Monopercitric acid- a new disinfectant with excellent activity towards clostridial spores

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targeting antibiotics are mostly used in the empiric treatment of early ventilator-acquired pneumonia, management of patients with infections due to *M. pneumoniae* is rarely optimal. We suggest that detection of IgM antibodies to *M. pneumoniae* should be part of the investigation protocol in patients with early ventilator-acquired pneumonia.

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Sir,

Only a few classes of liquid chemical disinfectant possess sporicidal activity. These include iodine-based, chlorine-based, aldehyde and peroxygen compounds. There is, therefore, a need for chemical disinfectants that have sporicidal activity and which are approved for practical use. The new peroxygen compound monopercitric acid (MPCA, Kesla Pharma Wolfen, Germany), which has no pungent smell like peracetic acid (PAA), was tested against spores of different clostridial species in qualitative suspension tests.[1] The spores were prepared from bacterial isolates with high pathogenicity.

Clostridium septicum was found to be the most resistant clostridial species. 1% MPCA was necessary for sporicidal efficacy within a contact time of 1 min. A concentration of 0.5% MPCA was sporicidal after 5 min and 0.1% MPCA after 30 min. The lowest sporicidal concentration to show activity against *C. septicum* spores within 60 min was 0.05% MPCA. The sporicidal profile of MPCA against *C. novyi* was comparable with that against *C. perfringens*. For these, 1% MPCA was effective within 0.5 min, 0.5% MPCA was sporicidal within 2 min and 0.1% MPCA within 15 min. The lowest sporicidal concentrations to show activity were 0.05% MPCA within 30 min against *C. perfringens* and 0.025% MPCA within 60 min against *C. novyi*. Spores of *C. tetani* were most sensitive. 0.25% MPCA was effective after 0.5 min, 0.1% MPCA was sporicidal after 2 min and 0.0125% MPCA after 15 min. In control experiments with *C. perfringens*, 0.2% PAA was effective within 5 min and 40% *n*-propyl alcohol did not show any sporicidal activity within 60 min. As demonstrated by electron microscopic observations, the typical structures of *C. tetani* spores, including the outer and the inner coat as well as the core, were destroyed after exposure to 0.5% MPCA for 5 min (Figure 1).

Our results demonstrate that 0.5% MPCA is sporicidal against clostridial spores within 5 min. Unfortunately, the control disinfectants could only be examined against *C. perfringens*. However, the data obtained for MPCA are similar to results reported about PAA in the literature.[2,3]

As test micro-organisms, spores of anaerobic bacteria of the gas gangrene group and the aetiologic agent of tetanus were used. These bacteria can be regarded as representative of clostridial species. Clostridial spores were selected for this study since they possess a high resistance to chemical biocides. According to the official German recommendations[4] for disinfection, these spores can only be killed by sterilization processes such as autoclaving. In comparison, *Bacillus* species, e.g. *Bacillus subtilis* or *B. cereus*, that are often used for sporicidal testing[5,6] possess a lower chemical resistance comparable to *B. anthracis*. Therefore, the activity of MPCA against clostridial spores probably indicates efficacy against spores of aerobic bacteria.

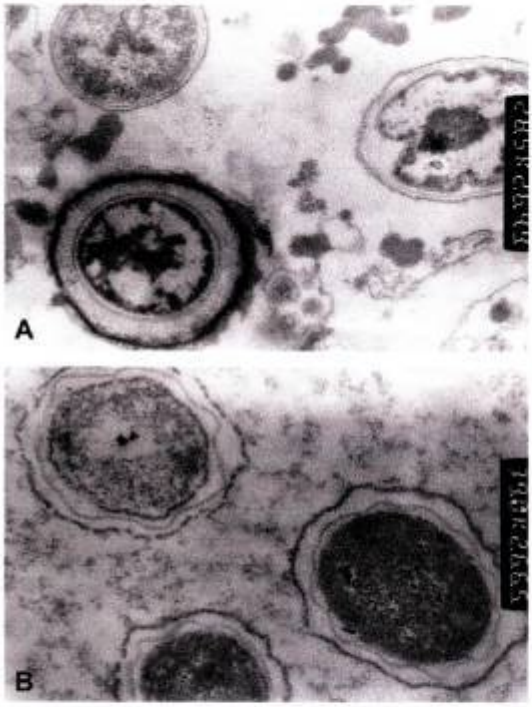

Figure 1 Spores of *Clostridium tetani* (A) before and (B) after 1 min of exposure to 0.5% monopercitric acid for 5 min. Transmission electron micrographs, negative staining, magnification: 39 000×.

The mechanism of germicidal action of MPCA is probably similar to that of PAA. Peroxy acids are strong oxidants and are likely to act non-specifically on micro-organisms by oxidizing effects on SH, OH and NH groups of amino acids, nucleotides and unsaturated fatty acids. This may modify bacterial proteins resulting in microbial inactivation. Peroxygen compounds may also cause degradation and inactivation of nucleic acids by their powerful oxidizing potential.[7] In this way, they inactivate micro-organisms completely.

The main disadvantage of peroxy-acid-based disinfectants is the high rate of hydrolysis during storage at room temperature, leading to loss of germicidal activity. This problem could be resolved by the application of dispensers for immediate diluting and mixing of ingredients. An equivalent part of peroxy acids may be inactivated by the haemoglobin of erythrocytes in the presence of blood.[8] Additionally, a marked decrease of activity has been demonstrated at pH 9.[2] This can be compensated by using elevated concentrations. The pungent smell even at relatively low concentrations often limits the use of PAA, especially when surfaces have to be decontaminated. This might be circumvented by the use of neutral-smelling MPCA. Like PAA, MPCA offers an ecologically desirable method of disinfection since no harmful decomposition products are formed.

To our knowledge, this is the first description of the sporicidal efficacy of MPCA. The excellent activity against clostridial spores seems to make this new peroxy acid suitable as an effective disinfectant for clinical use as well as possibly for decontamination during bioterrorist attacks with spores. We think that a more detailed study of MPCA as a sporicidal agent is warranted.

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