Editorial

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The vitamin D RDA for African American adults: higher than that for white persons?1,2

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The Recommended Dietary Allowance (RDA)3 values for vitamin D (600 IU/d up to the age of 70 y and 800 IU/d thereafter) established by the North American Institute of Medicine (IOM) in 2011 are the intakes that are likely to meet or exceed the needs of ~97.5% of the population (1). These were based on indicators of bone health and a serum 25-hydroxyvitamin D [25(OH)D] threshold of 50 nmol/L during winter (1). These RDA values are of enormous importance from a public health perspective in terms of preventing vitamin D deficiency and promoting adequate vitamin D status in the population. They were established for the entire population and, as such, dark-skinned population groups; however, they are based on an assumption that the requirements between white and other ethnic groups do not differ, largely due to the absence of data. This knowledge gap, encountered by the most recent Dietary Reference Intakes (DRI) committee, persists despite the fact that research recommendations in the previous DRI review of vitamin D (2), as well as a roundtable discussion on DRI research needs (3), called for studies to evaluate the intake requirements for vitamin D as related to optimal circulating 25(OH)D concentrations across life-stage and race-ethnicity groups of US and Canadian populations (1). In the United States, non-Hispanic blacks and Mexican Americans (representing ~13% and 17% of the adult population, respectively, based on 2012 US Census data) have been shown to have a higher risk of vitamin D inadequacy [serum 25(OH)D <50 nmol/L] than non-Hispanic whites (73%, 42%, and 21%, respectively), after adjusting for age and season (4). Thus, it is of note that new data on the dietary vitamin D requirements of African American adults have been published in the past 9 mo.

In the present issue of the Journal, Ng et al (5) report their findings from a 4-arm (placebo and 1000, 2000, and 4000 IU/d) randomized placebo-controlled trial (RCT) with vitamin D3 supplements daily for 3 mo in African American adult men and women (aged 30–80 y; n = 292; conducted in Boston, MA; ~42°N). By using the data on plasma 25(OH)D response after 3 mo of vitamin D3 supplementation, the authors estimated by using a mixed-model regression approach that the vitamin D RDA to maintain circulating 25(OH)D >50 nmol/L in 97.5% of African American adults is 1640 IU/d. This is considerably higher than the age-specific 600 and 800 IU/d established by the IOM, albeit using data from multiple RCTs with predominantly white subjects (1). If the new data from Ng et al are correct then the current RDA for vitamin D (1) may not provide the intended population-protective impact in the non-Hispanic black segment of the US population, a group at high risk of vitamin D deficiency and inadequacy (4).

It is tempting to suggest that the difference between the RDA estimates from the IOM (1) and Ng et al (5) may arise from the fact that the meta-regression approach as per the IOM possibly more reflects an average serum 25(OH)D response and thus requirement, whereas use of a 95% lower prediction interval (PI) approach with individual subject data as per Ng et al estimates the requirement of 97.5% of the population (see reference 6 for review). In this regard, it is of note that the RDA estimate from 2 winter-based vitamin D RCTs in white adults (age 20–40 y) and in older adults (age ≥64 y) at 51–55°N (7, 8), based on a 95% lower PI on a combined data set of individual subject data (n = 381), was 1216 IU/d and lower than the 1640-IU/d estimate for African American adults. Unfortunately, the RCT by Ng et al did not include a white group, so it is not possible to be sure whether requirements between their African American adults and a corresponding group of white adults would actually differ. Gallagher et al (9) also recently reported RCT data on the dose-response effects of vitamin D3 supplementation on serum 25(OH)D over 12 mo in older African American women (n = 110), which was in parallel to their similarly designed RCT in older white women (10). The RCT was conducted in Indiana (~40°N) and in Omaha, Nebraska (~41°N). By using combined data from both of their RCTs, Gallagher et al (9) evaluated the potential interaction of race in their mixed-model regression analysis and found no significant interaction. Thus, the authors concluded that, on the basis of their serum 25(OH)D dose-response data from the RCTs, the vitamin D RDA estimate was similar for white and African American postmenopausal women of a similar age (average age of 67 y). Moreover, despite also applying a 95% lower PI approach to their data so as to generate

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3 Abbreviations used: DRI, Dietary Reference Intakes; IOM, Institute of Medicine; PI, prediction interval; RCT, randomized placebo-controlled trial; RDA, Recommended Dietary Allowance; 25(OH)D, 25-hydroxyvitamin D.

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an estimate of the intake requirement for 97.5% of the population, they suggested that the RDA for vitamin D in older African American women was 800 IU/d, approximately half the estimate of Ng et al.

The IOM (1) and others (6) have reported a lack of age effect, ranging from childhood to older adults, on the response of serum 25(OH)D to vitamin D intake; and thus whereas the RCT by Ng et al (5) used adults aged 30–80 y compared with the older adults (57–90 y) in the RCT by Gallagher et al (9), this would not seem to be the major underpinning reason for these disparate RDA estimates. However, as pointed out by Ng et al, data have just been published from a separate dose-related vitamin D RCT (placebo and 400, 800, 1600, and 2400 IU/d) in young African American (n = 79) and white (n = 119) women, aged 25–45 y, which was also conducted by Gallagher et al (11), and which suggests an RDA for vitamin D of 1200 IU/d for young African American women and 400 IU/d for white women (11).

There were several differences between the RCTs in African American adults, as alluded to by Ng et al (5), as possible reasons for the disparate results. These included their study being of a much shorter duration, in subjects with lower baseline 25(OH)D concentrations, and of different age groups, as well as other potential factors, such as being conducted during an extended winter season, the inclusion of men and women (although sex was not predictor of response), and that all subjects received only 100 mg supplemental calcium compared with multiples of that in the Gallagher et al studies (9, 11).

It is particularly interesting that, despite these differences, the average response of serum 25(OH)D at 12 and 3 mo in the RCTs by Gallagher et al (9) and Ng et al (5), respectively, were comparable (Figure 3 in each article). However, the variability in the regression line (ie, the 95% lower PI) was much greater in the Ng et al data set compared with that of Gallagher et al, particularly up to the 3200-IU/d dose. This has a key impact on the RDA estimate: the larger the variability in the regression line, the greater the derived RDA value. A large variability in this type of analysis is of benefit because it reflects the large variability seen in the general population of African American adults (12).

Some of the reasons mentioned above in relation to the disparate results may well explain the greater spread in the data and thus the higher RDA estimates in the Ng et al (5) study. They had an n per group of 81–83 compared with an n of 14–25 in Gallagher et al’s (9) RCT, which would likely increase the variability at each dose. Ng et al had no restriction on baseline plasma 25(OH)D concentration, whereas Gallagher et al excluded women with baseline serum 25(OH)D <12.5 or >50 nmol/L. Furthermore, the dose groups in the Ng et al’s RCT included men and women, adults, and older adults, 2 factors that are likely also to contribute to a greater spread in serum 25(OH)D data (7, 8).

In conclusion, whereas other critically important knowledge gaps persist in relation to DRI for vitamin D in dark-skinned individuals, such as what serum 25(OH)D concentration might be optimal for bone health outcomes or possibly extraskeletal health outcomes in African Americans (1), which could be the basis for setting DRI, a current pressing need is to ascertain the vitamin D intake that maintains winter serum 25(OH)D above the current threshold of 50 nmol/L in 97.5% of African American adults. Finally, because other nonwhite ethnic groups, in addition to African Americans, in the United States (4) and Canada (13) have a high prevalence of vitamin D deficiency and inadequacy relative to that seen in white persons, clarification of the intake requirements for vitamin D in these dark-skinned population groups is still a research priority.

The author had no conflicts of interest.

REFERENCES