

Pathogens from dry surface biofilms (DSB) still transfer from hospital keyboards despite the use of sodium hypochlorite 1,000 ppm wipe

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How dirty is your QWERTY?

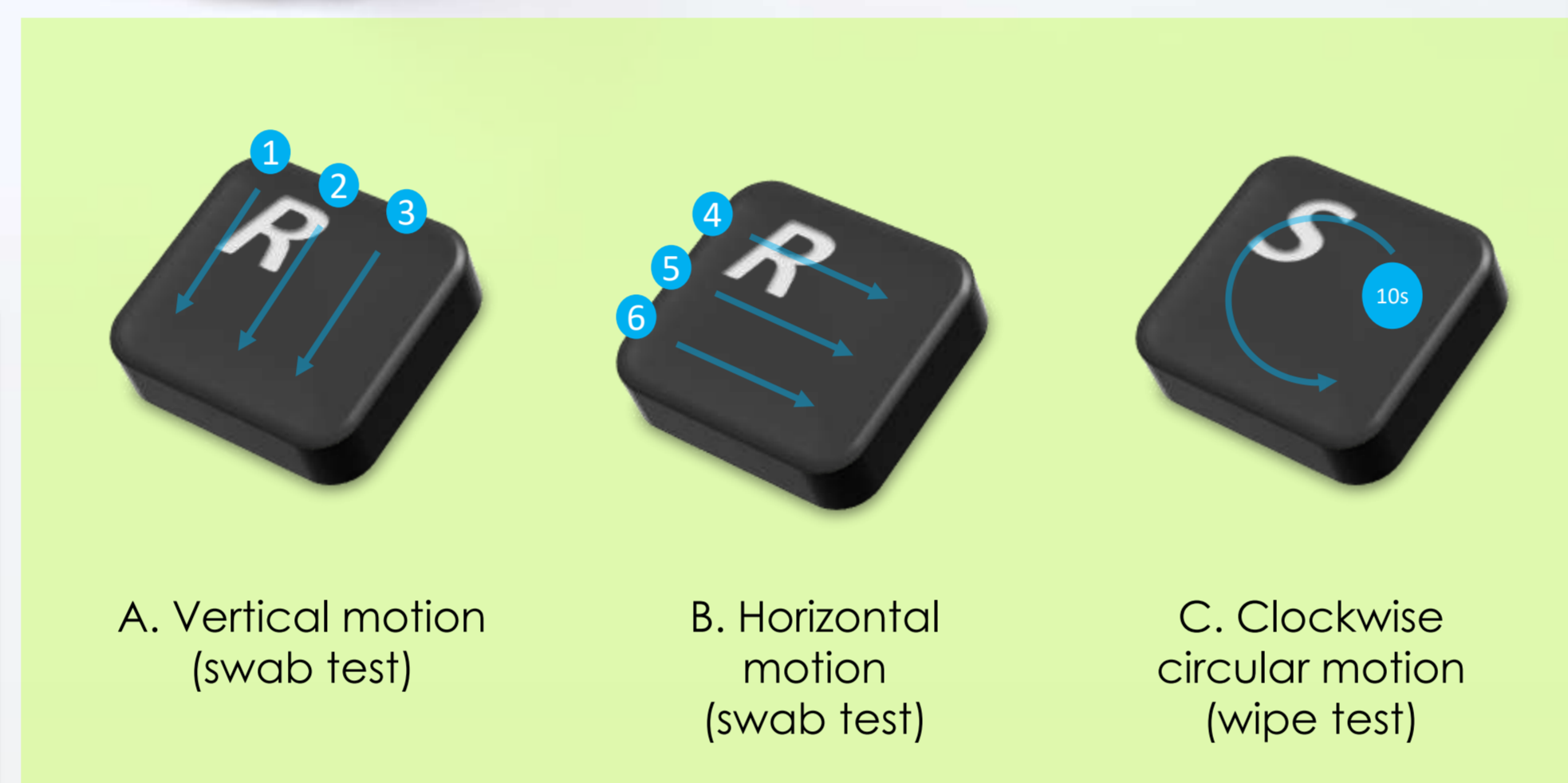
- Healthcare environmental surfaces may be contaminated with microorganisms that cause healthcare-associated infections (HCAIs)^{1,2}
- Special attention is paid to near-patient surfaces but less so for sites outside the patient zone³

QUESTIONS

- How contaminated are keyboards in hospitals?⁴
- What is the risk of pathogen transmission from keyboards?⁴

Dry surface biofilm analysis

- DSB detection by nutrient enrichment/swabbing▶
- Presence of pathogens confirmed by selective media▼



▲ Vertical (A) and horizontal (B) motion of swab on keyboard key during swab test, Clockwise circular motion of wipe on keyboard key as executed by Wiperator (C).

Keyboard samples

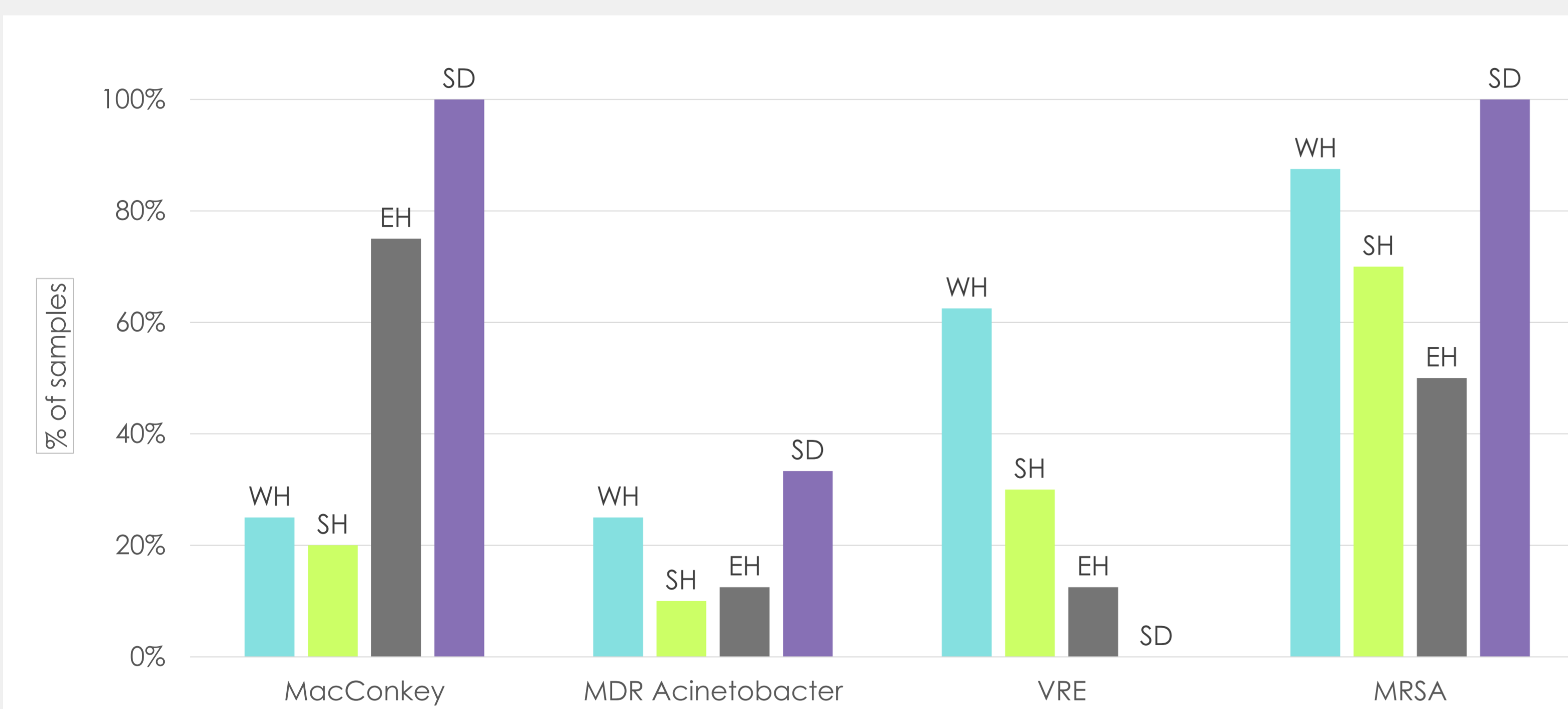
- Origin: nursing stations
- Source: three hospitals and a dental practice
- Standard plastic office keyboards with open keys

Samples pre-processing

- Routinely cleaned with detergent
- Washed three times with sterile water to remove all planktonic cells

Pathogens transferability

- Keys pressed against neutralising agar
- 150g adpressions following 10s wiping with sodium hypochlorite 1,000 ppm (NaOCl) or sterile water▼



▲ The percentage of hospital keyboard samples indicating positive bacterial growth as detected by selective plates.

MacConkey, MDR *Acinetobacter*, vancomycin-resistant enterococci (VRE) and methicillin-resistant *Staphylococcus aureus* (MRSA) selective plates. Keyboard samples from Welsh Hospital (WH), Scottish Hospital (SH), English Hospital (EH), and Scottish Dental practice (SD)

Keyboard sample number	Origin	Healthcare facility	Bacteria from DSB detected (+) / not detected (-)		
			Swab test for bacterial presence ¹	Transfer test after wiping with sterile water ²	Transfer test after wiping with NaOCl 1,000 ppm ²
1	Wales	1,000-bed hospital	-	+	+
2			-	+	-
3			-	-	-
4			-	-	-
5	Scotland	500-bed hospital	-	+	-
6			-	+	+
7			-	-	+
8			-	+	-
9	England	1,700-bed hospital	-	-	+
10			-	+	+
11			-	+	-
12			-	+	+
13	Scotland	Dental practice	-	+	+
Total			0/13	9/13	7/13

▲ Detection of bacteria from dry surface biofilm on keyboard key samples by swabbing and transfer tests

¹ All samples vortexed 3 times in 30 mL sterile water prior to swab test. Swab test performed at 150 g pressure for 10s
² All samples vortexed 3 times in 30 mL sterile water prior to wiping and transfer test. Wiping with 500g pressure for 10s. Rubbermaid wipe with 2.5 mL of sterile water/NaOCl 1,000 ppm solution per g of wipe.

Dirty QWERTY: There's no ESC!

- All keyboard samples (29/29) harboured pathogens, including MRSA, VRE and MDR *Acinetobacter* spp..
- Dry surface sampling failed to detect bacteria on any of the keyboard keys tested.
- Pathogens from 69% of samples could be transferred following wet wiping with sterile water.
- The majority of samples (54%) continued to transfer bacteria following 1,000 ppm NaOCl treatment.

Conclusions

- We showed that hospital keyboards harbour various MDROs pathogens that can be transferred to other surfaces or hands even after wiping with NaOCl 1,000 ppm.
- This is concerning considered 1,000 ppm chlorine is employed for standard terminal cleans in NHS Trusts.
- Keyboards used by healthcare staff, despite remote location from the patient zone, could pose a transmission risk. More frequent and more effective cleaning regimens should be considered to ensure staff and patients' safety

References

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