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Nutrition transition and chronic diseases in China (1990–2019): industrially processed and animal calories rather than nutrients and total calories as potential determinants of the health impact

Anthony Fardet*, Kenny Aubrun and Edmond Rock
INRAE, Université Clermont Auvergne, UNH, Human Nutrition Unit, CRNH Auvergne, Clermont-Ferrand 63000, France

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Abstract

Objective: To extend analyses of nutrition transition in developed countries to China within the framework of the 3Vs rule considering degree of processing starting with plant/animal calorie ratio (Rule 1), industrially processed foods (IPFs, Rule 2), and food diversity through nutrient intakes (Rule 3).
Design: Total and main food group (*n* 13) calorie intakes, percentages of animal and IPF calories, adequacy of the Dietary Reference Intake (DRI) and prevalence of chronic diseases were retrieved from scientific literature and international databases.
Setting: China, 1990–2019.
Participants: Overall population.
Results: The total calorie intake decreased by 9 % over 30 years while the prevalence of chronic diseases substantially increased. Percentages of IPFs (Rule 1) and animal (Rule 2) calorie intake shifted from 9 to 30 % and 2 to 30 %, respectively. Meanwhile, the overall DRI adequacy (Rule 3) did not improve, with calcium and retinol deficiencies in 2019, and, although remaining above DRI, iron, copper, magnesium, and vitamins E, C and B_1–B_9 intakes regularly decreased. Notably, the prevalence of obesity increased five-fold, paralleling the exponential increase in IPF calorie intake. Both sources of calories were highly correlated with prevalence of main chronic diseases.
Conclusions: Despite a slight decreased of total calorie consumption and small variations of adequacy with DRI, the farther the Chinese population moved away from the 3Vs rule during the 1990–2019 period, the more the prevalence of chronic diseases increased. Further analyses on foods' transitions will be better assessed when advocating sources/quality of calories (Rules 1/2), rather than only nutrient composition (Rule 3).

Keywords
Nutrition transition
China
Animal products
Processed foods
Nutrient intakes

Since the 1950s, the nutrition transition has occurred in many countries worldwide in different periods and at different rates[1]. Progressive and long lasting in developed countries[2], it is more rapid and recent in emerging and developing countries and is associated with increasing urbanisation, industrialization and population growth[3]. In developed countries, it marks the passage from a diet rich in minimally processed plant-based foods with limited variety (with a significant part of the diet composed of homemade dishes) before the Second World War to a diet richer in animal-based products and increasingly industrially processed foods (IPFs), and latter ultra-processed foods (UPFs)[4,5], showing peak sales in Western countries in the 1980s[5]. Therefore, this nutrition transition paralleled the industrial one, bringing together with an increase of non-communicable diseases[6].

Indeed, current analyses of developed countries indicate that excess animal and UPF calories are associated with increased risks of chronic diseases[4,7], especially overweight, obesity, metabolic syndrome, type 2 diabetes and hepatic steatosis[8–11], cardiovascular diseases, renal function decline and total cancers[10,12,13], all-cause mortality[14], and with the degradation of food system sustainability as well[2,15,16]. Notably, UPFs supply empty calories and numerous xenobiotic substances foreign to human body[4], and are mainly hyperglycaemic and poorly satiating food matrices[17].

*Corresponding author: Email anthony.fardet@inrae.fr