

Heater-cooler unit contamination with *Mycobacterium chimaera* — potential harmful risks for cardiac surgery patients

Skażenie *Mycobacterium chimaera* jednostek typu „heater-cooler” — potencjalne ryzyko poważnych powikłań u pacjentów leczonych kardiochirurgicznie

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An increasing number of reports of patients after cardio-surgical treatment, who developed *Mycobacterium chimaera* infection, can be seen in contemporary professional literature. Repeatable coincidence of *Mycobacterium*-related infections with the exposition for open cardiac procedures, particularly with the use of heater-cooler units (HCU), is reported [1]. Due to an independent discovery of proven infections in many countries (Switzerland, Germany, the Netherlands, the USA, the UK), this occurrence is increasingly referred to as epidemic.

The infection is characterised by late appearance of symptoms (ranging couple of years after cardiac surgery), poor response to treatment, and poor prognosis [2]. The incidence of these postoperative infections is related to repeatable contamination of HCU with *Mycobacterium chimaera*. Independent genetic tests of microorganisms isolated from HCU from different countries showed that the contamination of HCU units probably comes from the same place during the manufacturing process (point-source contamination) [3, 4]. It is believed that the pathogens are transmitted in operating theatres to the patients exposed for cardiac procedures by air — via aerosol produced by HCU. High risk of HCU-associated infections exists also in modern operating rooms despite observed highest standards of air quality, as reported by Sommerstein et al. [5].

It should be noted that the HCU manufacturer has constantly remained in contact with cardiac centres, and has recommended additional procedures of disinfection and cleaning for the device. However, as shown by Schreiber et al. [6], such actions could be ineffective — the contamination of the HCU can happen despite intensification of the disin-

fection process. The authors considered that corrosion and the materials used in the technology of HCU production are responsible for the development of specific conditions suitable for reproduction of *Mycobacteria*, and further formation of biofilm in the devices.

To the best of our knowledge, there has not yet been a case of *Mycobacterium chimaera* infection in a patient after cardiac surgery in Poland. Nevertheless, the risk potential has to be considered in everyday clinical practice. Until some universal methods of prevention of HCU contamination, disinfection of units, and safety of their use are established, it seems reasonable to follow the suggestions of the manufacturers and recommendations of the reference organisations. Centres for Disease Control and Prevention (CDC) and Food and Drug Administration (FDA) recommendations are concentrated primarily on the units manufactured before September 2014, and they emphasise the need to separate the exhaust air from the HCU from the atmosphere of an operative field. In addition, it is emphasised that, due to the complexity of the research methodology and significant percentage of false negative results, microbiological tests of HCUs are not currently recommended [7, 8].

Medical communities are increasingly aware of infections caused by *Mycobacterium chimaera*. It should be clarified how to treat infected patients effectively, and fundamentally — how to secure the patients from HCU-related risk. Cardiac centres should initiate preventive measures [2]. Currently, an easy way to protect patients from the HCU-exhausted infections is to separate the operating room air from the HCU atmosphere. This can be achieved by transferring the HCU outside the operating room, with a manufacturer-provided

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remote control for the device. This solution usually does not incur a great deal of expense and technical interference in the operating theatre [9].

This simple solution was effectively performed in our department. Reorganisation of operating theatres with complete isolation of HCU units should appear twice as effective — not only in terms of the patient's prevention from said infection related to *Mycobacterium chimaera*, but also to protect against wounds infections caused by other pathogens, which hypothetically can colonise HCU units. Finally, this 'architectural' solution fulfils the current recommendations of experts and the HCU manufacturers.

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