

Surface Disinfection



Prof. Dr. Dr. h.c. Hans-G. Sonntag
01.12.2011

Disinfection

- I just want to remind about that what is already done in the field of disinfection. Especially for this field in former times a real experimental background was missing, ...and a lot of money was thrown away for useless disinfection. But now we have very secure characteristics (dates) in our hands ...to test disinfecting substances concerning their effectivity, ..so that the now used disinfecting substances, as far as they have passed our tests really fulfill their purpose.

● Robert Koch 1890

Disinfection : Definition

- The demand for a sufficient disinfection is the reduction of the number of infectious germs on the object to be disinfected in that manner that no infection can be induced through it.
- With this the very often missing evidence of the pathogenicity of infectious germs and the quantitative reduction rate ($> 5,0$ log) is taken into account.

Cleaning : Definition

- The main aim of cleaning is the removing of waste and other substances from surfaces. According to certain washing or different chemical mechanisms this includes at the same time an effect of reduction of infectious germs, and thus leads to a prerequisite for an effective disinfection.

Routine Disinfection : Definition

- Synonym : normal, prophylactic disinfection.
- Purpose : Restriction of the spread of infectious germs while taking care and treatment of patients.
- Done on surfaces where a contamination is assumed without any sign or visibility of such a contamination.

Specific Disinfection : Definition

- Done if there is a visible contamination of surfaces with blood, pus, excrements (e.g. using pulp moistened with disinfecting substances).
- As a final disinfection in rooms or areas where infected or colonized patients were treated or taken care of.
- In outbreak situations to reduce or prevent the spread of infectious germs.

Evaluation of Environment as a risk for Infections

- Ubiquitäre Presence of Microorganisms
- Persistence and Virulence of infectious germs in the environment, possibility of transfer of and amount of infectious germs.
- Increasing number of patients with health risks (immunosuppression, old patients)
- Increasing number of antibiotic-resistant bacterien
- Knowledge from outbreaks and their control.

Survival Time of Viruses on Surfaces (1)

● Adenovirus	1 – 3 months
● CMV	8 hours
● Coxsackievirus	2 weeks
● HAV	up to 60 days
● HBV	> 1 week
● HIV	> 7 days
● HSV 1, HSV 2	4,5 to 7 days
● Influenza Virus	1 to 2 days

Survival Time of Viruses on Surfaces (2)

● Papilloma Virus	> 7 days
● Papova Virus	8 days
● Parainfluenza Virus	10 hours
● Parvo Virus	> 1 year
● Picorna Virus	> days
● Polio Virus	1 day to 8 weeks
● Rota Virus	6 to 60 days
● Vaccinia Virus	1 to 4 weeks

Survival Time of Bacteria on Surfaces (1)

- Acinetobacter spp > 60 days
- Bacillus anthracis Spores several years
- Bordetella pertussis 3 to 5 days
- Cl. difficile Spores 5 months
- Chlamydia pneumoniae < 30 hours
- Coryneb. Diphtheriae days to months
- E. coli 3 days – 16 months
- Enterococcus spp. 5 days – 4 months

Survival Time of Bacteria on Surfaces (1)

- Acinetobacter spp > 60 days
- Bacillus anthracis Spores several years
- Bordetella pertussis 3 to 5 days
- Cl. difficile Spores 5 months
- Chlamydia pneumoniae < 30 hours
- Coryneb. Diphtheriae days to months
- E. coli 3 days – 16 months
- Enterococcus spp. 5 days – 4 months

Survival Time of Bacteria on Surfaces (2)

- Helicobacter pylori up to 90 minutes
- Klebsiella spp. 18 days to 30 months
- Mycob. Tuberculosis 4 days to 4 months
- N. gonorrhoeae 1 to 3 days
- Ps. aeruginosa 2 days to 16 months
- Salmonella typhi 30 hours up to years
- Shigella spp. 2 days to 5 months

Survival Time of Bacteria on Surfaces (3)

- Staphylococcus aureus weeks to months
- MRSA weeks to months
- S. pneumoniae 1 to 20 days
- S. pyogenes 3 days to 6,5 months
- Vibrio cholerae 1 to 3 days

Survival Time of Fungi on Surfaces

- *C. albicans* 48 to 120 days
- *T. glabrata* 102 to 150 days
- Fungi Spores several years

Proof of Viruses on Patient dependent Surfaces

- HAV (Sundquist et al , 2000)
- Norwalk-like Virus (Roden et al , 1997)
- RS Virus (Hall, 1982, Hall, 1983)
- Rotavirus (Dutta et al, 1992, Wilde et al 1992)
- Rotavirus (Butz et al , 1993)

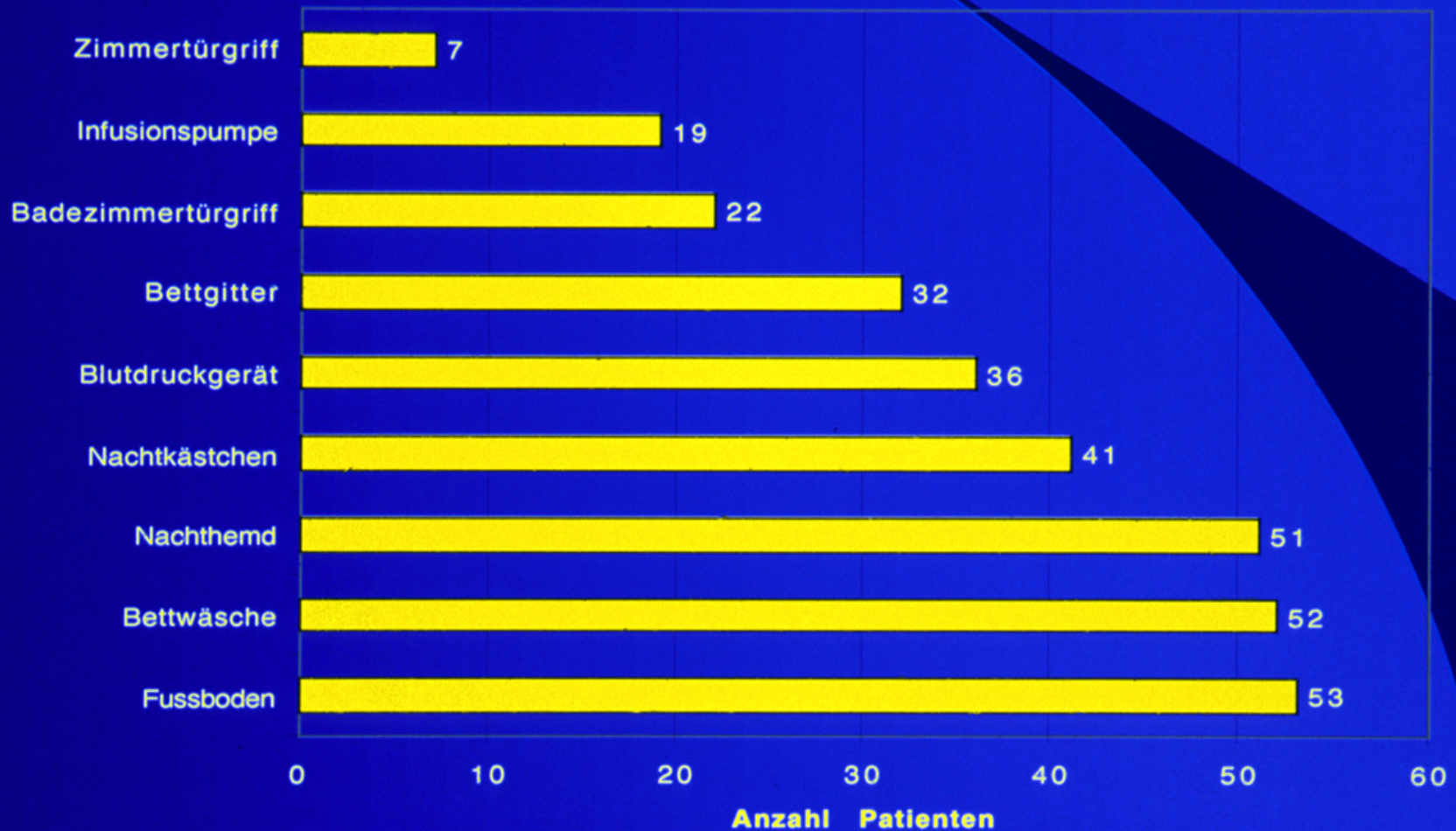
Proof of Bacteria on Patient dependent Surfaces

- Fäkalcoliforme (Laborde et al 1993)
- Shigella (Mermel et al, 1997)
- C. difficile (Kaatz et al, 1988, Corless , 1998)
- Acinetobacter (Catalano, 1999)
- VRE (Byers et al , 1998)
- MRSA (Boyce et al, 1997)
- Ps. aeruginosa (Pitten und Panzig, 2001)

Umgebungscontamination mit MRSA

- 38 konsekutive MRSA kolonisierte/infizierte Pt.
- 7-11 Umgebungsuntersuchungen im Pt.zimmer
- 96 (27%) der 350 Kulturen waren MRSA-positiv
- Bei 23 (85%) der 27 Pt. mit Nachweis von MRSA in Urin oder Wunden war Umgebung MRSA-positiv
- Dagegen nur bei 4 (36%) der 11 Pt. mit MRSA nur in Sputum, Blutkultur oder Konjunktiven war die Umgebung MRSA-positiv
- 13 (65%) der 20 Kittel von Personal mit direktem Patientkontakt waren MRSA-positiv

Umgebungskontamination mit MRSA



Boyce, Inf Control Hosp Epidemiol 1997;18:622

Transfer of infectious germs from the Environment to Patients

- E.coli, Salmonella, Klebsiella, S. aureus : (Scott and Bloomfield, 1990)
- Rhinovirus : (Sattar, Jacobsen et al. 1993)
- Rotavirus : (Sattar, Jacobsen et al. 1994, Ward, Bernstein et al. 1991)
- Bacteriophages : (v. Rheinbaben, Schunemann et al. 2000)

Surfaces close to the Patients with a frequent contact to Hands and Skin

- Bettgestell/-gitter, Haltegriff, Aufrichtehilfen,
- Nachttisch, Ablagen, patientennahe Möbel,
- Sanitärbereich für Patienten (z.B. Badewanne, Waschbecken, -umgebung),
- Medizinische Geräte (Monitore, Infusionsständer, EKG-Gerät, Kabel)
- Toilettenstuhl, Tragen,
- Inkubatoren, Wickeltisch
- Fußboden um das Patientenbett

Surfaces distant from Patients with frequent Possibilities for Contact

- Arbeitsflächen von Verbandwagen
- Arbeitsflächen im Stationszimmer (Zubereitung von Infusionslösungen, Spritzen),
- Tastaturen und Oberflächen von medizinischen Geräten,
- Bedienelemente von Kaffee- und Tafelwasseranlagen, Türgriffe, Haltegriffe außerhalb des Patientenzimmers

Surfaces distant from Patients without frequent Contact

- Fußböden (z.B. Stationsflur),
- Wände (außerhalb des direkten Kontaktbereiches),
- Lüftungsauslässe,
- Lampen,
- Heizkörper.

Patientenferne Flächen ohne häufige Kontakte

- Fußböden (z.B. Stationsflur),
- Wände (außerhalb des direkten Kontaktbereiches),
- Lüftungsauslässe,
- Lampen,
- Heizkörper.

Einteilung der Flächen nach Risikobereichen (1)

- Bereiche ohne erhöhtes Infektionsrisiko (Treppenhäuser, Flure, Verwaltung, Technik)
- Bereiche mit erhöhtem Infektionsrisiko (Normalstation, Ambulanz, Labor, Sanitärber.)
- Bereiche mit Patienten mit Infektionsrisiko (OP-Abt. Eingriffsräume, Intensiv, invas. Diag.)
- Bereiche mit kontaminierten Patienten (Infektionsstat., Dialyse, Intensiv, Kinderamb.)
- Bereiche mit Infektionsrisiko für Personal

Einteilung der Flächen nach Risikobereichen (2)

- Bereiche ohne erhöhtes Infektionsrisiko
(**Reinigung**)
- Bereiche mit erhöhtem Infektionsrisiko
(Patientennahe und Flächen mit häufigem Hautkontakt : **Desinfektion** , Fußböden und sonstige Patientenferne Flächen : **Reinigung**)
- Bereiche mit Patienten mit Infektionsrisiko
(Patientennahe und Flächen mit häufigem Hautkontakt sowie Fußböden :**Desinfektion**)

Einteilung der Flächen nach Risikobereichen (3)

- Bereiche mit kontaminierten Patienten (Patientennahe und Flächen mit häufigem Handkontakt sowie Fußböden **Desinfektion**)
- Bereiche mit Infektionsrisiko für Personal (Flächen mit häufigem Handkontakt, Arbeitsflächen und Fußböden:**Desinfektion**)

Evidence based measures (1)

- Absence of evidence for a health hazard is not equivalent to evidence of absence of a risk of exposure with an adverse health effect

● Mossel et al. , 2002

Evidence based measures (2)

- In the absence of convincing evidence, though circumstantial indications point to a putative health hazard, actions, based on putative health hazard actions , based on prudence constitute the legitimate policy for consumer protection

● Mossel et al., 2002

Categories of Hygienic Measures

- Category I b :
- Strongly recommended for implementation and supported by certain experimental, clinical or epidemiologic studies and a strong theoretical rationale

Categories of Hygienic Measures

- Category III :
- Measures with insufficient information about their effectivity or til now they are without consensus.



Ideal Requirements a Disinfecting Substance should fulfill

- Fast killing or inactivating pathogenic germs and their vegetative forms
- No toxic effect of the disinfecting substance in the used concentration
- No effect of the disinfecting substance on odor or taste of water
- Sufficient constancy in water to guarantee a germicide effect dissolved in the water