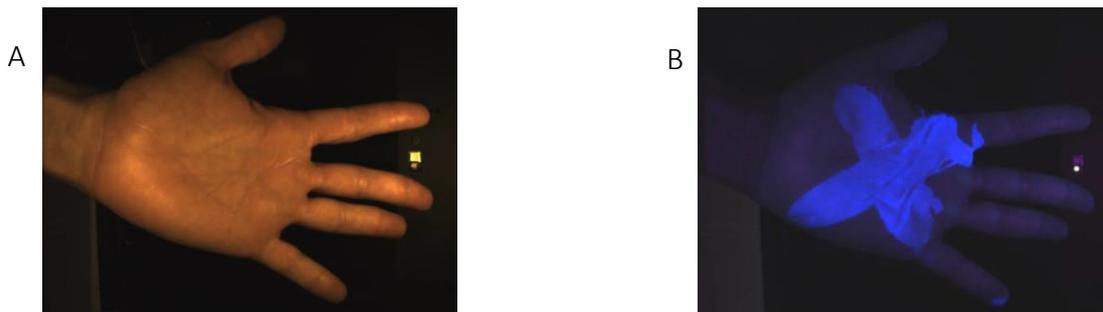


Evidence-based hand hygiene

In a previous post, we wrote about our experiments [to prove the close connection between microbiology results and hand coverage](#). We continued our study, and completed the validation of the fluorescent method ([Lehotsky et al. 2017](#)).

[The fluorescent trial](#) is the most common way to examine the hand hygiene technique, although there had been limited evidence for the microbiological validation of the method.



The distribution of UV-dyed hand rub on hand surface in normal light (A) and under UV light (B).

The aim of [the study](#) was to investigate whether the fluorescent marked regions on the hands correspond to the disinfected areas; the extent to which pathogen-free regions matched the disinfected areas was evaluated statistically.

For this work we created an artificial hand phantom, small enough to fit into a regular petri dish.

The hand phantoms made from plexiglass, and it was completely flat to contact well to the agar surface. The hands were covered with cow skin to better represent the human hand.



Plexiglass hand phantom



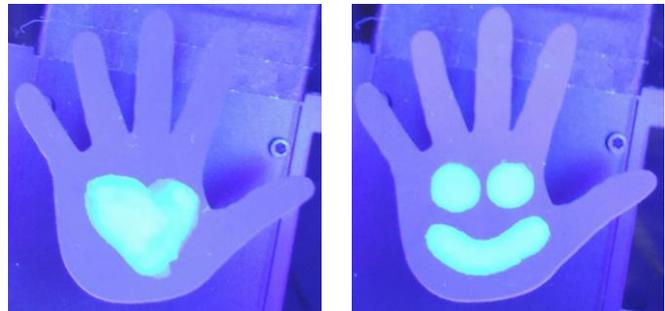
Artificial hand covered with cow skin

Images were recorded under 365 nm UV-A light of every phantom after a “hand rubbing” method applied. The chosen bacterium for the experiments was *Staphylococcus epidermidis*, because this strain is part of the normal skin flora. After the standard (48 hours) incubation time, photos were taken of the *S. epidermidis* colonies as well. The corresponding pairs of pictures (n=25) were fed to a

robust software image registration algorithm. The used algorithm performed pixel-to-pixel mapping between the two images.

Images recorded under UV-light technically showed the same coverage that of the results of the agar plates after culturing.

Images recorded under UV-A light



Results of software evaluation:
Disinfected vs. Not properly disinfected areas

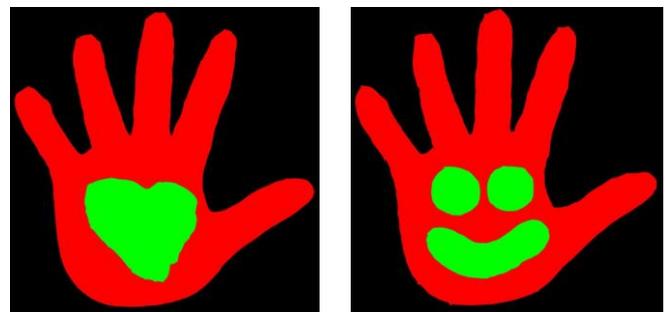


Image of *S. epidermidis* colonies after culturing



Average sensitivity (n=25) 0.95 ± 0.03

Average specificity (n=25) 0.98 ± 0.02

Sensitivity: 0.97

Specificity: 0.98

Sensitivity: 0.95

Specificity: 0.97

There were some limitations of this study, which should be mentioned. The adhesion of bacteria and the dispersion of the handrub on the used cow skin may not be as on the human hands. Our experiments may work with other bacterium strains differently.

Conclusion:

High sensitivity and specificity values suggest, that regions on the hand treated sufficiently with the UV-dye containing hand rub are in fact disinfected. Fluorescent trial is a reliable method for verifying individual hand hygiene technique.

Reference:

Á. Lehotsky et al.: "Evidence-based hand hygiene: microbiological validation of the fluorescein training" - The Journal of Hospital Infection, Sep;97(1):26-29. 2017. DOI: 10.1016/j.jhin.2017.05.022