

EFFECTS OF BIOCIDES ON MYCOBACTERIA

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Mycobacteria cause severe infections in man, the latest example being Mycobacterium avium intracellulare (MAI) associated occasionally with AIDS patients. Although they are considered to have a resistance to biocides intermediate between bacterial spores and non-sporulating, non-acid-fast bacteria, there is a surprising lack of knowledge of the effects of biocides on mycobacteria. Biocides representing phenolics, quaternary ammonium compounds (QACs), parabens, an aldehyde (glutaraldehyde) and a bisbiguanide (chlorhexidine) have been tested against MAI, M.fortuitum, M.phlei, BCG and M.tuberculosis. Techniques employed involved determinations of minimum inhibitory concentrations (MICs) at 37°C for up to 7 days in Middlebrook 7H9 liquid medium, viability assessments of 2% glutaraldehyde against ca. 10⁷ cfu/ml at 20°C and effects on growth over several days in the Bactec 460 apparatus which measures growth rate by the release of ¹⁴C-carbon dioxide at 37°C.

On the basis of MIC determinations (Table 1) M.phlei was the most sensitive strain to chlorhexidine diacetate (CHA: MIC, 0.5 - 1 µg/ml) and QACs, whereas MAI was the most resistant (MIC of CHA, 50µg/ml). In contrast, MAI was almost as sensitive as BCG to chlorocresol and the parabens. These findings with CHA were substantiated with the Bactec technique, in which 0.125 µg/ml reduced the onset of growth of M.phlei, with growth commencing only after 16 days in the presence of 0.25 µg/ml. In contrast, the growth rate of MAI was virtually unaffected by 15 or 30 µg/ml. With M.tuberculosis, 0.5 - 5 µg/ml CHA reduced considerably the rate of growth over a 14 day period, and with M.fortuitum 0.5 and 1 µg/ml delayed the onset of growth and a concentration of 2.5 µg/ml prevented growth completely over 36 days. 2% alkaline glutaraldehyde has been found to be mycobactericidal over a 60 min period to all strains.

Table 1. Sensitivity of mycobacteria to biocides

Biocide*	MIC (µg/ml) vs.			
	<u>M.fortuitum</u>	<u>M.phlei</u>	MAI	BCG
CHA	1-2.5	0.5-1	50	2.5-5
CPC	25-50	5-10	25-50	10-25
DB	10	2.5-5	10	5-10
Cetrimide	25	5-10	25	25
Chlorocresol	250	100-250	100	50-100
Parabens				
Methyl	2500	2500	1000	750
Ethyl	500	700	500	250
Propyl	320	320	200	200
Butyl	225	225	75-100	100

* CPC, cetylpyridinium chloride; DB, domiphen bromide

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