8. The effect of HMB with exercise on body composition

In Table 1, the published literature evaluating the combined effects of HMB and exercise on body composition (i.e. lean mass, fat mass, or their ratio) in placebo-controlled studies without subjective bias for study design or population is available. However, the population factors, as well as other differences between study designs, likely influence the findings. HMB supplementation has been studied across a wide range of populations with regard to age, sex, and training status and has been studied in combination with a variety of training stimuli in terms of mode, duration, and intensity.

HMB supplementation has been shown to increase fat-free mass (FFM) in response to exercise training in previously untrained individuals in as little as three weeks [6]. Among previously trained individuals, however, benefits are more likely to be realized over longer duration training protocols (i.e. ≥6 weeks) as short-term studies in trained individuals often do not detect benefits of HMB over placebo, although there are some exceptions [58,79]. It appears that there is even a benefit of HMB to increase FFM in athletes [104].

Interpretations of body composition changes are somewhat limited in most studies due to the lack of dietary control, especially habitual protein intake. However, most studies instructed participants not to change their diets and included some form of dietary assessment, typically a diet recall. A few studies tightly controlled participants' diets [81,85], and these studies were notably associated with some of the largest magnitude of changes observed to date in body composition with HMB supplementation during training. These studies were questioned for the large effects reported.

Due to dual mechanisms of enhancing protein synthesis and reducing protein breakdown, HMB may uniquely support optimal body composition during training and caloric restriction, which is often practiced by athletes participating in weight-classified sports. In a very small study ($n = 4$/group) of female judo athletes who were calorically restricted (mean intake of ~1160 kcal/d, 1.33 g/kg protein/d) for three days, the group taking HMB experienced significant reductions in body fat percentage and numerically smaller reductions in FFM compared to the control group [105]. In another study with energy restriction, researchers evaluated the effects of HMB supplementation on body composition during 8 weeks of resistance training and time-restricted feeding [91]. Though the intent-to-treat analysis did not show a definitive benefit of HMB on body composition, in the per-protocol analysis, which excluded individuals who dropped out of the study or had poor diet, supplement, or exercise compliance, only the HMB group had significantly reduced fat mass and body fat percentage relative to baseline values, and had a numerically greater change in FFM.

Though most studies evaluating the effects of HMB supplementation have been conducted with young (primarily male) adults, the effects of HMB supplementation during exercise training have also been evaluated in different age groups [21,77,84,106,107]. In adolescent (aged 13–18 y) elite volleyball players, HMB supplementation during 7 weeks of training significantly increased lean mass and decreased fat mass [83]. To our knowledge, Fairfield et al. [96] were the first to specifically evaluate the effects of exercise and HMB in middle-aged women. Though no significant effects of HMB + exercise were observed for overall body composition, HMB + vitamin D_3 supplementation significantly decreased intramuscular adipose tissue, as measured by magnetic resonance imaging of the thigh. Notably, a similar effect was observed in both resistance exercise trained