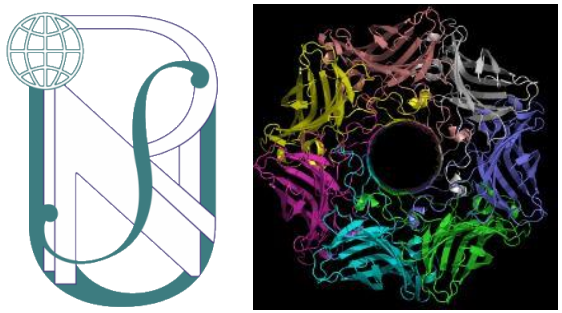
IN GOD WE TRUST



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سموم میکروبی و راه های پیشگیری در اتاق عمل

دکتر مجتبی هدایتی چکوسری
عضو هیات علمی گروه میکروب شناسی، ویروس شناسی و توکسینهای میکروبی
دانشکده پزشکی، دانشگاه علوم پزشکی گیلان

Elements of the chain of infection

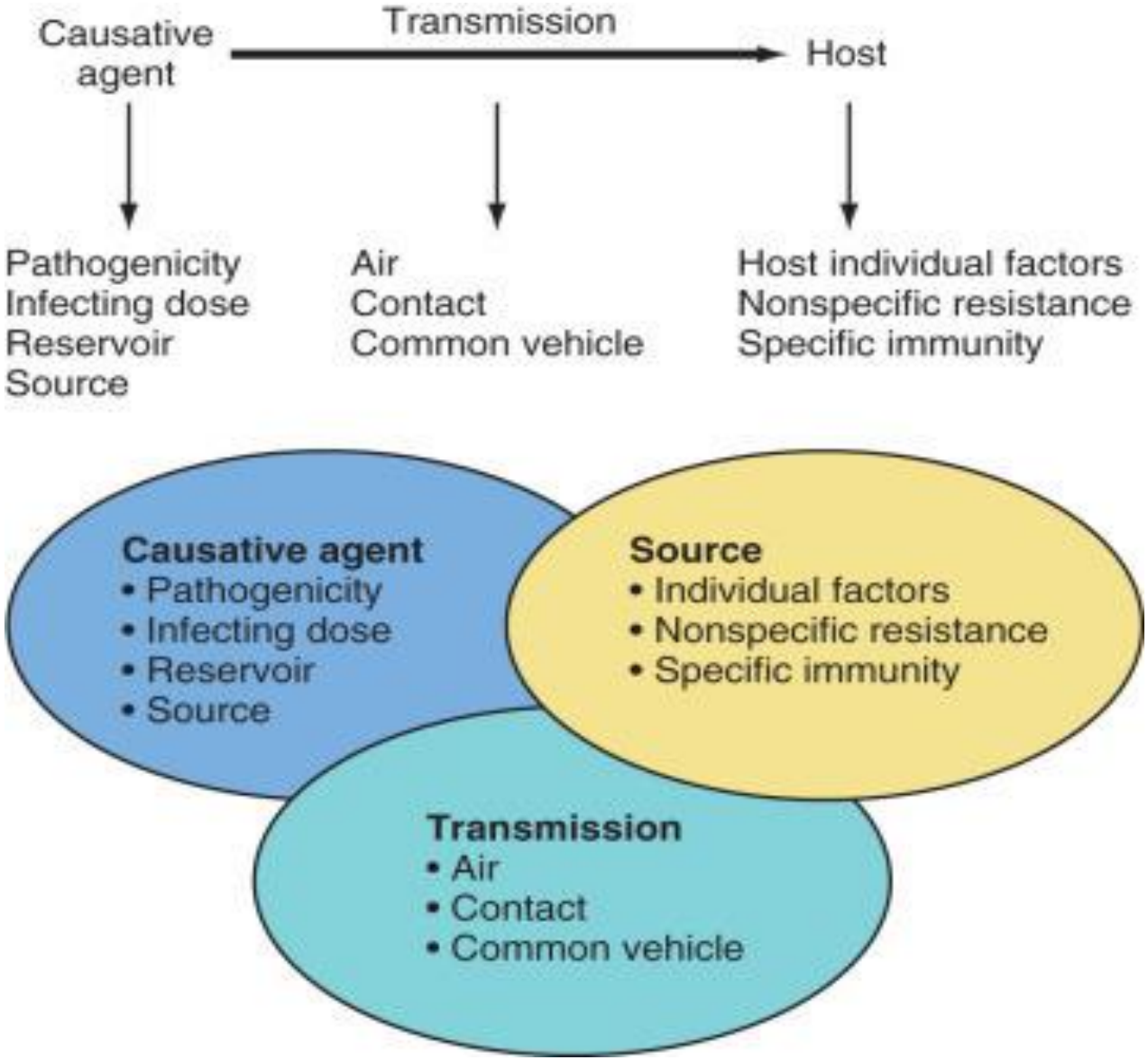


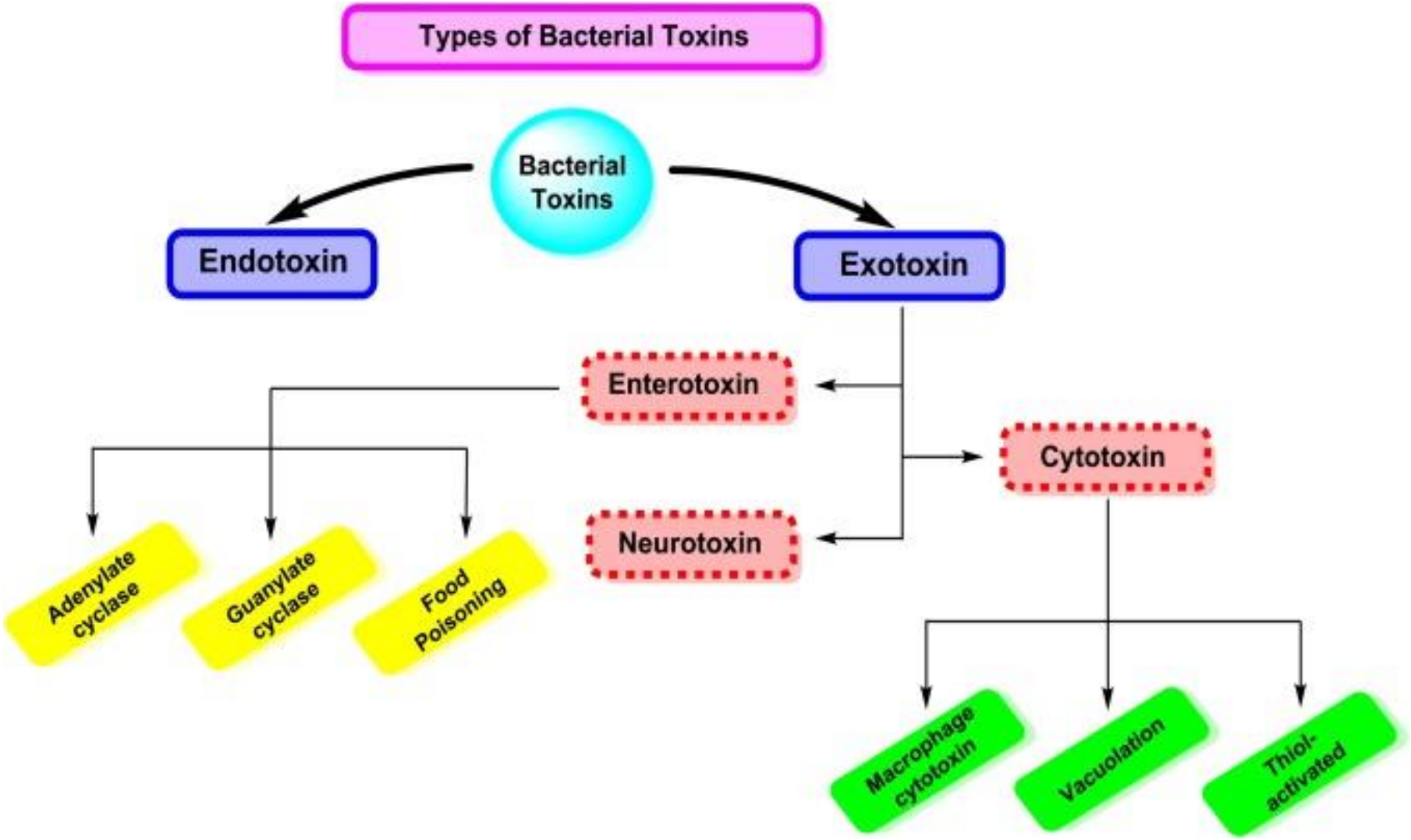
TABLE 50.1 Nosocomial Pathogens and Environmental Contamination

Pathogen	Types of Environmental Contamination	Organism Survival Time
Influenza virus	Aerosolization after cleaning; fomites	24–48 hours on nonporous surfaces
Parainfluenza virus	Clothes and nonporous surfaces	10 hours on nonporous surfaces; 6 hours on clothes
Norovirus	Extensive environmental contamination, possible aerosolization	≤14 days on fecal specimens, ≤12 days on carpets
Hepatitis B virus	Environmental contamination with blood	7 days
Coronavirus-SARS	Possible results from emergency department specimens; super-spreading events	24–72 hours on fomites and fecal specimens
Candida	Fomite contamination	3 days for *Candida albicans* and 14 days for *Candida parapsilosis*
Clostridium difficile	Extensive environmental contamination	5 months on hospital floors
Pseudomonas aeruginosa	Drain sink contamination	7 hours on glass slides
Acinetobacter baumannii	Extensive environmental contamination	33 hours on laminated plastic surfaces
MRSA	Extensively contaminated burn units	≤9 weeks after drying; 2 days on laminated plastic surfaces
VRE	Extensive environmental contamination	≤58 days on working surfaces

TABLE 50.3 Infectious Agents That May Be Found in the Operating Room

Viral Hepatitis	**Viruses**
Hepatitis A virus	Rhinovirus
Hepatitis B virus	Influenza
Hepatitis C virus	Parainfluenza
Hepatitis delta virus	Adenovirus
Non-A, non-B hepatitis	Respiratory syncytial virus
Human immunodeficiency virus	Measles
Cytomegalovirus	Rubella
Epstein-Barr virus	Cytomegalovirus[a]
Herpes simplex virus	
Respiratory Bacteria	**Gastrointestinal**
Streptococcus	Viruses: hepatitis A virus, rotavirus, adenovirus, enterovirus
Pneumococcus	Bacteria: *Giardia*,[a] *Cryptosporidium*, *Isospora*[a]
Meningococcus	Fungi: *Candida*[a]
Diphtheria	
Mycobacterium[a]	**Central Nervous System**
Legionella[a]	Viruses: Human immunodeficiency virus,[a] herpes simplex virus,[a] Epstein-Barr virus[a]
Fungi	Parasites: *Toxoplasma*[a]
Candida[a]	Fungi: *Cryptococcus*
Nocardia[a]	
Cryptococcus[a]	
Parasites	
Pneumocystis[a]	

Doi: 10.1016/B978-0-323-42974-0.00050-1


Types of Bacterial Toxins
Bacterial Toxins
Endotoxin
Exotoxin
Enterotoxin
Cytotoxin
Neurotoxin
Adenylate cyclase
Guanylate cyclase
Food Poisoning
Macrophage cytotoxin
Vacuolation
Thiol-activated

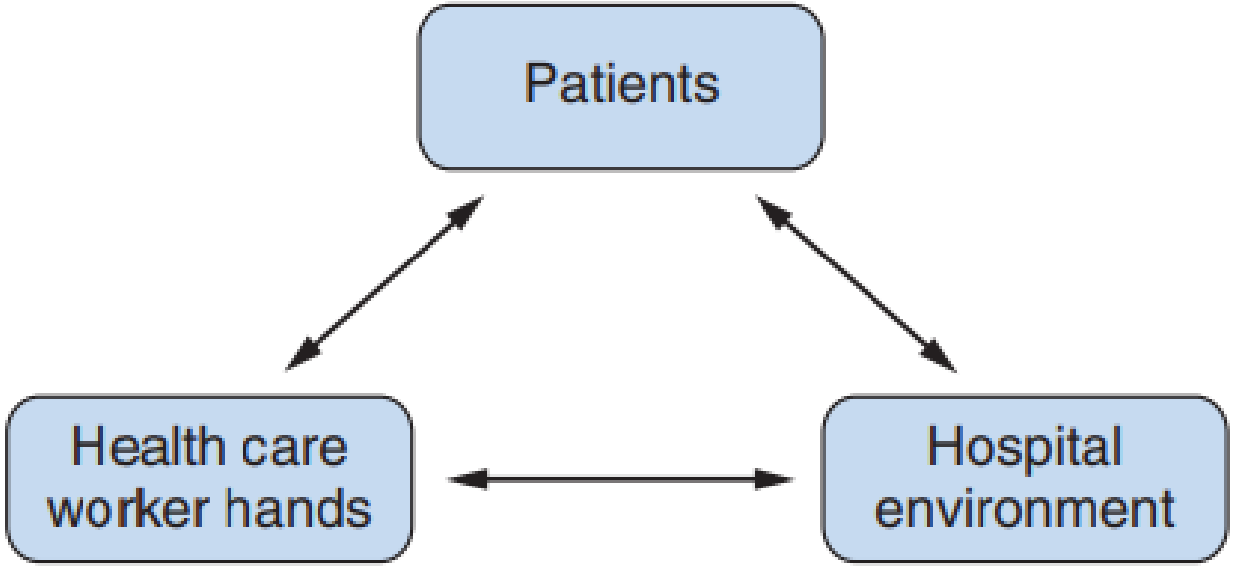


FIGURE 50.3 Epidemiologic links for transmission of multidrug-resistant organisms. (From Munoz-Price LS, Weinstein RA. Fecal patina in the anesthesia work area. *Anesth Analg*. 2015;120(4):703–705.)

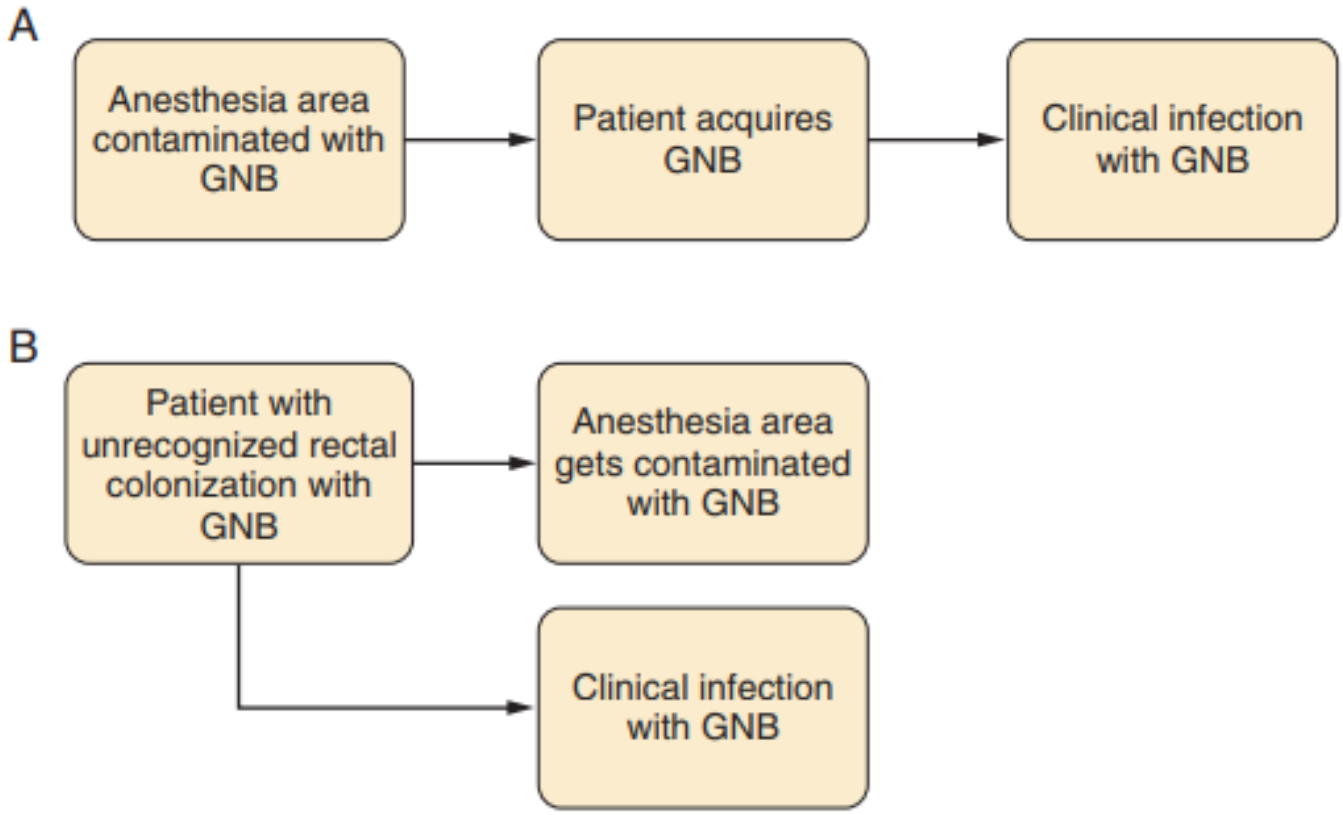
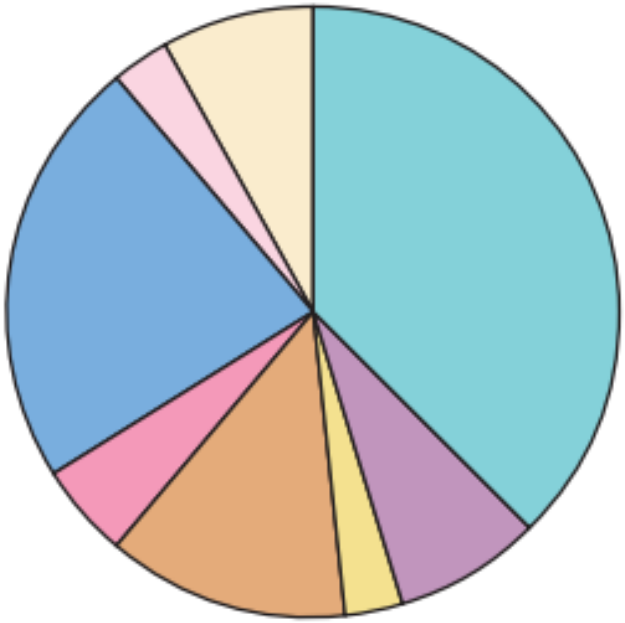
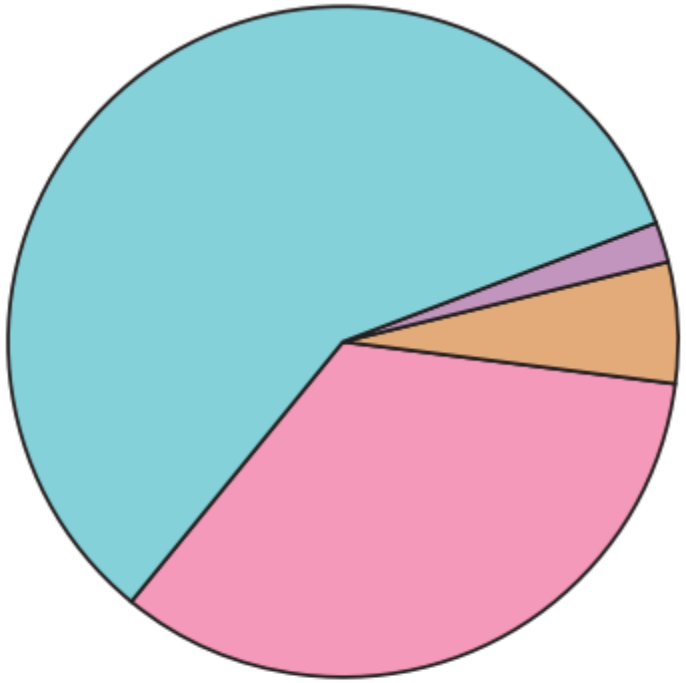


FIGURE 50.4 Possible explanations of subsequent clinical infections caused by the same organism cultured in the anaesthesia work area. **A,** Contaminated environment exposes patient to gram-negative bacilli (GNB) with the subsequent development of a clinical infection. **B,** Patient with unrecognized rectal colonization undergoes surgery, contaminating the anesthesia area with his/her endogenous GNB, and later develops a clinical infection with the same organism. (Data from Loftus RW, Brown JR, Patel HM, et al. Transmission dynamics of gram-negative bacterial pathogens in the anesthesia work area. *Anesth Analg*. 2015;120(4):819–826.)



- While using the device (38%)
- Between steps or during complex procedures (8%)
- While removing the needle from the rubber stopper or other resistant material (3%)
- While capping a used needle (13%)
- While setting components apart (5%)
- After use, before disposal (23%)
- While dumping the device in the waste container (3%)
- Other (8%)



- Hollow needles (59%)
- Glass (2%)
- Other/unknown (6%)
- Solid piercing device (34%)—suture needle 19%, scalpel 7%, other 8%

Guide to Post-exposure Prophylaxis and Prevention of Infection Transmission

- **PEP Step 1:** Treat Exposure Site

- **PEP Step 2:** Report and Document

- **PEP Step 3:** Evaluate the Exposure

- **PEP Step 4:** Evaluate the Exposure Source
  - ✓ When source patient is known
  - ✓ When source patient is NOT known/unable to be tested immediately

Factors to Consider in Assessing the Need for Follow-Up After Occupational Exposure

Type of Exposure

- Percutaneous injury
- Mucous membrane exposure
- Nonintact skin exposure
- Bites resulting in blood exposure to either person involved

Type and Amount of Fluid/Tissue

- Blood
- Fluids containing blood
- Potentially infectious fluid or tissue
- Direct contact with concentrated virus

Infection Status of Source Patient

- If positive for HBsAg testing for exposed person's vaccination status.
- If positive for HCV antibody, consider measuring HCV viral load.
- If positive for HIV antibody, consider obtaining HIV viral load testing, and evaluating clinical status of patient.

Susceptibility of Exposed HCP

- Hepatitis B vaccine and vaccine response status
- HBV, HCV, and HIV status—baseline testing for HbsAb, anti-HCV, and HIV antibody should be completed as early as possible (preferably within 72 hours)

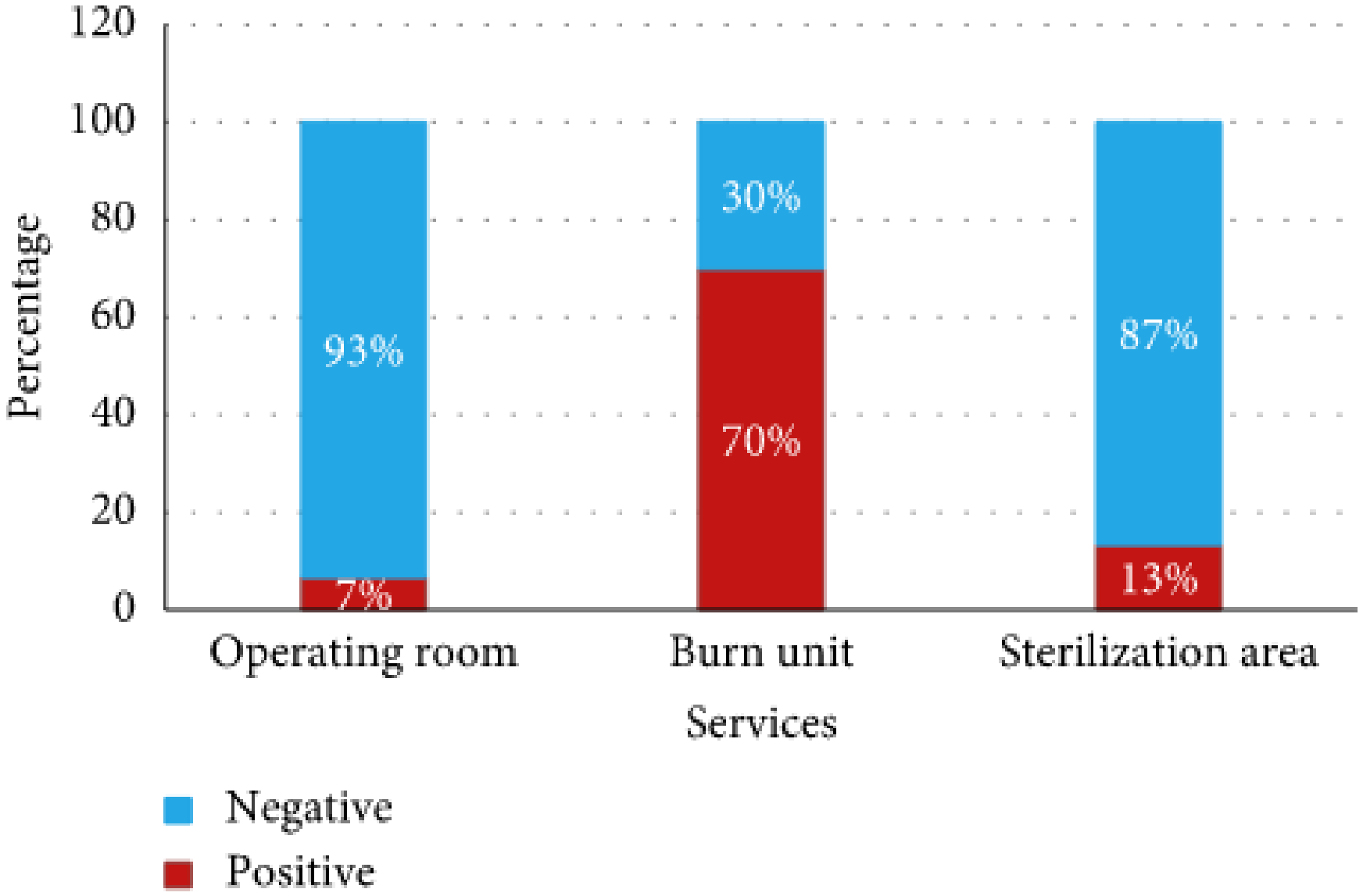
Accessibility of PEP and Follow-Up

- PEP should be initiated within 2 hours of the exposure.
- The eficacy of PEP initiation is thought to diminish after 24 to 36 hours following an exposure.

Laboratory Tests Used for Evaluation

- If the fourth-generation combination HIV Ag/Ab assay is used to test the source patient, HIV follow-up testing can be completed 4 months after exposure.

HBV, hepatitis B virus; *HBsAb*, hepatitis B surface antigen; *HCV*, hepatitis C virus; *HIV*, human immunodeficiency virus; *PEP*, postexposure prophylaxis.
From Mountain Plains AIDS Education and Training Center. PEP Steps, A Quick Guide to Postexposure Prophylaxis in the Health Care Setting (April 2006); PEP Steps: A Quick Guide to Postexposure Prophylaxis in the Health Care Setting (March 2014).



https://doi.org/10.1155/2020/1318480

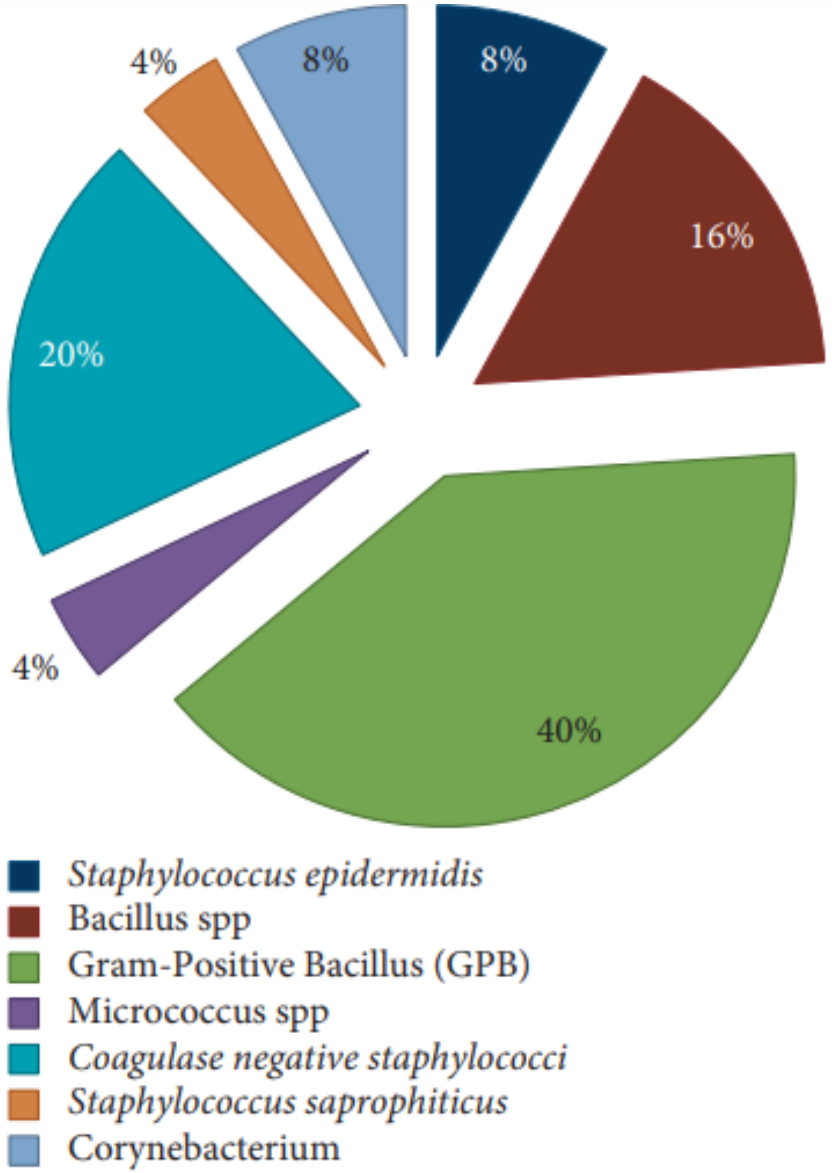


FIGURE 2: Distribution of isolated bacteria.

Table 1: CFU/25 cm^2 found in the different critical points of the three services studied.

	Services	Critical points	CFU/25 cm^2 ($M \pm \sigma$)
Burn unit	Operating room	Operating table	0
		Instruments table	0
		Anesthesia mask	0
	Patient's room 1	Cart	3 ± 1.67
		Bed rails	5 ± 4.67
		Bedside tables	8 ± 6.67
		Refrigerator	7 ± 4.33
	Patient's room 2	Cart	41 ± 25.33
		Bedside tables	87 ± 47.33
		Bed rails	173 ± 100
Operating room	Operating table	58 ± 33.33	
	Instruments table	0	
	Anesthesia table	0	
	Mask of anesthesia	0	
	Scialytic	0	
Sterilization	Conditioning area	Paillasse	0
		Autoclave	115 ± 66.67
	Storage area	Cart	0
		Paillasse (1)	0
		Paillasse (2)	$1 \pm 0,.3$

$M \pm \sigma$: mean $\pm$ standard deviations. CFU: colony-forming unit.

Type and concentration of bio-aerosols in the air of surgical rooms

Table 1
The genus and the median number of bacteria observed in the operating rooms before, during and after surgery (CFU/Plate).

Genus	Eye surgery			Orthopedic surgery			Internal Surgery			Cesarean section		
	Before	During	After	Before	During	After	Before	During	After	Before	During	After
S.epidermidis	2.20	2.60	3.40	2.46	4.00	2.61	5.00	5.50	4.75	2.00	3.50	1.50
S. aureus	0.60	0.80	1.20	0.60	0.64	0.69	0.50	0.50	0.50	ND	ND	0.50
B. subtilis	0.20	0.20	0.40	ND	0.37	0.36	0.25	0.70	0.25	0.50	ND	1.00
lactobacillus	0.40	0.20	0.40	0.40	ND	0.44	1.50	ND	0.25	2.50	1.00	0.50
diphtheriae	ND	0.20	0.50	0.64	0.64	0.64	ND	0.50	0.75	ND	4.00	1.00
E. coli	–	–	–	0.08	0.08	0.08	–	–	–	–	–	–

Table 2
The genus and a median number of fungi observed in the operating rooms before, during and after surgery.

Genus	Eye surgery			Orthopedic surgery			Internal Surgery			Cesarean section		
	Before	During	After	Before	During	After	Before	During	After	Before	During	After
Cladosporium	1.80	2.40	1.75	0.6	2.38	2.07	1.02	1.97	2.75	0.50	1.50	2.00
Aspergillus	1.60	2.00	1.00	0.46	2.07	1.46	1.00	0.80	ND	ND	1.50	ND
Penicillium	1.00	1.00	0.40	1.54	1.00	0.76	0.50	0.80	0.50	0.50	1.00	ND

https://doi.org/10.1016/j.mex.2019.03.016

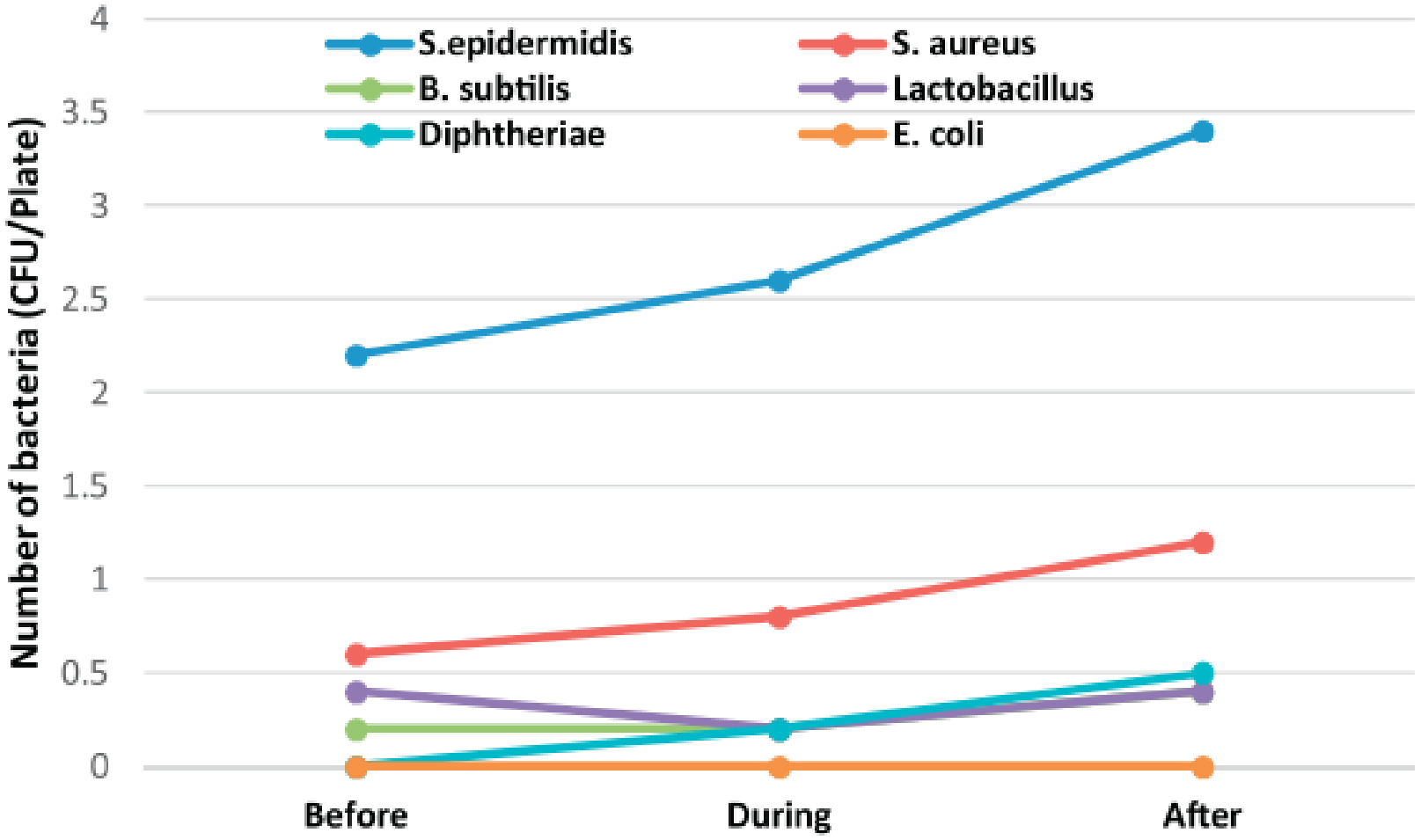


Fig. 1. The trend of bacteria count in the Eye surgery ward.

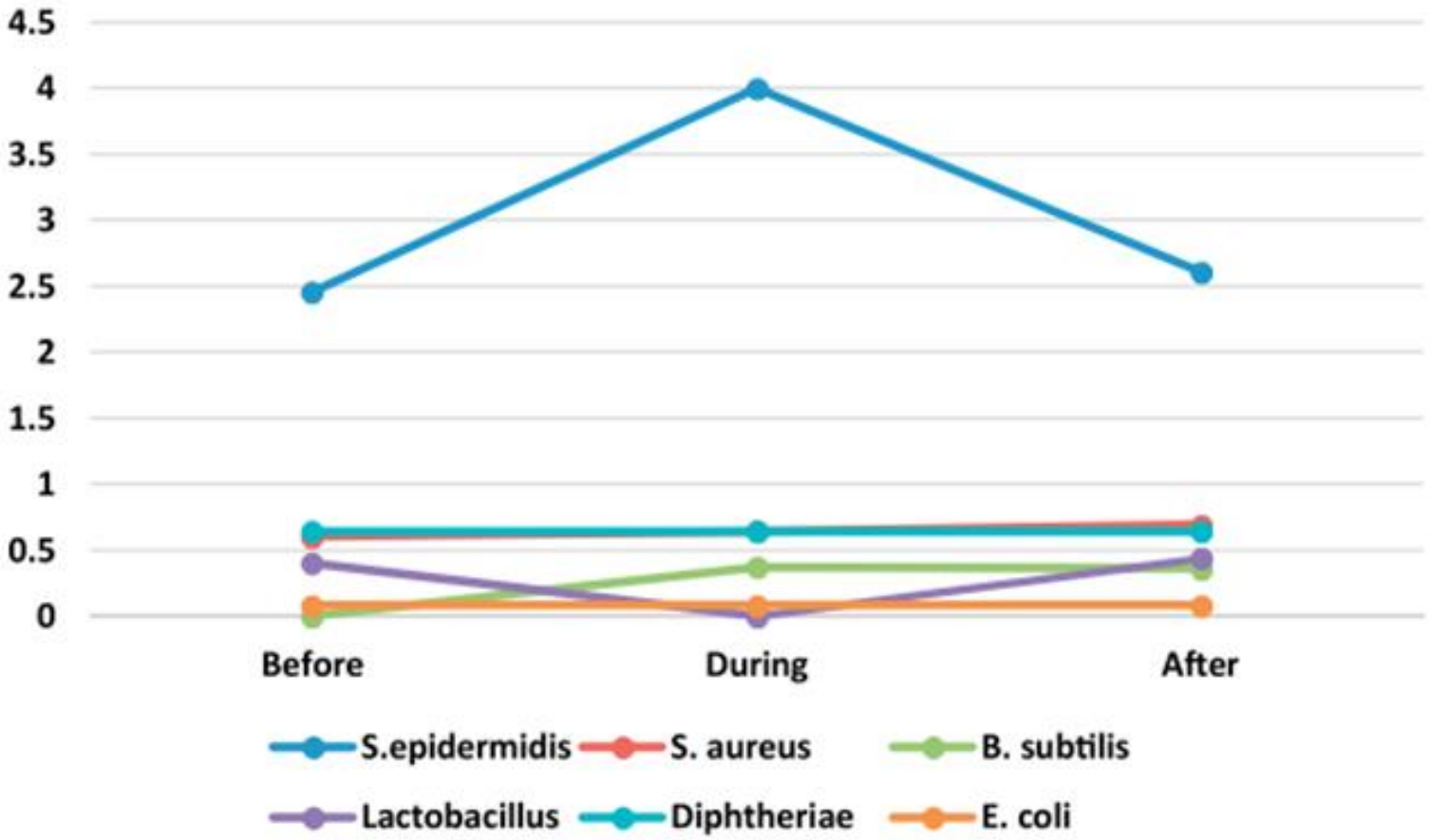


Fig. 2. The trend of bacteria count in Orthopedic surgery ward.

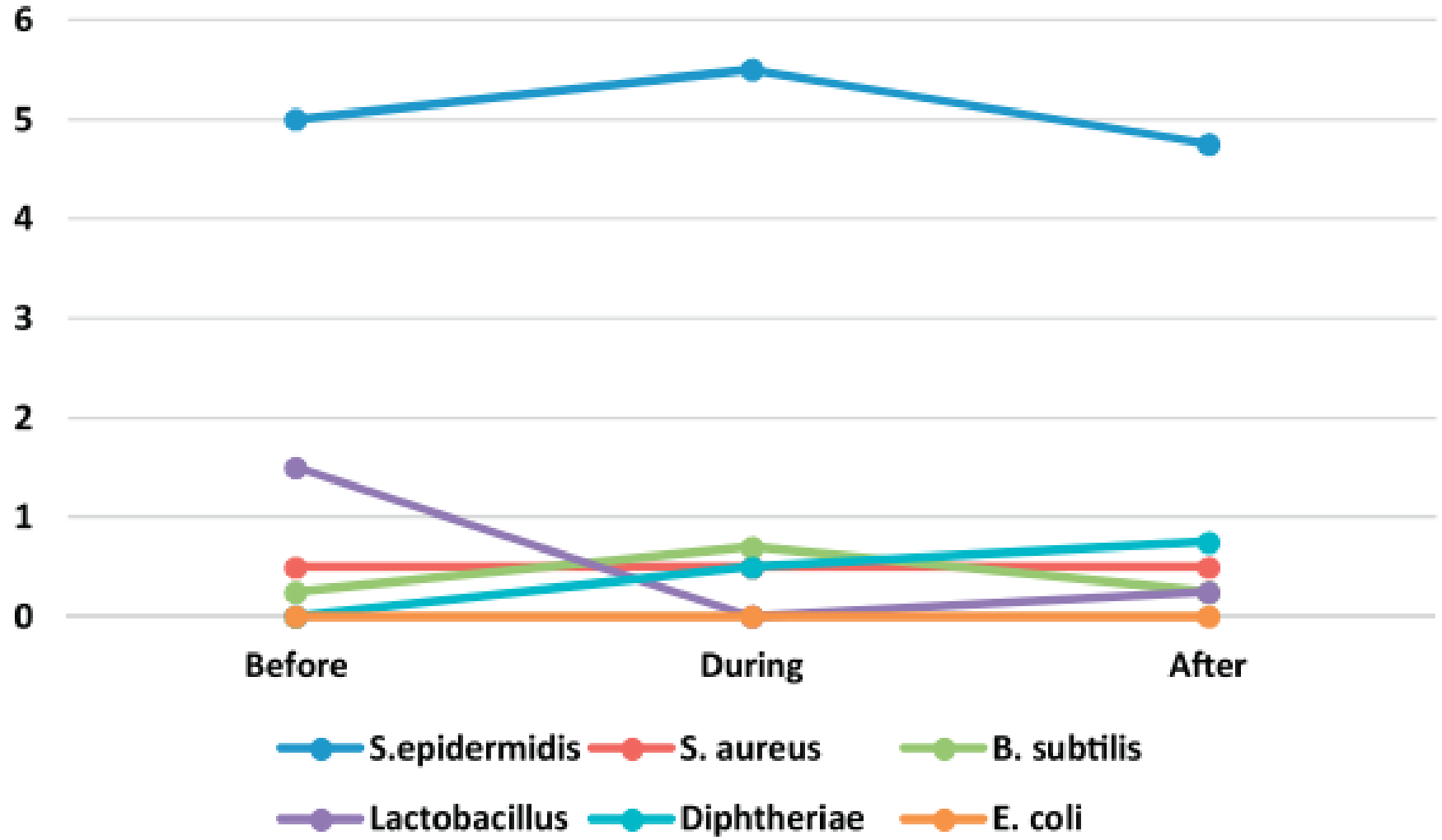


Fig. 3. The trend of bacteria count in Internal surgery ward.

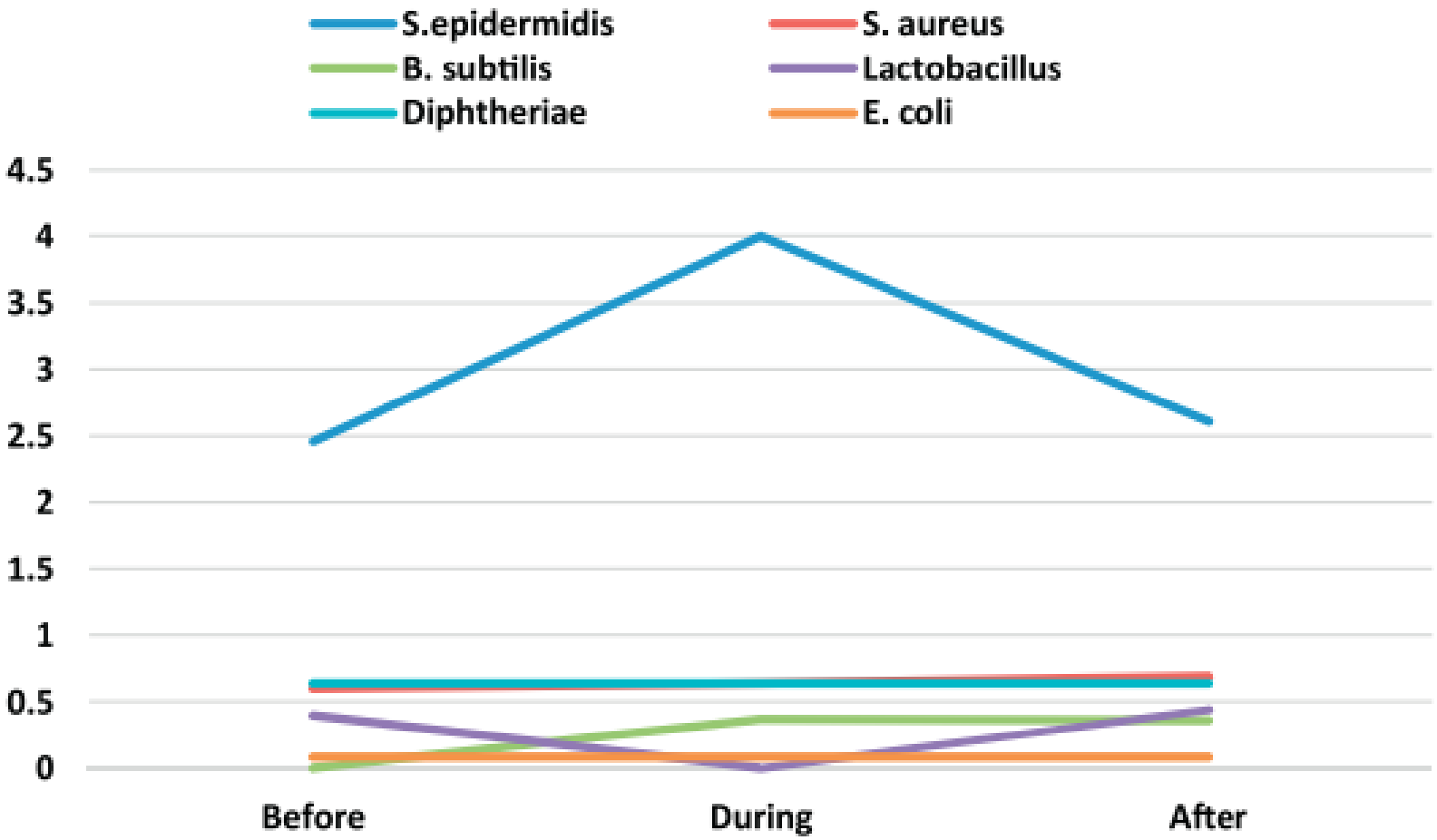


Fig. 4. The trend of bacteria count in Cesarean section ward.

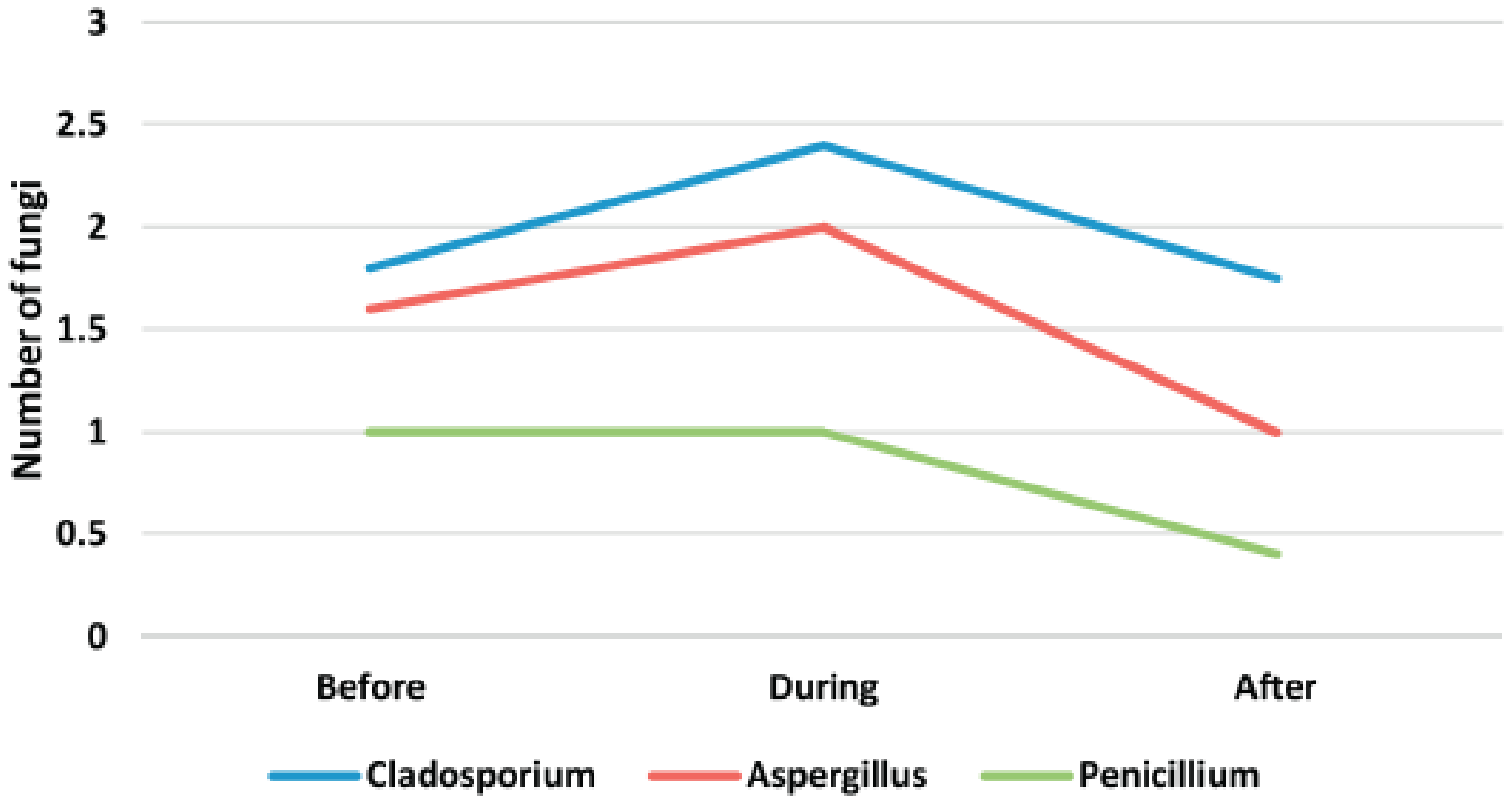


Fig. 5. The trend of the fungal count in Eye surgery section ward.

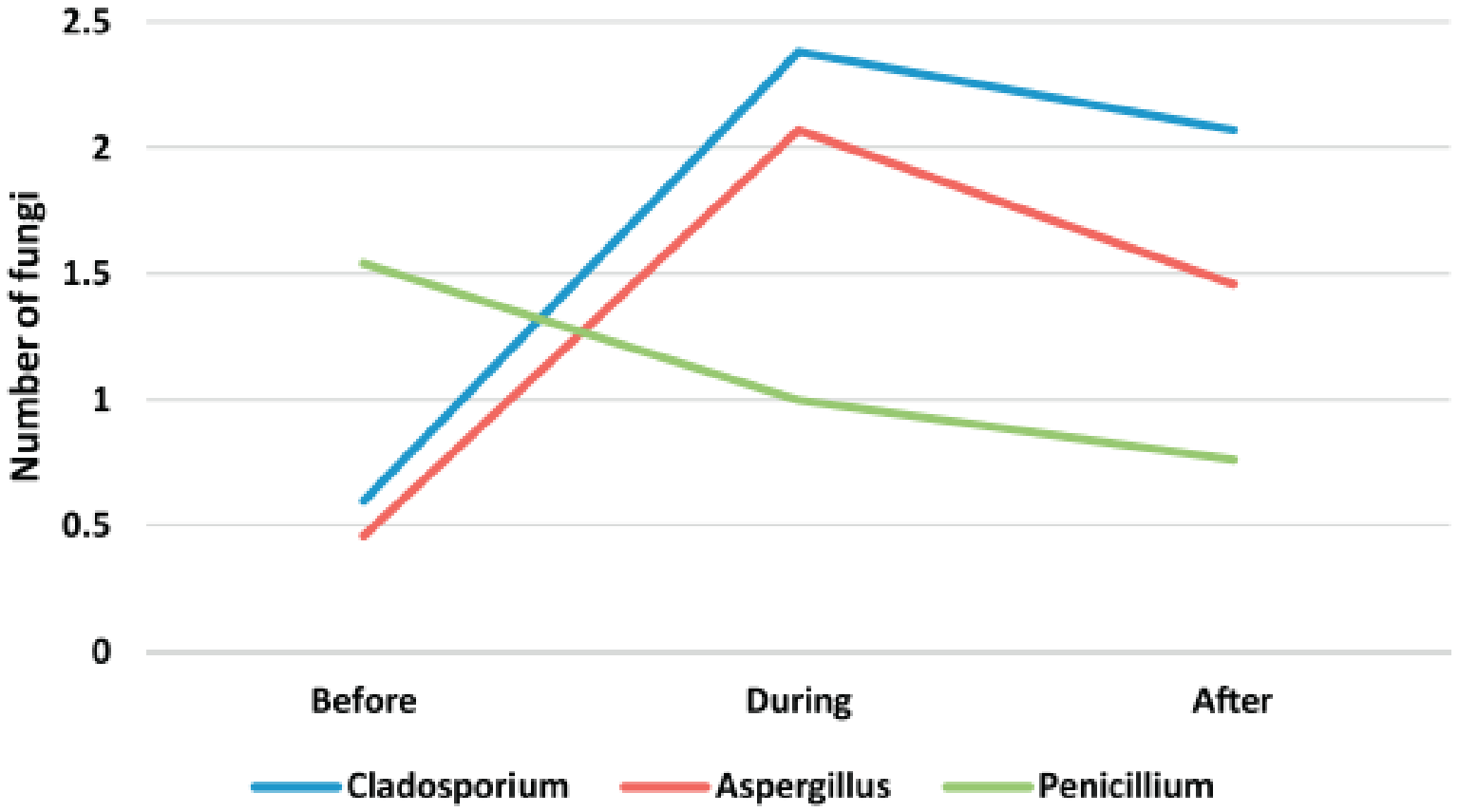


Fig. 6. The trend of the fungal count in Orthopedic surgery ward.

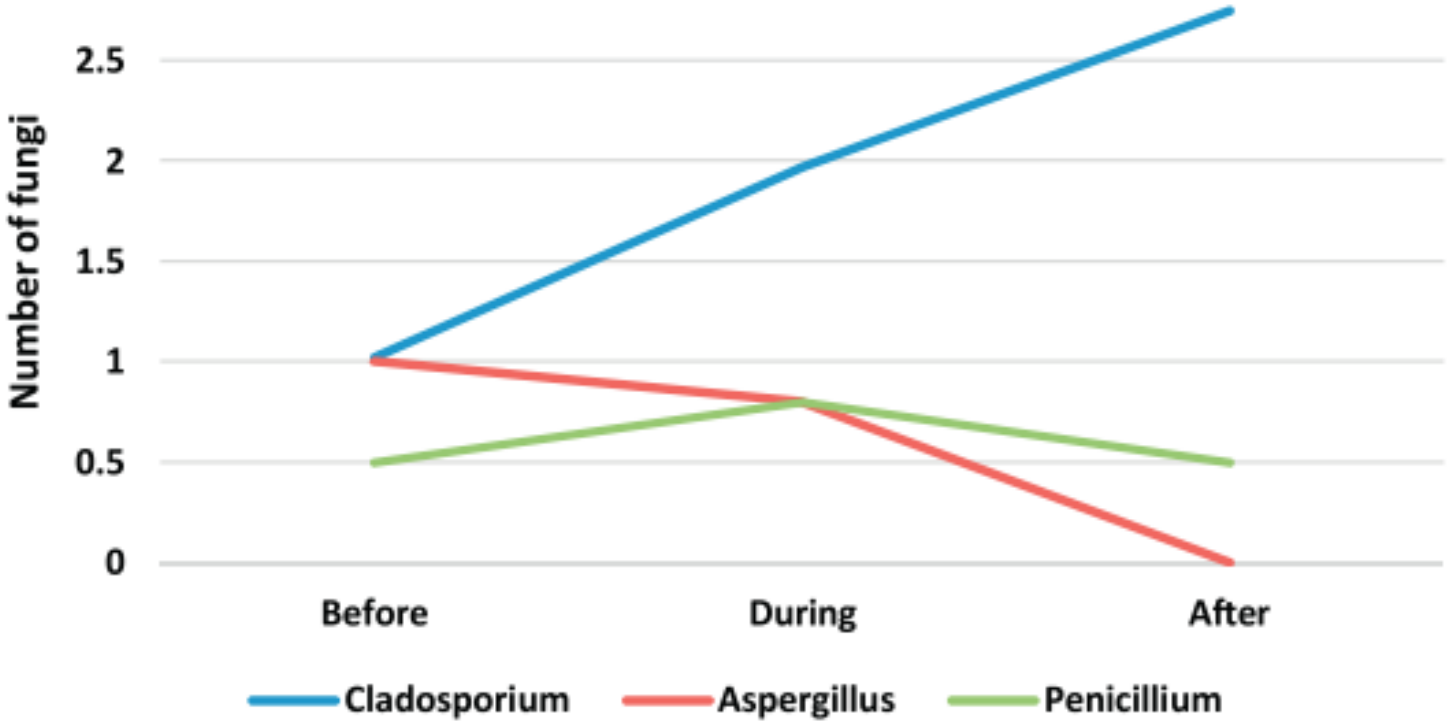


Fig. 7. The trend of the fungal count in Internal Surgery section ward.

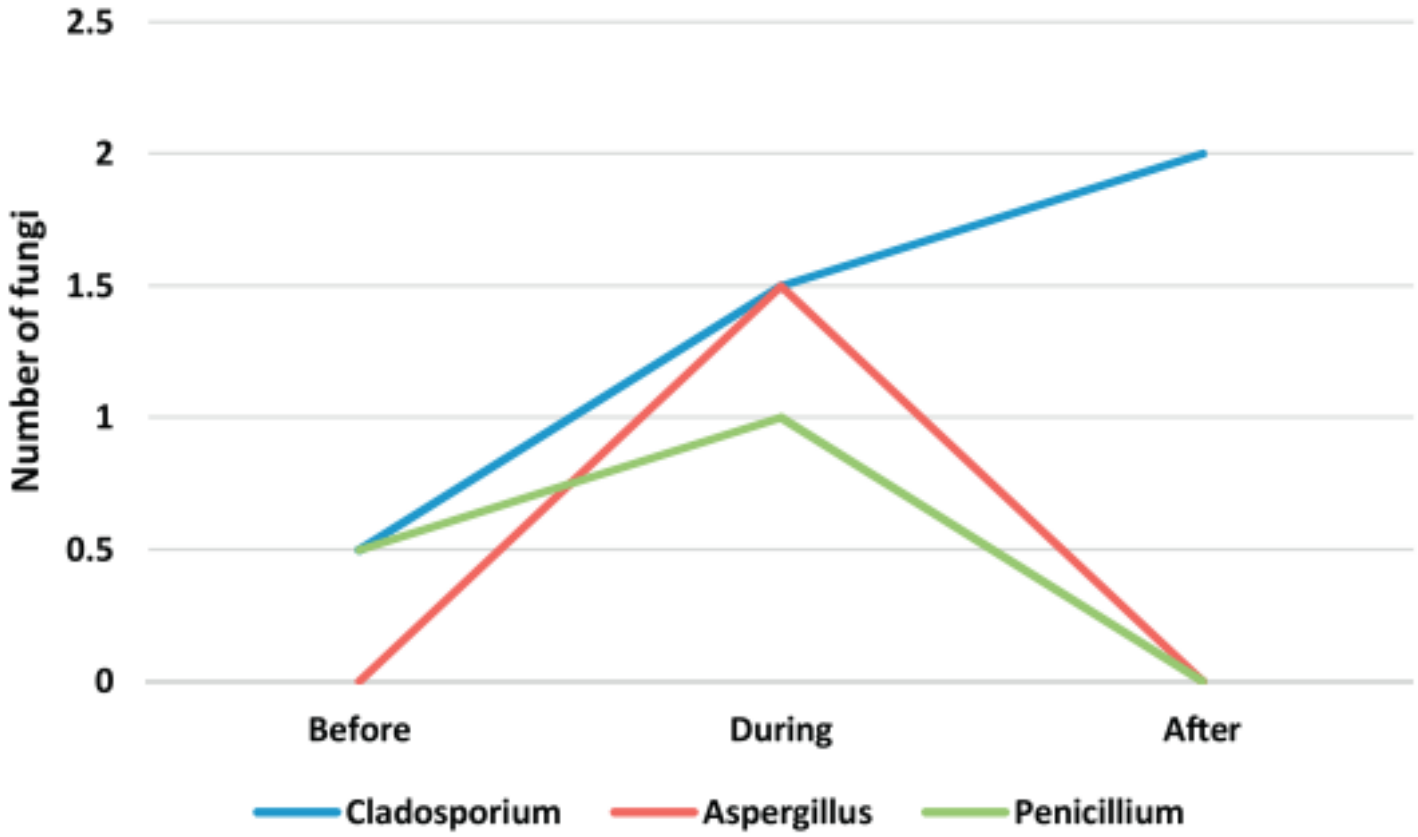


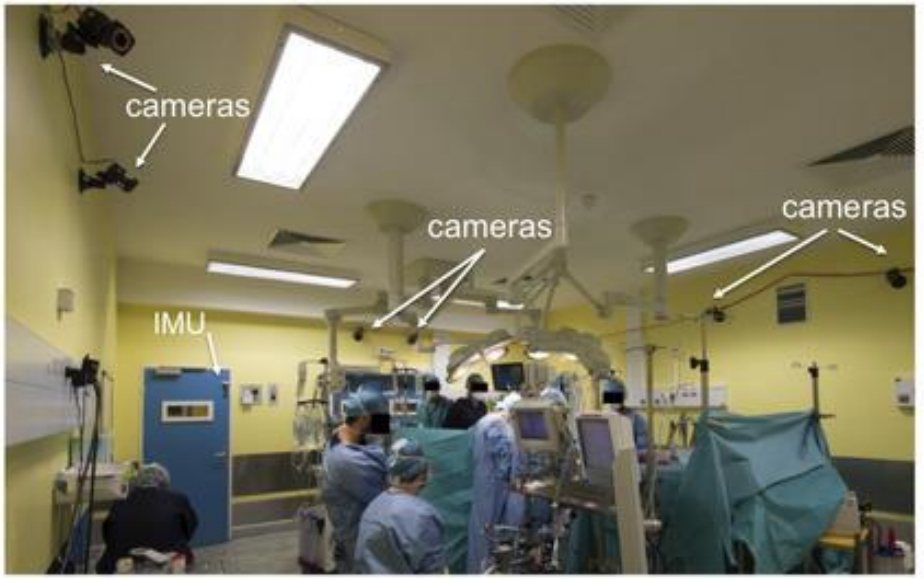
Fig. 8. The trend of the fungal count in Cesarean section ward.

The results of the correlation coefficient between bacterial and fungal bio-aerosol concentrations and the surgical incision size.

Parameter	Incision size		Bacterial concentration		Fungi concentration	
	correlation coefficient	p-value	correlation coefficient	p-value	Correlation coefficient	p-value
Incision size	1	0.00				
Bacterial concentration	0.10	0.64	1	0.00		
Fungi concentration	0.02	0.94	0.53	0.01	1	0.00

UV light could reduce hospital-acquired infections


cluster of
4 reflective
markers


cameras
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camera
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thank you