100521 | Traffic related air pollutants induced elevated platanus pollen allergenicity – A study in three cities of Iberian Peninsula

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Background: Air pollution aggravates asthma and respiratory allergies evoking higher incidence and/or symptoms worsening in heavily polluted areas. Road traffic is one of the major sources of air pollutants on urban environments. Pollen from *Platanus hispanica*, dispersed in early spring, contacts closely with air gaseous pollutants generated by automobile traffic, such as nitrogen oxides and ozone, whose effects on its allergenic properties are still unclear.
The objective of this work was to evaluate allergenicity in *P. hispanica* pollen from Lisbon, Toledo and Madrid in relation to local air pollutant levels.
Method: Pollen was harvested in 2019 in Lisbon, Toledo and in four locations within Madrid (Retiro, Pz. Eliptica, Ens. Vallecas and M. Alvaro), in the proximity of Air Quality Monitoring Stations. NOx, O_3, PM10 and PM2.5 concentrations were obtained from open access databases and were compared between stations.
Pla a 1 allergen was quantified by ELISA from pollen protein extracts. Western blot was used to compare pollen Pla a 1 relative content according to location and immunoblot using pooled sera from allergic individuals was used for IgE recognition patterns.
Results: NO and NO_2 levels were higher in *Pz.Elíptica*, reaching a maximum of 111 and 108 mg/m^3, respectively. *Retiro* station registered the lower values for both pollutants (max. 30 and 61 mg/m^3, respectively). Daily mean O_3 concentration varied between 20–80, 20–68 and 16–65 mg/m^3 in *Retiro*, *Ens. Vallecas* and *Pz.Eliptica*, commonly higher in the *Retiro* station during the whole period.
Pla a 1 concentration varied between 1.2 ± 0.2 and 2.9 ± 0.2 µg Pla a 1/mg protein and was significantly different in *Retiro* (higher O_3 levels) and *Pz Eliptica* (higher NOx levels) samples. Semi-quantitative analysis by western-blot revealed an equivalent profile.
IgE-recognition pattern showed several bands differentially detected in pollen extracts, with band 51 ± 1 kDa and 37 ± 1 kDa more intense in *Retiro*, M. Alvaro (both Madrid) and Toledo.
Conclusion: Taken together, these results show that pollution pockets with distinct characteristics could be found within Madrid city influencing pollen specific allergenic profiles. A better understanding of the effects of environmental pollutants on the allergenic characteristics of pollen is essential to understand the phenomenon of increased respiratory allergy incidence in urban spaces.
Conflicts of interest: The authors did not specify any links of interest.

100644 | Enhancing pollen forecasting for allergy management: A data-driven ensemble modeling approach

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Background: Reliable airborne pollen forecasting is essential for individuals with allergies, as exposure can lead to respiratory conditions such as rhinitis and asthma, trigger flare-ups of existing symptoms, and cause skin irritation. An accurate forecast minimizes exposure to allergenic pollen, improves quality of life, reduces health risks, and aids in managing symptoms effectively, ensuring better daily comfort and well-being.
Method: In this study, we developed an ensemble modeling approach to forecast grass airborne pollen concentrations, testing it in two European cities—Augsburg, Germany, and Córdoba, Spain—characterized by distinct climates. The model integrates historical pollen data from traditional Hirst-type volumetric traps with key meteorological parameters, including humidity, temperature, and precipitation. Using data from 2016–2023 for training and 2024 for validation, 61 models were initially tested.
Results: Seven high-performing sub-models—Generalized Linear Model, Extreme Gradient Boosting, Neural Network Time Series, Random Forest, Support Vector Machine, Hybrid Prophet-XGBoost, and ARIMA—were selected for ensemble development. The weighted ensemble strategy achieved, for Poaceae taxa, an R^2 of 0.64 in Córdoba and 0.63 in Augsburg, with the Neural Network Time Series and ARIMA contributing significantly to the final prediction during the pollen season. Historical pollen levels and previous-day temperature were identified as key predictive factors. Stronger predictive performance ($R^2 = 0.88$) was obtained by integrating historical pollen data from an automatic monitor (BAA5000, Helmut Hund GmbH) and adapting model weights to specific locations and pollen types. The model's real-world applicability was validated through a pilot study using the *PollDi* app, where three-day predicted pollen levels—generated by BAA5000 in Augsburg during 2023 grass pollen season—aligned well with reported allergy symptoms, including nasal, ocular, and bronchopulmonary.
Conclusion: The results reveal that robust pollen predictions are crucial for allergy management, helping individuals to mitigate exposure risks and better plan daily activities. Achieving this requires integrating environmental variables—such as temperature, precipitation, and real-time pollen data—and can be further enhanced by incorporating clinical symptom records for more personalized strategies. Our study provides a