Airborne biological particles and allergy

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Keywords: pollen, mold, allergy, allergen.
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RNSA (Réseau National de Surveillance Aérobiologique) is the French aerobiology network working in the prevention of asthma and respiratory allergy. For this purpose, RNSA manage a network of about 70 Hirst type pollen/mold traps (Hirst, 1952). The evolution of these biological particles has been followed since 1987 for pollens and 1999 for molds like *Alternaria* and *Cladosporium*.

Ambient air is sampled by a volumetric suction system and directed towards a suitably coated sampling tape through a specific orifice oriented towards the wind; the particles contained in the sampled air are impacted on a continuously moving adhesive tape which is then analyzed by optical microscopy in order to identify and count the allergy particles present in the air. This method allows to count particles and calculate daily and bi-hourly concentrations. The low-volume sampler (10 l/min) allows a continuous sampling for up to seven days.

Pollen monitoring permit to analyze and count all the pollen coming from anemophilous plants. Only a few of them have real allergy potency. The pollen season starts in February with *Cupressaceae* and *Betulaceae* pollens, the end of spring is full of *Poaceae* pollens while *Ambrosia* pollens dominate the end of summer. The daily concentrations can reach 5000 pollens/m^3 of air (for *Cupressaceae* pollens in Mediterranean area for instance) when only few hundreds of them are enough to cause symptoms.

The main fungal spores are *Alternaria* and *Cladosporium* for their well-known health impact on allergy sufferers. Many other fungal spores are analyzed (like *Ascospores*, *Didymella*, *Epicoccum*…) even if their allergenicity is not well-known yet. The daily concentration of *Cladosporium* (for instance, which is very abundant) can exceed 40 000 spores/m^3 of air.

The main symptoms provoked by these biological particles are rhinitis, conjunctivitis, cough and even sometimes asthma.

To evaluate the health impact of pollens and molds, RNSA set up a clinician network. Each week, they fill in a clinical report allowing to calculate a clinical index (Thibaudon and al., 2008) to follow the evolution of the symptoms during the year.

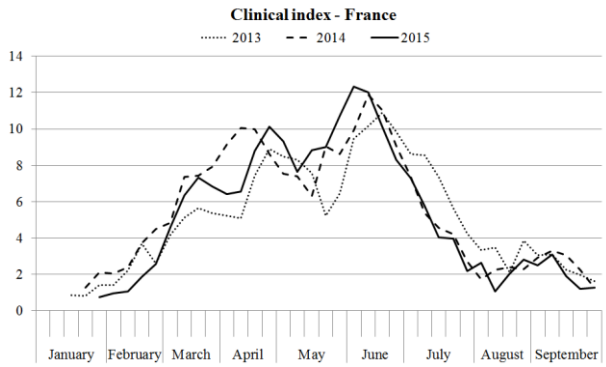

Figure 1. Evolution of the clinical index, France

Between 2009 and 2011, the goal of HIALINE (Health Impact of Airborne Allergen Information Network – European project) was to determine the concentrations in the air of 3 main allergens, Bet v1 for *Betula* (Buters and al., 2012), Phl p5 for *Poaceae* and Ole e1 for *Olea*, using high volumetric samplers (800 L/min) which collected PM10 and PM2.5.

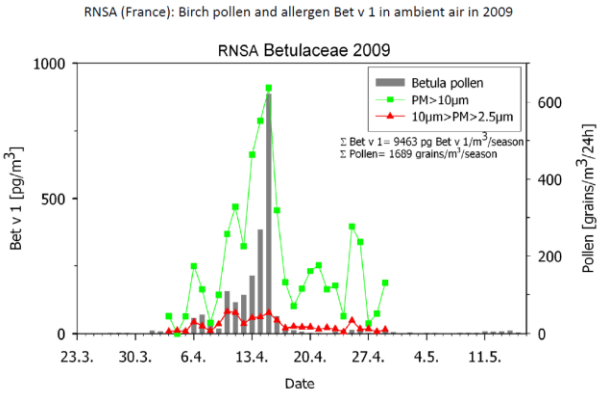

Figure 2. Bet v1 and Birch pollens concentrations

The conclusion of the study was that the concentration of allergens for one pollen could vary from one year to another and from one region to another.

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Buters J.T.M. and al. (2012), *Release of Bet v 1 from birch pollen from 5 European countries. Results from the HIALINE study*, Atmospheric Environment 55 (2012) 496-505