

Isolation of Surveillance Pathogenic Fungal Microbial Contaminant on Mobile Phone

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Abstract

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AIM: Mobile phone has been used daily by almost everyone. This Research surveyed microbial contamination of mobile phones in the faculty of Medicine Universitas Swadaya Gunung Jati and identify the most influential fungal microbial species.

METHODS: A group of 15 samples was analysed to identify fungal isolates. The mobile phones were swabbed firmly passing its touch screen using sterile swabs then inoculated into media for fungi. Frequency distribution of isolates was calculated.

RESULTS: There were fungal isolates as follows: *Aspergillus Orchareus*, *Aspergillus flavus*, *Alternaria*, *Aspergillus niger*, *Penicillium sp.*, *Cladosporium sp.*, *Candida sp.*, *Aspergillus Fumigatus*, and *Mucor sp.* at the rate of 19, 6, 1, 3, 2, 10, 2, 52, 2%, respectively.

CONCLUSION: The research indicates that all mobile phones were considerably having microbial infection, mostly from humans' natural flora and also from the air and soil. This determines that it is necessary to sterilize hands prior to a contact with mobile phones since it could lead into disease transmission.

Introduction

Data from the last 2 decades shows that Asian countries are increasing in mobile phone usage numbers in the world [1]. It was reported in China, that in the end of June 2017, there are 724 million mobile phone users, increasing from the previous data in 2016, that only 228.3 million users. Most of the users are aged 20 to 29, which are 29.7% of all the users [2]. With its affordable price, and ease of use of applications contained in the mobile phone, makes people interested in using the mobile phone. There are various features that make the mobile phone screen more comfortable to use, such as calculators, the internet, social media, games, cameras and more. In line with the advance of technology the mobile phone becomes an indispensable accessory in social

life [3], [4].

In spite of that, mobile phones can cause electromagnetic radiation effects that can cause sleeplessness, headaches, reduce memory and reduce sperm quality [5]. Conveniences of mobile phones to be carried, allowing users to store them in various places such as pants, dining tables, kitchens or even toilets. This can be potentially dangerous to health and can be a carrier of a number of microorganisms that live in every inch of the mobile phone screen [6], [7], [8]. Microbes that live and thrive on mobile phones are due to daily contact with body parts such as the face, ears, and hands and can survive on the surface of the cellphone for weeks. These microbes can cause a risk of infection from contaminated mobile phone [9], [10], one of which make nosocomial infection [11], [12]. The application of personal hygiene with hand washing habits before

and after using a mobile phone is an effort to prevent disease transmission through a mobile phone [6], [13]. However, the results of the study show that the hands and instruments of health workers have the potential as carriers of microorganisms, although control and prevention efforts have been carried out such as hand hygiene, environmental decontamination, still have the potential for various objects such as laboratory equipment and mobile phones [12].

In this study, we focused on mobile phones used by laboratory officers and administrative officers in the education area, especially in the faculty of medicine.

Methods

The research subjects were 15 participants who worked in the UGJ faculty of Medicine consisting of laboratory staff, lecturers, academic staff and signed informed consent and disclosure of identification. Samples was taken using sterile cotton swab sticks, then rubbed over the surfaces of mobile phone and streaked immediately on Sabouroud dextrose agar and incubated at a temperature of 35°C for 5 days and fungal growth was observed on the plate.

Results

Research is an effort to minimize the exposure of microbes that surround our lives. The habit of holding a mobile phone with an unclean hand makes the cellphone's surface greasy and sticky, allowing variations in the microfungi colonies. environmental factors where mobile phone users live and work can affect the diversity of pathogenic microfungi on mobile phones [12],[14], [15]. The results of the analysis show that the largest Colony forming unit (CFU) value is 0.2066 CFU, while the lowest CFU value is 0.036 which is isolated from the 2 subjects of mobile phone owners.

Table 1 show some microfungi that grow are those exposed to the environment, various microfungi environmental conditions allow a large diversity of microfungi [17]. Microfungi of the genus *Aspergillus* and *Candida* have pathogenic microorganism. So that microfungi of identified pathogens can indicate that mobile phones can be a vectors towards infectious transmissions for other individuals.

Fungal growth on the mobile phone can be caused by heat is delivered mobile phone, the heat temperature is the same as the temperature of the

human skin [18], [19]. fungi can grow and thrive in the humid temperature; humidity Cleaner can spur fungus grows in a very optimum.

Table 1: Results of isolation and identification of pathogenic microfungi in mobile phones

No	Code	Mikrofungi Spesies	Colony Number	Total Colony Found Unit (CFU)
1	AI	<i>Aspergillus Orchareus</i>	2	0.0328
		<i>Aspergillus flavus</i>	2	
		<i>Alternaria</i>	2	
		<i>Aspergillus niger</i>	2	
		<i>Penicillium sp.</i>	1	
2	AII	<i>Candida Sp</i>	1	0.0459
		<i>Aspergillus Fumigatus</i>	1	
		<i>Aspergillus Orchareus</i>	2	
		<i>Mucor sp.</i>	1	
		<i>Aspergillus Fumigatus</i>	10	
3	AIII	<i>Aspergillus Orchareus</i>	3	0.2066
		<i>Mucor sp.</i>	1	
		<i>Aspergillus Fumigatus</i>	58	
4	AIV	<i>Penicillium sp.</i>	1	0.1082
		<i>Aspergillus Orchareus</i>	1	
		<i>Aspergillus flavus</i>	1	
		<i>Cladosporium sp.</i>	6	
5	AV	<i>Aspergillus Fumigatus</i>	25	0.0459
		<i>Aspergillus flavus</i>	10	
		<i>Penicillium sp.</i>	3	
6	BI	<i>Candida Sp.</i>	1	0.0853
		<i>Aspergillus Fumigatus</i>	26	
		<i>Aspergillus Orchareus</i>	1	
7	BII	<i>Mucor sp.</i>	1	0.036
		<i>Cladosporium sp.</i>	7	
		<i>Syncephalastrum sp.</i>	1	
		<i>Candida Sp</i>	1	
8	BIII	<i>Aspergillus Orchareus</i>	22	0.0885
		<i>Cladosporium sp.</i>	1	
		<i>Penicillium sp.</i>	2	
		<i>Syncephalastrum sp.</i>	2	
9	BIV	<i>Aspergillus Orchareus</i>	1	0.0098
		<i>Aspergillus niger</i>	2	
		<i>Mucor sp.</i>	1	
10	BV	<i>Aspergillus niger</i>	1	0.0131
		<i>Aspergillus Fumigatus</i>	2	
		<i>Mucor sp.</i>	1	
		<i>Aspergillus flavus</i>	1	
11	C1	<i>Cladosporium sp.</i>	7	0.0328
		<i>Candida Sp</i>	1	
		<i>Aspergillus Orchareus</i>	19	
		<i>Aspergillus Fumigatus</i>	15	
12	C2	<i>Penicillium sp.</i>	1	0.1279
		<i>Aspergillus Versicolor</i>	4	
		<i>Cladosporium sp.</i>	3	
13	C3	<i>Aspergillus niger</i>	1	0.0098
		<i>Cladosporium sp.</i>	1	
14	C4	<i>Cladosporium sp.</i>	1	0.0065
		<i>Mucor sp.</i>	2	
		<i>Aspergillus flavus</i>	2	
		<i>Aspergillus niger</i>	3	
15	C5	<i>Aspergillus Fumigatus</i>	3	0.036
		<i>Candida Sp</i>	1	
		<i>Aspergillus niger</i>	1	

WHO 2009 states that fungal growth can be categorized as heavy (humidity > 90%), namely *Aspergillus fumigates*, *Mucor plumbeus*, *Rhizopus spp*, medium (humidity 80-90%), namely *Mucor circinelloides*, *Rhizopus oryzae*, *Aspergillus flavus* and mild (Humidity < 80%) namely *Sebi Walleimia*, *Aspergillus niger*. Some of these microfungi were found in this study. It is possible that the air also has an influence on the growth of fungi on a mobile phone, the fungal spores float in the air can be attached to the media on the mobile phone [20].

Other literature states that the colonies were found on the mobile phone can also lead to nosocomial infections [21], [22]. As in this study, we can find fungal species such as *Alternaria sp.*, *Pencillium sp.*, *Aspergillus sp.*, Which are known to cause respiratory infections, allergic asthma, and irritation [23]. Long and Continuous exposure to these microfungi could leads into negative effectst towards humans, although the microfungi does not by itself clinically develops the disease. The infection ocurred

partly depending on microorganisms' characteristics, such as intrinsic virulence resistance, and also the infective material amount. Thus, exposure to recurrent moldy material can also cause respiratory or allergic irritation in some individuals [24].

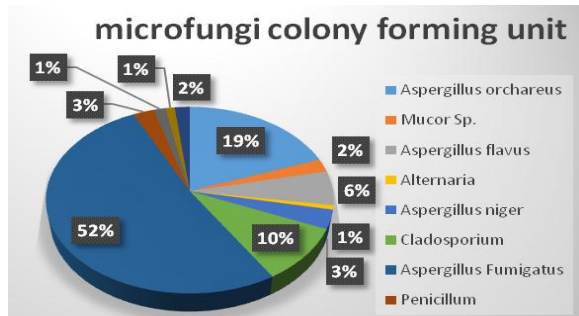


Figure 1: Percentage colony forming unit

Figure 2 shows that there is a variation of CFU on mobile phones for each mobile phone user, the diverse CFU shows that this fungal microbial can grow and develop through the skin on the hands or use handheld phones by exchanging hands with other users, allowing isolate populations.

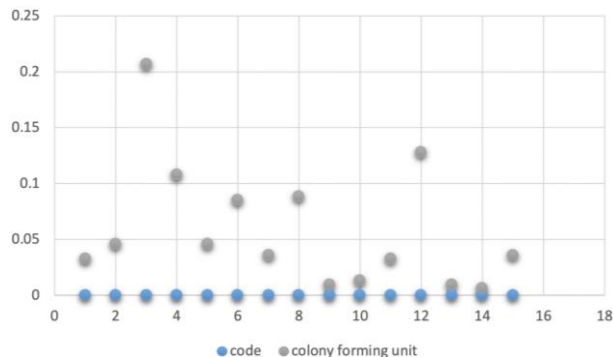


Figure 2: Variance colony forming unit in subject

Mobile phones really need sanitation procedures in order to suppress the growth of microfungi, especially developing dynamics such as Indonesia, especially in Cirebon, which is a tropical climate. Sanitation efforts on mobile phones could make microbial exposure minimal. Furthermore, tend to antibiotics usage reduction for infectious diseases [25]. It is necessary to suppress the number of infectious colonies and spores, even though the concentration is not high.

We can conclude:

1. There are 8 species in mobile phone; *Aspergillus oryzae*, *Aspergillus flavus*, *Aspergillus niger*, *Alternaria*, *Mucor sp.*, *Cladosporium*, *Penicillium*, *Aspergillus fumigatus*
2. Analysis show that the largest Colony forming unit (CFU) value is 0.2066 CFU, while the lowest CFU value is 0.036

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