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Prostate cancer epidemiology in the French West Indies and French Guyana

Epidemiologia del cancro alla prostata nelle Indie Occidentali francesi e nella Guiana francese

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Summary

Prostate cancer is the fifth cause of cancer death in the world today. In spite of numerous studies on the subject, its aetiology has not yet been clearly defined. Three French "départements", the French Antilles (Guadeloupe and Martinique) and French Guyana present unique epidemiological, geographical, ethnic and environmental characteristics which can help elucidate the complex causes behind the disease. These particular traits have been highlighted by a systematic scientific literature review, followed by the synthesis of current main aetiological hypotheses relative to the Caribbean-Guyanese context. Martinique and Guadeloupe register high world age-standardised incidence rates for prostate cancer (exceeding 150 cases per 100,000 in 2002), twice those of mainland France and in constant increase for the past

Riassunto

Oggi la prostata costituisce la quinta causa di morte per cancro nel mondo. Nonostante i numerosi studi sull'argomento, la sua eziologia non è ancora stata chiaramente definita. Le tre aree geografiche francesi, le Antille francesi (Guadalupe e Martinica) e la Guiana francese, presentano caratteristiche epidemiologiche, geografiche, etniche e ambientali uniche, tali da poter aiutare a chiarire le complesse cause che possono indurre la malattia. Queste peculiarità sono state evidenziate con una revisione sistematica della letteratura scientifica seguita da una sintesi delle ipotesi correntemente più accreditate relative all'ambiente dei Caraibi e della Guiana. La Martinica e le Guadalupe registrano un alto tasso di incidenza, aggiustato per l'età, del cancro della prostata (superiore a 150 casi per 100.000 nel 2002), due volte

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20 years, now making them comparable to the highest world incidence rates recorded amongst Afro-Americans in the United States of America. In Guyana, prostate cancer is also one of the commonest cancers in 2007. Ninety percent of the Caribbean population and 66% of the French Guyanese are of African descent. In these populations, favoured hypotheses for prostate cancer concern, along with genetic and ethnic factors, diet (change towards Western eating habits) and sexual behaviour (possible infectious cause such as a role for Human Papilloma Virus). The eventual implication of occupational risk factors (agriculture) shown in previous studies, as well as environmental factors such as pesticide exposure, need also to be examined. In the Caribbean-Guyanese context, no aetiological study has yet been published, even though abstracts and theses are available. While the natural environment of these three French "départements" is widely recognised as being contaminated by the intense and excessive use of pesticides, the latter's rôle in prostate cancer aetiology remains obscure, hence the need for a complete investigation, using reliable geographical, epidemiological and toxicological approaches. Only full cooperation between complementary scientific teams will help acquire the necessary knowledge for the comprehension of this complex health problem and then for effective prevention. Such a study is currently being planned in synergy with local (Martinique, Guadeloupe, Guyana) and Bordeaux researchers, and with the collaboration of other European scientists. Eur. J. Oncol., 14 (3), 171-178, 2009

Key words: **Prostate cancer, French West Indies, French Guyana, epidemiology, incidence, risk factors**

quello della Francia continentale e in costante aumento nei passati 20 anni, diventando così paragonabile ai più alti tassi di incidenza riportati tra gli afro-americani degli Stati Uniti. In Guiana, il cancro della prostata nel 2007 è risultato uno dei tumori più frequenti. Il 90% della popolazione caraibica e il 66% della Guiana francese sono discendenti dell'Africa. Le ipotesi maggiormente prese in considerazione per il cancro della prostata riguardano, oltre ai fattori genetici ed etnici, la dieta (orientata verso abitudini alimentari occidentali) e comportamenti sessuali (possibile causa infettiva dovuta al Papilloma Virus umano). È necessario inoltre prendere in considerazione le eventuali implicazioni di rischio professionale (agricoltura) evidenziate in precedenti studi ed altrettanto i fattori ambientali come l'esposizione a pesticidi. Nel contesto caraibico-guianese non sono ancora stati pubblicati studi sull'eziologia anche se sono disponibili abstract e tesi. Anche se è ampiamente riconosciuto che l'ambiente naturale di queste tre aree geografiche francesi è contaminato da un forte ed eccessivo uso di pesticidi, il ruolo di questi ultimi nell'eziologia della prostata rimane oscuro, da qui la necessità di una esaustiva indagine usando precisi approcci geografici, epidemiologici e tossicologici. Soltanto una stretta collaborazione fra gruppi scientifici integrati aiuterà ad acquisire le necessarie conoscenze per la comprensione di tale complesso problema sanitario e quindi per una effettiva prevenzione. Questo studio è al momento programmato in sinergia con ricercatori locali (Martinica, Guadalupe, Guiana), di Bordeaux e in collaborazione con altri ricercatori europei. Eur. J. Oncol., 14 (3), 171-178, 2009

Parole chiave: **Cancro alla prostata, Antille francesi, Guiana francese, epidemiologia, incidenza, fattori di rischio**

Introduction

Prostate cancer is the fifth cause of cancer death among men in the world today (1). The annual world age-standardised incidence rate is of 25.3 new cases per 100,000 man-years whilst the global age-standardised mortality rate amounts to 8.1 deaths per 100,000 man-years. Both incidence and mortality differ between countries, with data issuing from population-based registries showing markedly bigger divergences where incidence is concerned. Historically, it has been shown that the highest

prostate cancer rates prevail amongst African Americans living in the United States of America. Low occurrences are registered in Asian countries and intermediate ones are noted in parts of Africa and Southern America (Fig. 1) (2, 3). These geographical variations can be explained by a combination of ethnic, genetic, behavioural and environmental factors.

In spite of numerous studies on the subject, prostate cancer's aetiology has not yet been clearly defined. The only well-established risk factors are aging [(75% of cases being observed in men aged 65 years and above (5)], family history of prostate cancer and ethnic origin. Environmental factors and lifestyle also seem to be important, as evidenced by the increase in prostate cancer frequency amidst populations migrating from low cancer incidence countries to high cancer incidence ones (6, 7). Hence the identification and study of environmental and genetic characteristics of high risk populations will help make significant advances in the comprehension of the disease and its causes. In that matter, three French overseas "départements", the French West Indies or Antilles (Guadeloupe and Martinique) and French Guyana present unique epidemiological, geographical, ethnic and environmental characteristics which can help elucidate the complex causes behind prostate cancer (8).

Methods

We conducted a systematic scientific literature review (with Medline and Pubmed databases), followed by the synthesis of current main aetiological hypotheses relative to the West Indies-Guyanese context.

Results

The regional prostate cancer burden

Martinique and Guadeloupe registered world incidence rates for prostate cancer exceeding 150 new cases per 100,000 man-years in 2002. These figures were twice those of mainland France during that same year and are comparable to the highest world incidence rates recorded amongst Afro-Americans in the USA (Fig. 2) (4). Furthermore, the two islands contrast with other Caribbean territories, which all while sharing similar ethnic, genetic and geographical backgrounds, register lower rates, thus pointing to the potential implication of environmental factors (Table 1).

Prostate cancer incidence has been in constant increase in the French Antilles for the past 20 years, with an average annual increase of 1.1% from 1985 to 2002. In Martinique, rapid rises have been observed from 1981 to 2000, going up from 54.32 (1981-1990) to 101.16 (1991-2000) new cases per 100,000 man-years, accounting for a significant total increase of 86% during that period ($p<0.001$) (10). As for Guadeloupe, the number of cases rose by 67% between 2000 and 2003, from 100.9 cases to 168.7 cases per 100,000 man-years. The noted surges in incidence can be partly explained by increasing life spans and improvements in diagnostic and screening procedures (11, 12). While the change in population age structure can be accounted for by using age-standardised rates rather than crude figures, the second hypothesis fails to explain the difference in prostate cancer occurrence between the overseas "departments" and mainland France, given the similarities in medical practices.

In Guyana, the lack of precise data from the recently set-up Guyanese cancer registry makes it difficult to get detailed information on specific cancer incidences. However scientific reports point to two distinct facts: firstly, cancers of the digestive and respiratory systems and prostate cancers were among the main causes of death among Guyanese men (aged 35-64 years old) between 1988 and 1990 (13); secondly, the first two causes of death in 2007, among men aged 65 years and above, were respectively cardiovascular diseases and tumours, with prostate cancer being one of the commonest cancers (14).

The rôle of ethnic, genetic and infectious factors

Afro-American or Caribbean ancestry is a risk factor for prostate cancer and may be linked to genetic imprinting of either hormonal factors or of promoters of environmental carcinogens, as well as to socio-cultural and dietary habits (7). The populations of Martinique, Guadeloupe and French Guyana

Fig. 1. Geography of prostate cancer in the world (world age-standardised incidence rates/100,000 man-years) (8)

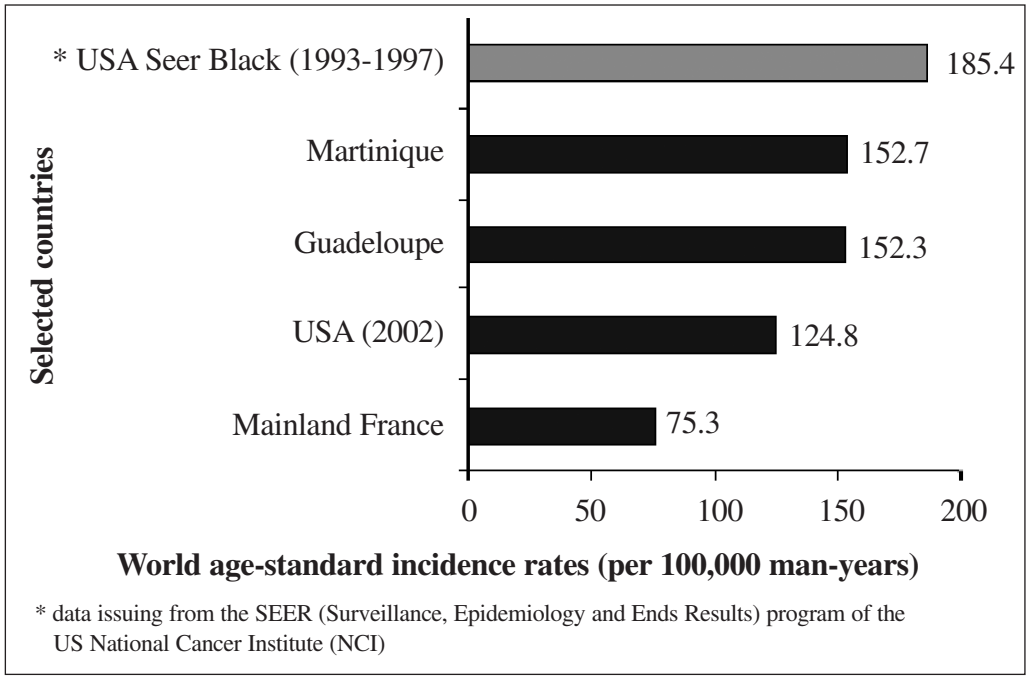

Fig. 2. World incidence rates of prostate cancer (per 100,000 man-years) in selected populations (2, 4)

Table 1 - World incidence rates (per 100,000 man-years) of prostate cancer in the Caribbean for the year 2002 (4)

Region	Age-standardised rates
World	25.3
Caribbean Islands	
Bahamas	65.3
Barbados	99.7
Cuba	28.2
Dominican Republic	85.3
Haiti	38.1
Jamaica	42.4
Puerto Rico	100.1
Trinidad and Tobago	60.5
Martinique (9)	152.7
Guadeloupe (8)	152.3
French Guyana	NA*

* Not Available

originate from a mix between different communities such as American-Indians, black, white and Asian populations (14). As a result, 90% of the inhabitants of Martinique and Guadeloupe, as well as 66% of the French Guyanese are of African descent. Observed elevated prostate cancer rates are therefore coherent with the presence of genetic factors linked with an African ethnic origin. Indeed, African Americans have a 9.8% lifetime risk of developing the disease compared to only 8% in whites (15). As for family history of prostate cancer, the risk of disease occurrence increases by a factor of 1.6 to 11 depending on the number of cancer cases in the family, the familial link and the age at cancer diagnosis among relatives (7).

Other hypotheses for prostate cancer in the Caribbean context concern infectious factors related to sexual behaviour which could be involved in prostate cancer occurrence (possible infectious cause such as Human Papilloma Virus). A rôle for hormonal factors, including those related to sexual activity, cannot be ruled out either (16-18).

Environmental and occupational factors

Environmental factors (dietary or xenobiotic) also play a rôle in prostate cancer development. The concepts of westernisation, involving a loss of protective factors (e.g. low antioxidant intake) or the adoption of lifestyles entailing additional risk (e.g. diet high in animal fats and red meat consumption) or an increase in chemical exposures (e.g. pesticides), have been introduced to account for the high level of prostate cancer risk in some populations and for geographical incidence variations (12). These concepts can be perfectly applied to the West Indies-

Guyanese context, where in addition to ethnic/genetic predispositions, populations are exposed to such environmental factors.

a. Diet

Although the common regional traditional diet remains rich in fish, vegetables and fruits and poor in beef and dairy products, there is a gradual adoption of western dietary habits. An example is Martinique Island where during the last 20 years, local food has been replaced by imported food. This has resulted in a sharp increase in the consumption of fat and animal proteins. In 1989, Martinique hence boasted of the second highest supply level of daily calories per capita in the Caribbean region after Cuba. It further reported a proportion of total animal-derived fat supply similar to that of the United States (9).

b. The pesticide track

The natural resources of the three overseas "départements" are also widely recognised as being contaminated by the intense and excessive use of pesticides and other chemicals. In Guyana, it is mainly water pollution by mercury wastes issuing from the mining industry which poses problem. As for the French Antilles, their economies are largely dependent on banana cultivations, which count amongst the heaviest pesticide-consuming crops on the planet. Since the middle of the 20th century, intensive banana farming activities have led to substantial organochlorine pesticide usage. This is clearly illustrated by the pesticide consumption in Guadeloupe and Martinique in 1998, set respectively at 2,100 and 2,800 tons, amounting to twice the total load and three to four times the amount used per hectare of cultivated surface in mainland France. Moreover, reports from several French Institutions and other agencies have revealed contaminations of land and water resources by organochlorine pesticides such as chlordecone, whose toxic effects on health are recognised (19).

Other studies have further hinted at the eventual implication of occupational risk factors in prostate cancer occurrence, such as possibly professional exposure to electromagnetic fields (20), and most especially in jobs exposing to pesticides, notably during farming activities (crop production, treatment and yielding) (21).

However, the link between pesticide exposure and prostate cancer is far from established. During a recent study led by the Martinique Association for Epidemiological Cancer Research and the local branch of the French Institute of Health Surveillance, the distribution (in space and time) of prostate cancer cases, diagnosed in Martinique between 1981-2000, revealed regional differences with high risk areas located in the southern parts of the island. This finding failed to confirm the hypothesis of the rôle of pesticide exposure in prostate cancer occurrence as pesticides were used more intensively in the northern parts of the island (Fig. 3) (10, 19).

Conclusion

For the future, prostate cancer will remain an important and, through evolutions in incidence and demography, growing health problem (15). Further investigations and more precise analysis are therefore necessary to assess the actual rôle of different risk factors. Studies on insular populations, as those of the French West Indies and French Guyana, can provide new insight into the aetiology of prostate cancer. In addition, the specific environmental characteristics of those three regions, including dietary habits and chemical exposures, will make it possible to explore environmental risk factors and their interactions with genetic ones in high-risk populations.

A study is currently being planned in synergy with local (Martinique, Guadeloupe, Guyana) and Bordeaux researchers, and in collaboration with other European scientists. The objectives will be to study known and suspected risk factors in prostate cancer, as well as to quantify pesticide exposure levels by using biological markers. As no aetiological study has yet been published in the West Indies-Guyanese context, except for a few abstracts and theses, such a project will present numerous novel aspects. Indeed, while excessive pesticide usage has resulted in a high level of environmental contamination, the rôle of pesticides in prostate cancer aetiology remains obscure, hence the need for a complete investigation, using reliable geographical, epidemiological and toxicological approaches taking into account other potential risk factors. Furthermore, the study will be set in a context of epidemio-

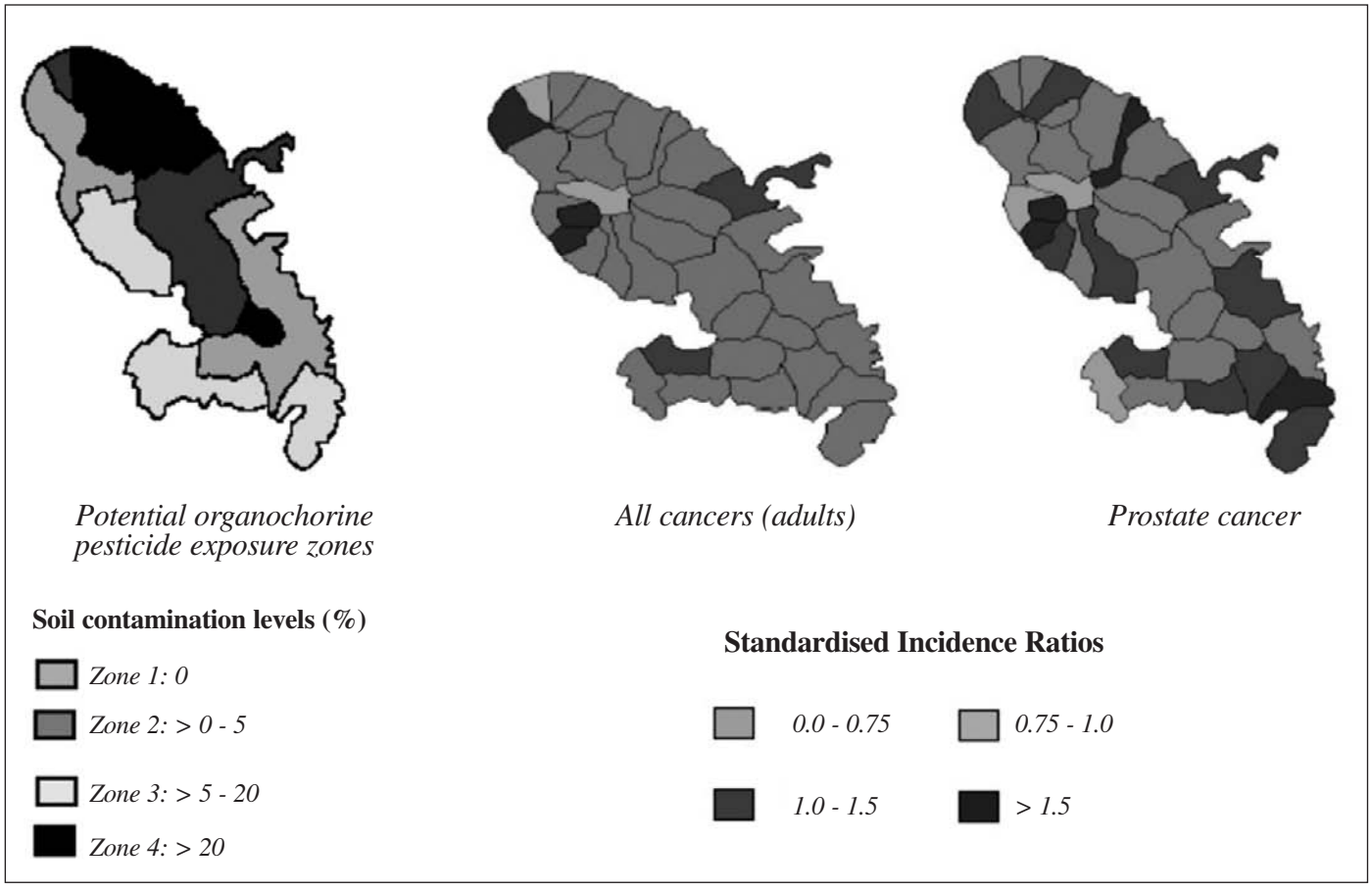

Fig. 3. Geographical distribution of cancer cases on Martinique Island (France), 1981-2000 (10)

logical transition and where the use of pesticides and other chemicals is still intensive. This provides better opportunities to examine the potential carcinogenic effects of pesticides, as compared to mainland France where the long-term regulated use of pesticides has resulted in lower exposure levels, thus rendering such research more difficult. And, last but not least, only full cooperation between complementary scientific teams will provide the necessary knowledge for the understanding of this complex population health problem and for effective prevention to ensue.

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