Bacterial contamination of glucose test strips: does the packaging matter?

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Infection control practitioner: so what?

- ***What we deal with?***

  ►We deal with **Infection Control**, that is prevention of **hospital acquired infection (HAIs)**, so called nosocomial infections

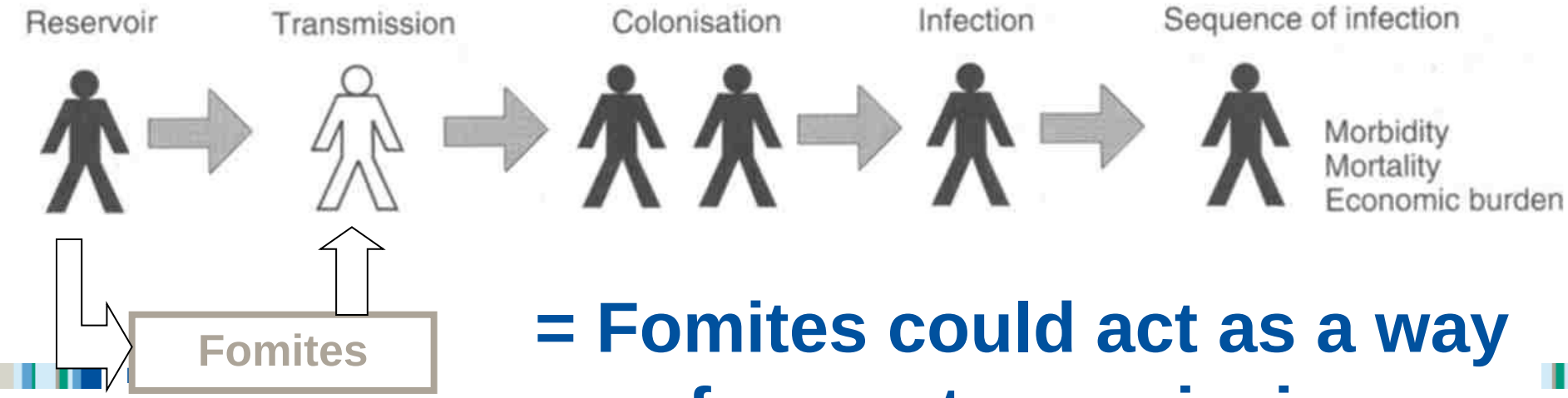
- ***How many people are concerned by this kind of adverse event occurring during the hospital stay?***

  ► In France, **about 5 %** of the inpatients acquire an HAI if the study is made one given day.

  - ► **That is one patient out of twenty.**
  - ► Each year in France, about **five hundred thousand** people suffer from HAIS and about **four thousand** people died at least in part because of them

Putative role of fomites in the transmission of bacteria

- ***Reminder: how become infected?***
  - First step: to become **colonized** after contact with a **« reservoir »** directly or indirectly (that is « through the hand of health care workers »)
  - Thereafter to become **infected** if flaw in immunity



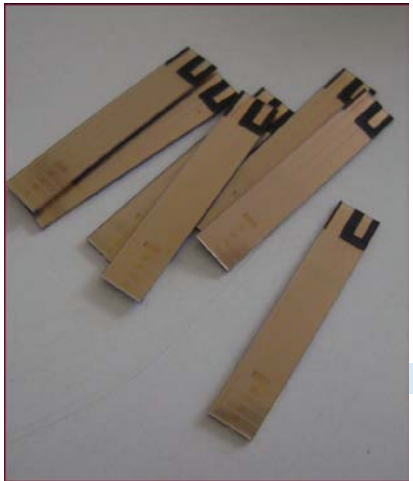
= Fomites could act as a way of cross transmission

AJIC letters to the Editor

Bacterial contamination of glucose test strips: Not to be neglected

VanHaren *et al.* Am j Infect Control. 2011: 37;612-613

- **148 strips** were collected from **4 different wards** from an university affiliated hospital
- **25.7%** yield a **positive culture** (38/148), consisting in most cases in **cutaneous flora** (24,3% vs 1,4% for intestinal flora).
- The bacterial load varied from **10 to 280 Colony Forming Unit per Strip** (average value: 27 Colony Forming Units /CFU)
- Neither a filling rate <50% nor the multi-patient use was statically associated with a bacterial contamination of the GTS
- **What about the packaging?**



Purpose and Methodology of the study

- ***Aim of the study:*** to explore the bacterial contamination of GTS available in **three different packaging**, i.e., two multi-uses vials and one unitarian packaging
- ***Method*:** prospective microbiologic lab-based multicenter study (n=4)

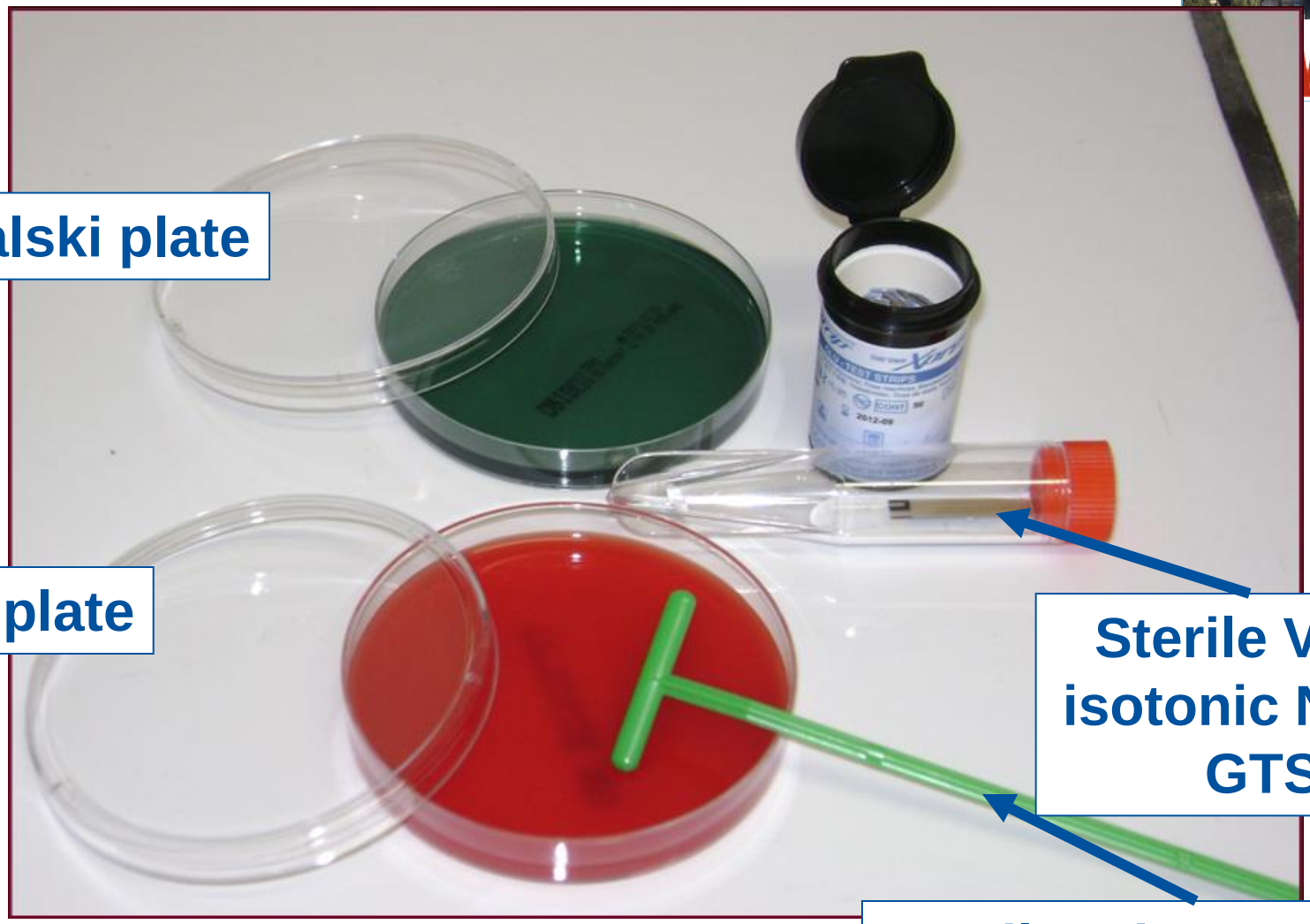
Methodology of the study (1)

- One given day in each hospital, **opened vials or boxes of GTS** containing **less than a half of the initial number** of strips were collected in different wards, and centralized in a core laboratory
- Each strip was placed in 1 ml of 0.9% NaCl and vortexed during 30s
- 100 µL of the suspension was cultured on:
  - ► **Colombia colistin nalidixic acid** agar plate
  - ► **Drigalski** agar plate
- **Viable bacteria were counted after 24 h and 48 h of culture at 37°C.**
  - ► **One colony on the plate** was equivalent to **10 Colony Forming Units per Strip.**

Methodology of the study (2)

- A **control sample** of two unopened vials/boxes will also be sampled from one randomly selected ward per hospital.

  ► 10 strips from each box will be cultured according to the same procedure.
- Each of the three types of strips will be evaluated for **antibacterial activity** according to the procedure previously written (activity against *Escherichia coli* strain ATCC25922 and *Staphylococcus aureus* strain ATCC29213).
- The **statistical association** between the packaging and the bacterial contamination was evaluated by using a $\chi 2$ test, with a level of significance of 0.05.



Drigalski plate

ANC plate

Sterile Vial + isotonic Nacl + GTS

Sterile rake to streak the plate

Methodology of the study (3)

- **Additional data were asked to the IC teams:**
  - Whether vials for a single or multiple patients were in use, or both types
  - Whether the idea of systematically disinfecting hands with an aqueous alcohol solution before opening a vial is understood by the personnel
  - How much aqueous alcohol solution was consumed for 2011 for the ward concerned and what % of the ministry's target objective (ICSHA1) was achieved.
  - Does a protocol or technical form exist for handling glucose test strips?

Results (1)
Global counts:

- **606 glucose test strips tested from 4 hospitals**
  - University affiliated teaching hospitals
  - Including 1 pediatric hospital
- **526 glucose test strips tested from 17 different wards**
  - Medical wards: 7
  - ICU: 4
  - surgicall wards: 6
- **80 control GTS from unopened vials/boxes**

Results (2): summary

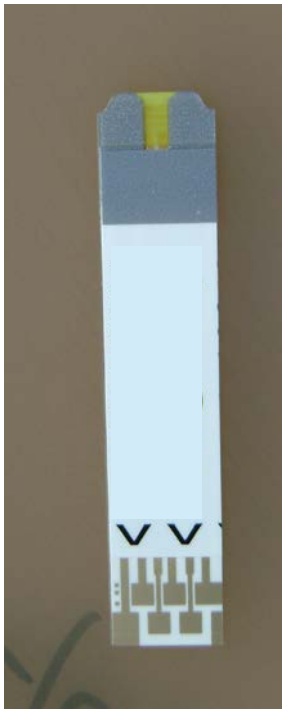
	A	B	C
			
Packaging	**Vial (50 pieces)**	**Vial (50 pieces)**	**Unitarian**
% positive GTS	**11.6%**	**8.15%**	**2.5%**
Median Bacterial Load (CFU/GTS)	**135**	**56**	**10**
Range (CFU/GTS)	**10 – 900**	**10 - 230**	**10 - 10**
Antibacterial activity	**+/-**	**-**	**-**

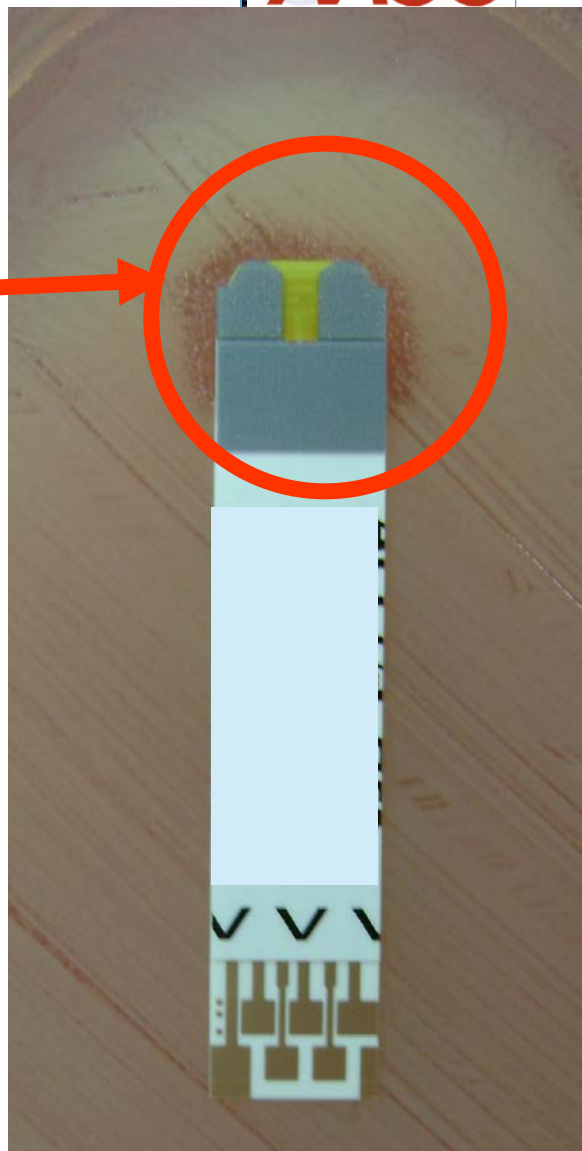
The % of positive GTS is 9.7% (32/330) for vials and 2.5% (5/196) for unitarian package (Coagulase negative staphylococci)

►the difference is significant (p <0.05)

Results (3):
GTS from a multi-uses vial named “A”

- **Antibacterial activity of the strips:**
  - ►**absent against *E. coli***
  - ►**exists against *S. aureus***





Results (4): Additional data from the participating centres

	A	B	C
Vial for single patient	**0/5**	**4/8**	**Not applicable**
Availability of a technical form for GTS manipulation	**yes**	**no**	**yes**
Local recommendation for a hand hygiene before opening the vial	**Yes**	**no**	**No**
% of the ministry's target for aqueous alcohol solution consumption	**124%**	**143%**	**136%**
GTS	*vials*	*vials*	*Unitarian*
% positive GTS	*11.6*	*8.15%*	*2.56%*

Results (5):
Bacterial contamination of control GTS

- **80 Control glucose test strips from unopened vials collected in the 4 hospitals**
  - **20 control GTS from**
    - **1/20 of the unitarian strips,**
    - **2/20 GTS from the multi-uses vial “B”**
    - **7/40 GTS from the multi-uses vial “C”**
  - **the mean bacterial load was 10 CFU/GTS, range [10-10 CFU/GTS]) which correspond to the limit of detection of the method (i.e one bacteria on a plate / in 100 µL)**
  - **Coagulase negative staphylococci**

Discussion:
Microbiologic contamination of GTS (1)

- **The percentage of positive GTS for the multi-uses vials is lower than in the princeps study (9.7% vs 25.7%)**
- **But the median bacterial load among positive strip is higher (135 and 56 CFU/GTS vs 27)**
  - ☐ Larger study (526 vs 148 GTS, 17 vs 4 wards)?
  - ☐ Muticenter vs monocentric study?
  - ☐ Inclusion of a pediatric hospital (“outliner”?)?
  - ☐ Differences in practices (single /multi patients)?
  - ☐ Increase in use of aqueous alcohol solution?
  - ☐ Impact of the antibacterial activity of GTS « A »?

Discussion:
Microbiologic contamination of glucose meters (2)

- **Even the control GTS from unopened vials or new packaging, or the individually packaged GTS (5 out of 196) in clinical wards are sometimes positive:**
  - The bacterial load of positive control GTS and all five positive unitarian GTS were only 10 CFU/GTS (1 CFU per plate), which is the **limit of detection**
  - A few, barely positive GTS may also be the "**the background noise"** of contamination since GS are **not manufactured as sterile products.**
  - While the exterior of the multi-use GTS vials was disinfected with alcohol-impregnated pads before removing GTS to culture, the exterior of the unitarian packaged GTS packet was not disinfected:
    - This may resulted in contamination of some of these GTS in the laboratory when removing theme from the packets to culture

Conclusion: Take home messages

What we learn from this study?

- **In the present study the bacterial contamination of GTS at the bedside was confirmed in a larger, multicentric study**
- **The percentage of positive GTS reached 10% and the bacterial load varied broadly, including huge values as 900 CFU/GTS**
- **The unitarian packaged GTS are significantly less frequently contaminated than GTS packaged in vials. The contamination of unitarian GTS corresponded the background noise.** This advantage should be taken into account.