



## Climate change, pollution, biodiversity and its influence on asthma, a collective musing!

*Mudanças climáticas, poluição, biodiversidade e suas influências na asma, uma reflexão de todos nós!*

Celso Taques Saldanha<sup>1</sup>

In recent times, the environment has been one of the most highlighted themes in global discussions, where climate change, global temperature increase, ozone layer destruction, air pollution and respective aggressions to human health are addressed, among other environmental consequences.<sup>1</sup> The environment presents a set of factors that maintain interactive relationships with causal agents and the susceptible individual. In this context, the physical environment, which includes and provides the means of possible anthropic life; the biological environment, which encompasses all living beings; and the social environment, place of social, political, economic and cultural interactions.<sup>1,2</sup>

Geographical position and its climatic peculiarities, soil, water resources, pollutants, physical agents and industrial products are the most known components of the physical environment, with climatic variables such as temperature, relative humidity, rainfall and wind speeds, those that are most closely related to diseases.<sup>3,4</sup> It is also known that biodiversity, a term that designates a variety of animals, plants, habitats and genes, interacts with the physical environment, which originates ecosystems, essential to life. These ecosystems have been suffering threats as a result of deforestation and burning for agricultural activities<sup>5</sup>.

Entire ecosystems consequently become more vulnerable; for example, (previously fertile) soils are modified and that leads to climate change (over 56% of local and regional rainfall depends on forests). As such, we are most certainly living in a time of favoring epigenetic diseases.

It should also be highlighted that aggressions to the ecosystem by human activities, especially the burning of our native forest, including the Amazon Forest, the Pantanal of Mato Grosso, the Cerrado, the Atlantic Forest and other Brazilian native forests, generate serious problems, with releases of polluting gases. These pollutants, which are increasingly discharged into our atmosphere, affect local climatology and human health, triggering asthma, inflammatory rhinosinusopathies, eye and dermatological diseases, among other illnesses.<sup>6</sup>

Alto Floresta, a city located in the Amazon region of northern Mato Grosso, is recognized among Brazilian municipalities for the highest prevalence of asthma in Latin America among schoolchildren aged between 6 and 7 years old. Research on exposure to gases from forest fires in this region showed a relation of these pollutants with asthma episodes.<sup>7</sup> The occurrence of differences in the epidemiological profile of geographically close communities is known,

1. Coordinator of the Department of Biodiversity, Pollution and Allergies at ASBAI. Assistant Professor, Faculty of Medicine, UnB - Brasília, DF, Brazil.

only because of the existence of well-defined climatic characteristics (microclimate). Such consideration is relevant, since it places climatic variables as determinants for the dynamics of diseases, especially those which affect the airways.<sup>4</sup>

Temperature, relative humidity and rainfall stand out among climatic variables, and in humid climates with sudden drops in temperature there has been an increase in the incidence of respiratory infections and greater diffusion of aeroallergens, thus contributing to climate change for the occurrence of numerous asthma attacks<sup>8</sup>. It is also important to describe the correlation between climatic factors and atmospheric pollution, such as air polluted by various gases in climatic regions characterized by high temperatures, typical in an immense part of the Brazilian territory, essentially the emergence of the pollutant ozone, which is known to be harmful to the respiratory epithelium.<sup>9</sup>

Another environmental factor widely raised as responsible for the worsening of human health, especially respiratory, are pesticides, chemicals capable of killing and preventing the proliferation of insects, mites, molluscs, rodents, fungi and other life forms that are harmful to health and to the plantation. Growth regulating substances, synthetic fertilizers, hormones, defoliants and desiccants also fall into the category of pesticides. In research on the effects of organophosphate pesticides on asthmatic children living in certain rural regions in Brazil with intense agricultural activity, the role of organophosphate pesticides as environmental triggers in the worsening of asthma in children was evidenced. There are several mechanisms by which pesticides attack the airways, and the main one is the inhibition of the acetylcholinesterase enzyme caused by organophosphates and carbamates. Chronic exposures can lead to airway hyperresponsiveness by direct interaction with muscarinic receptors, resulting in reflex bronchoconstriction due to pulmonary irritation and mucus secretion by the airways.<sup>10</sup>

As asthma is a chronic airway disease with genetic predisposition and its pathological substrate is bronchial inflammation with increased airway reactivity to a variety of stimuli, environmental factors participate in the complex interaction of these various stimuli, thus influencing in the epidemiological profile of this disease.<sup>11</sup> It should be considered that the breathing of approximately 10 to 20 thousand liters of air per day occurs at varying degrees of temperature and humidity, which must be adequately conditioned for the

lower airways with regard to filtration, humidification and heating. With each breathing movement, about hundreds of milliliters of air pass between the atmospheric air and the alveoli.<sup>4</sup>

The respiratory system of children up to the age of 8 years is characterized by a growth in the number of alveoli up to 10 times since birth and an increase in the number of bronchial generations. Therefore, the child population presents an anatomopathological substrate that is conducive to respiratory diseases<sup>12</sup> and which, associated with environmental factors, make this population group the most vulnerable to bronchial hyperresponsiveness and sensitivity to various agents in the environment.<sup>9</sup>

Thus, climatic variables, pollutants, irritants and air allergens affect the health of patients with asthma, intensifying and modulating the development of the disease, in addition to favoring respiratory infections,<sup>12</sup> having great relevance in children and adolescents, admittedly more susceptible.<sup>13</sup> In this environmental context of a country with geographic heterogeneity, added to climate change and aggression to our biodiversity, there is damage to health as a result of atmospheric pollutants from forest fires, among other sources of pollution. An ongoing understanding of these environmental factors that have possible repercussions on asthma should be sought.

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