Dietary risk factors for breast cancer attract the attention of scientists and the public alike because modifiable risk factors carry the potential for prevention. This interest is not new; the 16th-century Italian physician Gabriele Falloppio noted that “The efficient cause of cancer, however, is a flux of atrabiliary humor . . . . the cause of the flux is a faulty mixture of humors due to bad food.” The foods Falloppio postulated to be linked to cancer included beef and salty and bitter foods (1). After ~500 y and >3,000 scientific publications on this topic, we ask a similar question: Does intake of animal products including meat and dairy products significantly increase breast cancer risk? Interest in this hypothesis has been heightened by the high rates of breast cancer in Western countries, in which diets have been high in these foods.

Multiple biological mechanisms have been proposed to explain a possible link between animal products and breast cancer. Heterocyclic amines and polyaromatic hydrocarbons created during the high-temperature cooking of red meat are established mammary carcinogens. Exogenous hormones administered to cattle to increase muscle mass and promote milk production could be passed on to consumers of meat and dairy products and stimulate the growth of hormone-sensitive breast tumors. Additionally, nutritional components, such as the high iron concentrations in red meat, or the specific fatty acid content of milk products could promote mammary carcinogenesis. Contrary to other constituents of animal foods, conjugated linoleic acid (CLA), created by bacteria in the digestive tract of ruminants, has inhibited mammary tumorigenesis in vitro and may have additional health benefits, but studies in humans have been inconsistent. In this issue of the Journal, Norris et al (2) again have found unclear effects: they reported that CLA supplementation reduced lean mass and degraded glucose metabolism compared with safflower oil (high in linoleic acid) in obese diabetic women.

These biological mechanisms have not been translated into clear-cut associations between intake of animal foods and breast cancer in human studies. In 2 meta-analyses that included data from retrospective case-control studies, which are particularly susceptible to multiple sources of bias, small positive associations were seen between red meat intake and breast cancer (3), especially in premenopausal women (4). However, prospective studies have generally been null, and a pooled analysis that included a total of 7379 incident cases found no overall associations between meat or dairy foods and risk of breast cancer (5).

Also in this issue, Larsson et al (6) present data from the Swedish mammography cohort, which includes 2952 incident cases of breast cancer in 61,433 women who showed no significant association between dietary CLA and risk of breast cancer during 17 y of follow-up. The only other prospective study on CLA intake and breast, from the Netherlands, showed a weak positive association (relative risk = 1.24; 95% CI: 0.91, 1.69, comparing the highest to lowest quintile) (7).

In another article in this issue, Pala et al (8) present results from the European Prospective Investigation into Cancer and Nutrition (EPIC), which includes data from 10 countries and 7119 new diagnoses of breast cancer. They observed no significant overall relation of meat, dairy, or eggs to breast cancer incidence. A borderline increased risk was noted with consumption of processed meat (hazard ratio: 1.10; 95% CI: 1.00, 1.20, comparing the highest with the lowest quintile), and the association of red meat varied significantly between countries, possibly due to differences in temperature of cooking meat. These overall null findings echo those of other prospective studies (5), including the recent reports of the National Institutes of Health–AARP cohort (9) and the Swedish mammography cohort (10).

The overall lack of relation between consumption of animal products and breast cancer seen in prospective studies needs to be interpreted in light of the considerable methodologic challenges in studying the effects of diet on cancer risk. The timing of human mammary carcinogenesis, which likely spans several decades, makes large, long-term, prospective cohort studies with repeated exposure measures the optimal means of studying dietary risk factors. Thus far, the vast majority of data on diet and breast cancer are based on single assessments of diet and on follow-up for less than a decade. Also, from the general epidemiology of breast cancer, which includes data on exposure to radiation from the atomic bombing of Japan, we know that childhood and early adult life are periods of special susceptibility to carcinogenic influences. However, few prospective studies have collected dietary data for these periods. The EPIC did include premeno-

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pausal women, and the clearest association was with butter in-
take in these participants, which is interesting because an associ-
ation was seen with high-fat dairy products in premenopausal
women in another cohort (11). In the only prospective study of
adolescent diet, red meat consumption was associated with
breast cancer incidence (12). Error in measuring diet has been
raised as a possible reason for lack of positive associations be-
tween diet and cancer, but many studies have shown that the
degree of validity is sufficient to detect the hypothesized rela-
tions, and the same methods used to measure diet have shown
clear relations between dietary factors and risks of diabetes,
heart disease, and many other outcomes.

We are now fortunate to have reports from many large cohort
studies conducted worldwide, which include well over one mil-
lion women and many thousands of cases of breast cancer, that
are quite consistent in showing no overall relation of meat or
dairy products consumed in midlife or later to breast cancer risk.
Although more data on diet in childhood and early adult life are
needed, and on the effects of high temperature cooking, these data
are sufficient to exclude any major effect of consuming these
foods during midlife or later on risk of breast cancer. Of course,
a very small effect can never be ruled out. Nevertheless, good
reasons still exist for keeping consumption of red meat low, be-
cause this will likely help reduce risks of coronary heart disease
and type 2 diabetes (13, 14). Also, for women looking to reduce
their risk of breast cancer by nutritional means, solid evidence
documents that avoidance of weight gain during adult life and
low alcohol consumption will be effective.

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