Effect of Various Factors on Ozone Inactivating Giardia in Water

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Abstract: In order to study the effect of O₃ inactivating Giardia in water, different factors (CT value, pH, temperature, turbidity, organic content and inorganic ions) which might influence the inactivation were investigated by using fluorescence staining method. The results indicated that the whole process of O₃ inactivating Giardia could be divided into two periods, the inactivated rate in log phase was significantly faster than it in the slow phase. When the turbidity was 0.1 to 20 NTU, temperature was 5 to 35°C, pH was 6.0 to 9.0, HA content was 0.5 to 10.0 mg/L, the turbidity was lower, the higher inactivating ratio could be received. With the increasing of temperature, the inactivating effect was decreased. The ability of O₃ inactivating Giardia was stronger under acidic condition than it was in alkaline circumstance. When the reaction system contained higher concentration of organics, the competition reaction might take place between Giardia and organics with O₃+, which might reduce inactivation ratio. The sequence of affecting disinfectant ability of O₃ was NO₃⁻ > None > SO₄²⁻ > HCO₃⁻, while inorganic cations (Ca²⁺, Mg²⁺ and Cu²⁺) promoted the inactive reaction to a certain extent. If the CT value of O₃ was more than 15.0 min · mg/L, the ratio of inactivation could exceed 99.0% during disinfecting drinking water.

Key words; O₃; inactivating; Giardia; effect factors

(Figures and tables may be included here as necessary.)
灭活

F V P 4 检测
光显微镜下镜检

普匹碘胺
贾第虫
反应

Y 53 B

结果与分析
取数

次

( D )

荧光染色法
仪器设备
试剂
二脒基

取数

0 . !, 1. ! ( !)

HCO3-,Ca2+,Mg2+,Cu2+,Zn2+;：</p>
2.2

影响了对贾第虫的灭活率。从图2可以看出，不同浊度的反应体系对贾第虫灭活率的影响。在浊度为0.1 NTU下，其灭活率分别设置反应体系的浊度为0.1、0.5、1.0、2.0、5.0、10.0和20.0 NTU。图2显示了浊度对贾第虫灭活率的影响。当浊度增加时，灭活率逐渐下降，这可能与反应体系中悬浮物或胶体物质对贾第虫的吸附有关。研究在灭活机制尚不完全清楚。

2.3

温度对灭活率的影响

图3是不同温度下贾第虫的灭活率。当温度达到62°C时，贾第虫灭活能力减弱，这可能与细胞膜质的破坏有关。贾第虫灭活率为零时，温度一般在22°C时，O3反应能力强，使细胞膜的透性畸变，破坏细胞器和细胞内核酸。反之温度越低，O3越容易分解，故灭活率随温度的升高而降低。

2.4

温度对灭活率的影响

图3显示了不同温度下贾第虫的灭活率。从图中可以看出，当温度在5°C时，O3反应能力强，使细胞膜的透性畸变，破坏细胞器和细胞内核酸。反之温度越低，O3越容易分解，故灭活率随温度的升高而降低。

图3是不同温度下贾第虫的灭活率。当温度达到62°C时，贾第虫灭活能力减弱，这可能与细胞膜质的破坏有关。贾第虫灭活率为零时，温度一般在22°C时，O3反应能力强，使细胞膜的透性畸变，破坏细胞器和细胞内核酸。反之温度越低，O3越容易分解，故灭活率随温度的升高而降低。
不同浓度下贾第虫灭活率的比较

图2 无机离子对贾第虫灭活的影响

图4 pH值下贾第虫灭活率的比较

图5 不同HA浓度对贾第虫灭活的影响

表2 无机离子浓度设定表

<table>
<thead>
<tr>
<th>离子</th>
<th>设定浓度</th>
<th>水质标准</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCO₃⁻</td>
<td>5.0 mmol/L</td>
<td>450.0 µmol/L</td>
</tr>
<tr>
<td>Cu²⁺</td>
<td>1.0 mg/L</td>
<td>1.0 µmol/L</td>
</tr>
<tr>
<td>SO₄²⁻</td>
<td>3.0 mmol/L</td>
<td>250.0 µmol/L</td>
</tr>
<tr>
<td>Ca²⁺</td>
<td>4.0 mmol/L</td>
<td>450.0 µmol/L</td>
</tr>
<tr>
<td>NO₃⁻</td>
<td>20.0 mg/L</td>
<td>20.0 µmol/L</td>
</tr>
<tr>
<td>Mg²⁺</td>
<td>4.5 mmol/L</td>
<td>450.0 µmol/L</td>
</tr>
</tbody>
</table>

1) GB 5749-2006, pH = 7.2, 水温22°C, CT 9.0 min · mg/L, NO₃⁻, SO₄²⁻, HCO₃⁻, H₂O₂, H₂O, HA 0 ~ 1.0 mg/L, 贾第虫的灭活率

图6 不同无机离子对贾第虫灭活的影响
子水消毒的浊度对灭活效果的影响

离子是细胞表面蛋白的活性因子，低浓度促进。

实验考察了当反应体系中分别含有设定浓度的无机离

浊度值的增加温度在指数灭活期的灭活速度快于缓

对贾第虫的灭活率均在和

结论

对饮用

N >L T @ A ; ; G 8M @ D Y 8A 9 @ ? 59 G 9 @ N

6 , 7 - ' # 5 - # , . 1. 4" - !, = 4"

10.0 mg/L的

HA 0.5 ~ 10.0 mg/L

NO₃⁻ > None > SO₄²⁻ > HCO₃⁻, Ca²⁺、

Mg²⁺、Cu²⁺

CT ≥15.0 min · mg/L ( ≧15.0 mg · min/L)。

99.0%。


