Chapter 7
Environmental and Occupational Epidemiology Principles

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ABSTRACT

Occupational epidemiology studies the distribution of health events and health related determinants and its relation to the working environment. Environmental epidemiology focuses on the involuntary exposure to physical and chemical factors in the indoor or outdoor environment that may affect health patterns. Occupational and environmental epidemiology use similar methodology although the conditions differ. The environmental epidemiology studies beyond the health effect of exposure to specific environmental factors and must consider the long-term impact of the ecosystems to nearby populations. Molecular technologies allow the detection of effects at the molecular level originated by very low levels of exposure. The concept of an exposome is a kind of database with information concerning environmental exposure measurements in a life time and corresponding biomarkers concentrations in different biospeciments, considering internal individual genetic characteristics.

INTRODUCTION

Any adverse health effect related to genetic and external factors is linked to the conditions of life. Nutrition, smoking, alcohol consumption, physical activity are the most studied risks. The physical and social environment at the workplace may cause accidents, occupational diseases and it contributes to common diseases occurrence. The natural and artificial environment have a permanent influence. Eventual harmful factors in the environment are produced either physically like cosmic or ultra violet radiations, radon exposure from the ground, volcano activities, or by human activities like traffic and industrial pollution, war attacks, noisy events, etc. Humans are exposed to hazards mostly either by inhalation or orally by food and water consumption. Other ways of exposure are through the skin like radiation or by dermal absorption of chemicals. The noise may be harmful by audition under circumstances (Sherwin,

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1983; Shepherd et al., 2016). Epidemiology studies the distribution of health events and health related determinants in defined populations, it is therefore applied to the modification of risk factors for reducing the morbidity and mortality and improving the quality of life. This chapter discusses how epidemiology explores the association between occupational and environmental factors and health outcomes and what the limits and the prospectives are.

BACKGROUND

Occupational epidemiology focuses on the working environment where people spend one third of their life, and where they are exposed to physical or chemical risks. Environmental epidemiology focuses on physical and chemical factors from the indoor or outdoor environment that may affect health patterns. The exposure to these factors is involuntary. Biological factors are part of the environment; however, this field is claimed by infectious diseases epidemiology (Rothman, 1993). The conditions in which people are born, grow, live, work and age are considered as social determinants, that may have either a direct effect to health or influence the exposure to the specific harmful factors. Due to the dynamic nature and complexity of public health evidence, traditional epidemiological study designs are often insufficient to make conclusions informing policy or practice at the population level, for improving population health. Environmental epidemiology faces problems with correlated exposures and small relative risks. Occupational epidemiology must estimate risks related to the changing working conditions and its emerging psycho social effects. Molecular biology and ecosystems studies offer new challenges.

OCCUPATIONAL / ENVIRONMENTAL FACTORS AND HEALTH OUTCOMES: METHODS USED AND CHALLENGES

Occupational and environmental epidemiology associate exposure to health effects. They need therefore data related to health effects and data related to exposure to potential hazards. Health effects concern exposed population and their descendants. They also concern no exposed populations to examine the extent to which observed rates differ significantly between exposed and no exposed.

Health Data

Health data, referring to events by time, place and person, are (CDC, 2012):

- Incidence of diseases: Rate of new cases to the population during a period. It is interpreted as the risk for a new outcome.
- Prevalence of diseases: Rate of existing cases to the population at a moment of time. It describes the probability of an existing outcome in a population at a point in time
- General mortality and mortality by specific causes as indirect indices of diseases incidence.
- Birth outcomes, including fertility and infertility, premature birth, perinatal mortality, birthweight, sex ratio.
- Biological indices that may show either even minor health effect or indicate that the exposure exceeds allowed levels.