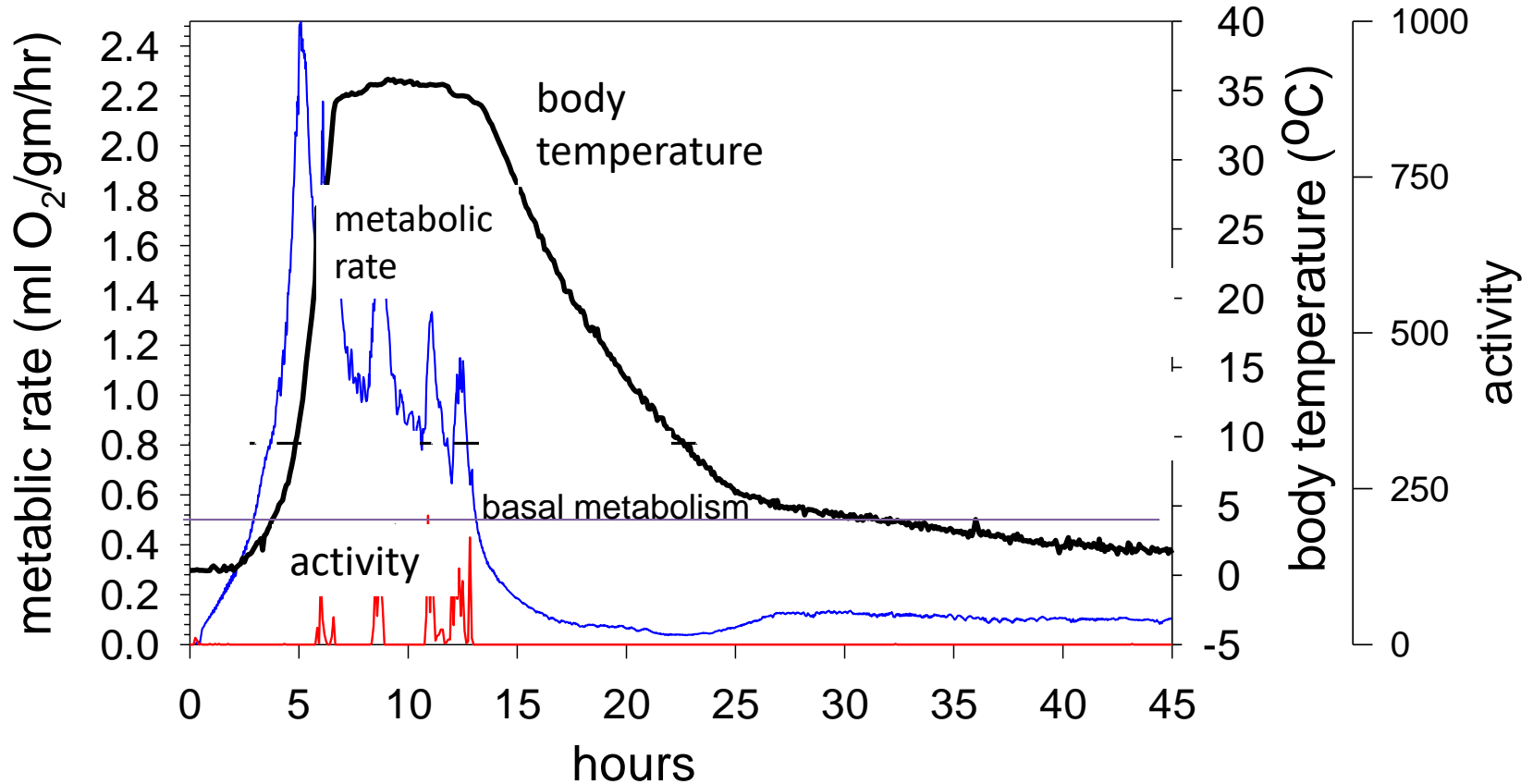




Hibernating ground squirrels
suppress metabolism first,
then body temperature falls.

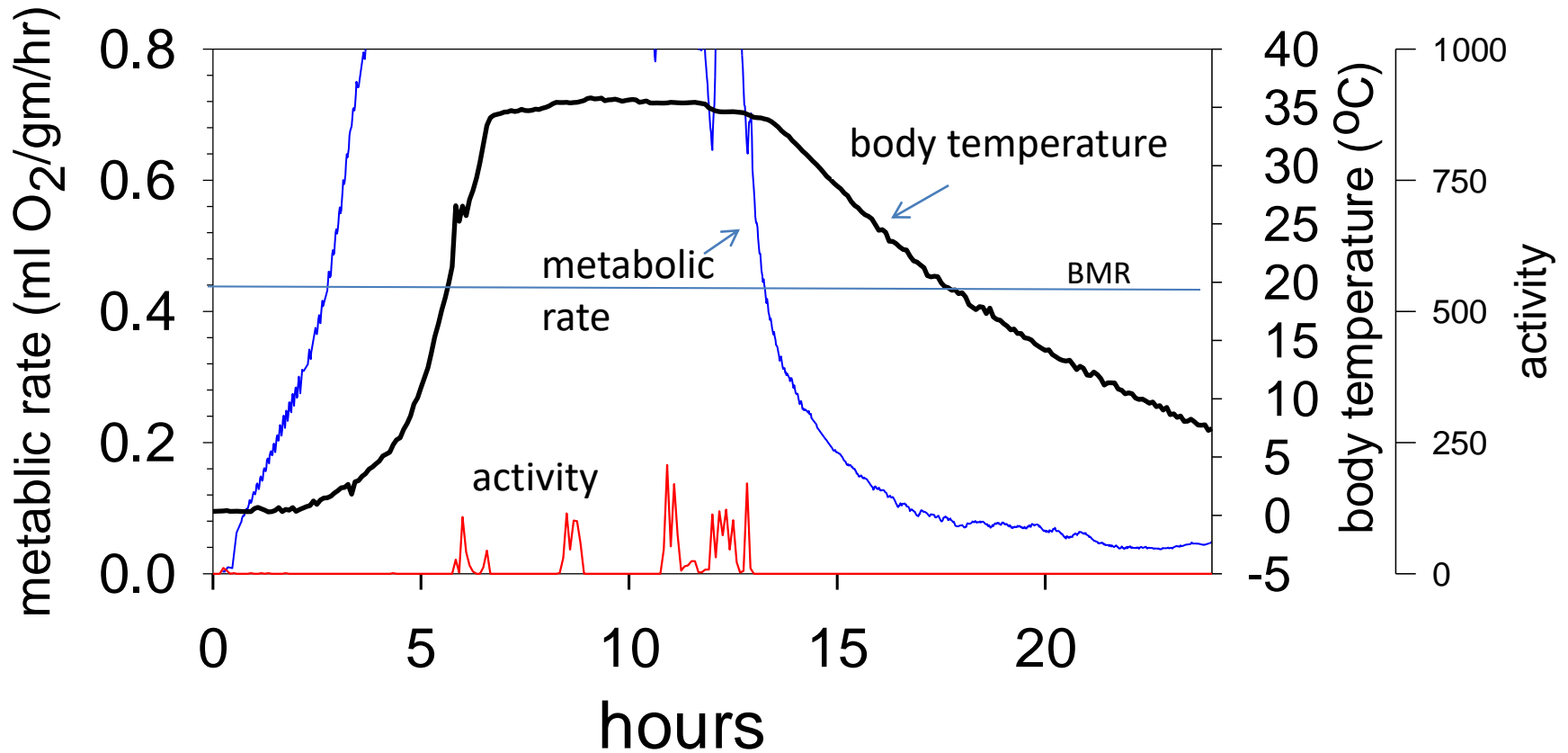


arousal and re-entry at ambient temperature -5°C



Karpovich S, Toien O, CL Buck and Barnes BM. 2009. Energetics of arousal episodes under arctic conditions in arctic ground squirrels. *J Comp Physiol* 179 691-700

arousal and re-entry at ambient temperature -5°C



Stroke and heart attack are a problem
of:

(Blood) supply = (metabolic) demand.

Stroke and heart attack are a problem
of:

(metabolic) demand.



(Blood) supply \neq

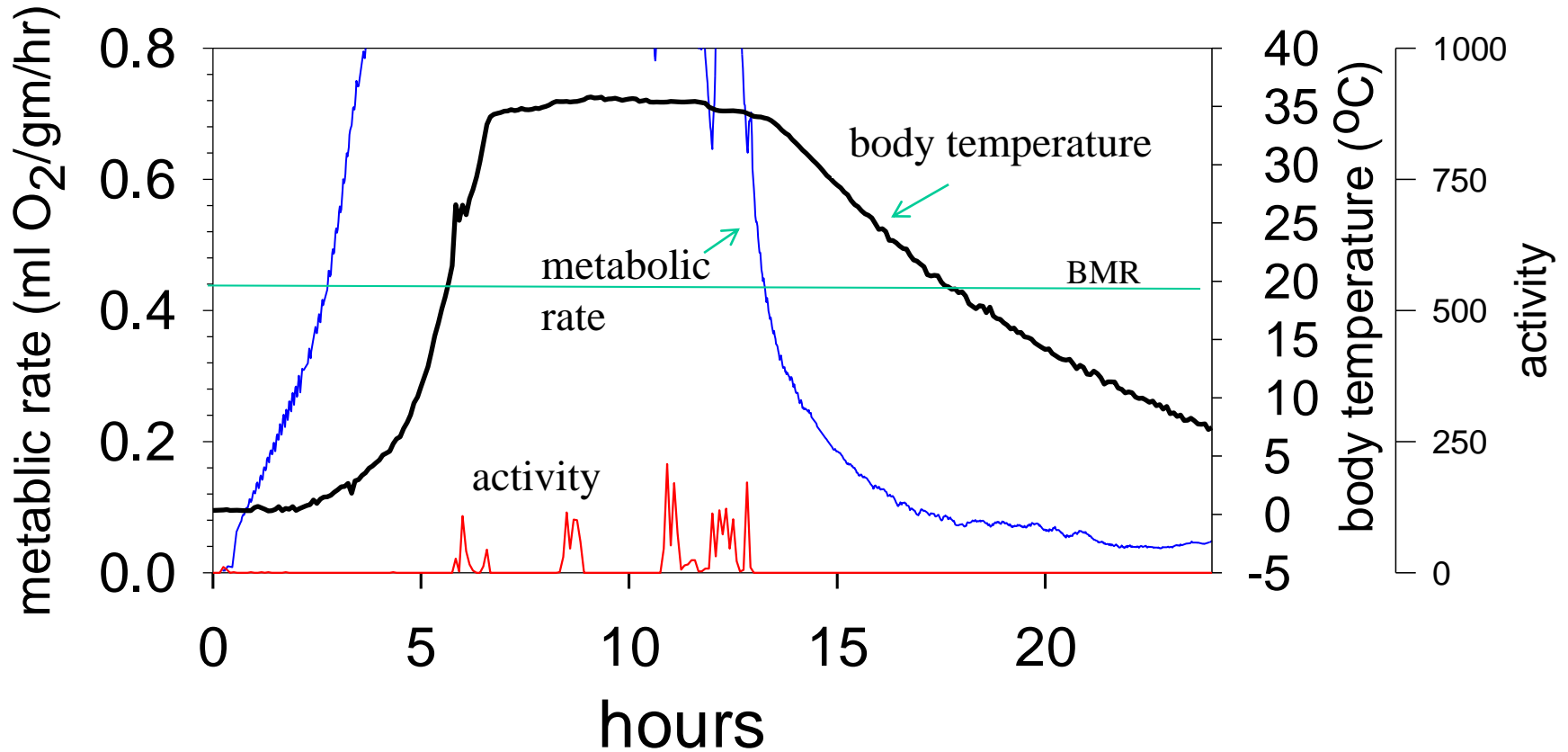
Stroke and heart attack are a problem
of:



(Blood) supply = (metabolic) demand.

Create stasis, time for transport
to advanced medical care.

arousal and re-entry at ambient temperature -5°C



Comparison of the mammalian hibernation phenotype in human-sized and small hibernators.



American black bear



Arctic ground squirrel



Photo by J. Hechtel



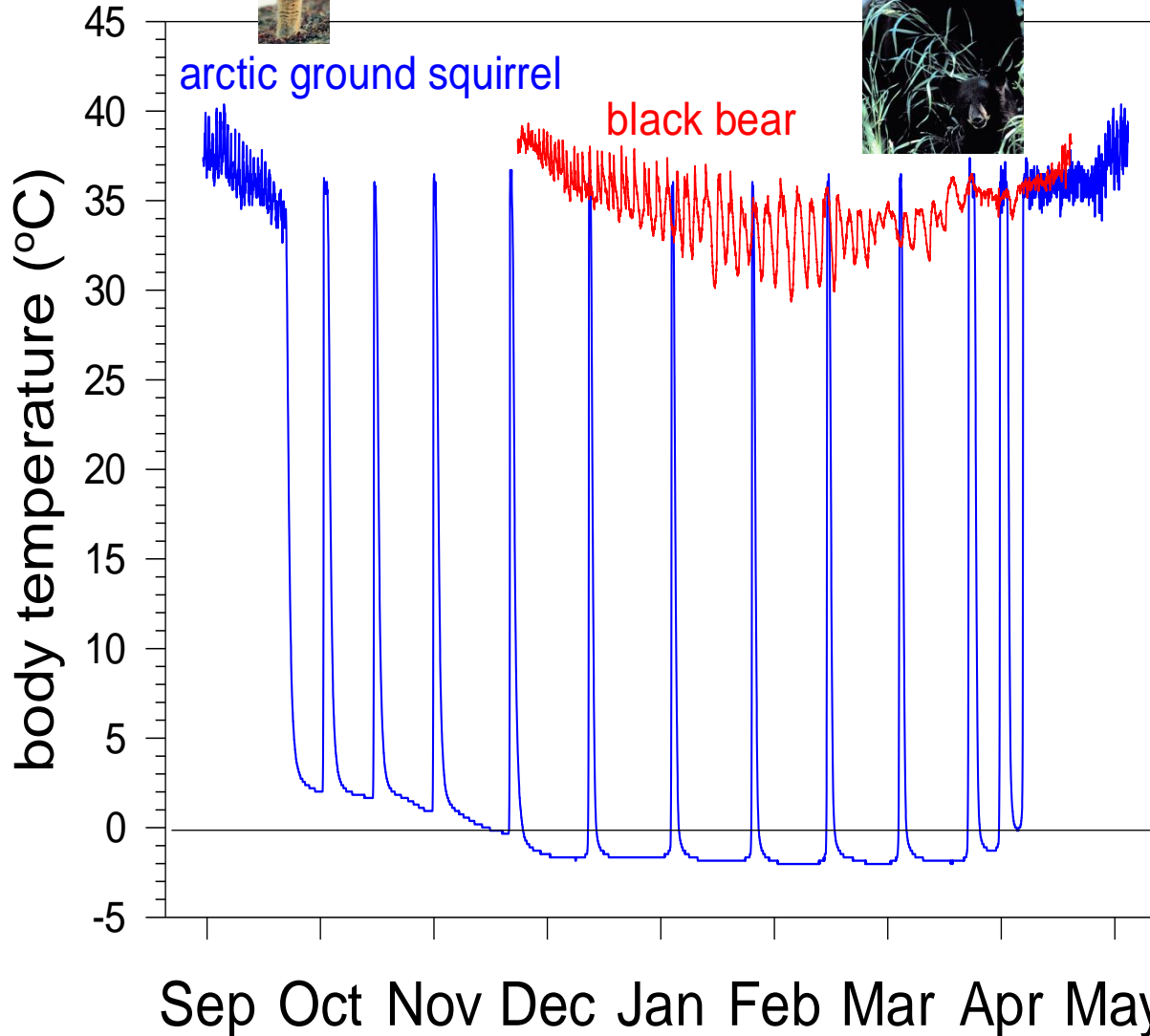


contrast of body temperatures during hibernation in small and large mammals



arctic ground squirrel

black bear



Hibernating black bears are human-sized, do not need to eat, drink, defecate or urinate for 7 months, do not lose muscle or bone mass, and can be wakened at anytime.

Hibernation in Black Bears: Independence of Metabolic Suppression from Body Temperature

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Tøien et al. 2011 *Science*