



Invited Review

Identification and management of toxicological hazards of street foods in developing countries



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ABSTRACT

Street food vending represents an important food security strategy for low-income communities worldwide.

However, no comprehensive risk analysis framework yet exists as regards specific aspects of chemical/toxicological hazards in street foods. Indeed, all steps of street food production and vending can be vulnerable, from the selection of raw materials, through to the storage and preparation of meals and even the vending site, often exposed to urban pollutants. Relevant examples are cheap ingredients with illegal or undesirable residues, substances arising in poorly stored commodities (e.g., mycotoxins, histamine in scombroid fish), metals leaching from cookware, and process contaminants such as PAHs and acrylamide. As a consequence, greater awareness and preventive measures need to be implemented for coping with chemical/toxicological risk factors in a systematic and effective way. This review proposes specific points of attention for street foods preparation and vending with related hazard-tailored actions. The proposed measures in street food vending could integrate the prevention of biological risk factors, in order to promote comprehensive and up-to-date consumer safety.

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1. Introduction

According to United Nations projections, by 2050 the world population is estimated to reach 9 billion. About 98% of the increase will occur in developing countries, encompassing emerging economies as well as poverty-stricken areas; moreover, the developing world will see an impressive increase in urban populations, reaching almost 5.2 billion in 2050 (UN, 2004; WHO/UN-HABITAT, 2010). The urbanization process is also associated with the growth of the informal food supply system. People with limited resources develop livelihood strategies, exploiting the opportunities offered by the metropolitan milieu. Ready-to-eat foods, prepared and sold by street food vendors represent a food security strategy put in place to support low-income populations. In developing countries all over the world street foods provide a wide range of commodities and nutrients, helping people to meet their nutritional needs: indeed, easy accessibility, variety in taste and choice and low cost make street foods an affordable option. Moreover, street foods play an important socio-economic role, in terms of employment and income for those involved in their production and/or selling, empowerment of the local economy and the preservation of the local food cultures (FAO, 1997, 2007; Ohiokpehai, 2003; Tinker, 2003).

The numerous advantages offered by street foods to food security should nevertheless be considered alongside several food safety issues. Food prepared and exposed for sale may become contaminated by pathogenic micro-organisms as well as hazardous chemicals. Vending stands are often not adequate and clean water, waste disposal and sanitary facilities are often not available in the whole vending area. Poor storage facilities and transport conditions also contribute to the overall difficulties in managing and improving street food safety (Omemu and Aderoju, 2008; Cohen and Garrett, 2010; Rane, 2011).

Several studies on microbiological hazards in street vended foods have been carried out in a number of developing countries (Abdussalam and Kaferstein, 1993; Barro et al., 2002; Mensah et al., 2002; WHO, 2003; Muinde and Kuria, 2005; Ghosh et al., 2007; Chukuezi, 2010; WHO/FAO, 2010; Annan-Prah et al., 2011; Elfaki and Elhakim, 2011; Edward et al., 2012); on the contrary, data are more limited on toxicological hazards, and no systematic appraisal has yet been performed. Indeed, toxicological hazards may be somewhat overlooked in the developing countries since, in contrast to microbiological hazards, they rarely cause acute clinical illness; however, unchecked toxicants may be highly relevant to next generation's health, and the developing countries context may present a number of specific scenarios of exposure to pollutants (Frazzoli et al., 2009). Identifying and assessing possible toxicological risks would allow a more effective protection of the street food system by addressing preventive actions. The present work aims at identifying points of particular attention (PPA) in the street food system as well as possible actions to minimize the occurrence of toxicological hazards at each identified point.

2. The value of street food system: society, economy and food security

The role of street food vending in urban livelihood and food provision has been recognized and investigated over many years (FAO, 1991, 1997, 2007; IFPRI, 2000). The greater job opportunities in the towns and metropolitan areas lead to both urbanization and a high rate of daily commuting from rural to urban areas. In most cases the workplace is distant from home and lacks cooking facilities, thus, most workers are used to eating out. Limited resources (budget and time) available for eating result in many workers preferring cheap ready-to-eat meals prepared by street vendors.

In general, street food represents an important source of nourishment (Ohiokpehai, 2003; FAO/WHO, 2005; FAO, 2006; Pang and Toh, 2008). In Africa, for example, street food enabled 80% of urban populations to feed themselves easily and at low prices and represented around 40% of food expenditure in urban settings in the 1990s (IFPRI, 2000). The sale of street foods represents also a good living for families involved in food vending, but, as it is considered part of the informal sector, the contribution of street food to the economies of developing countries has been considerably underestimated and even ignored (FAO, 1991, 2007). Nevertheless, the trade of street food generates income and employment. In Zambia in 2003 street food sales had an annual turnover of US\$100 million and employed around 16,000 people, mostly women with minimal education, to whom this sector offers a unique possibility of working and earning (FAO/WHO, 2005). The social value of street food sale is important particularly for women. Female heads of households account for the majority of street vendors in many countries, e.g., women are involved in 90% of street-food business in the Philippines, 81% in Zimbabwe, 67% in Nigeria and 53% in Senegal (Graffham et al., 2005; Chukuezi, 2010). Due to its importance as income-generating activity, for most women street food sale represents the only livelihood source for households (Guillaume, 2001).

Besides its social and economic importance, street foods provide nutritious low-cost food to millions of urban workers and inhabitants in developing countries; indeed, street food accounts for a variable, but significant part of the daily diet and nutritional requirements through a wide range of ingredients and products (FAO, 2000; Cohen and Garrett, 2010). A study in Indonesia reported that it was possible to obtain almost half the recommended daily allowance of protein, iron, vitamin A and vitamin C from a street food meal by spending US\$ 0.25 (FAO, 2000). Another investigation in Bangkok, Thailand, showed that street foods provided around 40%, 39% and 44% of total energy, protein and iron intake, respectively (FAO, 2004); the nutritional importance was even greater in children 4–6 years old, who obtained 80% of their energy, protein, fat and iron intake from street foods (FAO, 2000). A lesser, but still important, contribution was observed in Vietnamese adolescents, for whom street foods provided 23% of sodium and 21% of energy, vitamin A, iron and zinc consumed per day (Lachat et al., 2009). A further important aspect is the preservation of the local food cultures. Since it provides inexpensive and ready-to-eat food and service for people who cannot afford the time or money for a standard full meal, street foods can be defined as the “traditional fast food” of developing countries, as opposed to the growing presence of “factory cooking” or “fast food”. Indeed, type of meals and consumption patterns (frequency and regularity of consumption) vary from country to country and are influenced by the national and/or regional food cultures (Ohiokpehai, 2003). Most meals are based on combinations of staple foods, and are sold and consumed either as one-dish meals or as snacks: main examples are noodle- or rice-based meals, soups, porridges, and fried snacks. The animal protein components are variable, mainly represented by low-priced commodities such as poultry, offal, low-priced cuts and fish; the protein sources of vegetable origin are important as well, including soy and chickpeas, depending from geographical areas. Street food products encompass all main preparation ways, including frying, roasting, grilling, boiling, baking, and steaming, as well as served raw, depending on traditional patterns (Ohiokpehai, 2003; FAO/WHO, 2005). A study conducted by Drabo et al. (2009) in Bobo-Dioulasso (Burkina Faso) found that the basic ingredients consumed in street food booths were cereals (48.5%) and meat (33.9%), with a much lower contribution from milk (9.6%) and fruits (4.4%).

In many great cities in Southern Asia (e.g., Calcutta, India; Bangkok, Thailand; Bogor, Indonesia) and West Africa (e.g., Accra, Ghana; Dakar, Senegal) street foods were bought daily, representing an

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