

HIALINE, Health Impacts of Airborne Allergen Information Network

The project HIALINE started January 2009 and will last until January 2012. The project aims at determining the natural variation of allergen content of pollen from birch, grass and olive, and to implement an allergen forecast system. Of course the effects of climate change on allergen exposure are a major topic too.

Within HIALINE we have a good selection of stations across Europe. For birch Italy has a yearly pollen count of 467 birch pollen grains/m³/season compared to 21.156 in Poland, the other countries being in between. For Grass this varies from 728 in Finland to 17.107 in Portugal, again the other countries being in between. For Olive we have Spain with a yearly sum of olive pollen of 26.454 grains/m³/season, Portugal with 7.250 and Turkey with 1.298 grains/m³/season. Turkey pollen from olive stem mainly from wild trees, in Spain from agriculture. Thus our stations cover the extremes in natural variation across Europe.

The consortium counts pollen with a HIRST-type pollen trap, and determines allergen release from pollen collected with a Chemvol high-volume cascade impactor[®]. Allergen release is analysed using specific antibodies for the different allergens with ELISA. Our quality control showed that the intra-assay variability of the methods used to determine the allergen release from pollen was below 15% per station and below 25% between all European stations, which for an immunoassay is extremely well.

The consortium is in the middle of its experiments. We determine pollen exposure. On top of that is the potency of the pollen to release more (or less) allergen. Thus the same amount of pollen, say 10mg, can release up to 10-fold different amounts of allergen.

Some highlights from HIALINE are already available:

1. For birch pollen it is clear that allergen content of pollen is variable, but correlated well with birch pollen count. Differences across Europe in potency of pollen to release allergen were 30-50%.
2. For grass pollen, the results of 2009 were clearly confirmed: pollen from France (and in 2009 also UK) are 300-400% more potent in allergen release than from other stations. Also Finnish pollen at the beginning and the end of the season do not release any Phl p 5. These Phl p 5 empty pollen could originate from another grass species, perhaps *Phragmites communis* that is more abundant in Finland than in the rest of Europe.
3. Olive pollen varies about 400% across Europe in allergen potency. In Portugal the peak of olive pollen at the end of the season was 400-500% more potent in allergen release than at the start of the season. This pollen could have originated from Spain, as the wind on those days with high potency pollen came from Spain, were a olive pollen peak was recorded. At the end of season pollen from Portugal had the same high potency as pollen from Spain itself. The first results of our volunteer member from Turkey showed that the low olive pollen potency in Portugal in 2009 was similar to Turkey. This exemplifies that Spain might have higher potency pollen due to the use of other species (in Spain mainly *Picual* and others, in Portugal *Cobrancosa*). Also weather in Portugal in 2009 was different from 2010.

The results indicate that monitoring pollen as a proxy for environmental allergen exposure is good, but only a proxy. Yes, allergen measurements are new and need to be validated against patients' symptoms. We showed that monitoring allergens is probably a good alternative, and future developments in online exposure monitoring could be aimed at allergen monitoring instead of online pollen monitoring. Online pollen monitoring has been proven to be challenging. These new findings might change the design of clinical trials aimed at evaluating the efficacy of new drugs and specific immunotherapy (vaccines) for pollen-related respiratory allergy. Moreover, both allergy diagnostic and immunotherapy moved towards a molecular approach; in other words, allergens, instead of pollen extracts, are now used for identifying and selecting patients for immunotherapy and the latter is going to be standardized according to the allergen content.

One of the main added values of HIALINE is that up to now, pollen where a black box and the scientific community knew that human being react to allergens, but nobody knew the allergen from pollen. That has now changed by HIALINE. This opens up a whole new research field to establish to what patients react, only the allergen or is there more to pollen than allergen. These factors might react differently to climate change and environmental pollution than the allergen itself. If not, then we know where to look for and efforts should be made to make online allergen monitoring feasible, a challenge for European industries.

In HIALINE the patient symptoms are missing. Our results clearly indicate that patient symptoms should be monitored simultaneously to pollen count and allergen measurements. To do so a link to the Pollen Hayfever Diary is already posted on our website (<http://www.hialine.eu/en/pollen-diary-pollentagebuch.php>). This would be an excellent new topic for a future cooperation. Up to now it seems that pollen monitoring is a good qualitative way to investigate the absence or presence of allergen in the air. To quantify the amount, and perhaps the symptoms in patients, allergen measurements might be an improvement.

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