I was very interested to read the review by Vanhauwaert et al (1) and agree that in a number of pathological conditions there is the need for the temporary suspension of fiber intake. However, for the most part, it is important to have fiber at every meal to limit microbial growth and promote useful fermentation (1 - 5). Food moves rapidly through the small intestine, (from minutes to half an hour in healthy conditions). This velocity, combined with high absorption, protects the small intestine from bacterial growth (4 - 6). The colon also needs to limit bacterial replication. Provision of slowly fermentable material at each meal is essential to this goal (5). This fermentable material varies in biochemical composition and related pathological and physiological effects, which remain poorly understood. The review by Vanhauwaert et al. should stimulate further investigation. Intestinal microflora (the microbiome) is regulated by intake of indigestible fibers and residues. Cellulose, hemicellulose and lignins are insoluble fibers found in whole cereals. Fruit and vegetables are rich in soluble fiber (pectin) (2). In the colon, insoluble components are partially (30% – 50%) fermented and soluble components are more completely fermented (85%) by one hundred-trillion bacteria. Fiber fermentation takes 6 – 8 hours after meals, and yields acetic, propionic and butyric acids. These short chain fatty acids flow slowly into the blood, prolonging energy availability and preventing depressed blood glucose (7). A meal rich in non-starchy vegetables also delays hunger and allows subsequent intake to be more easily planned (2 - 4, 8, 9). Fiber also contributes to lower energy intake by increasing gastric volume, giving a
sensation of fullness (2 - 4, 7 - 8). Hunger decreases with lower energy concentration. In our experience with carbohydrates, preference is directly proportional to the glycemic index--the area under the blood glucose curve produced by 100 grams of food divided by the area produced by 100 grams of white bread.

Fiber intake, particularly from non-starchy vegetables, is critical in treating and preventing obesity. Each meal remains completely subjective. Measurement of pre-prandial blood glucose, an index of energy availability, is generally not feasible. At the sight of food, a will to eat a certain amount of energy develops, more or less consciously, from sensations that may be corrected by experience from previous meals. This experience considers the association between amount of energy intake and length of time without food (10). We trained children to recognize initial hunger three – four times per day to yield a subjective, reproducible limit in energy intake. Observed decreases in energy intake were attributed to higher intake of non-starchy vegetables. At the age of 8 y and beyond, between half and one kg of fruit/vegetables per day should be consumed (1-3). In some cases, adding these vegetables to the diet of an insulin resistant person produces excessive fermentation and induces bowel symptoms. However, non-starchy vegetable intake is needed to reduce energy intake and to recover insulin sensitivity. We find that training in the recognition of initial hunger is a way to tolerate these vegetables without symptom relapse (4). Healthy nutrition requires balancing these interdependent factors, along with other recommended changes, such as regular exercise.

Acknowledgments

The sole author (Mario Ciampolini) has read and approved the final version and takes responsibility for all aspects of the letter.

No conflicts of interest.

Financial support: Italian Ministry of University, Research, Science and Technology, and ONLUS Nutrizione e Prevenzione, Firenze.

References