

Multiple Sclerosis in Relation to Meat Preservation in France and Switzerland¹

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Abstract. In order to test a recent hypothesis on the possible role of defined agents from wood smoke in the etiology of multiple sclerosis (MS), the practices of meat preservation, as reported in ethnographic bibliography, were analyzed in relation to the MS distribution in France and Switzerland. In both countries, but more so in Switzerland, a significant association between both features could be demonstrated.

Introduction

Considering the complete lack of knowledge of the exogenous factors in the etiology of multiple sclerosis (MS) on one hand, and the large part of human environment covered by daily nutrition on the other, new hypotheses in this special field seem justified. The well-known difficulties of gathering reliable information on the nutrition of an individual, especially in retrospective case-control studies [1, 2], increase the value of comparisons between different countries or regions for dietary practices. Proceeding from the peculiar incidence curve of MS in the Faroe Islands between 1943 and the 1960s [3], it was recently proposed that special conditions of meat smoking, such as the use of coniferous wood or related agents, might play a role in MS and perhaps autoim-

munity in general [4]. In the present study, an attempt is made to corroborate this view by a comparative evaluation of two countries in which the smoking of meat shows greater regional variability.

Methods

For France, the mortality rates for 1968-1977, as reported by Alperovitch and Bouvier [5] for individual regions, were used. In order to reduce the biasing effect of migration, the Ile de France was omitted. Information on the habits of meat preservation was gathered from ethnographic and culinary work on all regions (see Appendix). Generally the chapters on ham and sausage preparation were evaluated. With respect to smoke curing, the 20 regions were divided into the categories 'smoking common', 'smoking vari-

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able', and 'smoking uncommon'. Classification of a given region into one of these groups was made by counting and offsetting the information from all sources from that region. The above-defined categories were compared as to the MS mortality by means of the Kruskal-Wallis test, and the U test.

For Switzerland, the prevalence data from 1956 as reported by Georgi et al. [6] were used. The practices of meat preservation were drawn from the Atlas of Swiss Folklore by Geiger et al. [7], which is based on extensive ethnographic studies in the whole country during the 1940s and 1950s. In that work, a special map on that particular subject is presented, along with a very detailed explanatory text. According to this information, the 22 cantons were divided into the classes 'only smoking' and 'air-drying in addition or exclusively'. For completeness, our own evaluation of descriptions from all cantons (excluding Zug) was made (see Appendix).

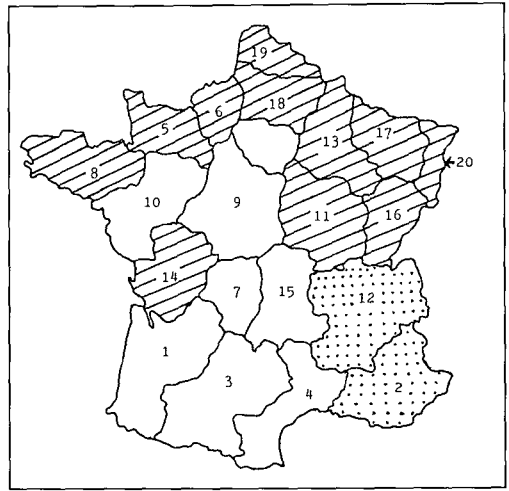


Fig. 1. MS mortality 1968–1977, according to Alpeřovitch and Bouvier [5], in geographical relation to the habit of meat smoking in France. Rank of MS mortality is indicated for each region (Ile de France omitted). Hatched = Meat smoking common; dotted = meat smoking variable; blank = meat smoking uncommon.

Results

The rank of MS mortality in France in relation to the habit of meat smoking, as resulting from this evaluation, is shown in figure 1. For both features, a clear gradient from northeast to southwest was obvious. Especially noteworthy was a comparatively sharp decline for both features in western France between Poitou-Charentes and Aquitaine. The majority of work on the Auvergne reported only air-drying, whereas meat smoking seemed to be more common in the Provence, but lacking in the alpine regions of southern France (see Appendix). The association of MS mortality with meat smoking was of borderline significance in the Kruskal-Wallis test ($H = 5.73$; $0.1 > p > 0.05$). However, when regions where meat smoking is predominant were compared with the remainder, a significant difference was found ($U = 18$; $p = 0.02$).

In Switzerland, the crude prevalence showed a highly significant correlation with

the rate based upon the population aged 16–65 years ($r_s = 0.987$; $p < 0.0001$), thus excluding differences in age distribution as a cause for the variations between cantons. The methods of meat preservation in relation to crude MS prevalence in 1956 are shown in figure 2. When only the data from the Atlas of Swiss Folklore were considered, the association between both features was significant ($U = 4$; $p < 0.002$). A more detailed analysis by inclusion of further work did not change the level of significance.

A remarkable finding of Georgi et al. [6] was the sharp decline of MS prevalence between two alpine cantons, Glarus and Uri (fig. 2). This gradient coincides with a difference in the practice of meat smoking, which

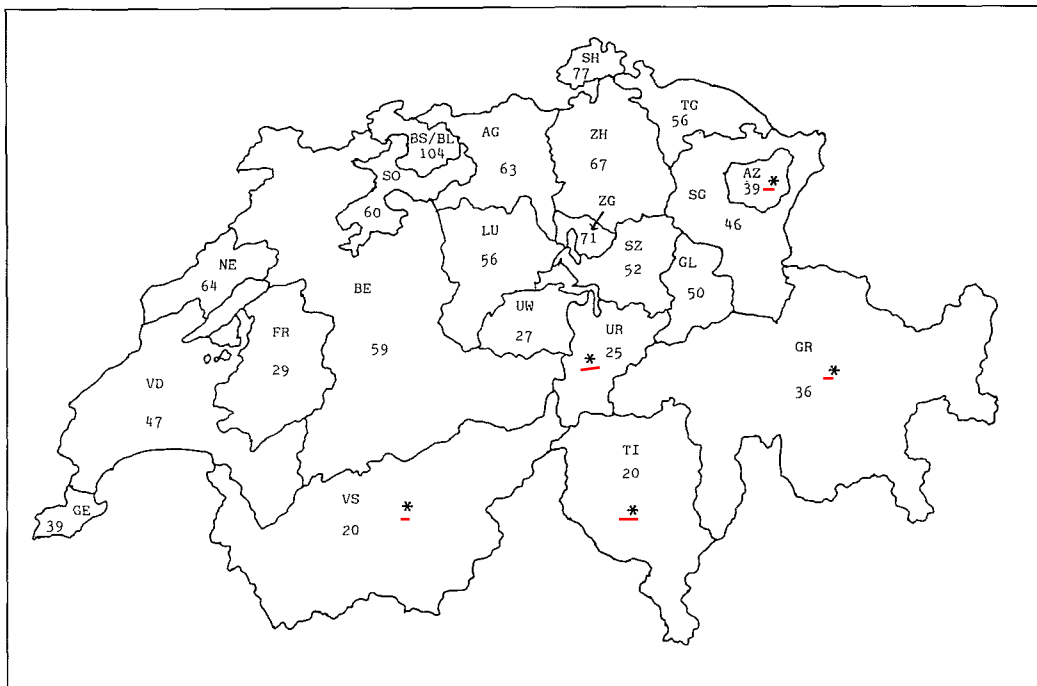


Fig. 2. MS prevalence 1956, according to Georgi et al. [6] in geographical relation to meat preservation in Switzerland [7] *Air-drying usual. Mann-Whitney test: $U = 4$; $p < 0.002$.

is more common in Glarus. The reason is the rareness of foehn (a warm alpine wind that descends from the mountains) [8], whereas such winds prevail in Uri [9] and permit air-drying even in winter.

Discussion

Important limitations pertinent to the present evaluation are the variations in the accuracy of the ethnographic sources, the spot-check character of the analysis by means of descriptions covering often only parts of a given region and, not least, the pre-conceived attitude of the investigator. On

the other hand, the material used was unselected, and all efforts were made to draw an objective picture. Doubtless, the findings must be corroborated by more sophisticated epidemiological methods before further conclusions can be drawn.

On the whole, the present results are in agreement with the earlier hypothesis which resulted from considerations on the peculiar time course of the MS incidence in the Faroe Islands [4]. The biological rationale for a favoring role of wood smoke, in particular when generated from soft wood, in combination with nitrite, in the pathogenesis of autoimmunity was the occurrence of various nitrophenols (e.g. nitroguaiacol and its deriva-

tives) and their conjugation with food proteins in this type of food [4, 10]. Further epidemiological arguments for this view are the association of MS with the felling and processing of conifers in Norway [11], the correlation between MS and the paper industry (which predominantly uses coniferous wood) in several countries [12, 13], a significant correlation between MS mortality and the proportion of certain conifers in regional forests in one state [14], and a similar trend in a small rural area in central West Germany [13]. Furthermore, an association of MS with the density of meat markets was found in the German state of Hesse [14], and in the US (unpublished data). The clustering of MS in areas with a prominent lumber industry [15] and an overrepresentation of woodworkers among MS patients in some studies [16, 17] are also in agreement with this hypothesis. In France, it was mentioned

explicitly that the use of coniferous wood for meat smoking prevails in the mountain regions of the Vosges and the Jura [18]; in these regions, MS mortality is particularly high [5]. No correlation between MS and the felling of coniferous wood was found in France [19] or Switzerland [11] but, in both countries, the association with meat smoking as such might obscure the role of wood type.

Considering these observations, further epidemiological studies, including meticulous case-control studies, seem justified. In addition, since some defined chemical agents can be indicated on the basis of these studies and on biological plausibility [4, 10], and since the immunological properties of this class of agents are well known from basic research, the question of a possible role of such foreign antigens might be settled experimentally in a short time.

Appendix

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