The impact of rainfall on airborne dynamics of *Alternaria* spores and its major allergen Alt a 1: A preliminary study.

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Alternaria spores are commonly found in the atmosphere and have been described as a significant source of allergens. Although up to 17 allergens have been characterized in this fungal genus, the glycoprotein Alt a 1 is the major allergen, reacting with over 90% of IgE serum in patients sensitized to *Alternaria*. Traditionally, the exposure to this allergen has been assessed by aerobiological spore counts, but this method does not always offer an accurate estimation of airborne allergen load. Previous studies have shown that allergens can be release from spores into the air under specific weather conditions such as thunderstorms, posing a higher risk to the allergic population. However, there is a lack of knowledge regarding the factors that facilitate the release and persistence of allergens in the atmosphere, particularly those related to fungi. This study aims to determine the impact of rainfall on allergen release from the spores and to explain potential discrepancies between the airborne concentration of allergen and *Alternaria* spores. The study was conducted in León (Spain) over a one-month sampling period (May 2017). This month was selected due to the particular meteorological features, being warmer than usual and keeping the normal precipitation values for this period. Airborne spores were sampled using a Hirst-type volumetric sampler, following the methodology proposed by CEN legislation EN 16868:2019. Daily spore concentration was measured following the methodology proposed by Galán et al. (2021). Furthermore, the allergenic fraction was collected by a cyclone low-volume sampler and the major allergen Alt a 1 was quantified by ELISA on daily samples. Additionally, rainfall variables were measured using a disdrometer. The non-parametric Spearman rank correlation was applied to analyze the relationships between rainfall parameters and the airborne concentration of spores and Alt a 1. The results reveal a noticeable delay between the occurrence of *Alternaria* spores and Alt a 1 due to rainfall events. Precipitation days with raindrop sizes ranged between 0.125 and 4 mm, distributed throughout the day, mainly at midday, had null or very low concentration values of *Alternaria* spores. However, the allergen concentration usually increases following a couple of days of rain, typically associated with light precipitation events (raindrop sizes < 4 mm and low intensity), coinciding with maximum temperatures around 20 ºC and an increment in minimum temperatures. On the other hand, punctual rainfall events with raindrop sizes higher than 4 mm could favor the release of *Alternaria* spores. This preliminary study highlights

the importance of analyzing different rainfall parameters to better understand the discrepancies between aerobiological counts and allergen concentration.