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Brief Report

Laboratory-acquired skin infections in a clinical microbiologist: Is wearing only gloves really safe?

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Laboratory-acquired infection is one of the leading occupational health hazards. On a laboratory worker's hands, carbuncles occurred. *Staphylococcus aureus* was isolated from pus samples of the carbuncles, with the same pulsed field gel electrophoresis band pattern with one of the recently studied strains in the laboratory. Incorrect or inadequate application of infection control measures may result in pathogen acquisition from the clinical samples, and wearing only gloves is not sufficient for the biosafety of laboratory workers in clinical diagnostic laboratories.

Workers are at high risk for pathogen acquisition in the clinical laboratories. The Centers for Disease Control and Prevention recommend technicians strictly adhere to the infection control measurements while they are processing infective or possibly infective clinical materials.[1] Nevertheless, surveys have shown that occupational infections occurred in thousands of laboratory staff, and hundreds died as a result of these infections.[2] On the other hand, there are less data about the transmission dynamics of the pathogens causing laboratory-acquired infections (LAIs).

Staphylococcus aureus spreads by many routes, and hand-borne transmission is a particular concern in the hospital setting.[3] Therefore, glove wearing and using alcohol-based handrub solution (or handwashing) are frequently suggested for health care workers to prevent such transmission.[4]

In this article, we have documented a laboratory worker who acquired infections in his hands as a result of breaks in biosafety measures during study. This report will be helpful to increase the awareness of laboratorians and infection control professionals to create and foster a culture of safety in the working environment.

CASE DESCRIPTION

Furuncles developed on the hands of a 38-year-old clinical microbiologist (Y.D.), and these lesions advanced to carbuncles within 2 days. In the physical examination, pus-filled bumps approximately 2 cm in diameter and hyperemia and edema in the surrounding skin tissues on the dorsal faces of both hands were detected (Fig 1A). The patient reported pain during hand movements, which was reflecting throughout the forearm; sometimes, he had a low-grade fever of approximately 37.5°C.

The bumps were drained, and pus samples were obtained. Amoxicilline–clavulanic acid 1 g twice a day by mouth was commenced empirically. Gram-positive cocci in cluster forms and a high number of neutrophils were seen in gram-stained slides of pus materials. *S aureus* was isolated from both samples. Antimicrobial susceptibility tests were performed according to Clinical Laboratory Standards Institute[5] criteria, and 2 isolates showed the same susceptibility pattern. To assess genetic relatedness of these isolates, pulsed field gel electrophoresis (PFGE) was performed. Finally, because the macrorestriction patterns of the strains were found to be indistinguishable from each other, both isolates were accepted as in the same genetic clone. A representative PFGE image of these strains is showed in Figure 2.

We aimed to determine the possible source of the organism and its transmission routes to the worker. The patient reported that he had stored some clinical isolates of *S aureus* in the last week. Unsurprisingly, PFGE band patterns of these 2 isolates were completely matched with one of the recently stored *S aureus* strains. Additionally, because of edema on the hands of the patient and necrotic focuses in the wounds (Fig 1B), we further studied the isolates for their Panton-Valentine leukocidin production. Polymerase chain reaction analysis confirmed that all 3 strains were positive for the *lukS/F-PV* gene.

The wounds of the patient healed within 10 days, bequeathing some scar tissue.

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Fig 1. Dorsal surfaces of right and left hands. (A) Carbuncles on the hands. (B) Wounds after eruption.

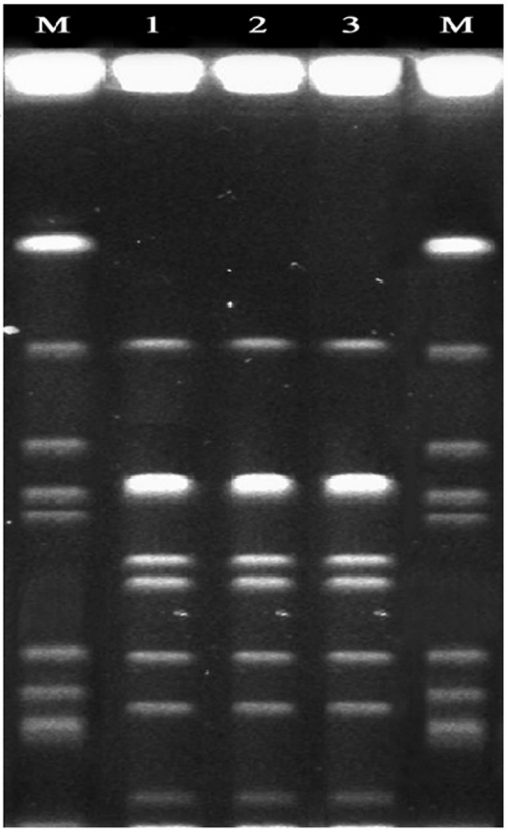

Fig 2. Pulsed field gel electrophoresis image. M shows control *Staphylococcus aureus*; 1, strains from the left hand; 2, strains from the right hand; 3, stored strains in the previous week. Macrorestriction patterns of 3 strains were completely matched.

DISCUSSION

Today, approximately 5 million persons work in clinical diagnostic laboratories worldwide. The workers employed in these laboratories are exposed to a number of health risks. In particular, clinical microbiology laboratories are critical units for staff because of the high possibility of microbial acquisition.

Measurements of the precise risks for LAIs are difficult because determining the source of transmission is not often possible. Early studies have shown that laboratory technicians are at risk for *Mycobacterium tuberculosis* infections almost 9 times more than the community.[6] Some authors have reported the overall rate of LAI to be approximately 0.18-3.5 per 1,000 employees in hospital laboratories.[7] Nevertheless, there is still no surveillance system for LAIs. A recent Centers for Disease Control and Prevention publication emphasized that >40% of all LAIs were caused by bacteria.[8] Baron and Miller[9] reported that *Shigella*, *Brucella*, *Salmonella*, *S aureus*, and *Neisseria meningitidis* are the most common bacterial pathogens.

Five possible ways for pathogen transmission were identified in clinical laboratories: sharp injuries, spills and splashes onto skin and mucous membranes, ingestion, animal bites and scratches, and inhalation of infectious aerosols. However, the exact transmission route is identified in only 20% of all LAIs.[10] Therefore, well documented transmission ways of the pathogens and identification of the possible breaks in safety precautions are important to improve preventive measurements to reduce LAIs.

Extensive efforts should be performed by the infection control authorities to increase the standards of safety measurements to protect the laboratory staff and other workers against health hazards that originate from the laboratory environment. The physical environment, including sufficient area, airflow, and lighting, in a clinical laboratory must be well organized. Therefore, the Clinical Laboratory Standards Institute published a guideline that suggested the optimal architecture and organization plan of the diagnostic laboratories in detail.[11]

Using and wearing proper personal protective equipment and handwashing are critical. However, unlike clinical wards, alcohol-based handrub solutions may not be enough for hand cleaning in diagnostic laboratories because of their low performance against chemical contamination. Therefore, handwashing with plain soap and using handrub solutions frequently may provide an acceptable level of safety against both biologic and chemical hazards. Laboratory personnel have to wash their hands immediately after taking off gloves, obvious contamination, finishing work, or before leaving the laboratory and before hand contact with nonintact skin, eyes, or mucous membranes.[11]

In the present case, we reported a clinical microbiologist infected with bacteria on his hands, which was acquired from the laboratory environment. We focused on the isolate archive, particularly the strains that were stored in recent days. Finally, we determined that the PFGE band pattern of a strain that was stored by the patient 3 days before the lesions emergence fully matched with the isolates obtained from his wounds. We further investigated possible breaks in biosafety precautions and the transmission

ways of the pathogen. We thought this was possibly caused by contact of the contaminated glove surface with the dorsal skin of both hands. The localizations of the wounds on both hand surfaces were evidently compatible with this opinion; the patient used gloves while working, but he might not have washed his hands after work and glove removing. Therefore, we underline that regular training of laboratory staff about occupational health protection measurements and supervision may be required to ensure the workers adequately adhere to these measurements.

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