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THE EXPOSOME IN ALLERGY AND ASTHMA: INDOOR AND OUTDOOR ENVIRONMENT
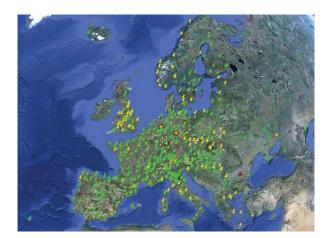
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Allergy is the fourth chronic disease in the world and respiratory allergies rank first among infant chronic diseases (WHO). The environment is a major source of the allergens. Indoor, the allergens are especially house dust mites (*Dermatophagoides pteronyssinus* and *farinæ*), storage mites, pet dander and fungal spores. Outdoor, the main allergens are pollen and fungal spores.

GAPS IN KNOWLEDGE

The different networks set up to monitor the outdoor allergen exposure and to produce information on the allergy risk due to the airborne particles are changing deeply:

- Aerobiological monitoring networks are becoming ever denser, especially for pollen, with more than 500 traps in Europe (figure 1). They follow at present a new European standard (EN TS 16868). The availability of long series enables to study the evolution in the last three decades of the main pollen and fungal spores under the combined influence of climate change (length of pollination, pollen index, transfer of the vegetation to the North and in altitude) and the chemical air pollution (exacerbation of symptoms, modification of the allergen content of biological particles).

- Exposure data can be cross-referenced with clinical data from sentinel physicians' networks or, in the last few years, with symptom load patient's networks. These last ones receive support from the new information technologies and are very important for doctors to better diagnose allergy, and for the patients to better manage their disease.

- Indoor biological particles samplers (impactors, cyclone) are usually help identifying different microorganisms such as bacteria, yeast and moulds. The later are important as allergy sources.

Figure 1. Pollen stations in Europe in 2017 (source EAN).

RESEARCH PRIORITIES, QUALITY CRITERIA, INNOVATIVE APPROACH

The main evolution started in recent times but still requires many years of development focused on new methods of sampling and analysis of the airborne biological particles.

Aerobiological monitoring networks development must allow real-time analysis to produce daily information on the allergy risk.

The use of modelling, simulation and high-performance computing to forecast pollen (and eventually fungal spores) concentrations has considerably increased, and is expected to increase further.

However, the reliability of the information based on these new techniques still needs to be tested by comparison to observations.

At the regulatory level, it is worth noting in recent years an evolution of the legislation on biological particles in some European states such as France. This legislation might be extended to other countries in order to achieve European legislation on airborne pollen and fungal spores. In the same way, we must stress an evolution of the regulation relating to invasive allergenic plants as the different ragweed species.

FURTHER READING

1. Bastl K, Kmenta M, Jäger S, Bergmann KC, Berger U. Development of a symptom load index: enabling temporal and regional pollen season comparisons and pointing out the need for personalized pollen information. *Aerobiologia* 2014;30:269-280.

2. Beggs PJ. Environmental allergens: from asthma to hay fever and beyond. *Curr Clim Change Rep* 2015;1:176-184.

3. Besancenot JP, Thibaudon M. Changement climatique et pollinisation. *Rev Mal Respir* 2012; 29:1238-1253.

4. Galán C, Alcázar P, Oteros J, García-Mozo H, Aira MJ, Belmonte J et al. Airborne pollen trends in the Iberian Peninsula. *Sc Tot Environ* 2016;550: 53-59.

5. Oteros J, Pusch G, Weichenmeier I, Heimann U, Möller R, Röseler S et al. Automatic and online pollen monitoring. *Int Arch Allergy Immunol* 2015;167:158-166.

6. Schiavoni G, D'Amato G, Afferni C. The dangerous liaison between pollens and pollution in respiratory allergy. *Ann Allergy Asthma Immunol* 2017;118: 269-275.

7. Siniscalco C, Caramiello R, Migliavacca M, Busetto L, Mercalli L, Colombo R et al. Models to predict the start of the airborne pollen season. *Int J Biometeorol* 2015;59:837-848.

8. Smith M, Jäger S, Berger U, Sikoparija B, Hallsdottir M, Sauliene I et al. Geographic and temporal variations in pollen exposure across Europe. *Allergy* 2014;69:913-923.

9. Thibaudon M, Caillaud D, Besancenot JP. Méthodes d'étude des pollens atmosphériques et calendriers polliniques. *Rev Mal Respir* 2013;30:463-479.