

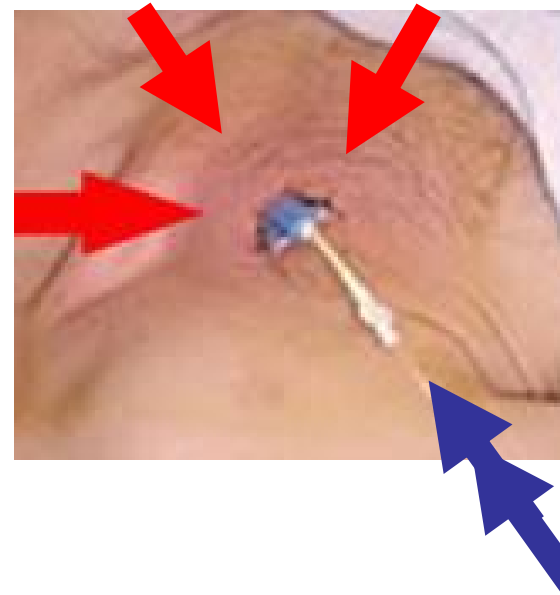
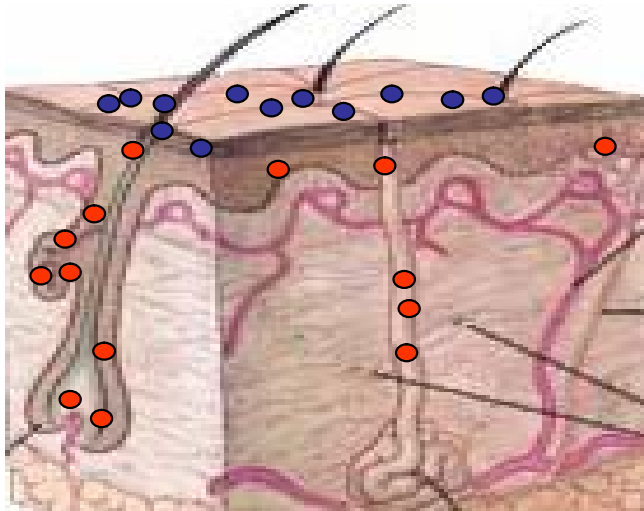


Biofilm and Staphylococcus

# **Dynamics of hemodialysis catheter colonisation by coagulase-negative staphylococci (CoNS)**

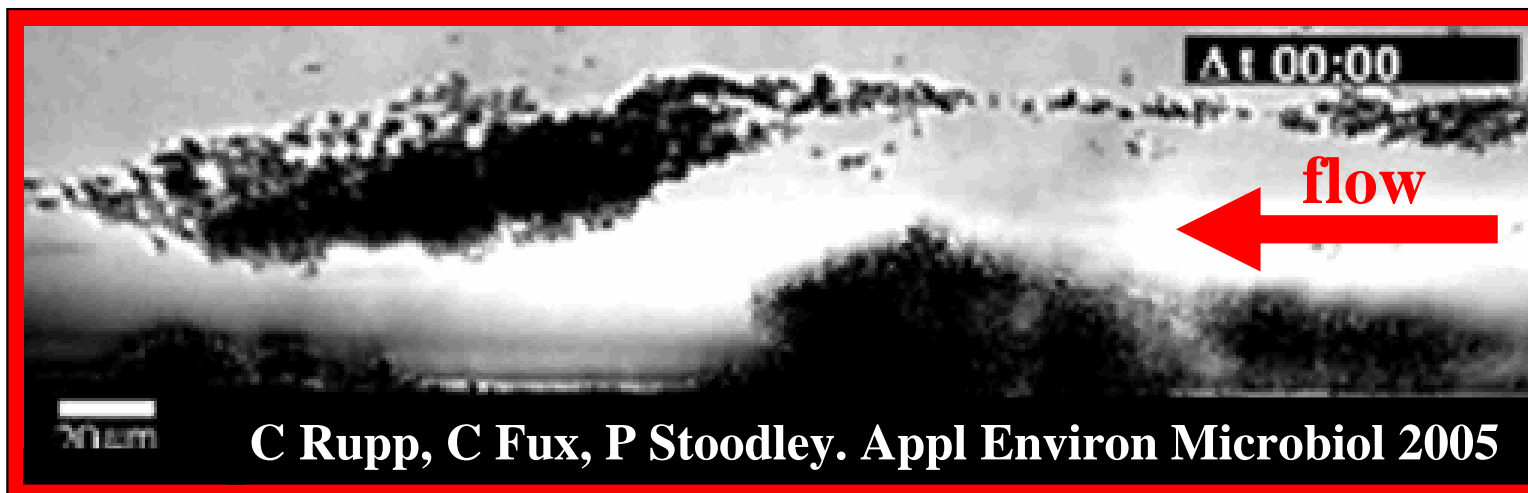
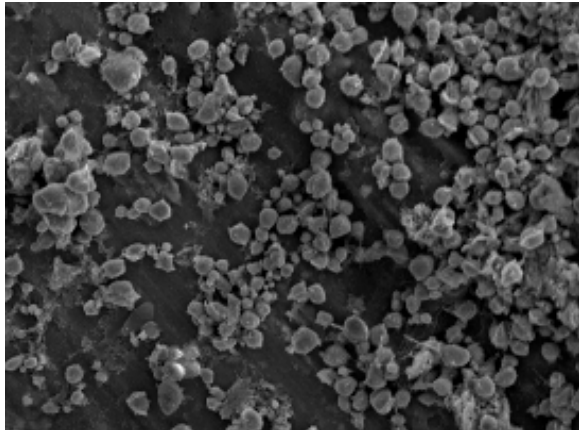
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## Catheter colonisation only is a matter of time...



- 5% of nosocomial infections
- 40% of nosocomial bacteremias related to intravascular catheters
- Catheter-related bloodstream infections: 1 to >12/1'000 catheter days

## Virulence factor: Biofilm formation



# Preventing colonisation = preventing infection

- **Guidelines for**
  - catheter insertion
  - catheter use
  
- **Choice of material**
  - catheter
  - dressings

**Insight in the pathophysiology is crucial**

## Aim 1: Colonisation dynamics with CoNS

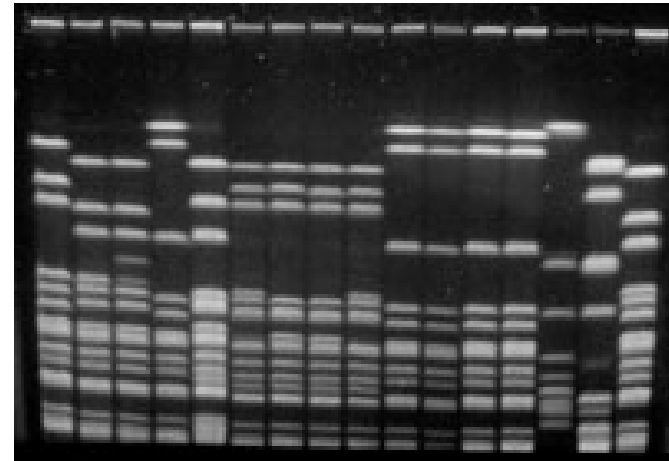
- **29 hemodialysis catheters, 1158 days**
  - 24 non-tunneled
  - median follow-up 28 days (range 9-204)
- **Skin colonisation**
  - monthly swabs
- **Catheter colonisation**
  - internal:** weekly blood cultures
  - endoluminal brushes
  
  - external & internal:** catheter tip



## Aim 2: CoNS characterisation



- antibiotic susceptibility
- colony morphology
- **Clonality: PFGE**



- **Virulence: IcaA gene**

## colonisation & infection

- colonisation **65.5%**, 89.5% CoNS

70.6% extraluminal

23.5% endoluminal

5.9% both

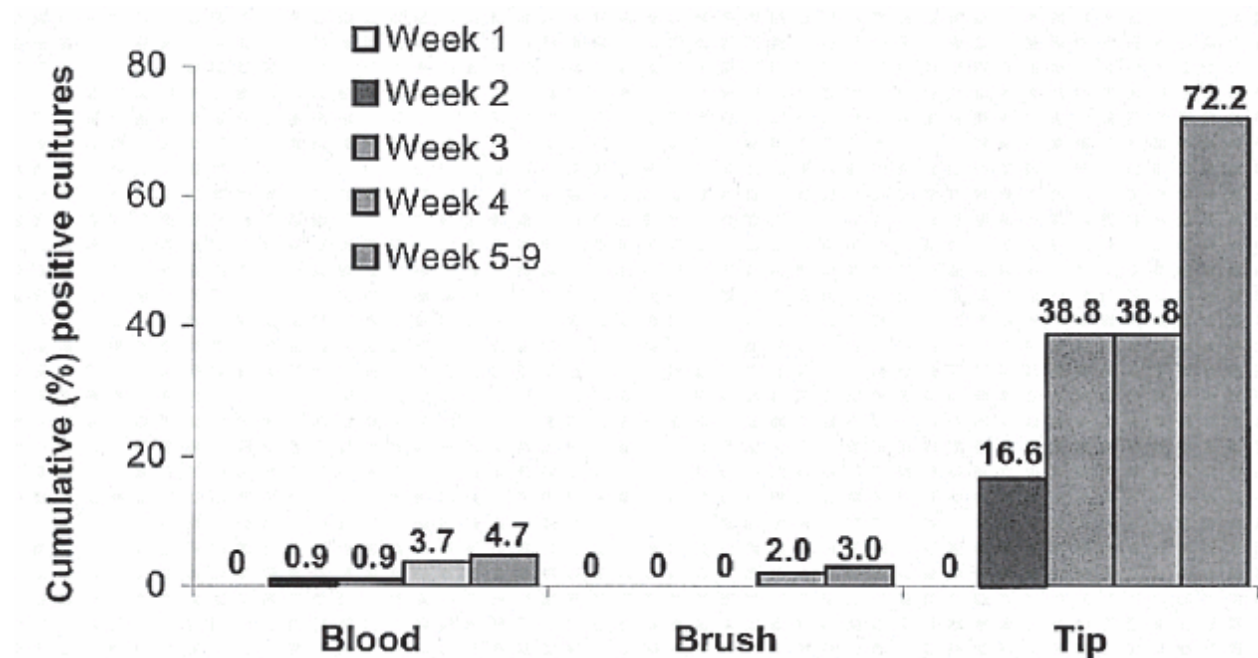
## colonisation & infection

- **colonisation 65.5%**, 89.5% of which CoNS

70.6% extraluminal  
23.5% endoluminal  
5.9% both

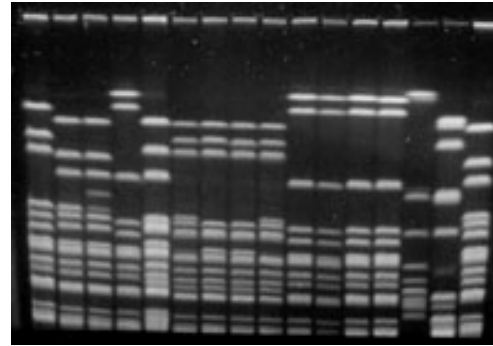
- **Infection**
  - suspected 20.7%**
  - documented 13.8%**
    - 2x insertion site (1.7/1'000 days)
    - 2x CR-BSI (1.7/1'000 days)

## Colonisation dynamics with CoNS



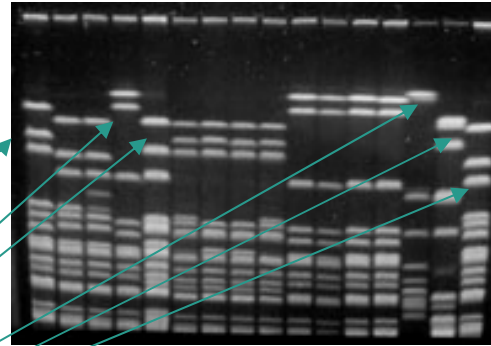
- **23.5% of positive samples showed mixed clones**  
 time interval 42 vs 25 days,  $p=0.03$
- **70.6% concomitant skin colonisation with CoNS,**  
 75% identical PFGE

# Clonality



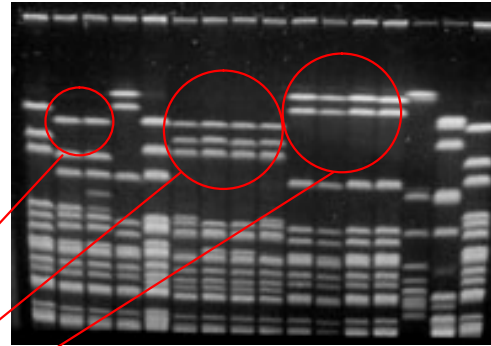
**30 PFGE patterns**

# Clonality



**30 PFGE patterns**  
**20 unique**

# Clonality



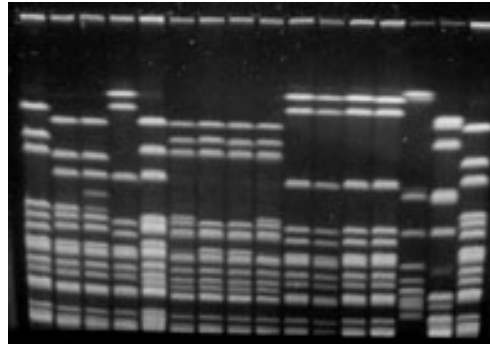
**30 PFGE patterns**

20 unique

**10 clonal:** 7 in single patient

3 in more than one patient

# Clonality



## 30 PFGE patterns

20 unique

10 clonal: 7 in single patient

3 in more than one patient

## Clonal isolates

more frequent in blood / brush culture (41% vs 15%,  $p=0.03$ )

**higher resistance:** 7 vs 2 antibiotics,  $p=0.03$

oxacillin 80% vs 40%,  $p=0.002$

**higher virulence:** icaA 64% vs 40%,  $p=0.07$

# Morphotypes (not only for microbiologists)



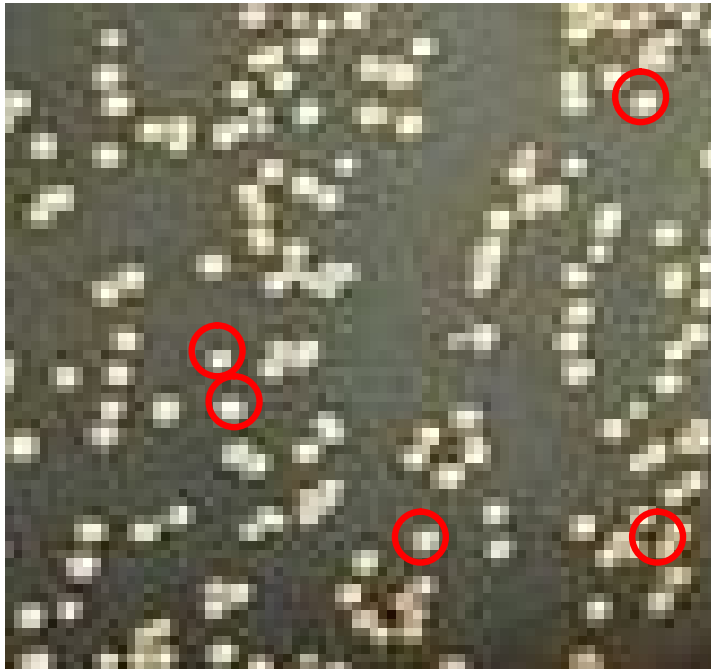
50 samples with CoNS

**48% different morphotypes**

difference in PFGE: 50%

**difference in antibiotic resistance: 58.3%**

# Morphotypes (not only for microbiologists)



**in samples with different morphotypes:**

5 random colonies per morphotype

**10% difference in antibiotic pattern**

- clindamycin
- tetracycline
- rifampin

# Conclusions (I)

1. **extraluminal colonisation occurs earlier**

**tunneling, cuffing**

**antimicrobial coatings?**

# Conclusions (I)

1. extraluminal colonisation occurs earlier  
tunneling, cuffing  
antimicrobial coatings?
  
2. **the skin is the main source of early colonisation**  
**chlorhexidin ointment?**  
**mupirocin?**

# Conclusions (I)

1. extraluminal colonisation occurs earlier  
tunneling, cuffing, catheter coatings?
2. the skin is the main source of early colonisation  
chlorhexiding ointment?  
mupirocin?
3. **polyclonal colonisation increases over time**  
**routine change in high risk patients?**

## Conclusions (II)

### 4. **Nosocomial, clonal strains: more resistant; more virulent?**

infection control / **hospital hygiene**

**anti-virulence factors?**

## Conclusions (II)

4. nosocomial clonal strains are more resistant and may be more virulent  
infection control / hospital hygiene  
anti-virulence factors?
  
5. **uniform morphotypes may hide genetic differences**  
**analyse 5 colonies/morphotype in samples with >1 morphotype?**

## Conclusions (II)

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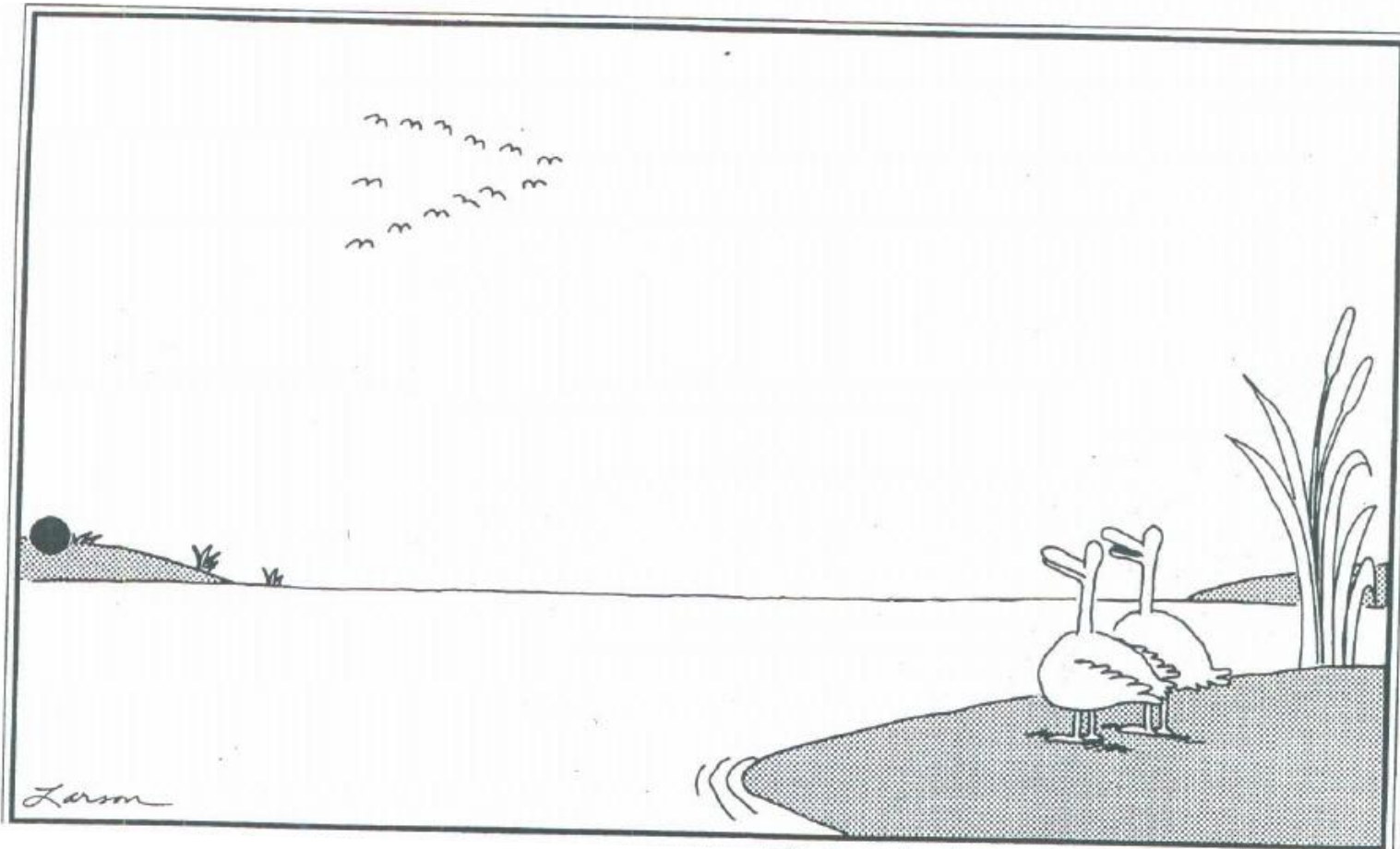
analyse 5 colonies/morphotype in samples with >1 morphotype?

6. **GCP = baseline infection rates**

**guidelines for standard procedures**

**NNT?**

## 7. it remains difficult to tell infection from colonisation



„I just can't tell from here....That could either be our flock, another flock,  
or just a bunch of little m's“

# Acknowledgements

## **Co-investigators**

Kathrin Mühlemann

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