Chapter 8
Prostate Cancer and Environmental Exposure: A Focus on Heavy Metals and Pesticides

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ABSTRACT
Prostate cancer (PC) is the most commonly diagnosed malignancy and the major cause of disease and mortality among men. Every year, around 1.6 million new cases are diagnosed with 366,000 death cases. Different etiologies have been associated to PC incidence including the genetic predisposition as well as the environmental influences. Recently, more interest has been given to the role of food and water contaminations with heavy metals and pesticides as direct carcinogenetic agents, particularly involved in the pathogenesis of PC. The chapter will address the relationship between heavy metals and pesticides exposures, and the development of PC with the support of epidemiological and experimental evidences.

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INTRODUCTION

Prostate cancer (PC) is considered as the fourth leading cancer in men and women, while it is the second most common cancer in men worldwide (Arnold et al., 2015; Siegel, Naishadham, & Jemal, 2013). The incidence of PC varies largely between continents, Hence, a high incidence is observed in developed countries compared to the underdeveloped world areas (Parkin, Bray, & Devesa, 2001).

Clinically, PC is generally without apparent symptoms (asymptomatic) at the earlier phase of the disease. While in rare patients, it can be associated to some manifestations similar to those of benign prostatic hyperplasia including nocturia, hematuria and anddysuria (Mustafa et al., 2016)

Different etiologies and risk factors of PC have been elucidated including genetic and environmental exposures. Although, elderly men are preferentially affected by PC with more than 60% in people with more than 65 years old (Desantis, Siegel, & Jemal, 2014).

Several etiologies of PC have been identified including, age and ethnicity, family history, diet, obesity, sexual behavior and sexually transmitted diseases, occupation and smoking (see for review Bashir, 2015).

Beside the genetic part of PC etiologies, environmental exposures to several exogenous chemical contaminants are generally well admitted as important carcinogens. Indeed, support of this view is provided by observations of abnormal PC incidence in certain subgroups of the population, leading to suppose the implication of the non-genetic influences (environment) as a non- neglected part of the disease causes (Mullins & Loeb, 2012)

Through the present chapter, we will review the available literature on environmental exposures, especially to heavy metals and pesticides, and the relationship to PC incidence with the support of experimental as well as epidemiological studies.

PROSTATE CANCER: EPIDEMIOLOGY AND RISK FACTORS

Adenocarcinoma of prostate or prostate cancer (PC) is a masculine pathology specific of elderly people, with about 9.7% of total male cancers and approximately (Ferlay, et al. 2015).

The incidence of PC is still variable. In fact, in developed countries it reaches 15.3%, while in the underdeveloped world it accounts only for 4.3% only (table 1) (Parkin, Bray, & Devesa, 2001). In US, PC is considered as the most commonly diagnosed cancer in men and the second most common cause of death after lung cancer (Parkin, Bray, & Devesa, 2001).

PC is a particular pathology with different etiologies and risk factors, including age, ethnicity, family history, diet, obesity, sexual behavior and sexually transmitted diseases, occupation and smoking. Indeed, PC is affecting elderly men especially with 6 /10 cases diagnosed at the age of 65 years or later. Generally, the average age at the time of PC diagnosis is 66 years (Desantis, Siegel, & Jemal, 2014). While according to the race and ethnicity, studies showed that African-Americans population presents the highest rate of PC incidence in the world (Table 1). (see Bashir, 2015).

Otherwise, family history of the disease as well, is considered as important risk factor for PC. Indeed, PC incidence is increased 2 to 3 folds among male who have a first-degree relative (father, son, brother) with a positive history of PC (Stanford & Ostrander, 2001).

At the genetic level, PC results from multi-gene interaction rather than a single gene involvement. Mutations in BRCA1 and BRCA2 genes considered as important risk factors for ovarian and breast cancers,
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