Processed and Cured Meats

Are we heading towards the vilification of a valuable food group?

Villainizing our traditional wholesome food is a shame, distracting Canadians from the indisputable downfall of the Canadian diet which is the over reliance on calorie rich nutrient poor highly processed foods such as pop, chips and backed goods which account for 50% of the calories in the Canadian diet. Swapping whole foods for these highly processed foods is a key message in Canadas Food Guide and one that we can all get behind.

As published in the International Journal of Food Microbiology (2018), does it make sense to villainize a group of culturally significant foods that offer a convenient and nutrient-dense source of nourishment? This article was written by Frédéric Leroy, et al, Research Group of Industrial Microbiology and Food Biotechnology (IMDO), Brussels.

Fermented meats (i.e., salami, saucisson sec, chorizo, fuet, etc.) have been extremely precious to humans for millennia, constituting a cultural heritage and category of foods that are not only exceptional with respect to their sensorial aspects and nutrient density (i.e., protein, fat, vitamins, iron, zinc, etc.), but also because of their stability and convenience (Leroy et al., 2013, 2015). They are generally prepared as sausages, by stuffing a meat batter consisting of mince, fat, curing salt, herbs, and spices into casings to exclude oxygen and initiate a microbial fermentation process, followed by drying and maturation. Optionally, smoking or moulding can be applied. The curing salt habitually contains nitrate, already applied since Roman times as salt peter, to create an appealing red colour and to generate additional food safety. Contemporary variants may also contain ascorbate and sometimes nitrite (besides or instead of nitrate), as well as some technological additives that are not strictly necessary but may reduce cost in products at the lower value end (e.g., buking agents, colourants, texturizers, ...) Within the larger category of processed meats (e.g., hot dogs, canned meat, meat-based sauces, and bacon), fermented meats nevertheless represent a stronghold for healthy products of outstanding quality, for which production relies on the long-standing and mild empiric preservation methods of salting, fermentation, and drying. In the last couple of decades, however, their positive image is increasingly under attack, often driven by ideological or economic agendas instead of solid scientific approaches. This evolution leads to confusing factual observations with more emotive elements that have little to do with the actual topic of discussion (i.e., the evidence-based analysis of the nutritional significance of fermented meats in healthy and varied diets). For instance, negative views on meat are often confounded with re- pugnance of animal killing or other non-nutritional issues (Leroy and Praet, 2017).

As an ad hoc collective of food scientists, technologists, and microbiologists, we wish to stress the need for further studies on this matter and to advance five arguments in favour of the inclusion of fermented meats in the diet rather than their elimination based on questionable grounds. Convinced of the unmatched and undoubtedly proven values of fermented meats, we argue that their condemnation by certain nutritional models (1) is inconsistent and logically flawed and (2) overstates potentially negative effects, whereas their strengths rely in their contribution to (3) the prevention of certain nutrient deficiencies, (4) the health-stimulating increase of microbial diversity in the gut, and (5) gastronomic legacy.

Regrettably, fermented meats are often negatively linked to issues of sustainability, degree of processing, and potential high contents of (curing) salt, sugar, and fat. Although true for some products, these aspects are certainly not to be generalized to the entire group. Moreover, they are equally applicable to several other food items that are more beneficially looked upon (Walker et al., 2010), which results in inconsistent and incoherent advice. As an example, a new food pyramid was published in Flanders, Belgium, on September 19, 2017, with a strong focus on plant foods as well as the advice to eat less red meat and to ban every type of processed meat from the human diet without differentiation, for instance including bacon but also dry-cured and fermented meat products (Vlaams Instituut Gezond Leven, 2017; i.e., a partner organization of the Flemish authorities, mandated as expertise centre for health promotion and commissioned to develop a food pyramid). As such, the latter have been put on the same level as crisps, candies, and alcoholic beverages. Although some existing food guides already advised to moderate or limit ("eat less") the consumption of processed meats (Food and Agricultural Organization, 2018), the message now clearly aims at avoidance ("eat as little as possible"), setting the limits even more strictly. About a month after its release, the Flemish food pyramid was heavily criticized by Harcombe (2017) as a belief system, which advances for instance that red meat, saturated fat, and processing are "bad", rather than using an

evidence-based nutritional approach. Meat analogues, for instance, are often ultra-processed foods with excessive amounts of salt and additives (Testaankoop, 2013), whereas several hyped plant foods are currently posing major environmental concerns (The Telegraph, 2016). Moreover, the approach whereby entire food groups are stigmatized without differentiation or any form of nuance is overly reductionist. It is scientifically unacceptable to reduce the vast variability of fermented meats into a single monolithic category. Potential health effects may not be the same for all products (Oostindjer et al., 2014). Indeed, existing products vary widely with respect to meat type, fat content, salt concentration, addition of sugar, nitrate or nitrite levels, use of additives, and degree of processing (Toldrá, 2014). The fact that some of these ingredients have sensory, technological, and especially hygienic safety advantages is mostly neglected, whereas their potential negative impacts are overstated. For instance, nitrate in fermented meats leads to colour and flavour development as well as enhanced food safety, while these fractions are very small compared to the intake through drinking water or vegetables (DFG, 2014). Besides, it is important to point out that there is no objective reason to equate processing defacto with non- healthiness (Gibney et al., 2017). The word "processing" is defined by the Oxford dictionary as to "perform a series of mechanical or chemical operations on (something) in order to change or preserve it" (Anonymous, 2017). Although some specific aspects of food processing may indeed be detrimental to health, for example by generating trans fatty acids or reducing the micronutrient availability (Cornwell et al., 2018; King and White, 1999), which mostly are of little concern in the case of fermented meats. Other processing steps are harmless or may even be beneficial, for instance to allow for preservation or to enhance the bioavailability of micronutrients or other beneficial compounds (Ribas-Agustí et al., 2017; Weaver et al., 2014). Binary oppositions as "processed/natural", of which one term is more highly valued than the other, have been exposed by post-structural theory as mere cultural constructs rather than foundational categories we can confidently rely on (Belsey, 2002). The related division of fermented meats in the binary opposition "traditional/innovative" has been deconstructed previously on similar grounds (Leroy et al., 2015). Such binary conceptions easily lead to misleading and fuzzy ideas about what is "natural", "traditional", "processed", or - for that matter - "healthy" when they go unchallenged. Because meaning is incorrectly seen as referential rather than differential, a whole spectrum of differently processed meats has been unrightfully lumped into a single category.

Although epidemiological data have linked the consumption of red meat and processed meat to cardiometabolic diseases and colon cancer (Bouvard et al., 2015; Micha et al., 2017), this line of thought has been heavily questioned and needs to be seen in proper perspective. In this respect, it has been pointed out that the relative risks are very small and that these studies can impossibly correct for all associated life-style factors, neglect the effect of inclusion in wholesome diets, mostly use "processed meats" as an undifferentiated category, and fail to convin- cingly show causality (Klurfeld, 2015; McNeill, 2014; McNeill and Van Elswyk, 2012). Bastide et al. (2016) have demonstrated that a global assessment of diets, rather than of single foods such as meat and its specific components, is needed for proper nutritional prevention of colorectal carcinogenesis. Indeed, intake of other dietary compounds, such as calcium carbonate, α-tocopherol, and chlorophyll from green vegetables, were shown to counteract carcinogenicity and cytotoxic outcomes of diets containing (cured) meat (de Vogel et al., 2005; Pierre et al., 2013). All-too simplistic approaches based on mere hazard identification and classification for carcinogenicity, which have been placing products with widely divergent modes of action and potencies into the same category, are increasingly being criticized as detrimental for both science and society (Boobis et al., 2016). It is primordial to point out that the classification of processed meats as carcinogenic by the International Agency for Research on Cancer (2015) is a hazard- based approach, which should not be mistaken for risk, the latter being based on the likelihood and level of exposure for different population groups at certain consumption levels. Based on the available evidence, the European Food Safety Authority (2017) concluded that existing safety levels for nitrites and nitrates added to meat and other foods are sufficiently protective for consumers. Such confusion can indeed lead to a range of perilous outcomes, namely the generation of public confusion and anxiety, the subjection of useful foods with a safe history of use to excessive scrutiny, the subsequent risk on replacement by less characterized and potentially unsafe alternatives, the unnecessary hypothecating of valuable public resources, and the diversion of attention from more substantial nutritional problems. Finally, intervention studies that convincingly prove that the inclusion of normal, non-excessive portions of fermented meats within healthy diets are harmful are currently missing (Turner and Lloyd, 2017).

Explicitly communicating that fermented meats are harmful may have several important negative consequences on human health. It is nothing less than a dangerous social experiment to steer towards the replacement of nutrient-rich foods that have a long tradition within a given food culture. Flemish households, for instance, lack the culinary feel with the leguminous meals that are common in the Mediterranean and are mostly alien to so-called meat analogues (e.g., mycoproteins, tofu, and tempeh). We can only speculate on which alternative dietary approaches will be followed, especially in the lower socio-economic classes, as nutritional guidelines often

overlook the resources and consumption culture of ordinary families (Gibney et al., 2017). Approaches thus tend to be fundamentally elitarian, whereby only people with the required level of education, nutritional and culinary knowledge, and budget can venture safely into such substitutions, whereas most are still relying on fermented meats as an easy and common option to introduce "difficult" nutrients in their diets and that of their children. This is particularly true for the necessary intake of protein, iron, zinc, and B vitamins. Fermented meats are not only compatible with Flemish food traditions and taste, they also are affordable and show an exceptional level of convenience (Leroy and Degreef, 2015). It will have to be evaluated how their substitution will, for instance, affect protein malnutrition (e.g., in infants and elderly) and anaemia (e.g., in young females). Whereas some population segments are already known to develop malnutrition due to meat-avoidance (Waldmann et al., 2004), the inclusion of animal-source snacks can effectively improve micro-nutrient intake in vulnerable populations (Hall et al., 2017).

Repercussions on health may also be expected on the level of gut health, when fermented meats are considered from a metagenomic point of view (Dutton and Turnbaugh, 2012). They are part of the larger food group of processed meat(s), for which it has been claimed that regular consumption improves health (Bell et al., 2017; Chilton et al., 2015; Marco et al., 2017), whereas deprivation may even potentially lead to higher risks on disease (Olivares et al., 2006). Fermented meats harbour a variety of living microorganisms, including lactic acid bacteria, coagulase-negative staphylococci, yeasts, and moulds (Toldrá, 2014), of which the lactic acid bacteria in particular are often cited with respect to possible health advantages (De Vuyst et al., 2008; Douillard and de Vos, 2010). As it has been demonstrated that meat-associated microorganisms can indeed be detected within the intestinal micro- biome (Dal Bello et al., 2003; David et al., 2014; Walter et al., 2001), they are expected to play a role in the overall gut microbial biodiversity and, hence, the health of the host. Advocating against their consumption is thus in stark contradiction with nutritional advice to increase the consumption of processed meat(s).

Finally, the production and consumption of fermented meats go back to Antiquity at least, although much older origins may be hypothesized, and they have remained valuable ever since (Leroy et al., 2013). Fermented meats are therefore an important part of our cultural patrimony. This is especially the case in Europe, where they often have strong connotations of local distinctiveness and artisan pride (Leroy et al., 2015). In other words, food is more than just a biochemical collection of fuel and nutrients, a vision that is all too often leading to damaging medicalization discourses (Fischler, 2013; Lecerf, 2015). Instead, food constitutes a profound part of our identity and cultural heritage (Bellasco, 2008), which holds particularly true for meat and its derived products (Leroy and Praet, 2015) estimated as being among the most precious parts of the human diet. It should be respected and enjoyed as such.

To conclude, we regret that fermented meat products are being incorrectly stigmatized as unhealthy foods in certain nutritional models, whereas they have many nutritional and other benefits to offer. Even within the context of sustainability, it should be considered that they often serve to valorise less-desired carcass parts, do not require strong cooling, have a high shelf-life stability, and are mostly eaten raw without heating. An appropriate message to the public should be that a varied and moderate daily diet, of which fermented meat products are a part, is the best for human health, as too much of anything is always bad. Together with other processed meat(s) they form a quantitatively balanced part and at the same time represent a true treasure in human nutrition.

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