Chapter 16
Epilepsy and Stroke Emerging From Climate Change–Related Neurotoxicity: Involvement of Food and Water Contaminations

Hind Benammi
Cadi Ayyad University, Morocco

Omar El Hiba
Chouaib Doukkali University, Morocco & Cadi Ayyad University, Morocco

Abdelmohcine Aimrane
Cadi Ayyad University, Morocco

Nadia Zouhairi
Cadi Ayyad University, Morocco

Hicham Chatoui
Private University of Marrakech, (UPM), Morocco & Cadi Ayyad University, Morocco

Hasna Lahouaoui
Cadi Ayyad University, Morocco

Kholoud Kahime
Cadi Ayyad University, Morocco

Morad Belkouri
Centre Hospitalier Universitaire, Morocco

Rokia Ghchime
Mohamed V University, Morocco

Ahmed Draoui
Cadi Ayyad University, Morocco

Halima Gamrani
Cadi Ayyad University, Morocco

ABSTRACT

Climate change has an important impact on the environment. As it degrades the quality of water, soil, and area, it also spreads the distribution of many toxic elements, specifically heavy metals and pesticides. The impact of climate change on contamination with heavy metals and pesticides has been well investigated and discussed. The influence of these elements on human health is obviously exacerbated following their extended distribution. Moreover, a wide range of health problems have been associated to such intoxication, among which impairment and dysfunction of the nervous system are prominent. In this chapter, the authors will shed light on two most common neurological diseases such as epilepsy and stroke affecting people worldwide arising from food and water contaminations, mainly with heavy metals and pesticides.

DOI: 10.4018/978-1-5225-7775-1.ch016
INTRODUCTION

Climate change endangers human health and affects all sectors of society, both domestically and globally. The impacts of climate change on the environment are obviously discernable through degradation of the quality of water, soil and area. Several challenges are facing scientists today on that issue. One of the most prominent questions preoccupying scientists, organizations and governments is the impacts of climate change on the risk of contamination with heavy metals. Thus, the related effects have been discussed qualitatively for the marine ecosystems (Schiedek, Sundelin, Readman, & Macdonald, 2007). In fact, the risk of contamination may increase with the increasing risk of flooding caused by climate change. In contaminated lands, flooding promotes remobilization of contaminants in sedimentation water, in marine areas and freshwater environment. Furthermore, human management of the system, such as industrialization and progresses to an exposure to toxic metals, have an important influence on the quality of water table, which consequently leads to the contamination of soil and food. Moreover, climate change has a powerful effect on the fate and the behavior of pesticides in the environment by modifying the fundamental partitioning mechanisms between environmental compartments, therefore affecting the use of pesticides (Figure 1) (Noyes et al., 2009). A lower pesticide residue on crops, due to climate change, increases the susceptibility to pests and diseases. That is to say, farmers in the future may need to spray more often during the growing season (Jackson et al., 2011). Higher parasitic or pathological pressure will also increase application frequencies and volumes. As a result, the residue levels detected could double for some products (Seeland, Oehlmann, & Müller, 2012). Consequently, the risk of depositing pesticide residues in food increases as well as the exposure of consumer to pesticides residues at the end of the food supply chain (Noyes et al., 2009). In this regard, food safety issues related to increased exposure to pesticide residues, due to climate change, are increasingly being addressed (Delcour, Spanoghe, & Uyttendaele, 2015).

Heavy metals and pesticides are toxics that may aggregate in the biological system setting off significant health hazards (Rajan, Nadiah, Firdaus, Appukutty, & Rama-, 2012; Tago, Andersson, & Treich, 2014). Overexposure to heavy metals and pesticides can cause myriad of problems in our bodies, autoimmune diseases, infertility, dementia, epilepsy, stroke and more (Tago et al., 2014). In this chapter we will put the focus on neurological diseases, especially epilepsy and stroke. Epilepsy is a common medical and social disorder or group of disorders with unique characteristics (Day, Wu, Strauss, Shavelle, & Reynolds, 2005). Epilepsy is usually defined as neurological disease characterized by the recurrence of excessive paroxysmal and hypersynchronous discharges of more or less extensive neuronal brain population called epileptic seizures (Devinsky, Vezzani, Jette, Curtis, & Perucca, 2018; Stafstrom & Carmant, 2015). Epilepsy occurs in approximately 0.7% of the population at any time. More than two-thirds of seizure problems begin in childhood, with a second peak of onset in the elderly. Usually, epilepsy does not significantly alter life expectancy, but the quality of life may be seriously compromised when seizures are not satisfactorily managed (Ann & Gus, 2008). The second disease, Stroke, also called brain attack, is a brain injury caused by a sudden interruption in the blood supply of the brain (Gund, Jagtap, Ingale, & Patil, 2013). World Health Organization (WHO) has defined stroke as “rapidly developed clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin.” (WHO, 2014). Worldwide burden of stroke, estimated that stroke is the second most common cause of death worldwide (Lim, Lee, Lee, & Ha, 2018).