Ann Nutr Metab 2016;68:228–229

DOI: 10.1159/000445510

DXA Estimates of Body Composition and Carbohydrate Loading Julia Bone^{a, b}, Louise M. Burke^{a, b}^aSports Nutrition, Australian Institute of Sport, Canberra, and^bMary McKillop Institute for Health Research, Australian Catholic University, Melbourne, Australia

We read with interest the study by Rouillier et al. [1], which reported that a carbohydrate (CHO)-loading strategy (3 days of high intake of CHO) in physically active men was associated with an increase in DXA estimates of lean body mass (LBM), thus confounding the ability of DXA to measure true changes in LBM (muscle mass) that might be of interest to an athlete. It is an intuitive hypothesis that increases in muscle glycogen and associated water might be considered within LBM estimates and thus represents an artefact of true changes in body composition. Indeed, we have recently conducted a study in which we manipulated the muscle content of creatine, glycogen and water in various combinations and found substantial changes in DXA estimates of LBM [2]. However, we would like to comment on the apparent issues (or lack of information) in the current investigation that preclude its ability to truly confirm that CHO loading is responsible for the observed changes in DXA estimates of LBM. First, although the dietary treatment was likely to be associated with increased muscle glycogen stores, this was not independently verified. More importantly, however, it appears from the methodology described in the paper, that the DXA measurements were made under nonstandardized conditions that could themselves create 'noise' in the LBM estimates. The paper states that DXA measurements were undertaken on 2 occasions, with the first measurement being undertaken 'just before the start of the diet on day 1' and the second 'after the diet on day 3'. From this we conclude that some measurements were made in the morning, while others were made later in the day.

Our group has undertaken a series of studies on the reliability of DXA estimates of body composition in athletes, and has shown that there are substantial changes in estimates of body composition over the course of the day, with changes in LBM of similar magnitude to that seen in this study [3, 4]. These changes are associated with the intake of food and fluid, as well as body fluid shifts, which occur during exercise [3, 4]. We have proposed that standardized conditions, with subjects having fasted and rested overnight, and positioned on the scanning bed in an identical protocol with use of positioning aids, be undertaken to minimise the errors of measurement [5, 6]. It is uncertain from the description provided in the current paper that these protocols were followed. We not only encourage researchers and practitioners to follow best practice protocols for the use of DXA to undertake body composition measurements, but to state clearly that such protocols have been followed when reporting such research. This will help to promote confidence in the findings of their specific investigation as well as to promote the importance of these protocols in general athletic practice and scientific research.

References

- 1 Rouillier MA, David-Riel S, Brazeau AS, St-Pierre DH, Karelis AD: Effect of an acute high carbohydrate diet on body composition using DXA in young men. *Ann Nutr Metab* 2015;66:233–236.
- 2 Bone JL, Burke LM: Manipulation creatine and glycogen influences DXA estimates of lean mass measurements. Vienna, 21st Annual Congress of the European College of Sport Science, July 6–9, 2016.
- 3 Nana A, Slater GJ, Hopkins WG, Burke LM: Effects of daily activities on dual-energy X-ray absorptiometry measurements of body composition in active people. *Med Sci Sports Exerc* 2012;44:180–189.
- 4 Nana A, Slater GJ, Hopkins WG, Burke LM: Effects of exercise sessions on DXA measurements of body composition in active people. *Med Sci Sports Exerc* 2013;45:178–185.
- 5 Nana A, Slater GJ, Stewart AD, Burke LM: Methodology review: using dual-energy X-ray absorptiometry (DXA) for the assessment of body composition in athletes and active people. *Int J Sport Nutr Exerc Metab* 2015;25:198–215.
- 6 Kerr A, Slater GJ, Byrne N, Nana A: Reliability of 2 different positioning protocols for dual-energy X-ray absorptiometry measurement of body composition in healthy adults. *J Clin Densitom* 2015;pii:S1094-6950(15)00165-1.

Reply

Antony Karelis, for all co-authors

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Our group read the Letter to the Editor from Bone et al. 2016 with great interest. We agree with the suggestions made by the authors in standardizing the conditions before using DXA for body composition measurements. Although we did not mention this in our study [1], all the DXA measurements (before and after the intervention) were performed in the morning in a state where the patients had fasted and rested. However, the goal of our recent study was to go even further and examine if we need to have a standard diet prior to using DXA. Our results suggest that this may

need to be considered and could eventually be followed for ensuring the best practice protocols for the use of DXA for body composition assessments.

Reference

- 1 Rouillier MA, David-Riel S, Brazeau AS, St-Pierre DH, Karelis AD: Effect of an acute high carbohydrate diet on body composition using DXA in young men. *Ann Nutr Metab* 2015;66:233–236.