Capteurs de pollens et pollution : étude Européenne AIS Life

Samuel Monnier, Michel Thibaudon, Charlotte Sintt, Gilles Oliver, Jean-Pierre Besancenot
RNSA (Réseau National de Surveillance Aérobiologique)
Capteurs de pollens et pollution : étude Européenne AIS Life - Samuel Monnier

• Intérêts financiers : néant

• Liens durables ou permanents : néant

• Interventions ponctuelles : néant

• Intérêts indirects : néant
Aerobiological Information Systems and allergic respiratory disease management

AIS LIFE (AIS LIFE LIFE13 ENV/IT/001107)

University of Florence - Department of Agrifood Production and Environmental Sciences, Florence, Italy (UNIFI)

CNR Institute of Clinical Physiology, Pisa, Italy (IFC-CNR)

University of Pisa - Department of Biology, Pisa, Italy (UNIP)
Main objectives

To develop the information base for policy on environment and health addressing of pollen-related allergic respiratory diseases.

The specific objectives:

- To improve pollen-related allergic respiratory disease management through the permanent setup of Aerobiological Information Systems (AIS) in three European countries, contributing to disease control, improved quality of life and direct/indirect reductions of direct/indirect of costs.

- To assess exposure to pollen at the general population level, by considering pollen count and interaction with air pollutants.
LIFE AIS project
Main objective: to develop the information base for policy on environment and health, in term of improved management of pollen-related allergic respiratory diseases

A: PREPARATORY ACTIONS:
Set up of Integrated Information Systems (IIS) in three countries (IT, FR, AT)
Set up of Personal Pollen Information system (PPI) in France and Italy in combination with QoL survey.

B: IMPLEMENTATION ACTIONS:
Implementation of IIS and PPI in three countries, health assessment of the patients.
Development of case studies:
1. Provision of recommendation for plant occupation of public green area.
2. Mapping of urban and rural environments through land use and allergenic plants data, agroclimatic indices.

C: MONITORING ACTIONS:
Monitoring of the long-term implementation of Aerobiological Information Systems. Validation and comparison of the effectiveness of the two Aerobiological Information System.

D: COMMUNICATION ACTIONS:
Dissemination, promotion and involvement plan; Website/social media; Stakeholder involvement activities; Informing Target Audiences and general Public.

E: MANAGEMENT ACTIONS:
Management, monitoring and evaluation of project progress, Networking, Planning for continued action (AFTER LIFE communication Plan), External audit.
Two aerobiological information systems will be developed and evaluated in terms of effectiveness:

- Integrated Information System (IIS) providing past weekly pollen and air pollutants concentrations, current weekly tendency and clinical recommendations
- Personalised Pollen Information System (PPI) showing a general and personal pollen information, with their tendency for the next 3 days.
System 1.

Pollen data

Meteorological data

Air quality data: analysis of pollutions

Improve the management of respiratory diseases

Medical indication

AIS

IIS
System 2. Symptoms Evaluation: method developed in Austria
Receive your personal pollen information

- Hazel: Low (3), Moderate (3), High (4)
- Alder: Low (3), Moderate (3), High (4)
- Birch: Low (2), Moderate (1), High (2)
The aims of study are to provide recommendations for plant cultivation in public green areas, to assess pollen counts in public gardens and to formulate recommendations in order to protect allergic patients.
RNSA actions  B4. Summary

• **WHAT:** Pollen count and allergens
• **HOW:** Pollen traps for analysis of local pollen dispersion:
  - Sigma 2 passive pollen trap (change slide daily)
  - Hirst pollen trap at proximity (change drum once a week)
  - Slides are analysing by the RNSA (in partnership with LHVP).
• **WHERE:** Public gardens in Paris and Lyon
• **WHEN:** 2 campaigns 16 weeks = 32 weeks
  - Campaign 1: March 2015 to mid-June 2015
  - Campaign 2: March 2016 to mid-June 2016
• **LEADER:** INSERM, RNSA will be coordinators of the field survey in their Centers (Paris and Lyon), UPMC will support the activities of the action.
• **Expected results:** field assessment of pollen count during pollen season. Study of distribution of pollen in public green spaces according to season. Recommendations on plant occupation of public green spaces.
RNSA actions B4: Pictures of the Hirst pollen traps in Paris

Paris Pasteur
The pollen trap is located on the roof of the Pasteur Institute in the 15th district.
Long. 2°20 – Lat. 48°52 – Alt. 60 m – pollen trap brand: Lanzoni – number of people concerned: 2 500 000

Paris LHVP
The pollen trap is located on the roof of the LHVP (Laboratory of Hygiene of the city of Paris) in the 13th district.
Long. 2°21 – Lat. 48°49 – Alt. 60 m – pollen trap brand: Lanzoni – number of people concerned: 2 500 000
RNSA actions B4: Pictures of the Hirst pollen traps in Lyon

**Lyon HEH**
The pollen trap is located on the roof of the Hospital Edouard Herriot (HEH) in the 3rd district in Lyon.
*Long. 4°53 – Lat. 45°44 – Alt. 52 m • pollen trap brand: Lanzoni • number of people concerned: 1 000 000*

**Lyon Gerland**
The pollen trap is located on the roof of the Biomnis and Inserm Institute in the 7th district Gerland.
*Long. 0°38 – Lat. 44°12 – Alt. 48 m • pollen trap brand : Lanzoni • number of people concerned : 1 000 000*
Sigma2-like traps (SLT): passive pollen trap

SLT is composed on one hand of a transfer zone of air flow (high part) and on the other hand of a reception zone of particles by sedimentation (low part). Air flow goes through the trap in central zone, particles sediment and come on a coated slide disposed in the lower part of the trap.

The slides are changed every day.

Then the slides are sent to the RNSA and analyzed with an optical microscope to obtain pollen counts (number of pollen grains by unit of time).

Analyses in a lab

1 slide by day

counting pollen through a speech recognition system with an optical microscope
RNSA actions B4.
Presentation of the gardens

Paris

- SLT Choisy 1 et Choisy 2
- SLT Jardin des plantes
- SLT Dalpayrat
- Hirst Paris Pasteur
- Hirst Paris LHVP
RNSA actions B4.
Presentation of the gardens

- **Parc de Choisy**: It’s a public garden of 43 000m² which was created in 1937.

  **Address**: Avenue de Choisy 75013 Paris France.

2 SLT pollen traps have been installed and the slides are changed every day by trained staff from LHVP (Laboratoire d’Hygiène de la Ville de Paris) who work next to the parc.
Parc Pierre Adrien Dalpayrat: It’s a public garden of 9898 m² which was created in 1985.

Address: 2 Rue André Gide, 75015 Paris France.

1 SLT pollen trap has been installed and the slides are changed every day by trained staff from city hall of Paris (“service exploitation des jardins”) who work in the parc.
Parc Jardin des Plantes du Museum d’Histoire Naturelle: It’s a big public garden of 24 hectares open to the public for over 400 years with a wide variety of species.
Address: 57 Rue Cuvier, 75005 Paris France

1 SLT pollen trap has been installed and the slides are changed every day by trained staff from the natural history museum (MNHN) who works in the garden.
RNSA actions  B4.
Presentation of the gardens

Lyon
Parc de la Tête d’Or:
The “Parc de la Tête d’Or” is one of the bigger public parc in France. It was designed on the model of the English garden and was created in 1857.
Address: Boulevard de Stalingrad 69006 Lyon France

1 SLT pollen trap has been installed and the slides are changed every day by trained student staff from Lyon.
RNSA actions B4.
Presentation of the gardens

- **Parc de Gerland**: It’s the second bigger parc in Lyon; it occupies an area of 18 hectares and was created recently in 2000.
  Address : Avenue Jean Jaures 69007 Lyon

1 SLT pollen trap has been installed and the slides are changed every day by trained staff from “jardin des fleurs” of the parc de Gerland in Lyon.
Parc de l’Hôpital de la Croix Rousse: It’s a parc of 4.5 ha located in the 4th arrondissement of Lyon next to the Croix-Rousse hospital. It was designed by René-Edouard André in 1913 and includes about 1200 trees.

Address: 103 Grande Rue de la Croix-Rousse 69004 Lyon France

1 SLT pollen trap has been installed and the slides are changed every day by trained student staff from Lyon.
RNSA actions B4.
Large public communication to present the action in each gardens

Paris

Lyon
Pollen allergy depends on several parameters such as the amount of pollen in the air, the sensitivity of people and the allergy potency of the pollen of each plant species.

The pollen allergy potency of a plant species is the ability of its pollen to cause an allergy to a significant part of the population.

The pollen allergy potency can be:

- **Low or negligible:** No problem to plant them in urban garden
- **Moderate:** Only a few species can be planted in the same garden
- **High:** This species must not be planted in urban places

Species or genus with a strong AP in red should be labeled as "Not to be planted in habitation or residence area", those with moderate AP in yellow should be labeled as "Not to be planted in big quantities in habitation or residence area". Other species with low or negligible AP in green may not be affected by public information.
Results Paris: Number of pollen grains for each allergenic taxon: March-June 2015 and March-June 2016

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Percentage of each taxon compared to all taxa

2015

2016
### Results Lyon: Number of pollen grains for each allergenic taxon: March-June 2015 and March-June 2016

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Percentage of each taxon compared to all taxa

Lyon SLT Gerland – Percentage of each taxon compared to all taxa
Lyon SLT Croix Rousse – Percentage of each taxon compared to all taxa
Lyon SLT Gerland - Percentage of each taxon compared to all taxa
Lyon SLT Croix Rousse - Percentage of each taxon compared to all taxa

2015

2016

[Bar charts showing the percentage of each taxon compared to all taxa for different locations and years]
Comparison Total taxa SLT and Total taxa HIRST

Comparison Total taxa SLT Choisy 2 and Hirst Pasteur - 2016

Comparison Total taxa SLT Choisy 2 and Hirst LHVP - 2016
### Index of exposure

*Index of exposure* takes into account the allergy potency of the species and the number of pollen grains.

\[
\text{Index of exposure} = \frac{\text{Allergy potency} \times \text{Number of pollen grains}}{1000}
\]

### Index of source

*Index of source* takes into account the allergy potency and the number of species.

\[
\text{Index of source} = \frac{\text{Allergy potency} \times \text{Number of species}}{10}
\]

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Pollen trap</th>
<th>SLT Tête d’Or Index of source</th>
<th>SLT Tête d’Or Index of exposition</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td>Betula (birch)</td>
<td>23</td>
<td>9</td>
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<td>Carpinus (hornbeam)</td>
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<td>n</td>
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<tr>
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<td>83</td>
<td>87</td>
<td></td>
<td>r</td>
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<tr>
<td>Salix (willow)</td>
<td>5</td>
<td>1</td>
<td></td>
<td>n</td>
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</table>

**Legend:**
- *n* = nothing to do
- *l* = limit the species
- *r* = remove the species
**Index of exposure**: it takes into account the allergy potency of the species and the number of pollen grains.

\[
\text{Index of exposure} = \frac{\text{Allergy potency} \times \text{Number of pollen grains}}{1000}
\]

**Index of source**: it takes into account the allergy potency and the number of species.

\[
\text{Index of source} = \frac{\text{Allergy potency} \times \text{Number of species}}{10}
\]

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<tr>
<th>Taxa</th>
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</table>

Legend:
- \( n \) = nothing to do
- \( l \) = limit the species
- \( r \) = remove the species
• The different results show that according to their locations, SLT pollen traps provide substantially similar results, despite some little differences for some taxa from one garden to another depending on the species locally present. The pollen seasons are the same on the Hirst and SLT pollen traps with often peaks at the same time.

• Some taxa highlighted on the proximity pollen traps seem to be related to the surrounding vegetation (Cupressaceae, Plantaginaceae, Platanus, Poaceae …)

• The exposure and source index calculated in this study in Paris and Lyon can be used as a tool to select the best and most appropriate plant species to include in new green spaces. These indices can also be applied to existing parks and gardens as a means of assessing current allergenicity and as a management tool for taking corrective action wherever risk situations are perceived.
• There are many allergenic species in the parc of the cities of Lyon and Paris like birch, cypress, plane tree .... We need to take into account the health impact in the choice of vegetal species to implant in green areas and avoid to plant allergenic species.

• With these results, a guide has been done with recommendations for species to avoid and species to plant in the green areas and parc in France available on the website:

http://www.vegetation-en-ville.org/que-faire/le-potentiel-allergisant/
A big thanks to

- Jean Claude Bertrand and the staff of the green spaces in Paris
- Eric Joly, Philippe Barré, Xavier Riffer, Sylvie Rebuffat and the staff of the MNHN in Paris
- Georges Salines and Marc Bret from the city hall of Paris
- Isabella Annesi-Maesano from Inserm Paris
- Valérie Bex, Vincent Doucet, Sophie Barral...and the staff of the LHVP in Paris
- Franck Grangette and the staff of the « maison des fleurs » de Gerland
- Jean-Claude Teoli the director of the Croix-Rousse hospital in Lyon
- Sophie Pamies Directrice de l’Ecologie Urbaine à Lyon
- Dominique Deruaz, Daniel Boulois, Fabienne Chevalier, Frédérique Pautz, Dominique Peyrard...of the city hall of Lyon
- Audrey Tissot for changing the slides every day of the SLT Parc Tête d’Or and Croix Rousse.
- The staff of the RNSA for reading the slides of each SLT
Thank you for your attention!