In their report, the authors noted that red meat has been associated with inflammation, type 2 diabetes, and heart disease (1). Yet, the association between red meat and chronic disease goes far beyond this. In addition to diabetes and coronary artery disease, evidence from epidemiologic studies and clinical trials has linked red meat with a host of other conditions, including, for instance, kidney injury (2), stroke (3), and heart failure (4). Red meat has also been associated with pancreatic cancer (5), colorectal cancer (6), and premature death (7). The American Heart Association and the World Cancer Research Fund/American Institute for Cancer Research both recommend limiting intake.

Recent evidence also showed that substituting alternate protein sources, such as nuts, legumes, fish, or poultry, for red meat decreased the risk of many of these chronic conditions. Importantly, substituting these alternate protein sources for red meat led to an improved biomarker profile of inflammatory and glucose metabolism (8), 2 processes that could help with muscle mass and strength in the elderly population under study. Providing lean, rather than full-fat, red meat is also not an optimal substitution because evidence suggests that the fat content is not solely responsible for red meat’s adverse effects: other constituents, such as heme iron (9) and carnitine (10), may play a role, as well as the cooking method and isocaloric displacement of healthful nutrients from other foods.

By comparing red meat plus resistance training with rice and pasta plus resistance training, it is not surprising that Daly et al (1) found that participants in the former group consumed more protein and gained muscle mass and strength. It would have been of greater scientific interest and public health import to see alternate, healthy protein choices in equal amounts combined with resistance training, comparing one with the other.

None of the authors declared a conflict of interest.

Adam M Bernstein
Mladen Golubic
Michael F Roizen

Wellness Institute
Cleveland Clinic
1950 Richmond Road
Lyndhurst, OH 44124
E-mail: bernsta2@ccf.org

REFERENCES

1. Daly RM, O’Connell SL, Mundell NL, Grimes CA, Dunstan DW, Newsom CA. Protein-enriched diet, with the use of lean red meat, combined with progressive resistance training enhances lean tissue mass and muscle strength and reduces circulating IL-6 concentrations in elderly women: a cluster randomized controlled trial. Am J Clin Nutr 2014;99:899–910.


Reply to AM Bernstein et al

Dear Sir:

We thank Bernstein et al for their perspectives and agree that future intervention trials should evaluate whether increased dietary protein achieved through sources other than red meat, such as nuts, legumes, fish, or poultry, could also enhance the effects of progressive resistance training (PRT) on muscle health and function and inflammation in the elderly. However, this was not the objective of our trial; rather, we specifically examined whether increasing dietary protein intake through the consumption of modest servings (80-g cooked) of high-quality lean red meat (beef, lamb, veal) twice per day on most days, with a complement of all 8 essential amino acids (unlike many vegetable protein sources), could promote greater gains in muscle mass, strength, and function and reduce markers of inflammation when combined with PRT.

Bernstein et al have queried our decision to use red meat alone to increase dietary protein intake, largely because of concerns around the reported associations between red meat and a host of chronic diseases and conditions. We do not dispute the fact that a number of epidemiologic studies have reported that meat intake, including red and processed meat, is associated with an increased risk of various chronic diseases and even mortality. However, we believe that these observational study findings must be interpreted with caution because of various methodologic limitations. In particular, there is considerable heterogeneity in the definitions of red and processed meat, with no consistency in how meat intake is measured, with many studies grouping red and processed meats together (1). In addition, most studies do not assess the degree of fat trimmed or the method of cooking used; and other important confounders, such as physical activity, body composition, and alcohol intake, are often not included in the analyses (1).

It was also suggested that providing lean, rather than full-fat, red meat is not an optimal substitution because there is evidence that other factors besides the fat content of meat may be harmful to health. Moreover, Bernstein et al proposed that substituting alternative sources of protein for red meat leads to an improved biomarker profile of inflammatory markers, which could help with muscle mass and strength in the elderly. It is worth highlighting that, of the limited human intervention trials available that have investigated the effects of red meat on cardiometabolic-related health outcomes (including lean red meat consumption), most have failed to detect any adverse effects on weight, blood lipids, blood pressure, thrombotic factors, markers of inflammation, and oxidative stress (2–6). Indeed, several systematic reviews and a meta-analysis of randomized controlled trials reported that the inclusion of lean red meat in a well-balanced diet is associated with a reduction in LDL cholesterol (7) and is
comparable to lean white meat in lowering total and LDL cholesterol and triglycerides (8). Similarly, we found that combining PRT with lean red meat was associated with a significantly greater reduction in the proinflammatory marker IL-6 relative to PRT alone; serum TNF-α also decreased in the lean red meat group after 4 mo. Thus, we believe that there is insufficient evidence from randomized controlled trials to definitively state that the consumption of lean red meat adversely affects health.

Although Bernstein et al suggest that our positive results on lean muscle mass and strength were not surprising, there are other studies that have shown this effect with such a modest increase in protein intake from 1.1 to 1.3 g/d. As detailed in our article, the findings from several previous interventions investigating the effects of PRT combined with a meat-containing diet on muscle have produced mixed results (9, 10), which is likely a result of the relatively short study durations (<12 wk), nonrandomized nature of the trials, the small sample sizes, and the dietary protein intake achieved (~1.0 g·kg⁻¹·d⁻¹), which may be insufficient to augment the effects of PRT on muscle in older adults. Thus, on these grounds, we maintain that our findings are important because they provide the strongest evidence to date that consumption of modest servings of lean red meat at 2 meals within the day, when combined with PRT, is not only effective for augmenting the effects of PRT on lean muscle and muscle strength in older adults but is safe, with no adverse effects on kidney function, blood pressure, or blood lipids.

This study was funded from a nationally competitive Meat and Livestock Australia grant. The authors had no other conflicts of interest to disclose.

Robin M Daly
Stella L O’Connell
Niamh L Mundell
Carley A Grimes
David W Dunstan
Caryl A Nowson

Centre for Physical Activity and Nutrition Research
Deakin University
221 Burwood Highway
Burwood, Victoria, 3125
Australia
E-mail: robin.daly@deakin.edu.au

REFERENCES


The conclusion on the impact of lipid-based nutrient supplements on child growth in Haiti may be too optimistic

Dear Sir:

The Journal recently published an article by Iannotti et al (1), in which the authors made the following conclusion: “A low-energy, fortified product improved the linear growth of young children in this urban setting.” We find this conclusion inconsistent with the statistical findings the authors reported.

The authors conducted a 3-arm parallel group trial in which they enrolled 589 healthy 6- to 12-mo-old infants and randomly assigned them to receive 1) no supplementation (control), 2) an average of 20 g Nutributter (Nutriset)/d [a lipid-based nutrient supplement (LNS)] for 3 mo following no supplementation for 3 mo (3-mo LNS), or 3) an average of 20 g of Nutributter/d for 6 mo (6-mo LNS). Length-for-age z score (LAZ) was the primary outcome, recorded monthly during the 6-mo intervention period (visits 1–6) and once at 6 mo after the end of intervention (visit 7).

According to the trial protocol, participants in the 3-mo LNS and 6-mo LNS groups received identical intervention during the first 3 mo of the follow-up. Despite no difference in the intervention, the mean LAZ was much lower in the 3-mo LNS group than in the 6-mo LNS group throughout this period. The reduction in mean LAZ during the first 3 mo was smaller in the 6-mo LNS group than in the control group, but the largest reduction was observed in the 3-mo LNS group. If one combines the first 3 mo data from the 6-mo LNS and the 3-mo LNS groups (as one logically should because the interventions were then the same) and makes a comparison with the control group, there is practically no difference in the mean LAZ between the LNS-supplemented and nonsupplemented participants at any time point during the first 3 mo of the intervention (the authors’ Table 3). After the first 3 mo, the mean LAZ reductions were largest in the 6-mo LNS group and smallest in the control group, such that the mean LAZ was almost identical in the control and 6-mo LNS groups at 6 and 12 mo after enrollment (Table 3 and Figure 2). If one would draw the trial conclusion from data collected either at 3 mo (comparing controls with those who had been receiving LNSs), or at 6 or 12 mo (comparing controls with the 3-mo LNS or the 6-mo LNS groups), the LNS could not have been deemed superior to “no intervention.”

Instead of basing their conclusions on analyses at any single time point, Iannotti et al presented regression modeling of repeated measures with or without adjustment for age (Table 4). It was from the modeling with adjustment for age that they concluded the superiority of the 6-mo LNS over no intervention. In our opinion, there are 2 problems with their analytic approach and interpretation. First, the