

RESEARCH ARTICLE

Mobile phones of roadside food vendors: An exogenous source of infections

Patil Vaishali G, Sonawane Adhiraj A, Gaikwad Shraddha N and Saha Moitreyee

Department of Botany, VPM's B.N. Bandodkar College of Science, Thane
e-mail: sahamoitreyee@gmail.com

Manuscript details:	ABSTRACT
Available online on http://www.ijlsci.in	Mobile phones have become an indispensable tool across all age groups in professional and social life. The potential role of mobile phones as an exogenous source of infection is a major concern. The objective of this study was to explore the prevalence of fungal contamination on mobile phones of various food vendors on road side food shops in vicinity of VPM's B. N. Bandodkar College of Science, Thane. These roadside food stalls are popular and are frequented by the students, staff members of the college and the public. Twenty swab samples were randomly collected from the roadside food vendors and were cultured to observe the presence of fungal microflora. The predominant fungi isolated were <i>Aspergillus flavus</i> , <i>Aspergillus niger</i> , <i>Mucor indicus</i> , <i>Rhizopus stolonifer</i> , <i>Penicillium</i> sp., <i>Candida albicans</i> and <i>Cladosporum</i> sp.
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Acknowledgments: Authors are thankful to Department of Botany, VPM's B. N. Bandodkar College of Science, Thane for providing the laboratory facilities under Research Scholar Programme. We are also thankful to DBT-Star College Scheme for providing the instruments required for the research work.	INTRODUCTION Street foods are foods and beverages sold by roadside vendors and hawkers. These food items are usually sold near public places and customers from various economic strata benefit from these low-cost meals. Customers however overlook aspects of hygiene or sanitation in these roadside stalls as availability and accessibility determine street food consumption. Mobile phone used by the food vendors constitutes a major health hazard as their phones are seldom cleaned. Their mobile phones may harbour various potential pathogens, thus becoming an exogenous source of infections and possible vector for transmission of pathogens. Colonization of potentially pathogenic organisms on various objects such as pagers, personal digital assistants, hands, and mobile phones has been reported (Singh <i>et al.</i> 2002). Level of contamination depends on the clinical and geographical setting (Heyba <i>et al.</i> , 2015). Microbiologists say that the combination of constant handling and the heat generated by the phones creates a prime breeding ground for all sorts of microorganisms that are normally found on our skin (Brady <i>et al.</i> , 2006). The aim of this study was to investigate the fungal contamination of mobile phones belonging to food vendors with their stalls in close
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vicinity of VPM's B. N. Bandodkar college of Science, Thane. These roadside food stalls are very popular with students and staff members of the college. The public also visit the food stalls as the Thane railway station and CIDCO bus stop are nearby. The food served in these stalls are tasty, of good value, available to everyone almost around the clock, best bet for grabbing a quick bite and are affordable.

MATERIALS AND METHODS

Study area: The study was conducted to investigate fungal contamination of mobile phones belonging to roadside food vendors in the vicinity of VPM's B. N. Bandodkar College of Science, Thane, Maharashtra.

Sample collection: In this cross-sectional study total twenty swab samples were randomly collected from the roadside food vendors. Sterile swab sticks were immersed in sterile normal saline and then used to swab the phones at the earpiece, mouthpiece, keypad, and the sides to ensure that microorganisms on the phone adhere to the swab sticks appropriately (Ekrakene and Igeleke, 2007) and then placed in sterile sealable plastic bags (one swab in one bag) and immediately transported to laboratory. For control mobile phone of a food vendor was thoroughly wiped and sterilized with 70% isopropyl alcohol and swab sample was collected.

Inoculation and Isolation: The specimens were inoculated onto potato dextrose agar (PDA) and incubated at room temperature for 72 hours (Chinedu et al., 2007).

Identification and characterization of the isolates: Preliminary identification and characterization of the

isolate fungi was done on the basis of culture appearance, colonial morphology, mycelia, spores and colour according to cotton blue test. Fungal isolates were characterized as described by Barnett and Hunter (1972) (Barnett and Hunter, 1972). Identification of fungal culture was also done by Biosource Biotech laboratories, Pune.

RESULTS AND DISCUSSION

Total 20 mobile phones belonging to roadside food vendors in the vicinity of VPM's B. N. Bandodkar College of Science, Thane, Maharashtra were analyzed. Fungal contamination was observed in all 20 samples when compared with control (Table 1). *Aspergillus flavus*, *Aspergillus niger*, *Mucor indicus*, *Rhizopus stolonifer*, *Penicillium* sp., *Candida albicans* and *Cladosporum* sp. were isolated and identified from these samples. The morphological characteristics of the fungal isolates were studied (Table 2).

Fungal contaminants like *Aspergillus* spp cause different forms of hypersensitivity diseases such as allergic asthma and aspergillosis. Chronic granulomatous disorder (CGD) with pulmonary infection is caused by *Penicillium* spp. *Mucor* spp is the reason behind gastrointestinal disorders. Root cause of mucocutaneous, pulmonary and urological infections is *Rhizopus* spp. *Candida albicans* is the causative agent for vaginal and urinary tract infection. *Cladosporum* species have been reported to cause infections of the skin. The airborne spores of *Cladosporum* species are significant allergens and in large amounts they can severely affect asthmatics and people with respiratory diseases (Deshmukh and Rai, 2005).

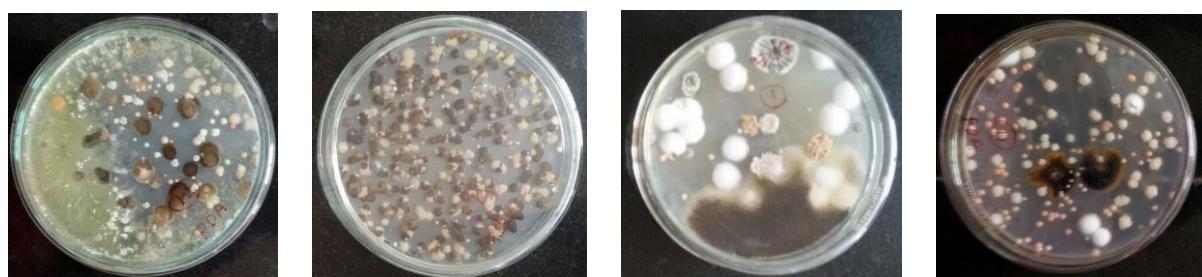
Table 1: Identification of fungal isolates from different food vendor's mobile phone

	C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	-	+	+	-	-	-	+	+	+	+	-	+	+	+	+	+	-	-	+	-	-
b	-	+	-	-	-	+	-	+	+	-	-	+	+	+	-	-	-	-	-	-	-
c	-	+	-	-	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+
d	-	-	-	+	+	-	-	-	-	-	-	+	+	+	-	-	+	-	-	-	-
e	-	+	-	-	-	-	-	+	-	+	+	-	-	-	-	-	+	-	+	+	+
f	-	+	-	-	-	-	-	+	-	-	-	+	+	+	-	-	-	-	-	-	-
g	-	+	-	-	-	-	-	+	-	-	-	+	+	-	+	-	-	-	-	-	-

a : *Aspergillus flavus*, b: *Aspergillus niger*, c: *Mucor indicus*, d : *Rhizopus stolonifer*, e: *Penicillium* sp., f: *Candida albicans*, g: *Cladosporum* sp.

Table 2: Morphological characteristics of fungi isolates

Sr. no.	Colony description	Morphological characteristics	Organism
1.	Pale brown colonies	Septate branched, mycelium, green-brown conidia	<i>Aspergillus flavus</i>
2.	Black colonies	Septate branched, mycelium, Blackish conidia	<i>Aspergillus niger</i>
3.	Greyish brown	Broad hyphae, non-septate sporangiophores	<i>Mucor indicus</i>
4.	Brownish colonies	Cottany surface, non-septate mycelium	<i>Rhizopus stolonifer</i>
5.	Blue green colonies	Septate branched, mycelium, with conidiophores	<i>Penicillium</i> spp.
6.	Yellow-white colonies	Pseudohyphae, septate	<i>Candida albicans</i>
7.	Green to dull green, then olive-grey	cylindrical, aseptate, pigmented, smooth, long chain of conidia	<i>Cladosporum</i> sp.

**Plate 1: Fungal isolates from different food vendor's mobile phone****Plate 2: Microscopic morphology of fungal isolates from different food vendor's mobile phone**

Poor personal hygiene and sanitation, unhygienic environment, unsafe storing and handling of food by the roadside food vendors pose a major health hazard. The potential role of mobile phones of these road side food vendors as an exogenous source of infection may be confirmed from this investigation as a variety of microbes were found on their mobile phones. The high prevalence of fungal agents isolated from their mobile phones was attributed to the poor hygienic and sanitary practices associated with the low level of education among marketers and food vendors.

The presence of the isolated fungi showed that the food vendor's phones and environment had been contaminated by fungal spores (Ekrakene and Igeleke, 2007). Most of the isolated fungi are also natural inhabitants of the soil and air. These pathogens may cause food borne infections, lowering of semen, brain

disorder, cancer, headache, nosocomial infections, cell damages, etc. (Flavia et al., 2001).

Since the restriction of the use of mobile phones is not effective for the prevention of the spread of infections, it is necessary to develop effective preventive strategies that will include creating awareness in relation to environmental decontamination, hand hygiene, surveillance and contact isolation for the prevention of infections (Farr et al., 2001). Simple cleaning of mobile phones with 70% isopropyl alcohol may decrease the microbial load (Neely and Sittig, 2002). This study showed that fungal contamination of food vendors' mobile phones in different food shops in vicinity of VPM's B.N.Bandodkar college of Science, Thane was high. These mobile phones could be marked as an exogenous source of infections however simple cleaning of mobile phones with 70% isopropyl

alcohol, good hygiene practice and safe food handling may decrease the fungal load.

CONCLUSION

Mobile phones are frequently used as they are an effective means of communication. The objectives of this cross-sectional study were to determine the level and type of fungal contamination of the mobile phones used by roadside food vendors. The predominant fungi isolated were *Aspergillus flavus*, *Aspergillus niger*, *Mucor indicus*, *Rhizopus stolonifer*, *Penicillium* sp., *Candida albicans* and *Cladosporum* sp. which can cause infection in humans. Students, staff and general public frequenting these food stalls are at a greater risk of acquiring and spreading infections, thus roadside food vendors require the stringent implementation of infection control guidelines.

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