The pollen as a biological pollutant?

Gilles Oliver – Michel Thibaudon
Contents

- « Pollution »
- Airborne particles and allergy
- Allergy potency and allergy risk
- Metrology
- Health impact
- Pollen and clinical index
If chemical particles that cause air pollution are subject to measures limiting their sources, it cannot be the case of biological particles such as pollens or moulds from vegetation.
Pollens = Biological pollutant?

In quantitative and qualitative terms, most of the pollens and moulds inhaled by the population come from natural plant species. But, downtown, in public park and garden, the air content in pollens is modified by surrounding plant species, planted by man.
Airborne particles and allergy

Some of these pollens have a high allergy potency and have a real health impact. But can we consider some of them as pollutants?

**Exposure**

**Health impact**

- sneezing
- itching
- rhinitis 90%
- conjunctivitis 75%
- cough
- tracheitis, asthma 50%
Allergy potency of pollens

The allergy potency takes into account the number more or less important of major allergens into pollen grains.
# Allergy potency of trees

<table>
<thead>
<tr>
<th>TREES</th>
<th>Potency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypress</td>
<td>5</td>
</tr>
<tr>
<td>Hazel</td>
<td>3</td>
</tr>
<tr>
<td>Alder</td>
<td>4</td>
</tr>
<tr>
<td>Poplar</td>
<td>2</td>
</tr>
<tr>
<td>Elm</td>
<td>1</td>
</tr>
<tr>
<td>Willow</td>
<td>3</td>
</tr>
<tr>
<td>Ash</td>
<td>4</td>
</tr>
<tr>
<td>Hornbeam</td>
<td>3</td>
</tr>
<tr>
<td>Birch</td>
<td>5</td>
</tr>
<tr>
<td>Plane tree</td>
<td>3</td>
</tr>
<tr>
<td>Mulberry</td>
<td>2</td>
</tr>
<tr>
<td>Beech</td>
<td>2</td>
</tr>
<tr>
<td>Oak</td>
<td>4</td>
</tr>
<tr>
<td>Pine</td>
<td>0</td>
</tr>
<tr>
<td>Olive</td>
<td>3</td>
</tr>
<tr>
<td>Lime</td>
<td>3</td>
</tr>
<tr>
<td>Chestnut</td>
<td>2</td>
</tr>
</tbody>
</table>
# Allergy potency of weeds

<table>
<thead>
<tr>
<th>Weeds</th>
<th>Potency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorrel</td>
<td>2</td>
</tr>
<tr>
<td>Grasses</td>
<td>5</td>
</tr>
<tr>
<td>Plantain</td>
<td>3</td>
</tr>
<tr>
<td>Pellitory</td>
<td>4</td>
</tr>
<tr>
<td>Nettle</td>
<td>1</td>
</tr>
<tr>
<td>Goosefoot</td>
<td>3</td>
</tr>
<tr>
<td>Mugwort</td>
<td>4</td>
</tr>
<tr>
<td>Ragweed</td>
<td>5</td>
</tr>
</tbody>
</table>

![Grasses](image1.png)

![Nettle / Pellitory](image2.png)

![Ragweed](image3.png)
What is the **allergy potency** of Birch?

High
Allergy risk

What is the **allergy risk** of Birch...

...in Munich?  ➔  High

...in Cordoba?  ➔  Null
Metrology

Orifice (10 l. air/min)

Reading
2 horizontal lines

Tape on the drum

<table>
<thead>
<tr>
<th>1st day</th>
<th>2nd day</th>
<th>etc...</th>
</tr>
</thead>
</table>

1h = 2mm
Analysis

Retrieving of the strip on the drum

Cutting of the strip in daily parts

1 slide by day

Counting thanks to a voice recognition system

Daily amounts in grains/m³

Pollens counts
EAN (European Aeroallergen Network)

- 423 pollen monitoring stations in Europe contributing to EAN

- Most are located in cities

- 1 or more networks in each country

- No official support in many countries (in contrast with air pollution)
Map of the French stations in 2014
The allergy is an abnormal reaction of the body against external substances called allergen. The main clinical symptoms are rhinitis, conjunctivitis and asthma. Allergies affect the quality of life (restriction of usual activities, sleep disturbances, impaired alertness) and have a cost (absence from work, consultations and treatments).
Health impact

Allergenic pollens cause to around 20% of the population troubles known as "hay fever" or "pollinosis". To measure the health impact, the RNSA use a network of sentinel clinicians who provide weekly data including information on the intensity of symptoms they noticed during consultations for the current week. From this information is calculated a clinical index.
Health impact

Clinical report
Sent each week to one hundred doctors
Distribution map of the French network of doctors of the RNSA

- Normandie - Île de France: 15
- Centre, Auvergne, Périgord: 13
- Rhône - Alpes: 13
- Méditerranée: 15
- Nord - Est: 17
- Centre - Est: 8
- Pays-de-Loire, Charente, Vendée: 16
- Bretagne: 4
- Sud - Ouest: 8

RNSA
**Health impact**

<table>
<thead>
<tr>
<th>Pollinosis Symptoms</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pollinoses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evolution/previous week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chosen criteria for the determination of **pollinosis number** correspond to the number of patients with symptoms consulting or phoning.
Health impact

Symptoms:

The 4 chosen criteria for the quotation of symptoms are:
- disabiling
- diurnal
- nocturnal
- repercussions on work

0 criteria correspond to **NULL**
1 ou 2 criteria correspond to **WEAK**
3 criteria correspond to **MEAN**
4 criteria correspond to **STRONG**
### How to evaluate the intensity of symptoms?

<table>
<thead>
<tr>
<th>Symptom Gravity</th>
<th>Null</th>
<th>Weak</th>
<th>Mean</th>
<th>Strong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>🟢</td>
<td>🟡</td>
<td>🟠</td>
<td>🟢</td>
</tr>
<tr>
<td>Rhinitis</td>
<td>🟢</td>
<td>🟡</td>
<td>🟠</td>
<td>✅</td>
</tr>
<tr>
<td>Cough</td>
<td>🟢</td>
<td>🟡</td>
<td>✅</td>
<td>🟧</td>
</tr>
<tr>
<td>Asthma</td>
<td>🟢</td>
<td>✅</td>
<td>🟠</td>
<td>🟢</td>
</tr>
<tr>
<td>Cutaneous signs or other</td>
<td>🟢</td>
<td>✅</td>
<td>🟧</td>
<td>🟢</td>
</tr>
</tbody>
</table>

**Example for a doctor:**
- « Mean » Conjunctivitis = 2 x 1 = 2
- « Strong » Rhinitis = 3 x 2 = 6
- « Weak » Cough = 1 x 1 = 1
- « Mean » Asthma = 2 x 1 = 2
- « Null » Cutaneous signs = 0 x 1 = 0

To add the results of all doctors of a town and make an average by doctor:

**Clinical Index → 11/18**
Pollens = biological pollutants?

For some species like oak and ash for instance, they come from natural species, and it is not possible to control sources. So we cannot consider them as pollutant.
Pollens = biological pollutants?

On the other hand, some species are planted by man:
- birch (planted in public parks)
Pollens = biological pollutants?

- cypress (Cupressaceae Sempervirens for instance) to make hedges in Mediterranean area
Pollens = biological pollutants?

- ornamental grasses on roundabout or public parks
Pollens = biological pollutants?

- ragweed is another kind of species for which human is directly concerned by the transport of the seeds and needs a real strategy of management to limit its proliferation.
Clinical and pollen index
Conclusion

For some species, they come from natural species and it is not possible to control sources. So we cannot consider them as pollutant.

But for some species planted by man (with pollens with a high allergy potency) which could also be controlled by man, maybe we can consider them as « biological pollutant »
THANK YOU FOR YOUR ATTENTION