

CFS announces Second Hong Kong Total Diet Study findings on nitrate and nitrite

The Centre for Food Safety (CFS) of the Food and Environmental Hygiene Department released the second report under the Second Hong Kong Total Diet Study today (June 10). This report examined the levels of nitrate and nitrite in food, and the associated dietary exposure. The findings showed that the dietary exposure to nitrate and nitrite among the overall adult and younger populations in Hong Kong fell within the alternative range of Acceptable Daily Intake (ADI) values and below the ADI respectively, indicating the general population is unlikely to experience any immediate health risks or effects.

Nitrate and nitrite are ubiquitous in the environment and can be produced endogenously in animals and humans. They are also used as food additives for preservative and colour retention purposes. Nitrate is found naturally in plant-based foods, with the highest concentrations typically found in leafy vegetables. Human exposure to nitrate mainly comes from consumption of vegetables, while exposure to nitrite mostly results from endogenous conversion from nitrate.

A spokesman for the CFS said that nitrate itself is relatively non-toxic, but it can be converted into nitrite by bacteria in the mouth. Nitrite can oxidise haemoglobin into methaemoglobin in the blood, reducing its oxygen-carrying capacity. Nitrite may also contribute to the formation of N-nitroso compounds, some of which are carcinogenic. However, when nitrate is consumed through a normal diet containing vegetables, other bioactive substances in vegetables, such as vitamin C, may inhibit the endogenous formation of N-nitroso compounds.

According to an evaluation conducted by the European Food Safety Authority (EFSA), the alternative range of ADI values estimated for nitrate is 1.05 to 9.4 milligrams/kilogram body weight (bw)/day. The Joint Food and Agriculture Organization of the United Nations/World Health Organization Expert Committee on Food Additives and the EFSA established the same ADI for nitrite, which is 0.07mg/kg bw/day.

Out of a total of 187 food items tested for nitrate and nitrite levels in the Study, nitrate was detected in 97 per cent of the items, while 32 per cent were found to contain nitrite. Among all food groups, "Vegetables and their products" had the highest mean concentration of nitrate, at 690mg/kg. For average consumers of the adult and younger populations, the vast majority of dietary sources of nitrate came from this food group, accounting for about 90 per cent of the total dietary exposure to nitrate. Among these, leafy vegetables alone contributed 70 to 80 per cent of the total daily nitrate exposure. As for nitrite, green string beans were detected with the highest mean concentration of nitrite (12mg/kg), followed by fruit and/or vegetable

juice, turnip cake, Chinese kale, European variety cabbage and watermelon, with mean concentrations ranging from 6.4 to 9.9mg/kg.

According to the findings, the estimated dietary exposure to nitrate was 3.8 and 8.0mg/kg bw/day for average and high consumers of the adult population respectively. For the younger population, the estimated dietary exposure to nitrate was 4.1 and 8.9mg/kg bw/day for average and high consumers respectively. Regarding nitrite, the estimated dietary exposure was 0.014 to 0.018mg/kg bw/day and 0.025 to 0.029mg/kg bw/day for average and high consumers of the adult population respectively. For the younger population, the estimated dietary exposure to nitrite was 0.019 to 0.025mg/kg bw/day and 0.038 to 0.045mg/kg bw/day for average and high consumers respectively.

The spokesman reminded members of the public to maintain a balanced diet, consume at least three servings of vegetables and two servings of fruits every day and incorporate a greater variety of vegetables into their diet, including flowerhead brassica vegetables, fruiting vegetables, mushrooms and fungus. The public is also advised to store and prepare vegetables properly to reduce nitrate levels and minimise nitrite formation. For example, keep vegetables under refrigeration if not consumed or sold immediately, wash vegetables thoroughly and peel them as appropriate before cooking, or boil vegetables in water rather than stir-fry.

The Second Hong Kong Total Diet Study aims to estimate the latest dietary exposure of the Hong Kong population and various population subgroups to some chemical substances of potential food safety concern, and assess the associated health risks. The Study commenced in February 2023 and is expected to be completed by the end of 2026. The reports of other groups of chemical substances will be released in phases and uploaded to the CFS webpage at www.cfs.gov.hk.