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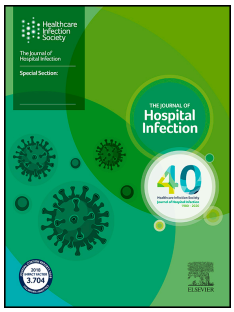

Monkeypox virus contamination in an office-based workplace environment

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Article text

More than 16,000 cases of monkeypox have been reported globally in 2022, predominately in non-endemic countries [1]. Although transmission in the current outbreak is typically via prolonged direct contact with confirmed cases, infection-competent monkeypox virus (MPXV) has been recovered from contaminated environments multiple days after last occupancy [2] raising the potential for fomite transmission. In addition, prolonged close contact such as working in an open-plan office could result in respiratory droplet transmission of MPXV [3,4].

In May 2022, an individual working in a non-clinical role in an administrative office within a hospital acquired MPXV infection following non-occupational exposure. The individual worked in a 15-desk open-plan office for one working day following onset of a mild, influenza-like illness, and took steps to reduce mixing and avoid close contact with others. Several COVID-19 control measures were still implemented within this office including a requirement to wear medical masks and regular hand hygiene. In addition, this office had permanent desk partitions between desk spaces. The individual reported skin lesions appeared two days after taking sickness absence at which point the office was closed to all staff pending a risk assessment and risk management plan. 17 staff contacts were identified, including six category 2 and four category 1 contacts according to UKHSA categorisation [5]; four individuals accepted post-exposure prophylaxis with Imvanex® vaccine when offered in accordance with UKHSA guidelines. No contacts developed symptoms consistent with monkeypox during their 21-day monitoring periods.

A decision to clean and decontaminate the office was made given its location within a healthcare facility and due to the environmental stability of orthopox viruses. This was

performed by professional decontamination staff following a protocol used during previous monkeypox outbreaks [6]. The hospital performed a final decontamination of the office using hydrogen peroxide vapour (Bioquell BQ-50 with 35% hydrogen peroxide solution).

Prior to decontamination, environmental sampling was performed to identify MPXV contamination. Sampling occurred four days after the case was last in the office and two days after office closure. Surface samples were collected from non-porous surfaces such as desks and telephones using Copan UTM® swabs, and from porous surfaces such as carpets and chair seats using the Sartorius MD8 Airport with gelatine filters. In addition, SKC wearable samplers were utilized during the sample collection process to measure any re-aerosolisation of MPXV. All samples were processed as previously described [7] and analysed for the presence of MPXV DNA using qRT-PCR as previously reported [2,8].

Only 3/34 surface samples were positive for the presence of MPXV DNA with all positive samples returning crossing threshold (Ct) values indicating low-level contamination (Figure 1). All three positive samples were from the case's desk area including their telephone (Ct 37.7), keyboard (Ct 36.9) and a 10x10cm area of their desk (Ct 34.3). Five other surface samples from the case's desk were negative for MPXV DNA as were 26 surface samples collected from other desks and high-touch areas throughout the office. All non-porous samples were negative for MPXV DNA, as were both wearable samples.

Virus isolation was attempted on the Ct 34.3 positive desk sample using a previously described method [7]; no evidence of replicating virus or cytopathic effect was observed after 10 days of monitoring suggesting the absence of infection-competent virus. As sampling was performed four days after occupancy by the infected individual, it is possible that some level of DNA or viral degradation occurred prior to sampling, although the office

was windowless (minimising UV light degradation), was not cleaned prior to sampling, and MPXV is known to be environmentally stable.

It is notable that the patient reported skin lesions only emerged after they had taken leave from work due to illness, raising the possibility that the MPXV DNA detected may have come from respiratory secretions through droplets or contaminated hands. If so, it is possible that their use of a medical mask may have reduced environmental contamination by respiratory droplets containing virus.

Although this office may be similar to other offices in design, our findings should be seen as context-specific, including that the individual worked only during the early 'prodromal' phase of their monkeypox illness, several COVID-19 measures were still in place, and physical partitions were present between desk spaces. The limited detection of MPXV DNA and absence of secondary cases do not demonstrate that cleaning is unnecessary in an office where an infected person has worked, or that focussed cleaning of an infected person's desk area is sufficient. In the absence of real-time environmental sampling to inform decontamination, and the fact that the office was within a hospital, our detection of environmental MPXV DNA supports the decision made to remediate the entire office. These data confirm that MPXV contamination can occur in workplace environments occupied by a person with early monkeypox illness and, accordingly, appropriate cleaning and decontamination measures should be considered in such situations.

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Authors' contributions:

Conceptualisation and methodology: BA, SG, TF, AMB and JD.

Investigation: BA, SG, T-CB and JD.

Formal analysis: BA, AS, OO, JF, JG and SS.

Writing – original draft: BA, SG, TF, AMB and JD.

Writing – review and editing: All authors.

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120 **Figure legend**

121 **Figure 1:** Diagrammatic representation of the office environment associated with a
122 confirmed case of monkeypox. Blue lines represent permanent office structures such as
123 walls and office door; purple lines represent desk partitions (wooden partitions
124 approximately 1.2 metres high enclosing work desks). Ct = crossing threshold value of MPXV
125 DNA detected in sample.

126

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