



***Eurofins-Inlab study results:  
microbial contamination of washroom surfaces  
with different hand drier devices.***

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drier devices.***

**Sources:**

- Eurofins-Inlab study
- Extracts from comments by Prof. Mark Wilcox about the study  
*(Professor of Medical Microbiology, University of Leeds & Leeds  
Teaching Hospitals, Leeds, UK)*

## **Institut for Microbiology of food, analyses, hygiene of companies and environmental hygiene**

Inlab was founded in 1992 as a microbiology laboratory of food. Inlab is member of the Eurofins Group since December 1st, 2007.

Microbiological testing, expert advice & sample drawing in the following areas:

- **Food (final-, intermediate products and raw materials), feeding stuff, articles of daily use including passing of rapid analyses**
- **Drinks and dispensing equipment**
- **Sanitary products, cosmetics and commercially available drugs**
- **Drinking- and mineral water, bath water**
- **Medical water like flushing water**
- **Hygiene of companies**
- **Compost**
- **Training courses, inspections, hygiene advice**

### **Accreditation:**

Accredited according to DIN/EN ISO/IEC 17025 (DAR and DAkKS for second governmental samples), § 43 IfSG (permission for working with pathogens - according to NRW-governmental permission) drinking water laboratory and admitted laboratory of the "compost quality control association" for analysis of salmonella." DIN EN ISO/IEC 17025:2005; Authorised experts for double and cross checks according to § 43 LFGB (German Food and Feed Code) cosmetics excluded - authorised for drinking water analysis by German authorities

For further informations about Eurofins and Inlab look up: [www.eurofins.de](http://www.eurofins.de) [www.eurofins.com](http://www.eurofins.com) [www.inlab-dortmund.de](http://www.inlab-dortmund.de)





# *Basics on the **need of Hands Drying***

*Extracts from comments by Prof. Mark Wilcox about the study*

- **Hand washing** helps to **prevent the cross-contamination** of microbes from one person or surface to another.
- It **prevents infection** and can sometimes even save lives, by reducing the numbers of pathogens on hands.
- A fundamental aspect to hand washing is **the drying of hands**.
- Hands can be dried with ...:
  - the use of single use **paper hand towels**,
  - reusable **cotton/textile** towels,
  - traditional **warm air driers**
  - high velocity **jet air driers**.
- The first two methods **absorb water** on the hands; the other types **disperse water into the air**, via a variety of mechanisms.
- Micro-organisms, especially **Staphylococci**, **Coliforms** and **Yeasts** may **contaminate hands during toileting**.
- Hands may **already be contaminated** with bacteria, viruses or yeasts **before** washing and could be transferred during the drying process or afterwards.



## *Eurofins – Inlab Study description*

- The Eurofins-Inlab study measured the **microbial contamination** of **three types of drier devices** in the washrooms. Commissioned by ETS, it was carried out in various settings in the **Ruhr region, West Germany** (Feb-May 2012).
- **150 washrooms** were selected by Eurofins –Inlab (ETS doesn't know their location) and contained **jet air driers, warm air driers, or hand towel dispensers** (50 of each). They were **balanced** to represent high versus low use settings.
- Specialised sponges were used to swab the surfaces of hand drying devices.
- The sampled surfaces were those **most likely touched** during hand drying, i.e. the **inside surface of jet air driers**, the **inside** or **outside surfaces** of the **outlet tube** of **warm air driers**, and the **outlet** (bottom) of **paper towel dispensers**. Also a **surface area** (100 cm<sup>2</sup>) of the **floors** below was sampled.
- The sponges were processed to **determine the total number of microorganisms** and numbers of **potential pathogens** (e.g. Staphylococci including *Staphylococcus aureus*, and coliforms including *Escherichia coli*).
- As the sampled drier device surfaces differed in size, measured microbial counts were **reanalysed** according to counts per unit surface area.

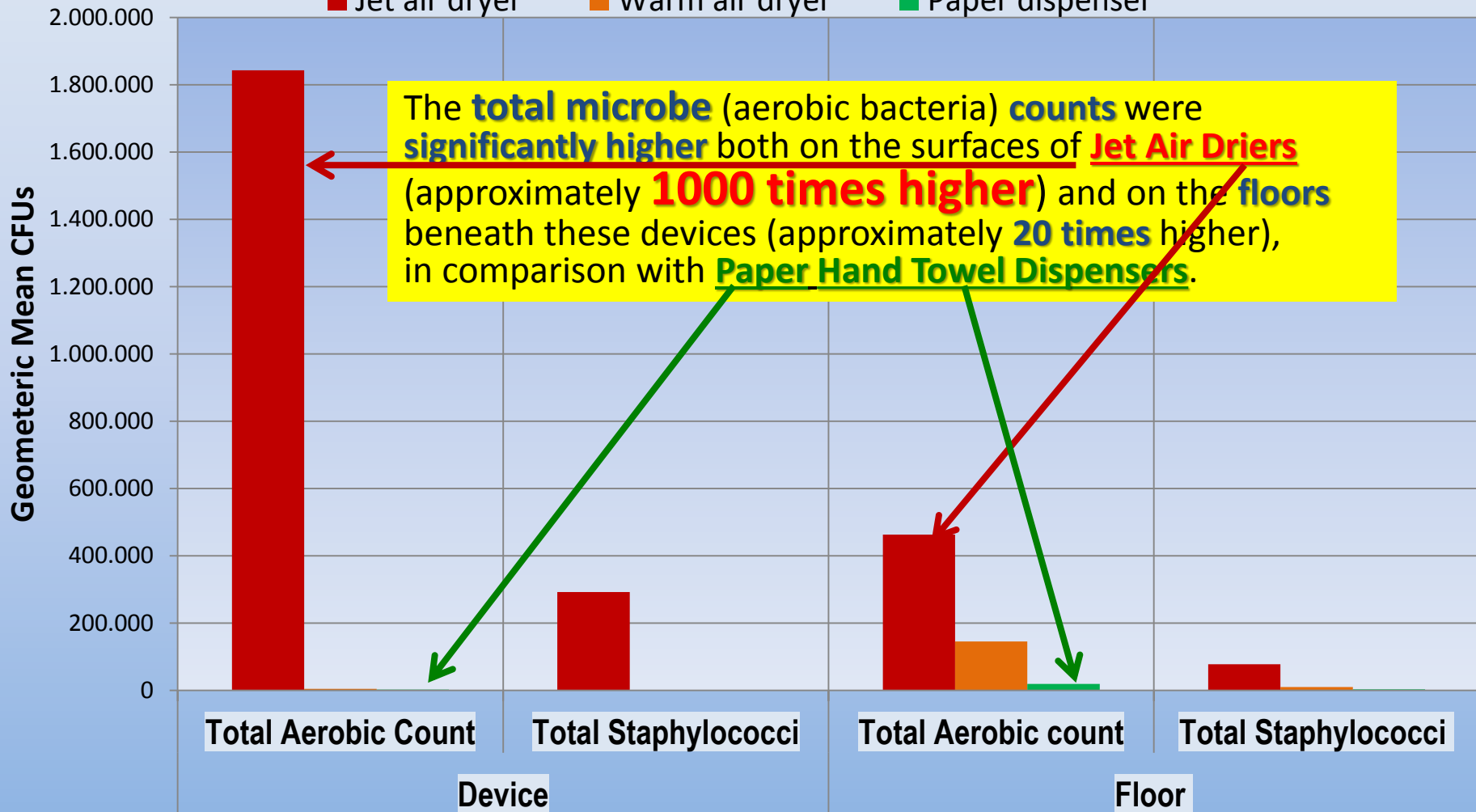




# *Eurofins – Inlab Study: key findings (1a)*

## Contamination from aerobic bacteria and Staphylococci

■ Jet air dryer    ■ Warm air dryer    ■ Paper dispenser



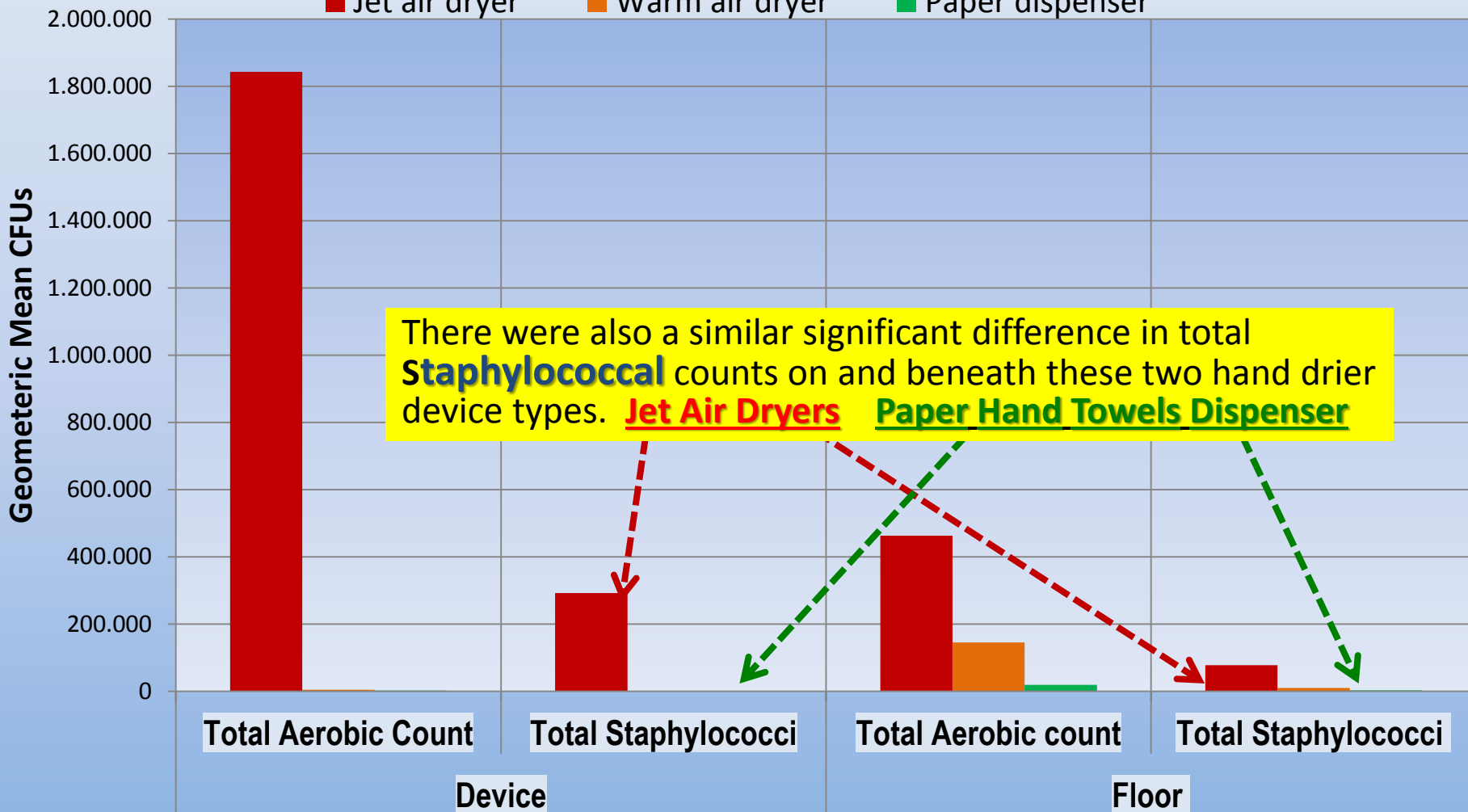




# *Eurofins – Inlab Study: key findings (1a)*

## Contamination from aerobic bacteria and Staphylococci

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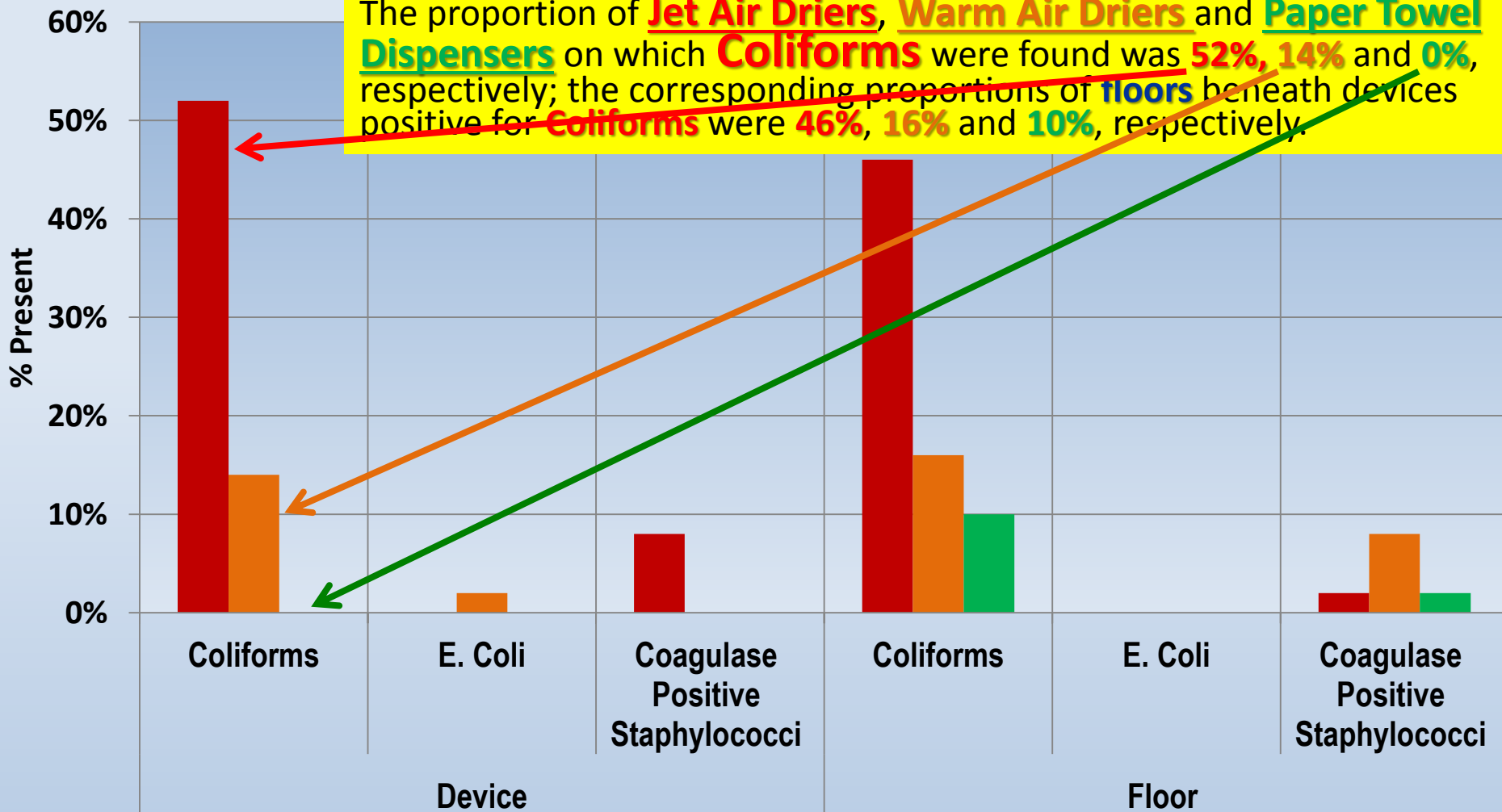


# *Eurofins – Inlab Study: key findings (1b)*

## Contamination from Coliforms, E. Coli, and coagulase positive Staphylococci

■ Jet air dryer    ■ Warm air dryer    ■ Paper dispenser

The proportion of **Jet Air Driers**, **Warm Air Driers** and **Paper Towel Dispensers** on which **Coliforms** were found was **52%**, **14%** and **0%**, respectively; the corresponding proportions of **floors** beneath devices positive for **Coliforms** were **46%**, **16%** and **10%**, respectively.



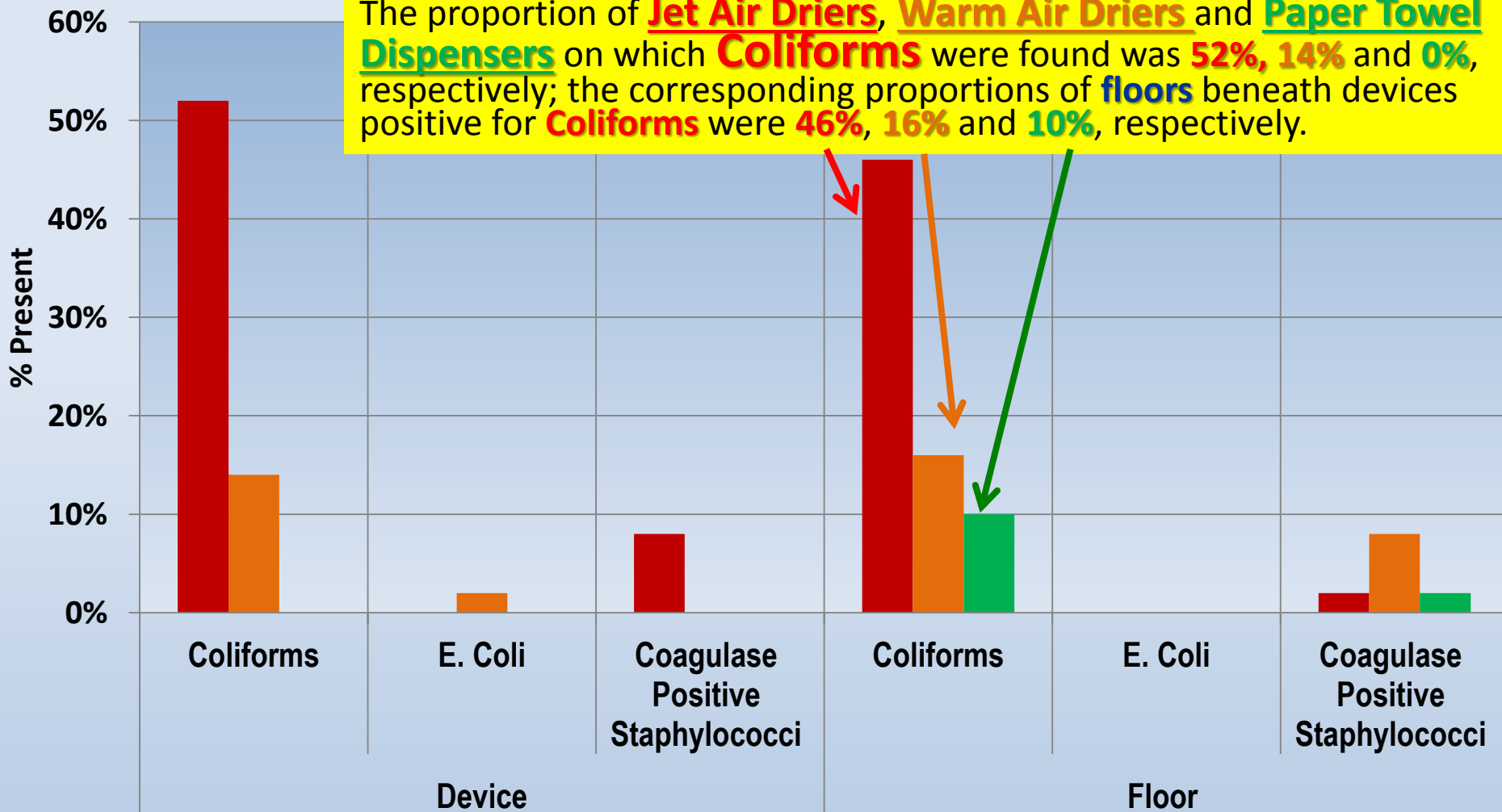


# *Eurofins – Inlab Study: key findings (1b)*

## Contamination from Coliforms, E. Coli, and coagulase positive Staphylococci

■ Jet air dryer    ■ Warm air dryer    ■ Paper dispenser

The proportion of **Jet Air Driers**, **Warm Air Driers** and **Paper Towel Dispensers** on which **Coliforms** were found was **52%**, **14%** and **0%**, respectively; the corresponding proportions of **floors** beneath devices positive for **Coliforms** were **46%**, **16%** and **10%**, respectively.







## *Eurofins – Inlab Study: key findings (2)*

- Approximately **1 in 8** of the **floors** below **Jet Air Driers** had **staphylococcal counts > 10 million** (per 100 cm<sup>2</sup>); **none** of the counts on the **floors** below **Paper Hand Towels Dispensers** exceeded this level. 4% of floors beneath **Warm Air Dryers** had counts above this level.
- There was **consistency of results**: higher drier surface microbe counts were usually accompanied by higher counts on the floors beneath the devices.
- The surfaces that were tested were those **most likely to be touched**. As a result, the actual surfaces that were examined differed in terms of size (surface area); the jet air driers had the largest potential touch areas.
- In a recent observational study (commissioned by the Kimberly-Clark Corporation), one or both hands of all subjects (n=120) touched the blades of a Dyson Jet Air Drier during hand drying; the avg. number of **observed device touches** by hands per drying was **13**.
- The **microbe counts** were **adjusted** to take account of the **differences in surface areas** that were sampled. Having made this adjustment, the microbe counts were still significantly higher (i.e. **over 300 times higher** per unit area sampled) on the **inner surfaces of Jet Air Drier** in comparison with those found on **bottom surface of Hand Towel Dispensers**.





# *Why microbes dispersal must be avoided*

- But how may micro-organisms contaminate the hand driers?
  - direct transfer by **hands touching** a device (direct touch transfer),
  - transfer by the **air during hand drying** (direct air transfer),
  - transfer by the **air after hand drying** (indirect air transfer).
- Procedures should **minimise the risk of microbes dispersal**.
- **Avoidance** of **touching contaminated surfaces** and **prevention** of **airborne spread** of **microbes** are key ways of **minimising the transmission of infection**.
- In cases of increased dispersal of microbes during hand drying, hands are more likely to be **re-contaminated** during the drying process, and this could lead to **increased spread** of **potential pathogens**.
- In some cases this could affect the person who acquires the microbes **during hand drying**, or a **subsequent person** using the same washroom.
- Microbes could be acquired either by **touching** a contaminated surface (e.g. the hand drier device), from microbe-containing **droplets/particles** present in the **air that land on a person**, or by **breathing** in tiny **microbe-containing particles** or **droplets**.



## Examples of risks associated with microbes dispersal: *Staphylococcus aureus* and flu virus

- Staphylococcus aureus** is carried in the nose and some skin sites of about 1 in 5 people.
- It can cause a wide range of disease if the bacteria gain access to certain sites e.g. a skin wound; some types of *Staphylococcus aureus* can also cause food poisoning.
  - **The most common way that *Staphylococcus aureus* is transferred is on hands.**
  - Therefore, the contaminated surface of some hand driers (*particularly, according to this study, Jet Air Driers*) may **pose a greater risk** of the **transfer** of such potential **pathogens**.

The **influenza (flu) virus** is highly contagious.

- Influenza can spread so easily because of the **large amounts of virus that an infected person can spread** into the environment, plus the **low number of virus cells needed** to set up a new infection, and the **time** that the viruses can survive (in the air / on surfaces).
- Acquisition of the influenza virus occurs when an infected person coughs or sneezes and small **droplets/particles** (each one can contain > 100 virus cells) are **breathed** in by another individual. **One or a few droplets/particles** can be **enough** to **initiate infection**.
- Transmission may also occur by **touching a surface that is contaminated** with the virus/respiratory secretions. Influenza virus can live on a hard surface for several hours.
- **Floors** in particular reflect the **potential for airborne transmission**, including from droplets emitted during hand drying. **Droplets/particles released during hand drying could transmit respiratory viruses such as influenza from contaminated hands**; alternatively, viruses could be acquired by **touching Hand Dryer surfaces**. Both possibilities would appear to be **more likely with Jet Air Driers**.



## *Conclusions drawn by Prof. Mark Wilcox*

- **Good hand washing** followed by **careful hand drying** are **key ways** to **prevent microbe spread**.
- A **hand drying method** should be chosen that **minimises** the risk of **re-contaminating** the hands.
- From the results of the current study, it appears that there may be a **greater risk** of **exposure** to **microbes** associated with some types of hand driers.
- There was an increased level of microbial contamination on and beneath **air driers, particularly Jet Air Driers**, in comparison with **Hand Towel Driers**.
- These findings have **implications** for the **prevention** of spread of microbes and infection, that should be explored further.





**For more information about the studies and the activities of the European Tissue Symposium, please look at:**

**<http://www.europeantissue.com/>**

**In particular to have access to the summary and the dataset of the Eurofins-Inlab study, please look at:**

**<http://www.europeantissue.com/hygiene/NewStudy/>**

**The Mayo Clinic Proceedings article can also be read at:**

**<http://www.europeantissue.com/facts-studies/research/published-on-mayo-clinic-proceedings-the-hygienic-efficacy-of-different-hand-drying-methods/>**

