

Emerging fungal infections in hospitals ... and control

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December 2, 2021

Aspergillus



Some Old Stuff

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The olden (lethal) days

... or ensure that construction site is sealed



Efficacy of Infection Control Measures during a Nosocomial Outbreak of Disseminated Aspergillosis Associated with Hospital Construction

Steven M. Opal, Arnold A. Asp, Preston B. Cannady Jr., Pari L. Morse, Linda J. Burton and Phillip G. Hammer II
The Journal of Infectious Diseases
Vol. 153, No. 3 (Mar., 1986), pp. 634-637

THE JOURNAL OF INFECTIOUS DISEASES • VOL. 153, NO. 3 • MARCH 1986

Efficacy of Infection Control Measures During a Nosocomial Outbreak of Disseminated Aspergillosis Associated with Hospital Construction

- ✧ 1981-1983 hospital construction
- ✧ 11 cases of disseminated, IA
- ✧ all died

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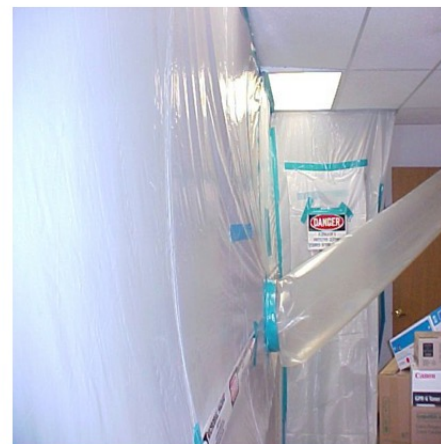
- During hospital construction, neutropenic patients with hematologic malignancy were required to wear high-efficiency masks when leaving their rooms
- IA rate decreased from 0.73 (1993-96) to 0.24 per 1,000 hospital patient-days (1996-99 ($p < 0.001$))
- „High-efficiency masks reduced nosocomial aspergillosis during hospital construction.“

Raad I et al. *ICHE* 2002;23:41-43

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Control measures during construction

- ⊙ Floor to ceiling plastic or dry walls
 - ✧ Sealed edges
 - ✧ Reach “real” ceiling (confined space)
- ⊙ Seal air handling system
- ⊙ External entrance and exit for work site
- ⊙ Exhaust vents
- ⊙ Dispose refuse by shutes (wet cover)
- ⊙ Audit & sampling



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Preven Steven Opal et al. *J Infect Dis* 1986;153:634

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Danger in the water?



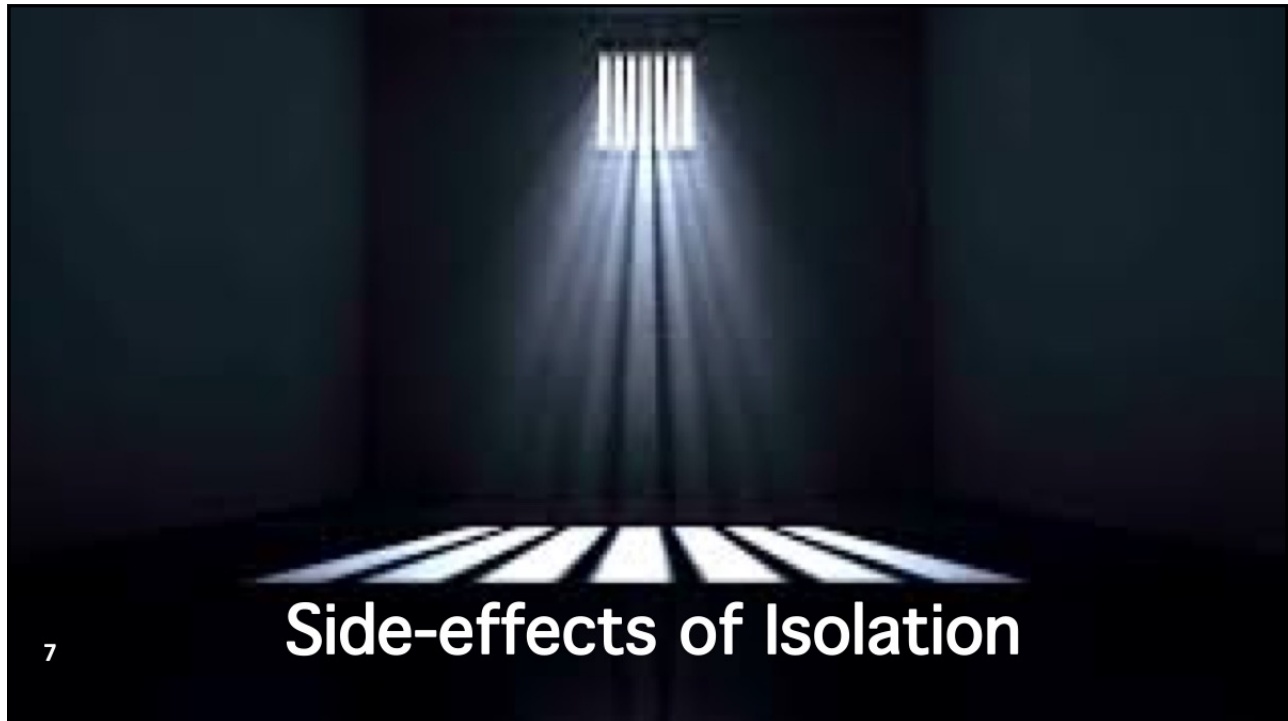
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Hospital water and molds



- Nosocomial aspergillus continues to occur despite air filtration → other sources for spores
- Found in water systems: *Fusarium*, *Aspergillus*, and *Exophiala*
- *Pseudallescheria boydii* in near-drowning

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Participants reported a moderate level of isolation-related distress, anxiety, and boredom: the more the anxiety and the boredom, the more the distress

Protective Isolation for Patients with Haematological Malignancies: A Pilot Study Investigating Patients' Distress and Use of Time

O. Annibali¹, C. Pensieri², V. Tomarchio¹, V. Biagioli³, M. Pennacchini², A. Tendas⁴, Tirindelli¹

¹Unit of Hematology, Stem Cell Transplantation, Transfusion Medicine and Cellular Therapy, Campus Bio-Medico University of Rome, Rome, Italy

²Institute of Philosophy of Scientific and Technological Activity, Campus Bio-Medico University of Rome, Rome, Italy

³Department of Biomedicine and Prevention, School of Nursing, University of Rome Tor Vergata, Rome, Italy

⁴Hematology Unit, Ospedale Sant'Eugenio Hospital, Roma, Italy

Boredom far less deadly than IA



Airway of a patient as source of *Aspergillus fumigatus*. Therefore, patients colonized with *Aspergillus* spp. should be treated in airborne infection isolation rooms.

Disclaimer: Ahead of print articles are not considered as final versions. Any changes will be reflected in the online version in the month of publication.



Volume 24, Number 8—August 2018

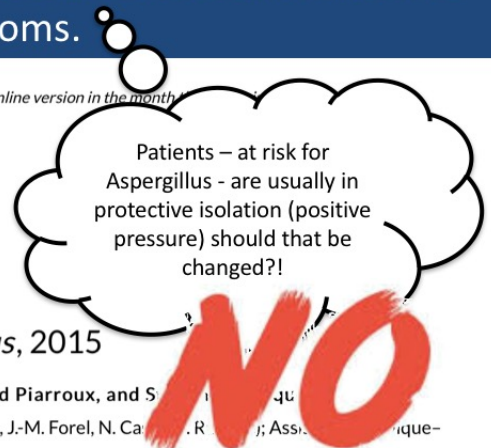
Dispatch

Hospitalized Patient as Source of *Aspergillus fumigatus*, 2015

Baptiste Lemaire, Anne-Cécile Normand, Jean-Marie Forel, Nadim Cassir, Renaud Piarroux, and S. Ranque
Author affiliations: Assistance Publique-Hôpitaux de Marseille, Marseille, France (B. Lemaire, J.-M. Forel, N. Cassir, R. Piarroux); Assistance Publique-Hôpitaux de Paris, Paris, France (A.-C. Normand, R. Piarroux); Aix-Marseille Université, Marseille (J.-M. Forel, S. Ranque); Institut Hospitalo-Universitaire Méditerranée Infection, Marseille (N. Cassir, S. Ranque); Sorbonne Université, Paris (R. Piarroux)

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Mycology & Infection Control



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...still most IC stuff is about bacteria and antimicrobial resistance

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Newest & Biggest Disaster



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Google access September 2017

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Where does *C. auris* come from?

bioRxiv preprint first posted online Jun. 3, 2019; doi: <http://dx.doi.org/10.1101/657635>. The copyright holder for this preprint (which was not peer-reviewed) is the author/funder, who has granted bioRxiv a license to display the preprint in perpetuity. It is made available under a [CC-BY-NC-ND 4.0 International license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

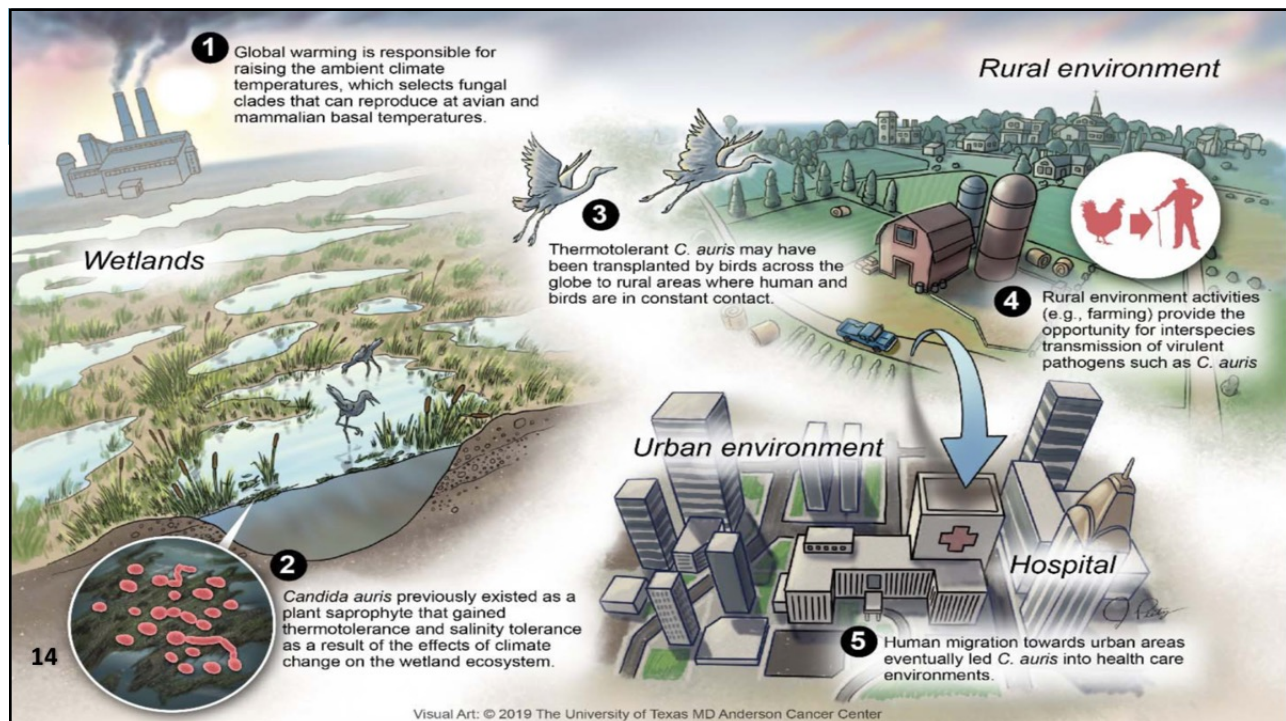
On the emergence of *Candida auris*: climate change, azoles, swamps and birds

Arturo Casadevall¹, Dimitrios P. Kontoyiannis² and Vincent Robert³

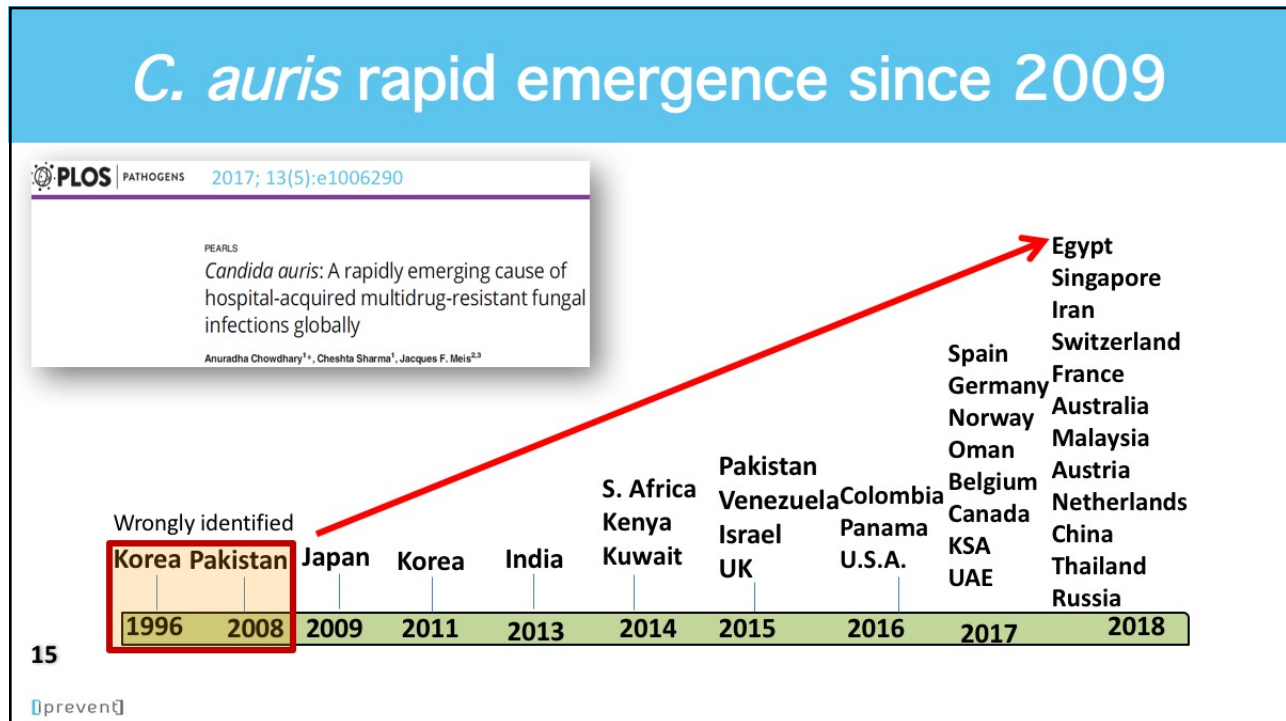
¹Department of Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA; ²Division of Internal Medicine, The University of Texas MD Anderson Cancer Center, Houston, TX, USA; ³Westerdijk Fungal Biodiversity Institute, Utrecht, Netherlands.

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Visual Art: © 2019 The University of Texas MD Anderson Cancer Center



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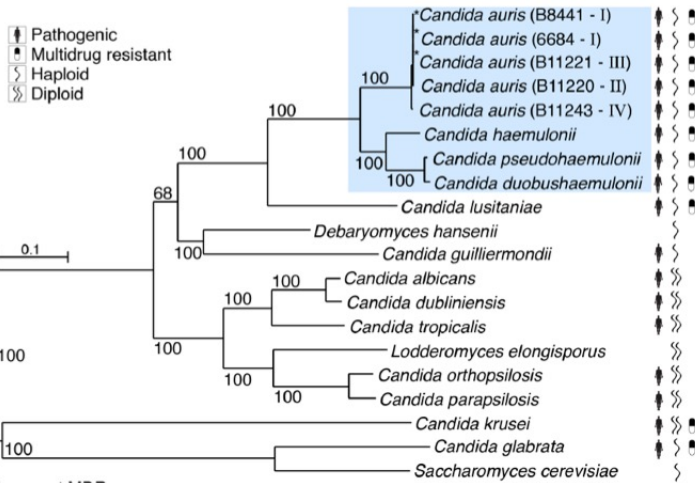


Isolation	Countries	References
Ear	Japan, Korea, USA, Austria, Iran, Switzerland, Canada	Satoh et al., 2009; Kim et al., 2009; Vallabhaneni et al., 2016; Choi et al., 2017 etc.
BAL, Sputum, Pleural Fluid	India, UK, USA, Spain	Chowdhary et al., 2014; Kathuria et al., 2015; Khillan et al., 2014; Borman et al., 2016; Prakash et al., 2016, Tsay et al 2017 etc
Pericardial fluid	India	Khillan et al 2014
Peritoneal fluid, Bile fluid	Colombia, USA	Morales-Lopez et al., 2017, Tsay S et al 2017
Cerebrospinal fluid	UK, Colombia, Spain	Borman et al., 2016; Morales-Lopez et al., 2017 etc.
Arterial line, Pustule swab, wound swab, femoral line, excised tissue, jejunal biopsy	UK, India, USA, Spain	Borman et al., 2016; Schelenz et al., 2016, Chowdhary et al., 2014, Kathuria et al., 2015; Lockhart et al., 2017, Tsay S et al 2017 etc.
Urine	India, Israel, USA, Colombia, UK, Spain	Kathuria et al., 2015; Ben Ami et al., 2017; Vallabhaneni et al., 2016; Lockhart et al., 2017; Morales-Lopez et al., 2017, Schelenz et al 2016 etc.
High vaginal swab	India	Kumar et al., 2015

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Saris et al. Curr Opin Infect Dis. 2018 Aug;31(4):334-340.

Clades of *C. auris*



Antifungal
Resistance
Clade

New Clonal Strain of *Candida auris*, Delhi, India

Anuradha Chowdhary, Cheshta Sharma, Shalini Duggal, Kahlaji Agarwal, Anupam Prakash, Pradeep Kumar Singh, Sarika Jain, Shalini Kathuria, Harbans S. Randhawa, Ferry Hagen, and Jacques F. Meis

Multidrug-resistant endemic clonal strain of *Candida auris* in India

A. Chowdhary · V. Anil Kumar · C. Sharma · A. Prakash · K. Agarwal · R. Babu · K. R. Dinesh · S. Karim · S. K. Singh · F. Hagen · J. F. Meis

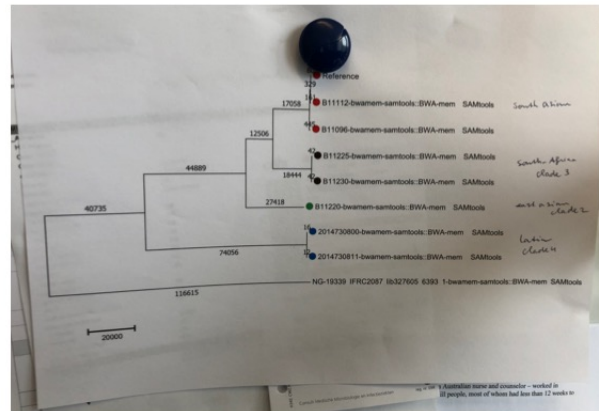
17



Jose F. Muñoz¹, Lalitha Gade², Nancy A. Chow³, Vladimir N. Loparev⁴, Phalasy Juleng⁵, Rhys A. Farrel⁶, Anastasia P. Livintseva⁷, Christina A. Cuomo⁸

bioRxiv preprint first posted online Apr. 11, 2018; doi: <http://dx.doi.org/10.1101/299917>. The copyright holder for this preprint (which was not peer-reviewed) is the author/funder. It is made available under a [CC-BY 4.0 International license](https://creativecommons.org/licenses/by/4.0/).

To be published ... the 5th Clade



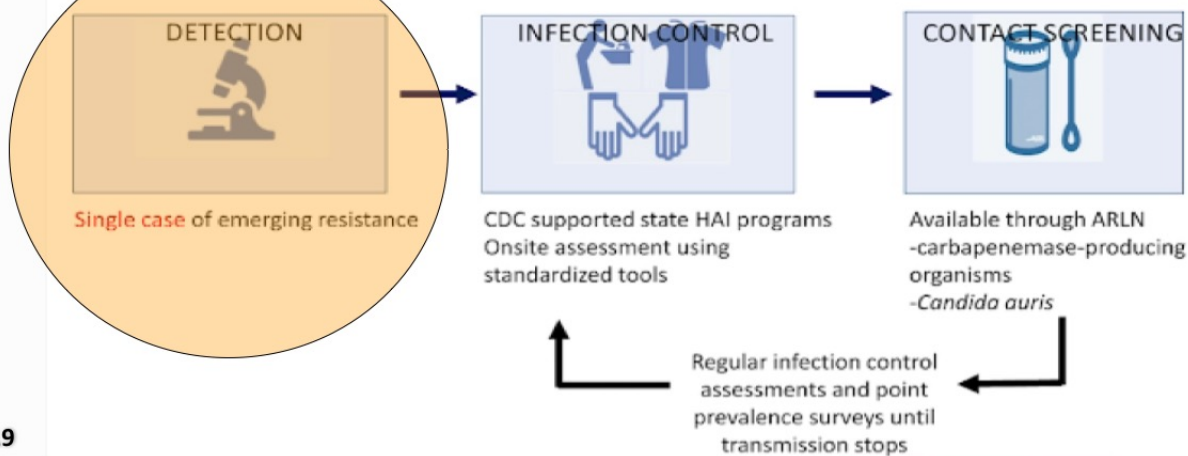
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Failure to diagnose (recognize) *C. auris* is major driver for spread

New CDC Strategy for Containment of Emerging Resistance



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Can Multidrug-Resistant *Candida auris* Be Reliably Identified in Clinical Microbiology Laboratories?

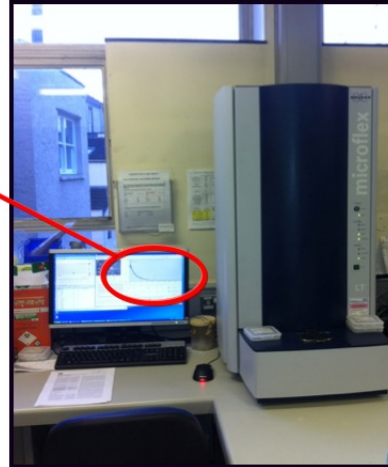
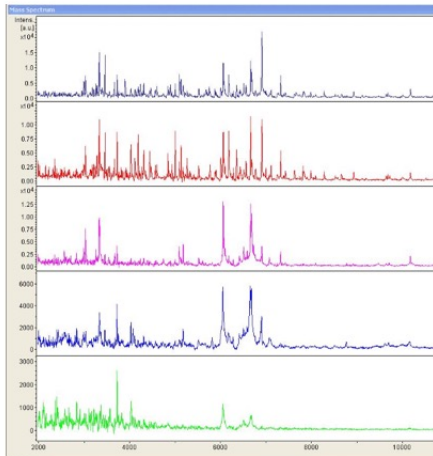
Masako Mizusawa,^a Heather Miller,^{a,b} Rachel Green,^b Richard Lee,^b Mariann Durante,^c Rosalie Perkins,^d Caroline Hewitt,^d Patricia J. Simner,^{a,b} Karen C. Carroll,^{a,b} Randall T. Hayden,^d Sean X. Zhang^{a,b}

VITEK 2 Compact (bioMérieux)	API20C-AUX (bioMérieux)	MicroScan (Beckman Coulter)	AuxaColor 2 (BioRad)	BD Phoenix (BD)
<i>C. haemulonii</i>	<i>Rhodotorula glutinis</i>	<i>C. famata</i>	<i>Saccharomyces cerevisiae</i>	<i>C. haemulonii</i>
<i>C. famata</i>	<i>C. sake</i>	<i>C. lusitanae</i>		<i>C. catenulata</i>
<i>C. lusitanae</i>	<i>C. famata</i>	<i>C. guilliermondii</i>		
		<i>C. parapsilosis</i>		
Updated VITEK2 <i>C. auris</i>		<i>C. tropicalis</i>		
20		<i>C. albicans</i>		

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MALDI-TOF

Candida auris proteomic profiles



Bruker Microflex MALDI-TOF and Biotyper software BDAL database

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Outbreak at a UK hospital: 2015-2016

Schelenz et al. *Antimicrobial Resistance and Infection Control* (2016) 5:35
 DOI 10.1186/s13756-016-0132-5

Antimicrobial Resistance
 and Infection Control

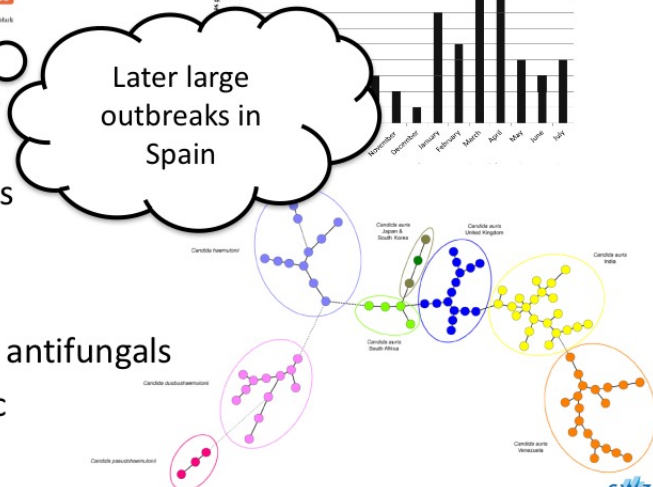
RESEARCH

Open Access

First hospital outbreak of the globally emerging *Candida auris* in a European hospital

Silke Schelenz^{1,2*}, Ferry Hagen², Johanna L. Rhodes², Alireza Abdolrasouli³, Anuradha Chowdhary⁴, Anne Hall¹, Lisa Ryan¹, Joanne Shackleton¹, Richard Trimlett², Jacques F. Meis^{2,5}, Darius Armstrong-James^{1,3} and Matthew C. Fisher²

- ⊙ Causing nosocomial outbreaks
- ⊙ Easily missed in diagnostics
- ⊙ Is very virulent (BSI)
- ⊙ Resistant to 3 basic classes of antifungals
- ⊙ Decontamination problematic



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preven Schelenz et al *Antimicrob Rest Infect Control* 2016;5:35

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Biggest Disaster

Candida auris

6 dagen geleden

ACTION NEEDED!

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C. auris & Infection Control

- ⊙ In essence, the infection control and prevention measures for *C. auris* are similar to those taken for other HRMO's
 - ✧ hand hygiene
 - ✧ adequate use of personal protective equipment
 - ✧ contact isolation in a single person isolation room (with ante-room and if available with airlock control system)
 - ✧ meticulous environmental cleaning

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preven Saris et al. Curr Opin Infect Dis. 2018 Aug;31(4):334-340.



C. auris & Infection Control

- ⊙ Schelenz et al. did not find colonization with *C. auris* of HCWs (only transient carriage) whereas Biswal et al. found 3% (4/145) to be colonized on their hands → HH helped
- ⊙ All contact patients should be traced and placed into (cohort) isolation until proven free off *C. auris* (screening).
- ⊙ Flagging & transfer reports (communication)
- ⊙ Axilla heavily colonized. Decolonization? (possibly povidone iodine)
- ⊙ Environmental and (multiple-use) equipment get contaminated (up to 7 days) → best disinfection method is not yet conclusively known

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preven Saris et al. Curr Opin Infect Dis. 2018 Aug;31(4):334-340.



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CWZ een santeon ziekenhuis

TABLE 1 | Recommendations from major world health organizations for infection control of *Candida auris*.

Health Organization	Environmental disinfection	Decolonization procedure	Hand hygiene procedure
Centers for Disease Control and Prevention	Daily and terminal cleaning with use of an EPA-registered hospital-grade disinfectant effective against <i>C. difficile</i> spores.	No recommendations.	Use alcohol-based hand sanitizer or hand washing with soap and water, before and after donning gloves.
Public Health England	Terminal cleaning with use of a hypochlorite at 1000 ppm. Equipment should be cleaned according to manufacturer's instructions.	No recommendations.	Hand washing with soap and water followed by alcohol-based hand sanitizer on dried hands, before and after donning gloves.
European Centre for Disease Prevention and Control	Terminal cleaning with disinfectants with certified antifungal activity.	No recommendations.	No recommendations.
Centre for Opportunistic, Tropical and Hospital Infections (South Africa)	Regular and terminal cleaning with chlorine-releasing agent at 1000 ppm. Consider hydrogen peroxide vapor in terminal cleaning, if feasible.	Not recommended due to limited evidence.	Hand washing with soap and water, especially with soiling, followed use of alcohol-based hand sanitizer.
Pan American Health Organization/World Health Organization	Daily and terminal cleaning with soap and water followed by 0.1% bleach. Clean, disinfect, or sterilize equipment and appliances as per the type of material, after use by the patient. Machine wash linens and clothes.	No recommendations.	No recommendations.

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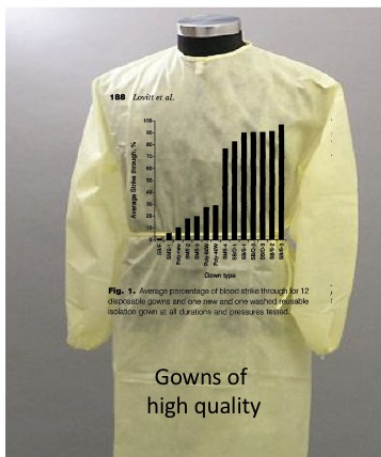
Not all desinfectants of the same group have same effect e.g. hydrogen peroxide

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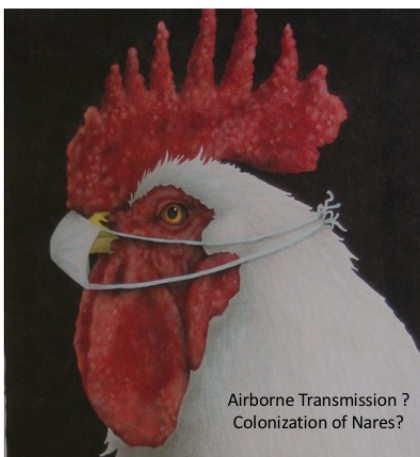
TABLE 2 | Surface disinfectants tested against *C. auris*.

Disinfectant	Concentrations tested (contact time in minutes)	Effective	Level of evidence	Comments	Reference
Chlorine	0.39% (1), 0.65% (1), 0.825% (1), 1% (10), 2% (10), 1000 ppm (3, 5, 180, 1800), 10000 ppm (3, 180, 1800)	Yes	Good	Most extensively studied. Can cause ocular irritation, oropharyngeal, esophageal, and gastric burns. Can corrode metals at concentrations > 500 ppm.	Abdolrasouli et al., 2017; Biswal et al., 2017; Cadnum et al., 2017b; Moore et al., 2017
Hydrogen peroxide	8 g/m ³ (?), 1.4% (1)	Yes	Moderate		Abdolrasouli et al., 2017; Cadnum et al., 2017b
Hydrogen peroxide+silver nitrate	11% (60)	Yes	Low		Biswal et al., 2017
Phenolics	5% (?)	Yes	Low	Not FDA-approved for use as high-level disinfectant but can be used to preclean before terminal sterilization.	Biswal et al., 2017
Glutaraldehyde	2% (20)	Yes	Low	Expensive and toxic. Should be used for medical equipment cleaning.	Biswal et al., 2017
Alcohols	29.4% (0.5)	Yes	Low	Difficult to achieve prolonged contact time due to rapid evaporation. Flammable. May harden rubber and certain plastic tubing after prolonged and repeated use.	Cadnum et al., 2017b
Acetic acid	> 5% (3)	No	Low		Cadnum et al., 2017b
Peracetic acid	2000 ppm (5, 10)	Yes	Low	For medical equipment cleaning. Can corrode certain metals.	Kean et al., 2018
Peracetic acid+hydrogen peroxide+acetic acid	1200 ppm/ <1% (3)	Yes	Low		Cadnum et al., 2017b
Quaternary ammonium compounds	2% didecyl/dimethyl ammonium chloride (60), alkyl dimethyl ammonium chlorides (10), didecyl/dimethyl ammonium chloride/dimethylbenzyl ammonium chloride (10)	No	Low		Biswal et al., 2017; Cadnum et al., 2017b

Personal Protective Equipment



30 (AJIC Am J Infect Control. 1992;20:185-91)



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Slide from Andreas Widmer CWZ

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Publisher: CDC; Journal: Emerging Infectious Diseases
 Article Type: Research; Volume: 24; Issue: 10; Year: 2018; Article ID: 18-0649
EMBARGOED UNTIL NOON EASTERN TIME, WEDNESDAY, SEPTEMBER 12, 2018

Candida auris in Healthcare Facilities, New York, USA, 2013–2017

Eleanor Adams, Monica Quinn, Sharon Tsay, Eugenie Poirot, Sudha Chaturvedi, Karen Southwick, Jane Greenko, Rafael Fernandez, Alex Kallen, Snigdha Vallabhaneni, Valerie Haley, Brad Hutton, Debra Blog, Emily Lutterloh, Howard Zucker; *Candida auris* Investigation Workgroup¹

51 clinical and 61 screening cases

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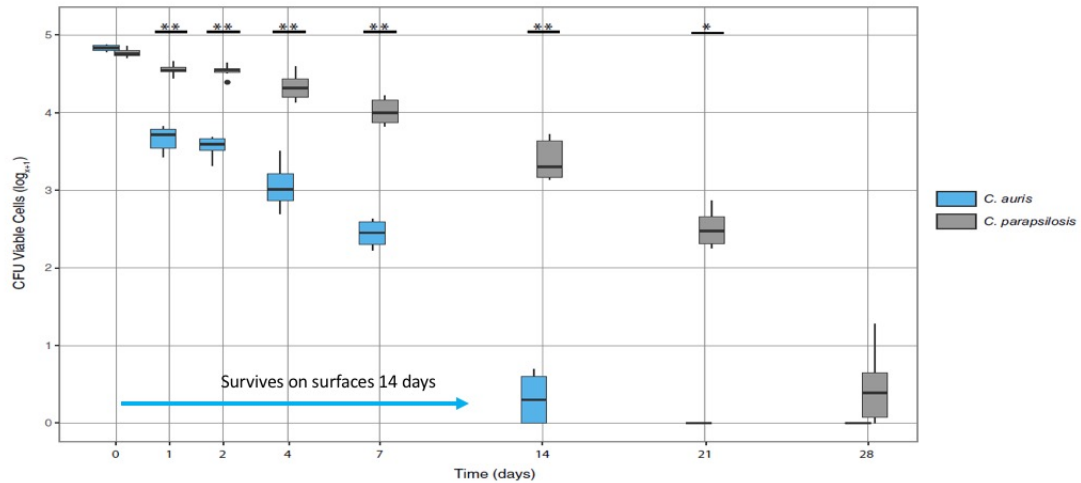
Category, object or surface	No. samples	Positive by culture, no. (%)	Positive by PCR and negative by culture, no. (%)	Negative by culture and PCR, no. (%)
Near-patient surfaces and objects in rooms				
Bedside/over bed table	44	2 (5)	2 (5)	40 (91)
Bed rail	49	7 (14)	5 (10)	37 (76)
TV remote/call button	36	2 (6)	2 (6)	32 (89)
IV poles	21	5 (24)	1 (5)	15 (71)
Bed	17	4 (24)	0	13 (77)
Privacy curtain	6	2 (33)	0	4 (67)
Miscellaneous other†	5	0	1 (20)	4 (80)
Total	178	22 (12)	11 (6)	145 (82)
Other surfaces and objects in rooms				
Door knob/handle				
Sink				
Window				
Floor				
Furniture				
Window curtain				
Light switch				
Closet				
Wall				
Bathroom				
Countertop				
Toilet				
Miscellaneous other‡				
Total				

Category, object or surface	No. samples	Positive by culture, no. (%)	Positive by PCR and negative by culture, no. (%)	Negative by culture and PCR, no. (%)
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Closet				
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Bathroom				
Countertop				
Toilet				
Miscellaneous other‡				
Total				

Category, object or surface	No. samples	Positive by culture, no. (%)	Positive by PCR and negative by culture, no. (%)	Negative by culture and PCR, no. (%)
Equipment outside of room				
Clean supply cart	51	1 (2)	0	50 (98)
Ventilator/respiratory equipment	45	1 (2)	0	44 (98)
Vital sign machine	21	3 (14)	1 (5)	17 (81)
Normothermia system (e.g., Bair hugger)	20	1 (5)	0	19 (95)
Computer workstation	20	0	0	20 (100)
Thermometer	14	1 (7)	1 (7)	12 (86)
PPE/isolation cart/box	12	1 (8)	1 (8)	10 (83)
Lift/scale	11	2 (18)	0	9 (82)
Glucometer	11	0	0	11 (100)
Housekeeping cart	9	0	1 (11)	8 (89)
Dialysis equipment	7	1 (14)	0	6 (86)
Suction canister	6	1 (17)	0	5 (83)
Ultrasonography equipment	4	0	0	4 (100)
Miscellaneous other‡	29	1 (3)	0	28 (97)
Total	260	13 (5)	4 (2)	243 (94)

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Survival of *C. auris* and *C. parapsilosis*



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Environmental Cleaning



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C. auris High-tech Disinfection with HPV and UV

- Hardly anything to review
- Hydrogen peroxide
 - ✧ Thought to be useful in outbreak control
 - ✧ Schelenz S, Hagen F, Rhodes JL, et al. First hospital outbreak of the globally emerging *Candida auris* in a European hospital. *Antimicrob Resist Infect Control*, **2016** ; 5: 35-41.
- Public Health England (PHE) recommends products containing hypochlorite at 1000 ppm for all cleaning, even if other products are used, e.g., gaseous hydrogen peroxide or UV-C
- South African Centre for Opportunistic, Tropical and Hospital Infections (COTHI) suggests addition of hydrogen peroxide vapor, when feasible

Not all disinfectants of the same group have same effect e.g. hydrogen peroxide

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Hydrogen peroxide in Vapour

- Efficacy in the killing of *C. auris* evaluated by exposing *C. auris* (n = 30) and four ATCC *Candida* species to dry gas vaporized H₂O₂ at 8g peroxide/m³ room space (Bioquell)
 - ✧ Abdolrasouli A. et al *Mycoses* 2017 60(11):758-763. doi: 10.1111/myc.12699.
- *C. auris* killed less effectively than *C. albicans* (96.6%-100% vs. 100%)
- One Indian (UK outbreak unrelated) *C. auris* isolate grew repeatedly in 2 out of triplicate wells exposed to H₂O₂ vapour which may indicate that some isolates may be more resilient to this form of disinfection

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Received: 4 February 2019 | Accepted: 5 February 2019
 DOI: 10.1111/myc.12903

ORIGINAL ARTICLE

WILEY **mycoses**

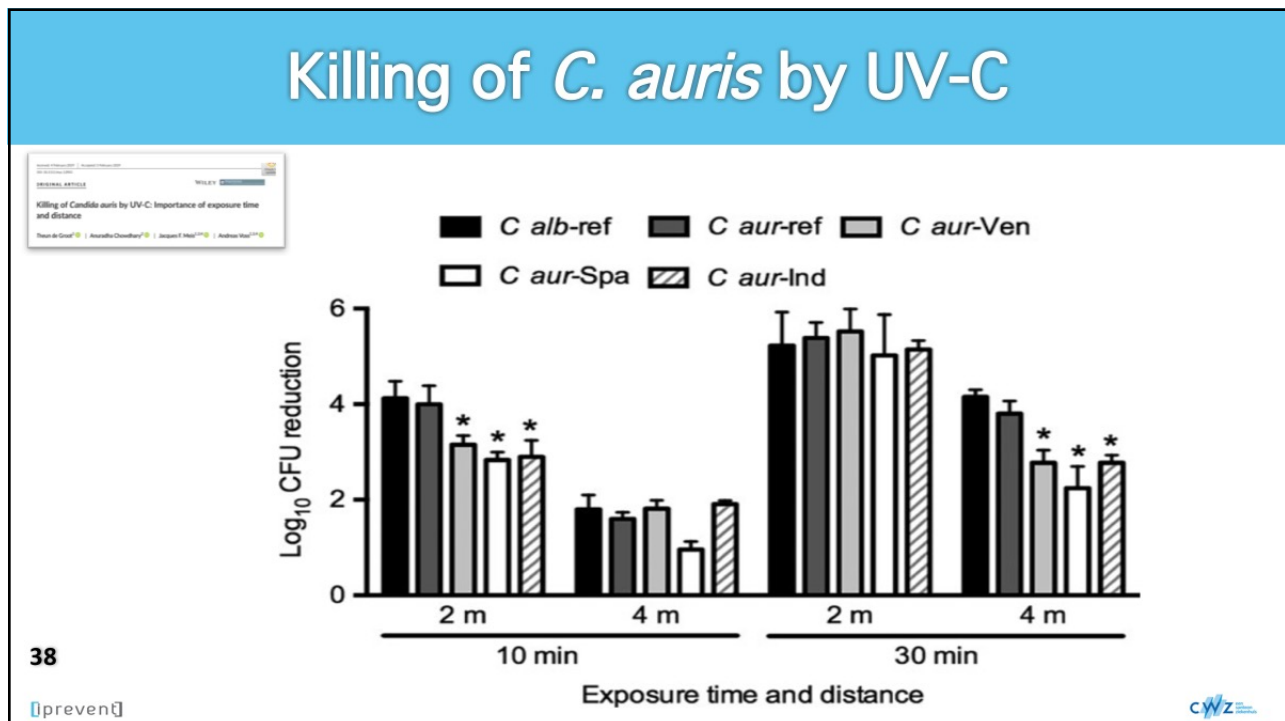
Killing of *Candida auris* by UV-C: Importance of exposure time and distance

Theun de Groot¹ | Anuradha Chowdhary² | Jacques F. Meis^{1,3,4} | Andreas Voss^{1,3,4}



UV-C exposure times and distance are the most critical parameters to kill *C. auris*, while strain variations of *C. auris* also determine UV-C efficacy

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Where to screen?



Controlling a possible outbreak of *Candida auris* infection: lessons learnt from multiple interventions
 M. Biswal¹, S.M. Rudramurthy², N. Jain³, A.S. Shanthi⁴, D. Sharma⁵, K. Jain⁶, L.N. Yadanapudi⁷, A. Chakrabarti⁸

Colonization rate by *Candida auris* of different body sites

Site	Oral	Rectal	Axilla	Groin
Trauma ICU				
No. of samples	89	83	158	168
Growth of <i>C. auris</i>	4 (4.4%)	15 (18%)	62 (39.2%)	34 (20.2%)
MICU				
No. of samples	38	35	38	38
Growth of <i>C. auris</i>	6 (15.7%)	3 (8.5%)	10 (26.3%)	2 (5.2%)
Total	10/95 (10.5%)	18/118 (15.2%)	72/196 (36.7%)	36/206 (17.4%)

ICU, intensive care unit; MICU, medical intensive care unit.

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preven | Biswal M. *J Hosp Infect.* 2017 Dec;97(4):363-370.



Research Gaps

- ⦿ Very limited evidence on effective surface disinfectants (except chlorine) + necessary contact time
- ⦿ Shedding amount unknown → Determine cleaning frequency
- ⦿ Limited evidence in real-world settings
- ⦿ No evidence on self disinfecting surfaces (innovation)

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***Candida auris*: Disinfectants and Implications for Infection Control**

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Skin antisepsis tested

TABLE 3 | Antiseptics tested against *C. auris*.

Disinfectant	Concentrations tested (contact time in minutes used)	Effective	Level of Evidence	Comments	Reference
Chlorhexidine gluconate	<0.02% (1440), 0.5% (0.5), 2% (2), 4% (3, 180, 1800)	Yes	Good	Most studied antiseptic. Limited clinical evaluation.	Schelenz et al., 2016; Abdolrasouli et al., 2017; Moore et al., 2017; Sherry et al., 2017
Chlorhexidine gluconate in isopropyl alcohol	2%/70% (2)	Yes	Low	<i>In vitro</i> testing only.	Moore et al., 2017
Povidone-iodine	10% (2, 3, 180, 1800)	Yes	Moderate	<i>In vitro</i> testing only.	Abdolrasouli et al., 2017; Moore et al., 2017;
Alcohol	70%	Yes	Low	Limited clinical evaluation.	Biswal et al., 2017

Very limited evidence on effectiveness skin disinfectants + necessary contact time

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Hot Topic

Control of *Candida auris* in healthcare institutions: Outcome of an International Society for Antimicrobial Chemotherapy expert meeting

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IPC measures for <i>Candida auris</i>			
	Single case		Outbreak
	Minimum standard	Best practice	Single room and cohort
Patient room			
Room	Single room	Single isolation room with ante room, private, en-suite bathroom	Single room or cohort
Ventilation	Neutral	Negative	Neutral
Toilet/commode	Commode	Single-use commode	Single-use commode
	Validated machine	Single-use bedpan	Single-use bedpan
Washroom	Dedicated washroom	Dry bath	Dry bath/dedicated wash
Bedding	Check pillow and mattresses (when linen is removed) for damage	Check pillow and mattresses (when linen is removed) for damage	Single-use pillows and mattresses (when linen is removed) for damage

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IPC measures for *Candida auris*

	Single case		Outbreak
	Minimum standard	Best practice	Single room and cohort
Personal protective equipment			
Gown	Cuffed long sleeves (water repellent) + apron if needed	Cuffed long sleeves (grade 3) ¹	Cuffed long sleeves per patient in cohort
Gloves	Yes	Yes	Gloves per patient in cohort
Hand hygiene	Alcohol based*	Alcohol based*	Alcohol based*
Shoe covers	Discouraged	Discouraged	Discouraged
Cleaning			
Cleaning material	Single-use cloths	Disposable microfibre cloths	Single-use (microfibre) cloths
Cleaning frequency	Twice daily	Twice daily	Three times a day

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December 16, 2021	<p><i>(FREE Teleclass)</i></p> <p>COVID-19 AS DRESS REHERSAL: THE RISE OF DISEASE X Speaker: Prof. Stephen S. Morse, Mailman School of Public Health, Columbia University</p>
January 13, 2022	<p><i>(FREE Teleclass)</i></p> <p>ONE HEALTH FOR HUMAN HEALTH CLINICIANS – IN LIGHT OF COVID-19, ARE WE APPROACHING A 'TIPPING POINT'? Speaker: Dr. Cheryl Stroud, One Health Commission</p>
January 19, 2022	<p><i>(South Pacific Teleclass)</i></p> <p>THE MENTAL HEALTH OF HEALTHCARE WORKERS IN THE COVID-19 PANDEMIC Speaker: Prof. Salut Muhidin, Macquarie University, Australia</p>
January 27, 2022	<p>CLINICAL SYNDROMES AND CONDITIONS WARRANTING EMPIRIC TRANSMISSION BASED PRECAUTIONS Speaker: Dr. Jennifer Cole, Adventi Hospitals, California</p>

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