

## **One Meal A Day (OMAD): is there merit in the midst of madness?**

By Lorenzo Pansini

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*One Meal A Day* (OMAD) is a type of intermittent fasting that has become a cult hit in recent years. OMAD is often presented by its promoters as a superior method for various benefits, such as weight loss, appetite control, and a slew of health-related claims. To the surprise of many, OMAD has been studied in the human literature for decades. Do the sensationalized benefits in diet books align with the findings in the research literature? Let's dive in and have a look, but first a quick primer on what OMAD is all about.

### **What is OMAD?**

OMAD is a dietary pattern (not really a diet) based on a single daily meal. For this reason, OMAD is an extreme form of time-restricted feeding (TRF),<sup>1</sup> that is, that type of intermittent fasting (IF) where it is expected to eat in a restricted window of time during the day. If the regular TRF is characterized by a feeding window between 4 and 10 hours,<sup>1,2</sup> with OMAD the only request is to eat in the time window needed to consume the single meal; in other words, it is TRF with a 23/1 ratio or something similar.

The research interest in studies examining the comparative effects of a traditional pattern versus a single meal are scarce, but they exist.<sup>3-6</sup> It's notable that OMAD in research is rarely described as a type of TRF, probably for its more extreme characteristics keeping it far-removed from more common patterns of 2-4 meals.

The early human OMAD research emerged in the 60s under the name of *single daily meal*,<sup>5,6</sup> and only during the 2000s, it began to be better known online under the current acronym. The pattern has achieved a significant increase in popularity likely starting from 2017, when several books have been published. Thanks to the catchy acronym, it has emerged as popular fad diet.

Precisely because of this rampant craze and the sensationalist tones of questionable books and web articles, in a few years, OMAD has gone from being

perhaps one of the worst food patterns to the secret to solve all health & weight problems. However, an impartial look at the published research provides a considerably more cautious, and less flattering picture.

### **Thermic effect of food and body fat**

Any self-respecting fad-diet must be considered as more effective for fat loss, giving it a sort of "magic" *metabolic advantage*, in this case, compared to multiple meals. Research shows that meal frequency does not significantly affect the thermic effect of food (TEF), and it's interesting to note that some studies have found a higher TEF with OMAD, but with differences too small to be considered practically meaningful (<20 kcal).<sup>7</sup>

It's much more important to look at the inherent long-term effects of OMAD on fat changes compared to multiple meals, i.e. under energy-matched conditions. Although body composition was not measured, classic metabolic ward studies of the 1960s enforced isocaloric conditions and didn't observe any difference or advantage in weight changes between OMAD and frequent meals.<sup>5,6</sup> A recent metabolic ward study confirmed similar fat changes between a very low-calorie diet with 5 meals and OMAD.<sup>8,9</sup> the 5-meal condition resulted in slightly higher fat loss, but this was likely confounded by the sequence of consecutive stages.<sup>8,9</sup>

One of several common limitations in these metabolic ward studies was the short duration (14-20 days), while the longer-term free-living studies (5-6 weeks and a cross-over design) observed similar<sup>10,11</sup> or greater fat loss for OMAD compared to frequent meals.<sup>3</sup> Since the free-living setting can't perfectly match calories between treatments when a clear OMAD advantage was observed, this was attributed to the lower calorie intake.<sup>3</sup>

### **Fat-free mass**

The early studies that compared the nitrogen balance between OMAD and multiple meals showed no difference.<sup>6,10,11</sup> This led to the conclusion that a single meal is not less sparing/preservative of lean mass. Long-term studies where fat-free mass (FFM) was monitored or estimated did not observe a negative impact of OMAD compared to multiple meals, even with calorie restriction.<sup>3,8,10,11</sup>

The issue has been better studied by a recent meta-analysis (co-authored by Alan), finding that no particular meal frequency favors FFM gain or maintenance, especially after a sensitivity analysis removed a study with outlying results.<sup>7</sup> The published studies (including those on OMAD), however, used poor FFM measurements (BIA or simple estimates), muscle mass was not directly measured, and involved sedentary and/or non-resistance trained populations. Based on the limited available evidence, it's not possible to provide a clear answer about the effects of OMAD on lean and muscle mass, nor on its effects in combination with resistance training.

Some authors have suggested that very low meal frequency would suppress anabolism when protein intake is suboptimal and/or when calorie restriction is chronic and marked;<sup>12,13</sup> others suggest a minimum of 4 meals (with at least 20 g of protein each) to maintain optimal anabolic state.<sup>14</sup> This is based on the notion that a more frequent muscle protein synthesis stimulation throughout the day positively affects the net muscle protein balance,<sup>14,15</sup> but strong long-term evidence is still lacking.

### **Health parameters**

The health parameters issue is the most serious and delicate, and upon which OMAD fad-diet books have likely created the most dangerous misinformation. The very first metabolic ward study on eucaloric OMAD found a worsening of the lipid profile (especially plasma cholesterol) compared to 3-10 meals,<sup>5</sup> and other classic later studies confirmed worsening of total and LDL cholesterol, insulin resistance (both IGT and IFG), and blood pressure when compared to 3 or more meals.<sup>3,4,10,11</sup>

Some of the side effects had already been mentioned in an old 1997 review about the relationships between lipid profile and meal frequency, which included the OMAD studies published until that time.<sup>16</sup> Only one of the studies published to date has not observed worsening of lipid profile,<sup>6</sup> but the results were confounded by the strong calorie restriction (~600 kcal/day), in contrast to the others where the diets were eucaloric or moderately hypocaloric.

One might suspect that a lag time would be required to allow for adaptation and normalization, but several of these lasted 5-8 weeks,<sup>3,10,11</sup> a period long enough to

observe adaptations. Another limitation is the population studied, but worsening has been seen in both hyperlipidemic overweight/obese and normolipidemic/normal-weight subjects.

### **Appetite and calorie intake**

Perhaps one of the few concrete merits of OMAD is the spontaneous reduction of caloric intake, allowing it to establish a calorie restriction in an ad libitum context. This advantage has been observed several times for normal TRF (feeding window up to 8-10 hours),<sup>17,18</sup> and a much narrower feeding window is assumed to emphasize this benefit. In fact, a free-living eucaloric study comparing OMAD and multiple meals found a slight fat loss advantage over 3 meals, despite the isocaloric targets.<sup>3</sup> Compared to 3 meals, the study found adverse changes in various appetite parameters (hunger and desire to eat), which gradually increased over the 8 weeks.<sup>3</sup> On the other hand, the OMAD group reported excessive fullness during and after the meal, struggling to eat it all. In addition, the OMAD treatment resulted in fat loss (2.1 kg) which correlated with a slightly lower calorie intake (~65 kcal).

It is assumed that if the subjects had not been forced to consume calories at maintenance, the ad libitum intake would have been further reduced. A previous OMAD study reported distraction from hunger during the day for over half of the subjects, and 40% of them reported a preference over 6 meals.<sup>11</sup> If a person adheres to the long-term pattern for personal preference, OMAD is certainly an easy way to lose weight, but probably at the expense of a slight deterioration in health parameters compensated only in part by calorie restriction.

### **Feeding window timing: early-OMAD vs late-OMAD**

Currently, some research teams are strongly promoting the TRF feeding window positioned in the early part of the day (early-TRF). The supposed benefits include improvements in insulin sensitivity, blood pressure, inflammation, oxidative stress and appetite,<sup>1,19</sup> but the topic is still debated (see May and September 2019 issues by AARR for Alan's comments).

Few people know the existence of many old "obscure" 80s studies that compared e-TRF and l-TRF in an OMAD

style. Some of these were conducted by Franz Halberg's team (defined by some as the father of modern chronobiology)<sup>20,21</sup> the others by two Italian teams, Sensi & Capani et al, and Caviezel et al.<sup>11</sup> Halberg's studies found that a 2000 kcal or an ad libitum OMAD at breakfast caused weight loss, whereas this same meal provided at dinner weight was maintained.<sup>20,21</sup>

Sensi & Capani's team observed slightly higher weight loss with very-low-calorie late-OMAD (~700 kcal/day), while Caviezel found that very low-calorie (~600 kcal/day) early-OMAD produced greater weight loss than late-OMAD only in severely obese, but not in moderately obese.<sup>22</sup> It's noteworthy that all Italian studies were conducted in metabolic ward, but were still of very poor quality, lacking important pieces of information, and harboring a high risk of bias.<sup>22</sup> The duration of all these studies was always rather short (1-3 weeks), health parameters and body composition were not monitored, and many are brief reports or symposium presentations that cannot be retrieved, and many data are not reported.<sup>20-22</sup>

Likely the most reliable comparative early- vs late-OMAD study to date, conducted in metabolic ward, showed similar, albeit slightly higher fat loss for the very low-calorie (1000 kcal/day) early-OMAD over 18 days.<sup>8</sup> But these differences may have been influenced by the various treatments in consecutive order in the same subjects, and in any case, were not considered significant.

Since energy balance predominantly dictates changes in fat mass<sup>2</sup> it's likely that there is no inherent effect of the feeding window timing or placement, as suggested by the authors of the most reliable study in this regard.<sup>8</sup> Differences in health parameters attributed to TRF cannot be ruled out, but the issue requires further study to move toward definitive conclusions.

### Alternate-day OMAD

The term *Intermittent Energy Restriction* (IER) identifies those intermittent fasting patterns super-family consisting of 1-4 so-called *fast days* in the week, alternated with the remaining weekly days around maintenance or *ad libitum* (*feed days*). Fast days usually consist of a *semi-fast*, with a high calorie restriction of up to 75% of the energy needs. Perhaps the most famous type of IER-style IF is the *alternate-day fasting* (ADF), which alternates feed days

and semi-fast days every other day over the week.

Since it goes from days of energy abundance to semi-fasting, ADF research is essentially a very-low-calorie OMAD followed every other day (therefore 3-4 days a week).<sup>23</sup> ADF research generally shows an improvement in health parameters similar to chronic calorie restriction, and other IER models, such as the classic 5:2, also show similar results.<sup>23-25</sup> This would mean that when the OMAD is expected only for 2-4 days of the week in a very-low-calorie mode, the impact on the health parameters can be very different from the eucaloric or slightly low-calorie OMAD followed chronically. Moreover, even one of the early 60s studies on chronic very-low-calorie OMAD (~600 kcal/day) showed a similar lipid profile improvement compared to multiple meals.<sup>6</sup>

Some IER-ADF promoters have argued that this pattern can spare lean mass compared to chronic energy restriction (ideally matching weekly energy balance).<sup>26</sup> However, this idea has been questioned, since in most cases similar effects have been observed.<sup>24</sup> In addition, doubts have been raised regarding the reliability of the fat mass measurement measurements.<sup>27</sup>

### Conclusions

One Meal A Day (OMAD) is likely the most extreme and controversial intermittent fasting pattern/TRF variant. On the one hand, it can be an interesting strategy to reduce *ad libitum* calorie intake. It might surprise some that it doesn't have a clear negative impact on lean mass compared to multiple meals, even if from a theoretical and mechanistic standpoint it's not considered optimal for muscle growth.

On the other hand, the alleged metabolic benefit of OMAD for fat loss described by some fad-diet books is very implausible. What deserves greater consideration is the worsening of health parameters such as the lipid profile (TC and LDL-C) and insulin resistance (IGT and IFG), even with moderate calorie restriction, and also in metabolically healthy subjects. These side-effects do not seem to exist if the calorie restriction is substantial ( $\leq 1000$  kcal/day). Unfortunately, this aggressive deficit can further challenge the sustainability of OMAD.

Before choosing this pattern, you should stop and ask yourself the real reason behind this choice: have you been

smitten by the catchy acronym? Are you prone to jumping on the latest trends? Or, is it an informed choice after an honest, objective examination of the data? In most cases, the answer is the former.

Nevertheless, OMAD is not a pattern deserving of universal dismissal. When inserted in a very-low-calorie mode on some days of the week (i.e., in an IER-ADF-style intermittent fasting), its potentially deleterious impact can be avoided. If applied in this way, OMAD fits well with flexible *calorie cycling* modalities. It can be incorporated with a variable cadence through the week according to the need to control or lose weight. Using OMAD as a tactical tool would minimize its potential for negative impacts on health parameters.

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