



## Consumption of cured meats and risk of chronic obstructive pulmonary disease

Dear Sir:

In a recent issue of the Journal, Jiang et al (1) report that frequent consumption of cured meats is associated with an increased risk of chronic obstructive pulmonary disease (COPD) in women. The prospective cohort study determined the relation between frequency of cured meat consumption and risk of newly diagnosed COPD among 71 531 women from the Nurses' Health Study between 1984 and 2000. The companion papers reporting similar findings in men, published earlier (2, 3), have received considerable publicity because the findings suggest that consumption of cured meats causes COPD independent of cigarette smoking. In these reports, nitrite in cured meats is implicated as causing nitrative and nitrosative damage to the lung. However, available information suggests that nitrite in cured meats is not likely to play a significant role in the development of COPD.

First, although meat products are the major sources of nitrite in the human diet, cured meats contribute only a small portion of total nitrite exposure. In the United States, <200 parts per million of nitrites, nitrates, or combinations thereof, calculated as sodium nitrite, is allowed in meat products. Vegetables contribute much more nitrite to the human diet than do cured meats, because nitrate in vegetables can be converted to nitrite by microorganisms in the mouth and intestine (4, 5). It is estimated that the nitrate to nitrite conversion process from eating vegetables accounts for >70% of the daily nitrite intake, and <10% of nitrite intake comes from meat and meat products (6). Drinking water contributes to the remaining nitrate and nitrite intakes in a typical American diet. Additionally, nitrite in the body can also be derived from nitric oxide generated as a part of normal metabolic processes (5).

The finding that frequent consumption of cured meats is associated with an increased risk of newly diagnosed COPD is interesting. However, as is shown in Table 1 of Liang et al's article (p 1004), the subjects who consumed more cured meats also had a higher total energy intake, lower physical activity, higher body mass index, and higher smoking exposure than did those who consumed less-cured meats. It is thus reasonable to argue that these unhealthy characteristics of studied subjects play a more important role in the development of COPD (and other chronic diseases) than do either cured meats or nitrite in cured meats consumed as proposed. The finding that frequent consumption of cured meats is associated with an increased risk of newly diagnosed COPD only in those who smoke, but not in those who never smoke (p 1005; Table 3), supports this view.

Nitrite is both an end product and a precursor of nitric oxide, an important endothelium derived relaxing factor, and conversion of nitrite to nitric oxide to form iron-nitrosyl-myoglobin is the basis of meat curing (5). Nitrite concentrations in the blood reflect nitric oxide production from the L-arginine-nitric oxide-synthase pathway, and, as a precursor of nitric oxide, nitrite contributes to blood flow regulation (5, 7). Sterk et al (8) examined the relation between exhaled nitric oxide and risk of COPD and found that exhaled nitric oxide is not significantly

different between patients with COPD and control subjects. Also, although inhalation of nitrogen dioxide can cause pathologic changes to the lungs consistent with emphysema, nitrite is not known to serve as a precursor of nitrogen dioxide or to convert into nitrogen dioxide in vivo as stated (p1002, column 2, lines 3–5).

In recent decades scientific panels commissioned by the US Department of Agriculture, Food and Drug Administration, and professional organizations have largely agreed that the amount of nitrite permitted in cured meats is not only safe but is also essential to prevent dangerous botulism. The reported association between cured meat consumption and an increased risk of COPD (1–3) has again raised a safety concern regarding nitrite in meat products. It is ironic that human exposure to nitrite is derived mainly from the conversion of nitrate in vegetables (6), and increased intake of vegetable has been promoted as healthy. Also, the nitrite–nitric oxide relation suggests that nitrite may have therapeutic potential in such conditions as myocardial infarction, stroke, systemic and pulmonary hypertension, and gastric ulceration (7). It appears that a more critical evaluation of available information is needed to determine whether consumption of cured meats or nitrite in cured meats is associated with an increased risk of COPD.

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Ching Kuang Chow

Graduate Center for Nutritional Sciences  
University of Kentucky  
Lexington, KY 40506-0054  
E-mail: ckchow@uky.edu

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