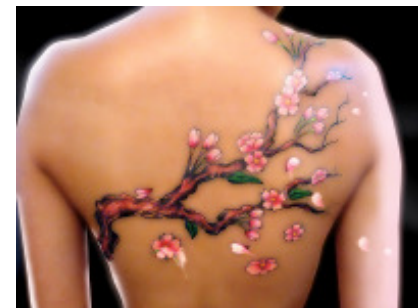


The hidden dangers of getting inked

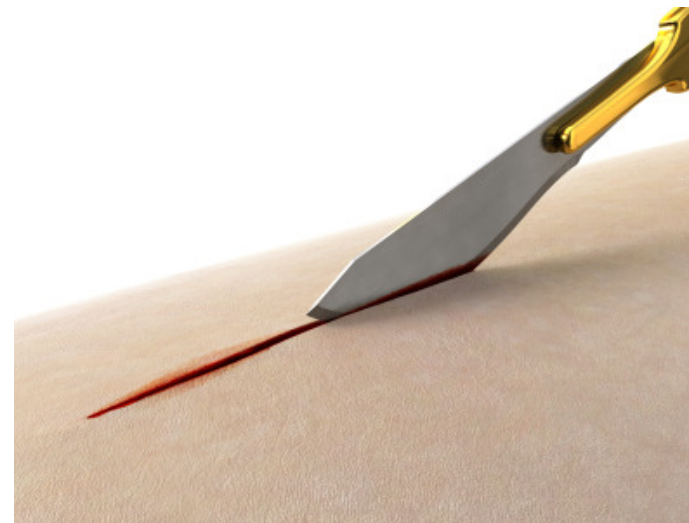
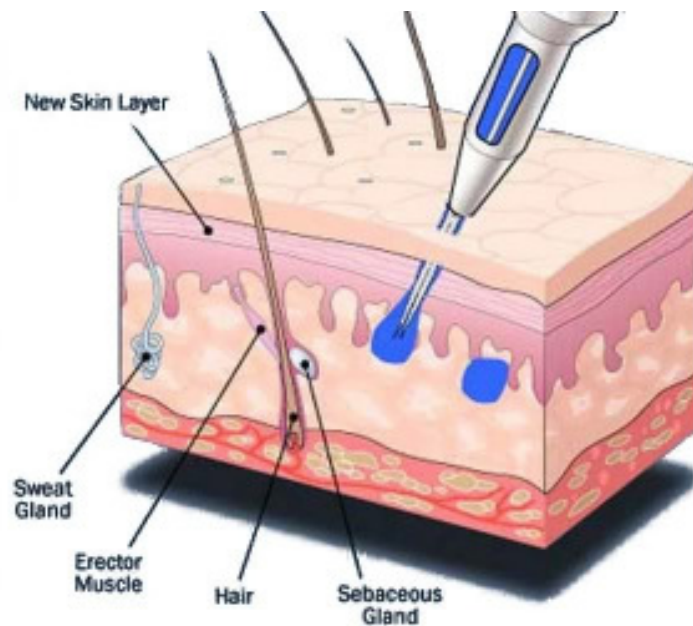
Microbial risks associated with tattooing

Sascha Al Dahouk



Tattoo process

- surgical procedure **breaking the skin barrier**
- **180,000 puncture wounds** for one-hour-tattoo
- **health risks** including **infections**



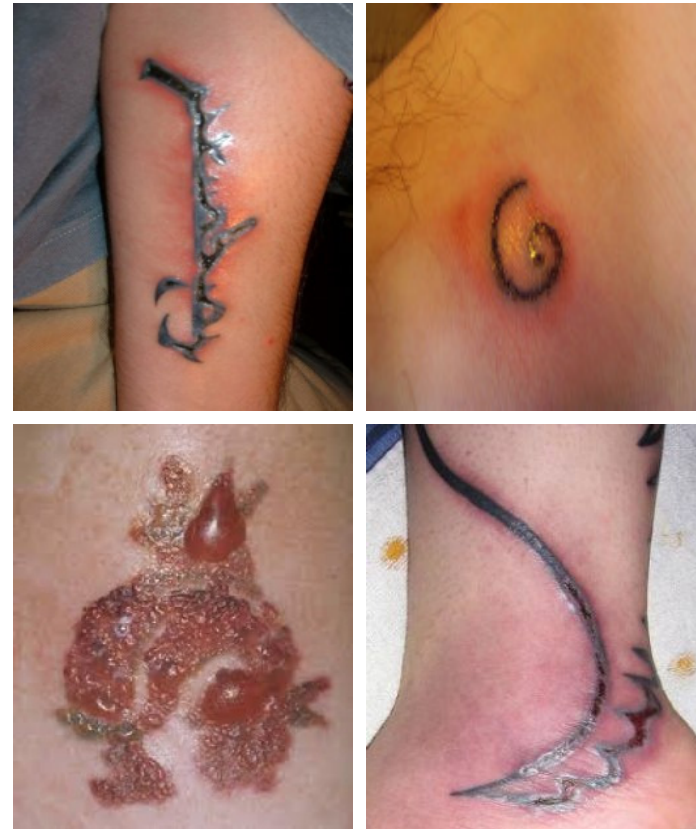
Infected tattoos – clinical signs and symptoms

Cardinal signs of inflammation

- Dolor (pain)
- Calor (heat)
- Rubor (redness)
- Tumor (swelling)
- Functio laesa (loss of function)

Systemic effects

- Lymphadenitis
- Fever



Incidence of tattoo-related infections

- no reliable data available
- ICD-10-GM code: U69.10
 - diseases related to aesthetic surgery, tattoos and piercing
- Internet survey in German-speaking countries (n = 3,411)
 - 67.5% skin problems and 6.6% systemic reactions directly after tattooing
 - 6% persistent skin problems in tattooed area
 - 1% medical consultation
- rough estimate of infection rate: 1-5%
 - about 120 Mio people in Europe and USA are tattooed
 - 1-6 Mio people may be affected

Klügl et al. (2010); *Dermatology* 221: 43-50

Local and systemic tattoo infections



Local skin infections

- superficial (folliculitis, impetigo, furunculosis, **ecthyma**)
- severe pyogenic (erysipelas, gangrene)
- polybacterial (cellulitis, necrotizing fasciitis)
- fungal (rare cases of zygomycosis, sporotrichosis)

Systemic complications

- bloodborne infections
 - hepatitis B/C and HIV (only single case reports)
 - tetanus, tuberculosis, leprosy, syphilis (mainly historic cases)
- infective endocarditis (rare, predisposing valvular heart disease)
- deep skin infection leading to bacteremia and sepsis (very rare)

Origin and types of pathogens

endogenous microbial skin flora

Staphylococcus aureus (CA-MRSA) & group A-Streptococci

environmental/opportunistic bacterial pathogens

non-tuberculosis *Mycobacteria* (MOTT), *Corynebacteria*,
Pseudomonas, *Klebsiella*

bloodborne pathogens

viruses



Mycobacterium chelonae



red hyperkeratotic papules
restricted to grey tattoo areas

Potential source of infection: **Tap water**

- for diluting black ink into grey
- for rinsing tattoo devices

Rodriguez-Blanco et al. (2011); *Acta Derm Venereol* 91: 61-106

Methicillin-resistant *Staphylococcus aureus*



pustules surrounding in a tattoo recipient

Potential source of infection:

- suboptimal infection-control practices
- non-sterile equipment

Centers for Disease Control (2006); *MMWR* 55: 677-9

Main routes of transmission



- non-sterile devices and lack of sterile conditions
 - from one client to another (contamination with infected blood)
 - from tattoo artists (personal hygiene)
 - from surfaces and equipment (environmental contamination)
- infection during the healing process
- tattoo products (pigments, inks, dilution solvents)

Skin infection outbreaks via tattooing and permanent make-up

Country	Year	No. of cases	Pathogens	Origin of infection
Ohio, Vermont, Kentucky	2004/2005	44 (6 clusters)	MRSA	nonsterile equipment, suboptimal infection-control practices
France	2005	8	MOTT	tap water
Minnesota	2007-2008	6	<i>M. chelonae</i>	non-sterile water
Switzerland	2009	12	<i>M. haemophilum</i>	PMU ink
Spain	2008/2009	5	<i>M. chelonae</i>	non-sterile water, non-sterile devices
Germany	2011	7	<i>M. chelonae</i>	PMU ink
Rochester, New York	2011/2012	19	<i>M. chelonae</i> et <i>abcessus</i>	unopened ink bottles, manufacturing chain
Scotland	2012	4	<i>M. chelonae</i>	undiluted ink

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Tattoo ink-related infections



Tattoo Ink

- pigments/dyes (metallic salts or organic molecules)
- liquid carrier (water, glycerine or alcohol)

Inks and pigments can be contaminated through

- contaminated ingredients
- manufacturing process
- unhygienic tattoo practice
- non-sterile water
- tattoo inks after the expiry date

Microbiological status of tattoo inks

Reference	No. of samples	Contaminated samples	Bacterial counts (cfu/ml)	Bacterial species
Droß & Mildau (Germany, 2007)	216	14 % [mainly opened bottles]	10^3 - 10^6	Pseudomonades Enterobacteria
Baumgartner & Gautsch (Switzerland, 2011)	145	20 % [7 of 39 unopened bottles, 22 of 106 opened bottles]	10^1 - 10^2 up to 10^3 - 10^8	gram-neg rods (Bacilli), gram-pos cocci (Staphylococci)
Hoegsberg et al. (Denmark, 2013)	64	11 % [6 of 58 unopened bottles, 1 of 6 opened bottles]	10^2 - 10^3	Streptococci Staphylococci Pseudomonades Enterococci Acinetobacter

→ Microbiologically contaminated tattoo inks
have to be considered as a source of skin infection!

Regulations for tattoo and PMU products

Germany

- regulations of the **Lebensmittel- und Futtermittelgesetzbuch (LFGB)** and the **Tätowiermittel-Verordnung** (1st May 2009)
 - products must not endanger the health or safety of people
- **no authorisation** requirements for tattoo/PMU products
 - manufacturer or distributor have to comply with relevant legislations

Europe

- only instituted guidelines and **no laws relating to tattoo inks**
- in some member states **national regulations** based on **Resolutions of the Council of Europe** (ResAP(2003)2 & ResAP(2008)1)

Council of Europe Resolutions ResAP(2003)2 & ResAP(2008)1 on „requirements and criteria for the safety of tattoos and permanent make-up“

- tattoo and PMU products must be **sterile** and supplied in preferably **single-use** containers
- **packaging information** should contain a **guarantee of sterility**
- **preservatives** should only be used to ensure the **preservation of the product** after opening (no correction of purity grade!)
- tattooing and application of PMU must be carried out in conformity with **hygiene regulations** laid down by national public health services

Are tattoos a biohazard?



Who do you want to entrust your skin?





Summary and needs

- growing trend (25% of young adults in Germany are tattooed)
- only little knowledge about infectious health risks of tattoo products
 - tattoos are open wounds
 - microbial contaminations are not rare
- lack of international standards for the microbiological analysis of inks
- tattoo compounds in contrast to cosmetics are not officially controlled

Thank you for your attention

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