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# Climate change and increase of allergic diseases

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## Introduction

Several studies have demonstrated that the asthma prevalence is increased from the early sixties, with a growth concerning both children and adults in different countries with different ways of life.

Other allergic diseases has increased all over the world too. Among the supposition suggested, we can find the air pollution and the Hygiene Hypothesis (1). Climate Change is a further additional and supplementary element that it could come into play to explain the increase in allergic diseases observed during recent years. In recent years the Climate Change discussion has carried on from the field of academic studies into the political field. Certainly, this matter does not bring to an objective understanding of the problem. This is the reason why I'll not debate if the real cause of the Climate Change lies in the anthropogenetics factors or in a natural cycle of the earth.

## Kyoto Protocol

On 16 February 2005, after a series of Climate Change Conferences organized by the United Nations, the Kyoto Protocol has entered into force; the agreement signed in the Japanese city in 1997, with which 160 countries committed themselves to carrying out Industrial and Environmental polices, tending to reduce the global warming. All acceding countries, including Italy, EU, Russia and Japan, but not USA, should check and reduce emissions of gaseous pollutants in the Atmosphere, especially those derived from industrial. Economic sanctions would be expected for those countries which won't observe the rules. It is certain that in the 19 Century, an increase in global

average temperature of 0,6% has already occurred. In parallel to the rise in temperatures has occurred an increase in atmospheric concentrations of some gasses, such as CO<sub>2</sub>, because of human activities. The consequences of that phenomenon are countless. On worldwide, the mean sea-level has an yearly growth from 1 to 2 mm. Actually, it is known to all the decrease of non-polar glaciers.

Moreover, consequently to the rise in temperatures, it takes place an early blooming and an early return of migratory birds. Other consequences of rising temperatures are: anticipated seasons and the appearance of insects in the northern Hemisphere. No need to neglect the eventuality of a continental precipitation increase of 5-10% in the northern Hemisphere.

## Scientific evidences

Many evidences show the form with the Climate Change alter the clinical manifestations of allergic diseases too. On this topic, recently, they have been published some review (2, 3).

Firstly, it could assert that, in certain changing climatic conditions, plants produce a greater quantity of pollens. Secondly, there are some evidences in increased allergenicity in pollens produced by trees exposed to highly temperatures. Moreover, it seems that the temporal and geographical distribution of pollen has been altered by the Climate Change. For instance, some studies have shown that the trend towards early pollinic seasons spread in some species (4,5).

Some others studies have checked other characteristics from allergenic plants. The allergenic plants seem produce greater number of pollen if exposed higher carbon dioxide concentration.

### Atmospheric events and asthma

The climate change seems to be associated to an increase of the frequency of intense rain and thunderstorms. It is known for long time the relation between storms and asthma crisis, in which the release of pauci-micronic particles should come into play, thanks to Gramineae pollens and a more highly fungal spore concentration (6-8). Also other pollens, like the Parietaria, can be asthma cause (9,10). During thunderstorms should not be ignored the rising in the air of the wind and electric discharges, because they should have an asthmatic effect derived from aspecific hyper-reactivity. There is also who suppose that an increase in the number of lightning all over the world is correlated to the Climate Change, but this hypothesis is not still supported from valid studies.

Also other atmospheric event, like the Nino, in the Tropical Pacific (becoming more frequent and persistent, especially in the last 30 years), have been considered cause of allergic symptoms, but not there is unanimous agreement on this. Indeed, it is present only a paper, in literature, based on only three years of data (11).

### Increasing in temperatures and asthma

The importance of increasing in temperatures has already been noted in 1998 by Hales (12), and he learnt a significant correlation between asthma prevalence and average temperatures. Other studies – that showed the importance of climate factors in the asthma prevalence – has been done by Weiland (13) and Zanolin (14). The first study conclusions were that the asthma prevalence is correlated inversely to the altitude, and directly to indoor relative humidity levels. In the second study asthma symptoms are correlated with the lowest latitude in proximity of the sea, with highest annual average temperatures and also with lower temperature ranges.

### Early blooms

We hold scientific evidences that suggest the Climate Change has already caused a relevant impact on the behaviour of migratory animals and on flowering plants. For instance, Menzel's (15) studies have showed that in Europe, from 1969 up till now, spring blooms come about 6 days early and the autumn is 4,8 days late. In Great Britain, Fitter (16) showed that in the last ten years the

average of flowering date of 385 plant species is 4,5 days early.

Emberlin highlight, in two different reports (17, 18), information that show how in the last 30 years in Europe there was an advanced of 5-10 days of birch flowering and he shows that in the last 10 years in Worcester (UK), the *Alnus* spp and *Corylus* spp flowering season is more prolonged and severe. A similar situation has been showed by Garcia Moro (19) in Spain : in the last 10 years in the Iberian Peninsula the Fagaceae flowering 15 days earlier than the *Quercus*. Stach's work (20) shows that the average temperature plays an important rule in flowering and with its rise the temperature influences also the advance in flowering. Moreover, Stach emphasizes how the temperature is correlated to the concentration of *Artemisia* pollen. In addition to anticipating the flowering, the temperature support the contents of pollen within the pollen granules. Ahlholm (21) has found to notice a large content of Bet v 1 within pollen granules picked in gardens with the average of the average daily temperature.

### Anthropogenic Climate Change

Human activities lead to an increase in CO<sub>2</sub> and a resulting Climate Change (IPCC). Carbon dioxide, one of the environmental pollution factors, is the more important gas to greenhouse effect and it is growing in parallel with the average temperature level. Some studies (22, 23) showed, both greenhouse and outdoor, that a large *Ambrosia* pollen production is joined to a growth in atmospheric CO<sub>2</sub>. At high carbon dioxide levels ragweeds plants (*Ambrosia artemisiifolia* L.) showed greater biomass and reproductive effort with increase of pollen production. One of the clearest changes is earlier onset of flowering and lengthening of the growing season (24). The consequence of this is the greater exposure of the atopic patients, with increased risk of sensitizations and onset of symptoms.

### Conclusion

The data that we have exposed indicate that an association exist between the increase of air temperature and an earlier flowering period. Therefore, the people with allergies are exposed to a greater pollen allergen with a consequent increase of sensitization and symptoms. In our experience, in the space of 30 years, in our outpatients' de-

partment, we have checked those information on patients. Particularly, we have noticed that in the last 30 years, in the Mediterranean area, some flowering were in remarkable advance, such as the *Parietaria spp* and the *Olea aerea*. Also other species have showed a significative advance, such as the Cupressaceae and the Graminaceae. Closed to those advance, there is an increase in days with presence of pollens and also in total pollen count, in most pollens produced, in the space of a year.

In parallel, as a likely consequence of growing exposure, there is an increase in preponderance of sensitization to inhaled allergens over atopic subjects living in the area where the aerobiological study took place. We can conclude that the allergic respiratory diseases, especially the asthma, are complex diseases with a large number of causal factors that interact with each other. The Climate Change get worse those diseases. The Climate Change hypothesis is not clashed with the Hygiene Hypothesis one, but it is a further hypothetical explanation.

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