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Skin Infections and prevention measures

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Potential bacterial contaminations of tattoo inks

Reference	Total number of tested inks (opened/unopened)	Number (percentage) of contaminated samples		Bacterial load [cfu/g] (samples)	Organisms identified
		Total	Opened, Unopened		
Reus and van Buuren (2001) (e5)	63 (32/31)	11 (18)	8 (25), 3 (10)	10^4 – 10^5 (1), $> 10^5$ (7) 10^2 – 10^4 (3)	<i>Pseudomonas aeruginosa</i> , <i>P. putida</i> , <i>P. fluorescens</i>
Charnock (2004) (e6)	12 (10/2)	7 (58)	6 (60), 1 (50)	10^2 – 10^3 (2), 10^6 – 10^9 (4) 10^2 – 10^3 (1)	Gram-positive, aerobic rods, <i>Citrobacter freundii</i> , <i>Achromobacter xylosoxidans</i> , <i>A. denitrificans</i> , <i>Corynebacterium</i> sp., <i>Brevundimonas diminuta</i> , <i>P. aeruginosa</i> , <i>Stenotrophomonas maltophilia</i> , <i>Leuconostoc</i> spp., <i>Methylobacterium mesophilicum</i>
Droß and Mildau (2007) (e7)	245 (mainly opened)	26 (11)		10^2 – 10^7 (26)	<i>Pseudomonas</i> spp., <i>Citrobacter</i> spp., aerobic spore-forming bacteria, <i>Ralstonia pickettii</i> , coliform bacteria
Baumgartner and Gautsch (2011) (e8)	145 (106/39)	41 (28)	27 (26), 14 (36)	$< 10^1$ (5), 10^1 – 10^3 (18), 10^3 – 10^8 (4) $< 10^1$ (7), 10^1 – 10^3 (7)	<i>Enterococcus</i> spp., <i>Micrococcus</i> spp., <i>Staphylococcus</i> spp., <i>Brevundimonas vesicularis</i> , <i>P. fluorescens</i> , <i>S. maltophilia</i> , <i>Bacillus</i> spp., <i>Geobacillus</i> spp., <i>Paenibacillus</i> spp., <i>Virgibacillus pantothenicus</i> , <i>Brevibacillus laterosporus</i>
Kluger et al. (2011) (e9)	16 (16/0)	0 (0)	–	–	–
Høgsberg et al. (2013) (e10)	64 (6/58)	7 (11)	1 (17), 6 (10)	10^2 (1) 10^2 – 10^3 (6)	<i>Streptococcus</i> spp., <i>Acinetobacter</i> sp., <i>Bacillus</i> sp., <i>Staphylococcus</i> sp., <i>Aeromonas sobria</i> , <i>Acidovorax</i> , <i>Pseudomonas</i> sp., <i>Dietzia maris</i> , <i>Blastomonas</i> sp., <i>Enterococcus faecium</i>
Bonadonna et al. (2014) (e11)	34 (27/7)	29 (85)	23 (85), 6 (86)	$< 10^1$ (11), 10^1 – 10^3 (12) $< 10^1$ (4), $< 10^2$ (2)	<i>Bacillus</i> spp., <i>Staphylococcus</i> spp., <i>Enterobacter intermedium</i> , <i>Cronobacter sakazakii</i> , <i>Sphingomonas paucimobilis</i>

Local skin infections by bacteria

- Abscesses
 - Staphylococcal scalded skin syndrome (SSSS)
 - Necrotizing fasciitis / tissue necrosis
 - Cutaneous diphtheria
 - Erythema
 - Pustules or papules
 - cellulitis
- *Staphylococcus aureus*
 - MSSA or MRSA
 - *Streptococcus pyogenes*
 - *Corynebacterium diphtheriae*
 - *Pseudomonas aeruginosa*

Systemic bacterial complications

- Compartment syndrome
- Bacteremia / septicemia
- Septic shock and organ failure
- Toxic shock syndrome
- endocarditis
- Iliopsoas abscess
- Necrotizing pneumonia
- *Staphylococcus aureus*
 - MSSA or MRSA
- *Streptococcus pyogenes*
- Streptococcus spp. C
- *Bacteroides fragilis*
- *Corynebacterium* ssp.
- plus many others

General risks of infection

Tattooing results inevitably in traumatization of the skin as tattoo needles punch through the epidermis thereby coming into contact with blood and lymph vessels in the dermal layer.

General recommendations for infection prevention

- Tattoo artist:
 - Personnel qualification
 - Personnel hygiene
 - Vaccination (i.e. HBV)
 - After-treatment and complications
- Client
 - Individual health condition (contraindications!)
 - Information and written consent (recommended)

Knowledge of Tattoo artist

- about typical microbial contaminants of tattoo inks, equipment and studio environment
- about possible routes of infection
- about typical skin and wound infecting organisms (especially bacterial)
- about the risks of blood-borne infections (HBC, HCV, and HIV) and own vaccination (HBV)
- how to react quickly to suspected treatment infectious complications

Knowledge of Tattoo artist

- of special strategies of infection prevention such as
 - indication of **hand hygiene procedures** i.e. appropriate use of alcohol-based hand disinfectants
 - Correct use of **gloves** (hand disinfection before after use!)
 - Correct **skin antiseptic** before starting
 - Use only **sterile water** for cleaning procedures (mycobacteria!)
 - Sufficient **surface decontamination** of any surface and equipment (HBV prevention!)
 - Correct storage and use of **sterile equipment** and its **protection from cross-contamination** (closed boxes and/or cupboards)
 - **Cleaning, disinfection and sterilization** of used instruments
 - **Safe waste and sharps disposal** in special boxes

Hand disinfection – when?

- Before contact with client and/or tattoo area
- Immediately after contact with blood or obvious infected areas or material (pus)
- After contact with any possible contaminated surfaces or equipment during the procedure before continuing work
- Before (!) and after (!) use of gloves

Continuous training is mandatory for safe hand disinfection



It is impossible to remove gloves without massive hand contamination



Correct aseptic procedures when opening sterile medical devices !



Prevention of Hepatitis B transmission - fight against the invisible enemy

One drop of blood from an acute or chronic HBV-infected client is sufficient to contaminate a full bath tube so effectively that the invisible contact with any drop of water during the tattooing procedure will inevitably transmit enough HBV particles to infect the next client or the tattooing artist if she/he gets injured accidentally!

Don't touch anything or any surface during the tattooing procedure that was not disinfected properly before the next client!