What do we really know about the health effects of natural sources of *trans* fatty acids?1–3

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Although the food industry remains actively engaged in the development of alternatives for partially hydrogenated vegetable oils to reduce intake of TFAs4, intake of these fatty acids from natural sources has become an increasing proportion of TFAs in our diet. Moreover, through research in dairy production, feeding practices for dairy cows have been developed that can increase the concentration of naturally occurring TFAs in dairy foods (1). The motivation to increase TFAs in dairy foods is being driven partially by interest in the purported health benefits of consuming CLA (trivial name: rumenic acid), and especially for potential benefits associated with reducing the risk of cancer (1). However, feeding practices that increase rumenic acid concentration in dairy foods also increase the concentration of an 18:1 MUFA *trans* isomer (trans-11 18:1; trivial name, vaccenic acid). Furthermore, research results have suggested that vaccenic acid can be converted to rumenic acid in humans; thus, a monounsaturated TFA isomer could be converted to CLA with purported health benefits. Simultaneously with these research efforts, TFA food labeling regulations and legislation to limit use of TFAs, typically without regard to source, are taking effect globally. Several research projects have been conducted to determine the effects of vaccenic acid and rumenic acid from enriched dairy products on risk factors for cardiovascular disease (1). The question remains: Are there differences in the health effects between the TFAs derived from ruminant animals, and if so, do the differences matter?

Studies of vaccenic acid or dairy fats enriched in vaccenic acid and other TFAs showed no effect on LDL-cholesterol concentration or showed an increase in LDL-cholesterol concentration at higher intakes of vaccenic acid (1). The effect of these treatments on HDL cholesterol concentration is inconsistent, with some studies showing an increase, some showing a decrease, and some showing no effect. In 2010, Brouwer et al (2) completed a quantitative review of the literature and concluded that regardless of dietary source, all fatty acids with one or more double bonds in a *trans* configuration raise the ratio of LDL to HDL cholesterol. Willett and Mozaffarian (3) argued that the dietary source of TFAs is not an important public health or policy issue. Despite these sentiments, research investigating vaccenic acid continues to be conducted and reported. Of course, without such research, we would not be able to draw conclusions or make recommendations. Most important, the research needs to be appropriately designed and conducted to make valid conclusions. To date, few women have been included in intervention studies (~11% of those studied are women), and because there is some suggestion that men and women may respond differently to rTFAs (4, 5), there may be a sex bias in the literature.

In this issue of the Journal, Lacroix et al (6) report on an intervention study in women using enriched vaccenic acid butter as a dietary source of rTFA. In this well-controlled feeding study, there was no effect of vaccenic acid on LDL-cholesterol concentration. However, there was a significant 5.2% decrease in HDL cholesterol in women with a BMI (in kg/m²) ≥25 but not a significant effect among women with a BMI <25. These data are in contrast to those reported in the study by Chardigny et al (7), in which LDL and HDL cholesterol increased in women after consumption of rTFAs. Moreover, in the Chardigny study (7) (a less rigorously controlled dietary intervention), the mean BMI for women was 21.1 (with an SD of 2.0), suggesting that ≥97% of the women studied had a BMI <25. We are left with trying to reconcile differences in response to dietary rTFAs, potentially confounded by population characteristics and approach to feeding.

A cautionary note: care is needed in describing and interpreting what is actually being investigated—a food or a food component. In their intervention, Lacroix et al (6) used a butter that contained butter fat with enhanced concentrations of rTFAs (6). This product also had lower concentrations of SFAs and higher concentration of MUFAs than did their control butter. However, when these 2 butters were incorporated into foods, fatty acid adjustments were made such that the resulting diets were matched with respect to SFAs, allowing for a comparison of cis and *trans* MUFAs. Thus, this study is a comparison of cis (predominantly oleic acid) and *trans* (predominantly vaccenic acid) MUFAs using butter as a source of the vaccenic acid. It is not a study of a butter enriched in TFA. Other studies (8, 9)...

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2 The mention of trade names or commercial products in this editorial is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA.
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4 Abbreviations used: CLA, cis-9,trans-11 conjugated linoleic acid; rTFA, ruminant TFA; TFA, *trans* fatty acid.

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have not made adjustments to fatty acids, so these studies are studies of foods in which multiple fatty acids are allowed to change, many of which can exert a significant independent effect on LDL and HDL cholesterol. Both dietary designs are valid, but each provides different information.

It is still difficult to draw definitive conclusions about the role of rTFAs in modulating risk of cardiovascular disease as mediated through changes in LDL and HDL cholesterol. Intake of these fatty acids is typically low in the diet. Even with enrichment of these fatty acids in the diet, there are different characteristics of subjects (eg, sex, BMI) who have been studied, different doses of fatty acids consumed, different lengths of dietary intervention, different composition of control diets (eg, vaccenic acid compared with oleic or partially hydrogenated vegetable oils or SFAs, etc), and different approaches to dietary control. All of these differences matter and affect the conclusions that one may draw about a treatment effect. The new research reported in this issue of the Journal helps to fill a missing knowledge gap with regard to sex.

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REFERENCES