Ozone-induced chemical modifications of pollen coating

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Keywords: bioaerosol, pollen allergy.

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The pollen coating is a layer, or droplets, of organic compounds deposited onto the surface of pollen grain (Piffanelli, 1998). The following chemical families were identified on the pollen coating: saturated and unsaturated fatty acids, alkanes, alkenes, alcohols, aldehydes, ethers, amino-alcohols and phenolic compounds. The pollen coating plays important role for pollen-water interactions during germination and its constituents may also be implicated as adjuvant of the allergenic reaction.

Pollen may be altered by air pollution in different ways (Sénéchal, 2015): physical degradations (like cracks), chemical changes (including protein nitration) and sticking of particles. Those alterations produced changes in allergenic potential, an easier dispersal of allergen and a decrease in germination. Only little information is however available on the modification of the pollen coating by pollution.

In this work, pollen was exposed to ozone in laboratory conditions (16 hours of exposure, 100-1300 ppb). Coating was extracted by aqueous or organic solvents; after several steps of preparation (filtration, solvent evaporation and derivatization) samples were injected into gas chromatography with either flame ionization or mass spectrometry detector.

The coating of pollen was modified by laboratory ozone exposure (figure 1). Increases in the quantities of dicarboxylic acids, short-chain fatty acids and aldehydes were observed. 4-hydroxybenzaldehyde was the main reaction product and its formation was linearly increasing with the ozone concentration. 4-hydroxy-benzaldehyde is formed via the ozonolysis of acid coumaric monomers constitutive of the sporopollenin and was not formed from the ozonolysis of constituents of the pollen coating. This assumption was checked by exposing defatted-pollen to ozone.

These chemical modifications may have effects on pollen germination, on lipids adjuvant effects to allergenic reaction and cloud condensation activities of pollen or pollen parts.

Piffanelli, P., Joanne H. Ross, E., and Murphy, D.J. *Sexual Plant Reproduction* **11**, (1998): 65–80.

Sénéchal, H., Visez, N., Charpin, D., Shahali, Y., et al. *The Scientific World Journal* 2015: ID 940243.

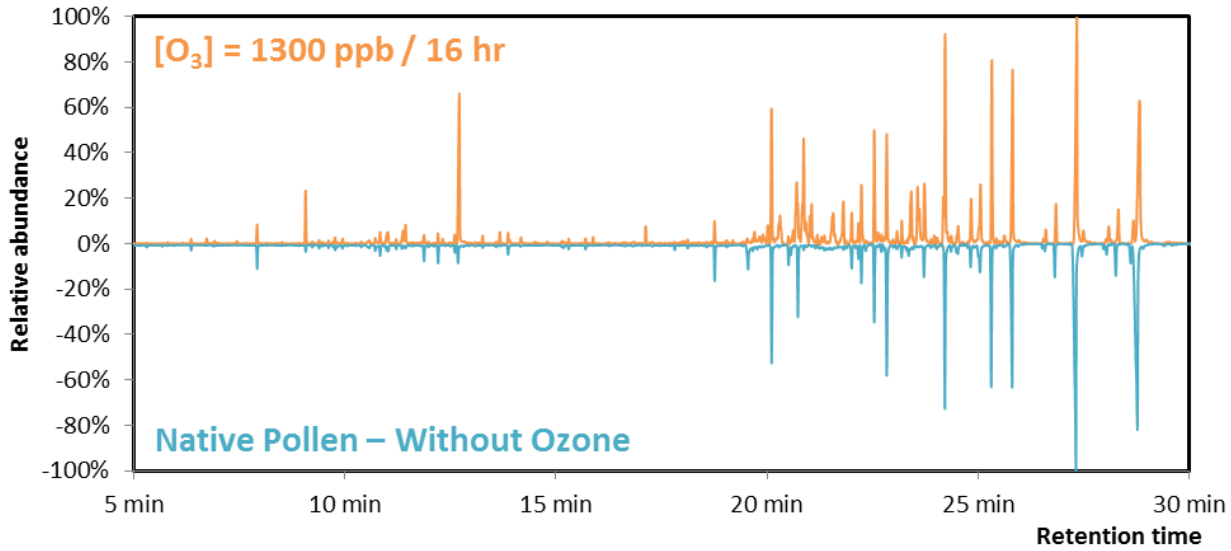

Figure 1. Comparison of chromatograms for laboratory ozone-polluted pollen (top) and native *Pinus halepensis* pollen (bottom)