



Fungal contamination of wind instruments: Immunological and clinical consequences for musicians

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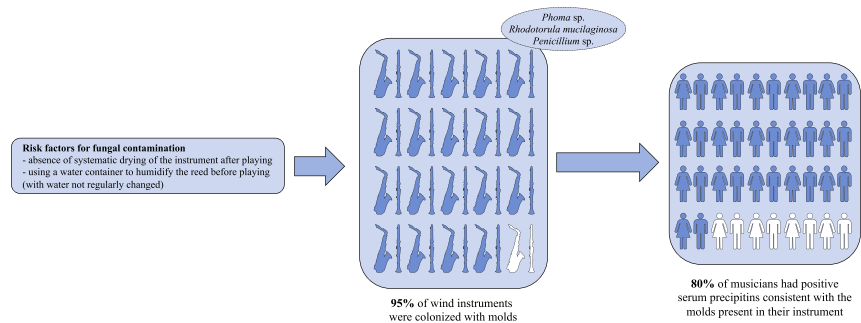
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HIGHLIGHTS

- Wind instruments are considered as an increasingly reported cause of hypersensitivity pneumonitis.
- There is considerable uncertainty over which organisms are responsible and over clinical and immunological consequences for musicians.
- Fungal contamination was found in almost every wind instrument and almost every musician had a significant sensitization to these fungi.
- Risk factor for fungi development were failure to dry the instrument after playing.
- Our findings suggest a way forward in the prevention of what is a widespread source of exposure and might probably become a common cause of HP.

GRAPHICAL ABSTRACT



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ABSTRACT

Introduction: Playing a wind instrument is an increasingly reported cause of hypersensitivity pneumonitis. However, current knowledge about contamination of wind instruments by fungi and specific fungal sensitization is scarce. Therefore, we aimed: (i) to assess the current prevalence and type of fungal contamination of wind instruments, (ii) to identify potential risk factors associated with instrument contamination, and (iii) to evaluate the prevalence of sensitization to these fungi among musicians.

Material and methods: Musicians from music schools in eastern France and who played a wind instrument were prospectively recruited (NCT01487850). The mouthpiece and the reed of their instrument were sampled to quantify the magnitude and type of fungi. Each subject had a physical examination, a mycological analysis of saliva and a blood sample in search of serum precipitins against the most frequent fungi isolated from instruments. The results were compared with those of 40 healthy non-exposed controls.

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Fungal contamination
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Results: Forty musicians playing a wind instrument (bassoon, clarinet, oboe, saxophone) were included. (i) 95% of wind instruments were colonized by fungi, mainly with *Phoma* spp., *Penicillium* spp. and *Rhodotorula mucilaginosa*; (ii) absence of systematic drying of the instrument was a main contributing factor; (iii) serum precipitins were significantly more present in the musicians' sera than in control sera and were consistent with the fungi present in their instrument.

Conclusion: This study reveals a constant and specific fungal contamination among wind reed instruments with a significant sensitization among musicians, pleading in favour of regular instrument cleaning. Physicians should be aware of this possible source of antigenic exposure.

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1. Introduction

Playing musical instruments is an increasingly reported cause of various health issues ranging from mild disorders to potentially fatal conditions (Okoshi et al., 2017). Respiratory disorders, especially resulting from wind instrument practice, include pneumo-mediastinum, lung infection, asthma and hypersensitivity pneumonitis (HP). The latter represents the only reported cause of fatal outcomes, and has become a major concern among musicians (Davis, 2016; King et al., 2017). HP is an interstitial lung disease caused by an immune response to a variety of antigens to which patients have previously been sensitized (Lacasse et al., 2012). In wind instrument players, HP is likely caused by the inhalation of microorganisms, mainly fungi, contaminating the reed or the mouthpiece of the instrument. Nevertheless, current knowledge on HP due to musical instruments is scarce, and HP is probably underdiagnosed, as only seven cases of HP in musicians have been reported since 1988 (King et al., 2017; Lodha and Sharma, 1988; Metersky et al., 2010; Metzger et al., 2010; Moller et al., 2017; Rackley and Meltzer, 2011).

Musical instruments provide an excellent breeding ground for potentially harmful microorganisms (Woolnough-King, 1994). Saliva saturation of the mouthpiece and the reed is frequent after playing for some time. With repeated playing, quantities of microorganisms can quickly build up inside mouthpieces that are not regularly cleaned. Only a few previous studies with a small number of samples have highlighted that about 80 to 100% of instruments harbour viable bacteria (Marshall and Levy, 2011; Walter and Chaffey, 1959). These previous studies have focussed on bacteria because of the potential risk of inter-person sharing and lung infections (Moore, 2004). However, little is known about fungal contamination which could represent a noteworthy health hazard, especially HP. In addition, while the amount of bacteria appears to decline after 72 h after playing, the exposure to fungi and yeast contamination has been suggested to increase, thereby increasing

the possibilities of HP from repetitive play (Marshall and Levy, 2011). Furthermore, no previous study has investigated the consequences of instrument contamination on the musician.

Improved knowledge of the type, magnitude and risk factors for fungal contamination of wind instruments is therefore warranted. Moreover, specific fungal sensitization among musicians and the potential risk of immunologically-induced lung disease are currently unknown.

We therefore conducted a prospective study on musicians playing wind instruments (bassoon, clarinet, oboe and saxophone) in order to: (i) assess the prevalence and type of fungal contamination of wind instruments, (ii) identify the potential risk factors associated with fungal contamination of the instrument, and (iii) evaluate the prevalence of sensitization to these micro-organisms among musicians.

2. Materials and methods

2.1. Study population

All musicians playing a wind instrument (bassoon, clarinet, oboe or saxophone) containing a reed (Fig. 1), at least 1 h a week for at least 3 years, among music schools and orchestras of the region of Franche-Comté were invited to participate in the current study (NCT01487850). Approval was received from the local ethics committee (Comité de Protection des Personnes (CPP) Est; P/2007/55) and written consent was obtained from all subjects.

2.2. Subjects

All musicians completed a self-report questionnaire about their medical history and respiratory symptoms based on the European Community Respiratory Health Survey, as previously described (Dalphin et al., 1998), as well as a questionnaire about their practice of the

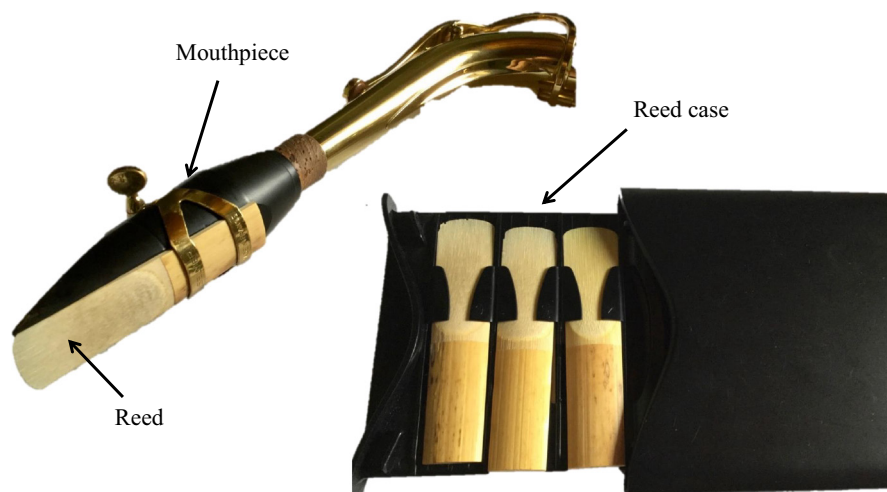


Fig. 1. Reed and mouthpiece of a saxophone.

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