Influence of climate change on pollen counts and pollinosis in Madrid, a study over 40 years.

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BACKGROUND

Climate changes may affect the quality and amount of airborne allergenic pollens. The direct assessment of such effect requires long observation periods in a restricted geographic area.

METHODS

Pollen counting was carried out from **1979 to 2018 using a Burkard 7 day recording volumetric spore trap**. Meteorological data from the Madrid-Barajas station located at 9 km, were used. The beginning and the end of the season were considered as the **first day for three consecutive days >10** and the **last day for three consecutive days >10 grains/m³**. The prevalence of positive skin prick tests was studied among patients with pollinosis in 1979 (n=100), 1994 (n=316) and 2019 (n=100). Descriptive statistics, grouping average data for successive five-year periods, non-parametric correlations (Spearman's rho) to assess the effect of temperature on pollen concentrations and on skin sensitization, were carried out.

RESULTS

Temperature increase over 40 years in Madrid

- A significant **1.3 ºC increase** in 5-year mean temperature records over 40 years in Madrid, was observed (r_s=0.81, p=0.014).

Total pollen concentrations

- 5-year mean total pollen concentrations with temperature provided significant correlations (r_s=0.74; 0.90 and 0.71; p=0.037; p=0.002 and p=0.047, for **Cupressaceae, *Platanus*, and *Quercus*** respectively). In the linear regression analysis, **one-degree annual mean increase in temperature** has produced **an annual increase** of approximately **3,000, 9,000 and 5,000 pollen grains/m³, respectively**.

Pollen season, start and end

- An **advance at the beginning** was observed on **Cupressaceae -31 days** that correlate significantly with the 5-year mean temperature (r_s = -0.76 p = 0.18**), Olea -7 days** (rs = -0.71, p = 0.047) and almost significant in the case **of Poaceae -4 days** (r_s = -0.690, p = 0.058). An advance, but not significant were observed on **Quercus -13 days** and **Platanus: -6 days**.
  An **advance**, but not significant at **the end** of the season were observed on **Poaceae -7** days and **Olea -8** days. (Table)

Pollen season duration

- A significant **increase** in the 5-year mean pollen season duration, was observed only for **Quercus 7 days**, (r_s = 0.90; p = 0.002).
- An increase but not significant in the 5-year mean pollen duration were observed on **Cupressaceae 13 days** and **Platanus 4 days**

On the contrary, a **decrease**, but not significant, were observed on pollen season durations of **Poaceae, -3** days and **Olea -1 day.** (Table)

Positive skin prick test

A dramatic increase in **the prevalence of positive skin prick tests** performed **in 1979, 1994 and 2019** were observed for **Cupressus arizonica (0%, 20%, 59%), Platanus acerifolia (2%, 52%, 56%)**, and **Quercus rotundifolia (0%, 14%, 22%)**, but without statistical significance in the linear regression analysis, due to insufficient sample size.

CONCLUSIONS

The increase of temperature over 40 years in Madrid, **could have modified the global pollen load** and affected the **rate of Cupressaceae, *Platanus* and *Quercus allergic* sensitization** among pollinosis patients of this city.

5 years averages	Mean Tº	Platanus*			Cupressaceae**			Poaceae***			Olea*			Quercus*		
		Days respect begining -6	Days respect end -2	Dura-tion	Days respect begining -31	Days respect end -18	Dura-tion	Days respect begining -4	Days respect end -7	Dura-tion	Days respect begining -7	Days res. end -8	Dura-tion	Days respect begining -13	Days respect end -6	Dura-tion
		Start	End	Dura-tion	Start	End	Dura-tion	Start	End	Dura-tion	Start	End	Dura-tion	Start	End	Dura-tion
79-83	14,3	87	119	31	120	207	87	13	78	66	142	179	37	115	177	62
84-88	13,9	88	121	33	94	179	84	10	76	66	145	182	37	109	170	61
89-93	14,4	81	120	39	103	172	69	8	72	64	137	177	40	110	174	64
94-98	15,0	73	110	37	69	190	121	8	71	63	125	164	39	89	162	73
99-03	14,3	75	111	35	90	170	81	8	69	61	134	165	31	97	163	65
04-08	14,8	80	117	38	74	197	123	6	68	61	132	167	35	102	173	71
09-13	14,9	84	115	31	92	220	128	6	69	63	130	165	35	92	170	78
14-18	15,7	84	117	33	71	180	109	8	64	56	135	168	33	99	176	77

*Day of the year from January 1. **Day of the year October 1.*** Day of year May 1