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## 西安市秋季灰霾天气微生物气溶胶的特性研究

### Characteristics of microbial aerosols on haze days in Autumn in Xi'an, China

关键词: [灰霾](#) [微生物气溶胶](#) [浓度](#) [粒径分布](#) [种属](#)

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**摘要:** 为探明西安市秋季灰霾天气条件下微生物气溶胶的特性,于2014年10月7日到23日两次灰霾过程期间,在西安市长安大学站点,采用Andersen六级撞击式空气采样器对细菌与真菌气溶胶进行采样,并对其浓度、粒径、种属分布及其与气象因素的相关关系进行详细分析.结果表明,在灰霾天期间,可培养细菌与真菌气溶胶的浓度水平分别为 $1102\sim 1737\text{ CFU}\cdot\text{m}^{-3}$ 和 $1466\sim 1704\text{ CFU}\cdot\text{m}^{-3}$ ,不仅远高于非灰霾天微生物气溶胶的浓度值,也超过了中国科学院推荐的标准值.在非灰霾天气条件下,空气中大部分可培养细菌气溶胶(79.7%)与真菌气溶胶(74.6%)均分布在粗颗粒范围( $>2.1\mu\text{m}$ ),它们的中位径(NMD)分别为 $(2.32\pm 0.12)\mu\text{m}$ 、 $(2.48\pm 0.24)\mu\text{m}$ ;而在灰霾天气条件下,可培养细菌气溶胶与真菌气溶胶的中位径分别为 $(1.96\pm 0.29)\mu\text{m}$ 和 $(2.44\pm 0.23)\mu\text{m}$ .此外,在灰霾天期间,空气中优势细菌除了葡萄球菌属(*Micrococcus*)与微球菌属(*Staphylococcus*)外,还鉴定出了非霾天没有检测出的致病菌种奈瑟氏菌属(*Neisseria*);而真菌在灰霾天时,除了曲霉属(*Aspergillus*)检出频率大幅提高外,还出现了非霾天未鉴定出的致病菌属拟青霉属(*Paecilomyces*)与头孢霉属(*Cephalosporium*).研究表明,相比于非灰霾天气,灰霾天气下有更高的微生物气溶胶暴露风险.研究结果可以为评估灰霾暴发时微生物气溶胶引起的环境与健康效应提供基础数据.

**Abstract:** To study the characteristics of microbial aerosols on haze days in Autumn in Xi'an, China, air sampling were carried out on the campus of Chang'an University using a six-stage cascade impactor during 7~23 October 2014. Concentration, size distribution and microorganism genera of bioaerosols and their relationship with meteorological factors were analyzed. During haze days, the average concentrations of viable bacteria and fungi ranged from  $1102\text{ CFU}\cdot\text{m}^{-3}$  to  $1737\text{ CFU}\cdot\text{m}^{-3}$  and  $1466\text{ CFU}\cdot\text{m}^{-3}$  to  $1704\text{ CFU}\cdot\text{m}^{-3}$ , respectively, which were much higher than those detected during the non-haze days and exceeded the standard recommended by Chinese Academy of Sciences. 79.7% of airborne viable bacteria and 74.6% of fungi appeared in coarse size range ( $>2.1\mu\text{m}$ ) with the number median diameter (NMD) of  $(2.32\pm 0.12)\mu\text{m}$  and  $(2.48\pm 0.24)\mu\text{m}$ , respectively, during non-haze days. During haze days, however, the NMD of airborne bacteria and fungi was  $(1.96\pm 0.29)\mu\text{m}$  and  $(2.44\pm 0.23)\mu\text{m}$ , respectively. Moreover, the dominant genera of airborne bacteria on haze days were *Micrococcus*, *Staphylococcus* and *Neisseria*. *Neisseria* known as a pathogen was not found on non-haze days. For airborne fungi, the percentage of *Aspergillus* increased significantly on haze days. Two pathogenic genera, *Paecilomyces* and *Cephalosporium*, were not detected on non-haze days. Results indicated that there was an increased exposure risk to allergic and infectious bioaerosols during haze days. The present findings provide information for hazard of bioaerosols on environment and human health during haze days.

**Key words:** [haze days](#) [microbial aerosols](#) [concentration](#) [size distribution](#) [genera](#)

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