

## Breathing and Thermoregulation in Sauropod Dinosaurs: Size Matters

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It often has been pointed out that the surface area of a large dinosaur is too small to dissipate the metabolic heat produced, thereby limiting either the volume of the animal (if the metabolic rate is high) or the metabolic rate (if the animal is gigantic). We have calculated that a sauropod of 12 tonnes would already have the metabolic rate of a bird at a body temperature of 40°C. (Perry et al., 2009) if no temperature-control mechanism were in place. Based on a "consensus" avian-style sauropod lung, we present here a model combining convective air cooling in the trachea with heat transfer in the air sacs and the lungs, and suggest that this mechanism, heat export during exhalation combined with radiational heat loss at night could possibly have sufficed to maintain reasonable body temperature in a large, growing sauropod. In a 38-tonne *Brachiosaurus branchai* the evaporational cooling in the trachea alone would result in the cooling by 103.45 megajoules\*day<sup>-1</sup> together with an additional 2.9 MJ\*day<sup>-1</sup> exported in the exhaled air.

Perry, S.F., Christian, A., Breuer, T., Pajor, N., Codd, J.R. (2009) Implications of an avian-style respiratory system for gigantism in sauropod dinosaurs. *J. Exp. Zool.* 311A:600-610.

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