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Peter J. Rogers, Jeffrey M. Brunstrom

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Peter J. Rogers and Jeffrey M. Brunstrom

Nutrition and Behaviour Unit, School of Experimental Psychology, University of Bristol, Bristol, UK

Corresponding author at: Peter J. Rogers, School of Experimental Psychology, University of Bristol, 12a Priory Road, Bristol, BS8 1TU, UK. E-mail address: peter.rogers@bristol.ac.uk

Abstract

The idea that food intake is motivated by (or in anticipation of) 'hunger' arising from energy depletion is apparent in both public and scientific discourse on eating behaviour. In contrast, our thesis is that eating is largely unrelated to short-term energy depletion. Energy requirements meal-to-meal are trivial compared with total body energy stores, so energy supply to the body's tissues is maintained if a meal or even several meals are missed. Complex and exquisite metabolic machinery ensures that this happens, but metabolic regulation is only loosely coupled with the control of energy intake. Instead, food intake needs to be controlled because the limited capacity of the gut means that processing a meal presents a significant physiological challenge and potentially hinders other activities. We illustrate the relationship between energy (food) intake and energy expenditure with a simple analogy in which: (1) water in a bathtub represents body energy content, (2) water in a saucepan represents food in the gut, and (3) the bathtub is filled via the saucepan. Furthermore, (4) it takes hours to process and pass the full energy (macronutrient) content of the saucepan to the bathtub, and (5) both the saucepan and bathtub resist overfilling, representing negative feedbacks on appetite (desire to eat). This model is consistent with the observations that appetite is reduced acutely by energy intake (a meal added to the limited capacity of the saucepan/gut), but not by an increase in acute energy expenditure (energy removed from the large store of energy in the bathtub/body). The existence of a relatively weak but chronic negative feedback effect on appetite proportional to body fatness is supported by observations on the dynamics of energy intake and weight gain in rat dietary obesity. (We use the term 'appetite' here because 'hunger' implies energy depletion.) In our model, appetite is motivated by the accessibility of food and the anticipated and

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