

**THE REMOVAL OF CYANOBACTERIAL
METABOLITES FROM DRINKING WATER
USING OZONE AND GRANULAR
ACTIVATED CARBON**

By

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EXECUTIVE SUMMARY

The prevalence of the cyanobacterial metabolites: MIB, geosmin and microcystin in drinking water is a major concern to the water industry as these metabolites can compromise the quality of drinking water. Consequently, effective removal of these metabolites from drinking water is paramount. The combination of ozone (O₃) and granular activated carbon (GAC) has been shown to be effective for the removal of these metabolites from drinking water.

In this study, the ozonation of MIB and geosmin was affected by the character of natural organic material (NOM). In particular, NOM containing compounds of high UV absorbing properties and high molecular weight (MW) resulted in greater destruction of MIB and geosmin due to the formation of hydroxyl (OH) radicals. In addition, alkalinity also affected the ozonation process, with waters containing higher alkalinity resulting in decreased destruction of MIB and geosmin.

Laboratory scale minicolumn experiments, coupled with the homogenous surface diffusion model (HSDM), were found to be ineffective in predicting the GAC breakthrough behaviour of MIB and microcystin at two different pilot plants. This can be attributed to the biological degradation of the metabolites at the pilot plants which cannot be modelled by the HSDM. In addition, the volume of GAC used in the minicolumn experiments may not have been appropriate for the predictions, rather, larger laboratory scale columns were found to be more applicable in mimicking pilot plant results.

Microcystins were shown to be readily degraded by the bacteria attached to the GAC. Furthermore, the lag period prior to the onset of degradation, which is indicative of most biological degradation studies, was effectively eliminated and in one instance abated. This finding suggests that biological filtration of microcystin is practically feasible especially since the occurrence of microcystins in water supplies is seasonal.

This study expands on previous research in the area of O₃ and GAC for the treatment of MIB, geosmin and microcystin. With the imminent increase of the use of O₃ and GAC in Australian water treatment plants (WTPs), this study provides valuable information for the use of these processes both alone and in combination, particularly since minimal research in this area has been conducted in Australia.