Mini Review

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# Meal optimization to reduce obesity

## Abstract

This review article elaborates on the significance of meal properties in reducing obesity. Meal properties of importance include timing, size, frequency, and sequence. Reducing meal size, avoiding large evening meals, increasing the circadian meal frequency, and optimizing meal sequence (e.g., balancing vegetable and animal food intake) are all required for minimizing obesity risks in today's busy lifestyles.

**Keywords:** obesity, meal, frequency, timing, size, sequence

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## Discussion

This review article elaborates on the significance of meal properties in minimizing risks of obesity. Meal properties including timing, size, frequency, and sequence play significant roles in preventing and managing obesity. However, no or little (if any) attention has been given to these as a whole.[1] The overly busy lifestyles have greatly contributed to the interrupted public health programs aiming to optimize meal properties altogether. Securing such knowledge is crucial when human suffers from devastating diseases such as cancer and obesity.[2–6]

Recent science arisen from optimizing the timing of eating has led to a new insight that morning is a batter time for eating than evening, and thus, evening large meals must be avoided.[6–16] This is mainly due to the circadian properties of human endocrinology and metabolism. Human cells during day are better prepared than overnight for nutrient assimilation and oxidation. In addition, it is thought that waste management takes place more effectively during morning and day time compared to evening and night.[17]

Larger meals may cause higher insulin surges that do not lead to healthy metabolism. Larger meals, thus, may greatly enhance the risk of abnormal insulin dynamics, which increase adipogenesis and obesity. Instead, making meals smaller and distributing them over day hours should improve metabolism and health. With smaller meals more frequently taken, hormonal actions do not experience high fluctuations. As a result, insulin resistance and glucose intolerance are less likely to occur. This will reduce the risk of visceral and abdominal obesity. As a result, normal liver function is maintained and immunity does not weaken.[18–23]

Meal sequence is a property that has been discussed very insufficiently, maybe because limited information is available. By definition, meal sequence is the order of eating animal (e.g., milk, meat, eggs) and non-animal (e.g., fruits, vegetables, plant products) foods. It is contemplated that including fibrous foods of mainly fruits and vegetables between animal meals and/or non-animal non-fibrous meals can improve nutrient assimilation. This can reduce risks from gut diseases. Adequate plant cell wall intake is necessary for normal gut motility and function. In addition, plant cell walls slow down substrate absorption and help control insulin response. Moreover, plant fibres improve energy metabolism and waste management in both gut and peripheral cells. The latter is required for a cancer-free life.[2,17,24–27] Towards night, meals should, however, be made mainly from vegetables.

## Implications

Meals must increase in frequency and decrease in size to support a healthy lifestyle. Timing of food intake must follow evolutionary human endocrinology and metabolism that necessitate avoiding large evening meals and well-distributed small day-time meals. Supportive plant meals containing adequate cell walls from fruits and vegetables must be included between animal-food meals and/or non-animal non-fibre meals.

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## Conflict of interest

The author declares no conflict of interest.

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