Letters editor, BMJ.

Please consider the letter below for publication in BMJ online and hardcopy.

It refers to When Somebody loses weight, where does the fat go? BMJ 2014;349 16th December.

Yours faithfully,

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Carbon dioxide and weight loss.

In the absence of an internal nuclear reactor to destroy atoms then the pulmonary excretion of carbon dioxide for weight regulation as reported by Meerman and Brown was obvious. What is less obvious is that the quantity of carbon dioxide that can be excreted by ventilation is dependent on the exquisite sensitivity of respiratory centres to carbon dioxide levels. Importantly individuals vary in sensitivity to carbon dioxide levels, the evidence for this being the ranges in normal values. Even small increases in ventilation of one breath per minute (15-16) will, increase ventilation and thus carbon dioxide excretion by about 7 percent without causing symptoms of hyperventilation they describe. Without changes in the weight of carbon excreted, metabolism, genetic factors or exercise cannot explain medium term weight changes because these processes cannot destroy atoms and their weight.

The implications of this mechanism of carbon homeostasis deserve emphasis.

Some people on the same diet will be more sensitive to carbon dioxide, ventilate more, and thereby excrete more carbon and remain slim whereas some overweight people do the opposite and have to store extra retained carbon as fat or glycogen. Thus, for some, obesity may not be a “moral failure.”

Obviously the calorie fundamentalists are correct about the rigid linkage of Calories and weight of carbon containing during absorption and metabolism, but this rigid linkage is broken during disposal of Calories and carbon as carbon dioxide after Krebs cycle metabolism. Disposal of carbon can be varied by changes in pulmonary ventilation (we excrete about 161 grams 24hrly of carbon in the breath and there is wide individual variation) whereas Calorie disposal can be disposed of by changes in peripheral blood flow and by latent heat of evaporation of water thus breaking the rigid relationship between

The individual variation in response to metabolically produced carbon dioxide also explains why people who eat too much do not inexorably continue to gain weight “explode” because they produce more carbon dioxide which will increase ventilation that increases carbon dioxide excretion and thus weight gain will plateau. Perhaps more importantly failures of diet after initial response predictably occur because those overweight (because they have reduced responsiveness to carbon dioxide) will produce less carbon dioxide consequent to dieting, their ventilation will be reduced and they will excrete less carbon dioxide so their initial weight loss will tend to plateau.

Enhanced carbon dioxide excretion also explains why people who go to high altitude lose weight. Increased ventilation caused by low oxygen levels results in higher carbon dioxide excretion and hence weight loss.

Calorie fundamentalists, thermodynamicists, and respiratory physiologists, perhaps forgivably, did not see the weighty significance of respiratory carbon dioxide excretion precisely because carbon dioxide is invisible.


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