

UNDERSTANDING THE EFFECTS OF HEAT EVENTS ON FLYING- FOXES

Dr. Tania Bishop

BVSc(hons1a)MANZCVS(Avian Health)



Climate Change and flying foxes



Why are flying-foxes so susceptible during heat events?



Animals with higher metabolic rates have lower thermo-neutral temperatures. Metabolic activity generates heat.

Above this temperature, they need to engage active cooling measures. The animals with the highest metabolic rates will be most susceptible to the development of heat stroke. E.g.; Lactating and pregnant females.

What happens during a heat event?

Thermo neutral Zone

Higher or lower depending on current physiological status.

(No active measures needed to maintain core temperature)

Thalamus detects temperature rise above thermo neutral zone

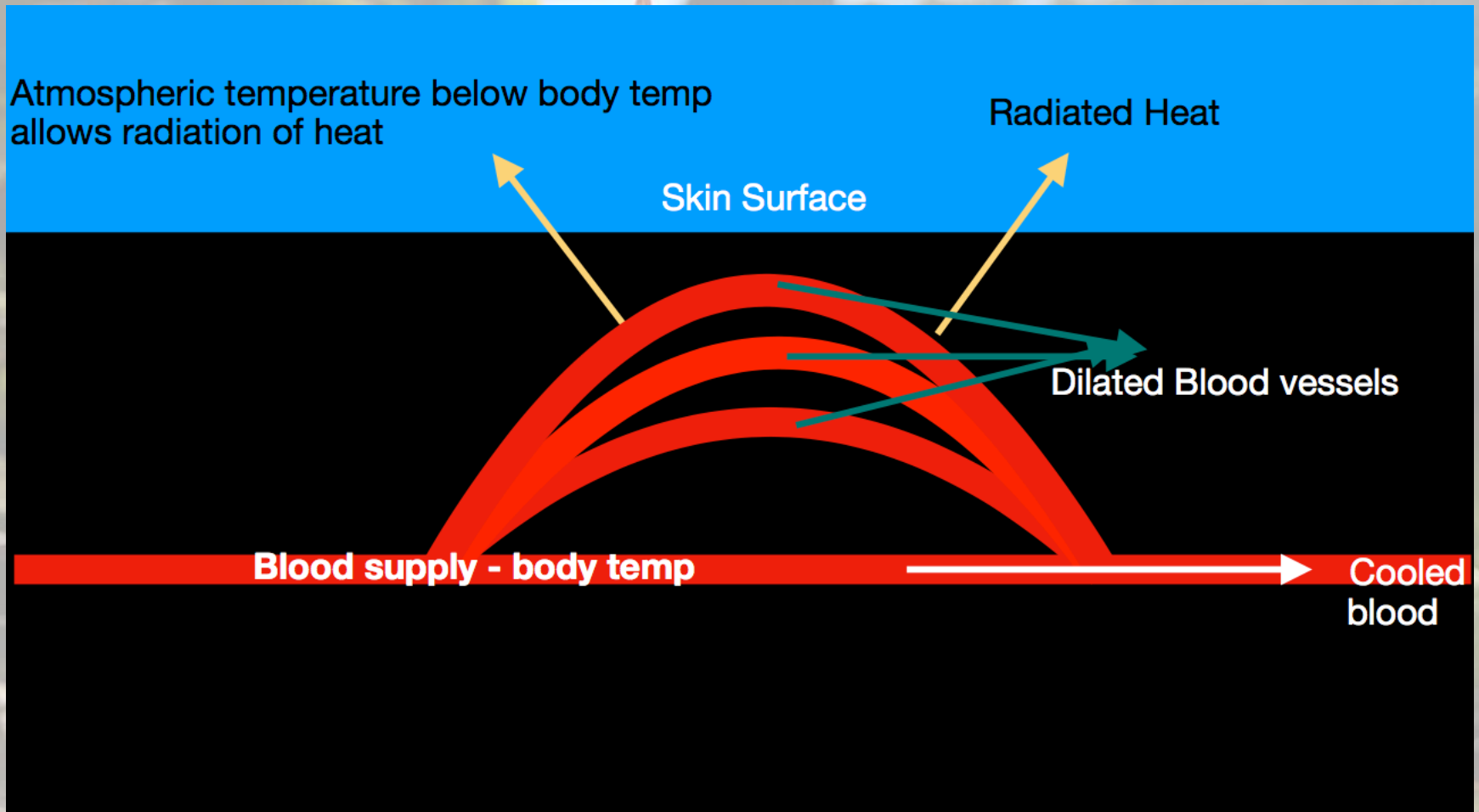
Behaviours to maintain core body temperature start
- fanning and shade seeking

Blood vessels in the skin vasodilate to allow heat to radiate away and cool the body.

At this stage the flying foxes are considered to be experiencing heat **stress**

As the temperature continues to rise, fanning increases core body temperature due to energy produced by pectoral muscles. This hastens the process toward heat stroke.

What happens during a heat event?



Wing fanning assists this process by moving cooler air over the dilated Vessels in the wing membranes

What happens during a heat event?

Ambient
rises and
temperatures



ive
es

UES TO
ATURE
TREES
AND
GE HAS

ALREADY STARTED

Heat Stroke



Direct cellular damage to the brain and associated blood vessels

Damage to vascular beds all over body

- Worsens shock
- Fluid buildup in lungs
- Multi organ damage occurs

- Gut lining sloughs worsening fluid loss

- Results in disseminated intravascular coagulation (DIC) and death

DE
Severe
panti
cooling
and multi-organ damage
and renal failure

Intervention



- Spraying bats with water has the potential to prevent mass deaths.
- **HOWEVER**, spraying must aim to directly wet the bat aiding evaporative cooling and sparing fluid loss and myopathy from reaching critical levels.
- Ensuring camp structure is intact will offer the most protection for bats during a heat event.

Animal Welfare

Guidelines for Euthanasia

- Uncontrolled seizing
 - Comatose
- Blind / no corneal reflex
- Rectal temperature of > 41.5
- Not responding to cooling measures or SC fluids
- Additional injuries - e.g.; fractures or severe lacerations from falling



Questions?



BIBLIOGRAPHY

- Arnemo, JM, Caulkett, N 2007, 'Stress', in Zoo animal and wildlife immobilization and anesthesia, Blackwell Publishing, Iowa, USA.
- Gfeller, G 2005, 'Heatstroke', in Ettinger, SJ & Feldman, EC, Textbook of Veterinary Internal Medicine, 6th edn, St Louis, Missouri.
- Guyton A, 1991, Textbook of Medical Physiology, WB Saunders, Philadelphia. Pg 288(diagram).
- Brammer, J.R, Humphries, M.H, 2015, Climate Change – Observed impacts on planet earth, Elsevier, U.S., Pg 135-137.
- <http://www.abc.net.au/radionational/programs/summerfeatures/give-a-bat-a-bad-name/4397186>
- <http://www.brainmuseum.org/Specimens/chiroptera/flyingfox/index.html>
- https://catalyst.library.jhu.edu/catalog/bib_2649264
- <http://extraordinarylight.blogspot.com.au/2010/12/magic-in-bush.html>
- <http://theconversation.com/killer-climate-tens-of-thousands-of-flying-foxes-dead-in-a-day-23227>
- <http://www.ozarkwild.org/docs/Heat-Stress30-01-14.pdf>.
- <http://www.news.com.au/technology/environment/climate-change/australians-endured-exceptional-heat-during-september/news-story/f566c12ba0df17895b3fcf31c1a0f6af>

BIBLIOGRAPHY

- Steven, P, Thoman, D, Follette, B, Farabaugh, T 1991, ' Influence of air temperature on ventilation rates and thermoregulation of flying bat', American Physiological Society. 960-968.
- <http://www.wollondilly.nsw.gov.au>
- <http://www.esc.nsw.gov.au/living-in/about/our-natural-environment/grey-headed-flying-foxes/flying-fox-plans,-approvals-and-legislation>
- Welbergen, JA, Klose, SM, Markus, N, Eby, P 2008, 'Climate change and the effects of temperature extremes on Australian flying-foxes', Proceedings of the Royal Society B, vol 275, pp. 419-425.
- Snoyman, S, Jasmina, M, Brown, C 2012, 'Nursing females are more prone to heat stress: Demography matters when managing flying -foxes for climate change', Applied Animal Behaviour Science, vol 142 pp. 90-97.
- Stanvic, S, McDonald, V, Collins, L 2013, Monitoring Heat Stress in Flying-foxes, viewed April 2014
- <http://www.australianweathernews.com/archives/temperature/max/anomaly/day/2017092320170923.gif>