Photoactivation of aerobically and anaerobically grown diploid yeast cells under aerobe and hypoxic conditions

JÜRGEN KIEFER
Paterson Laboratories, Christie Hospital and Holt Radium Institute, Manchester *  

It has been suggested that photoreactivation may occur by a mechanism which is similar to a photosensitised splitting of pyrimidine-dimers. Since photosensitised processes depend very often on the presence or absence of oxygen, it is of interest in this context to know whether the gaseous environment has any effect on the photoreactivability of UV-irradiated cells. If the cytochrome system is involved in the photoreactivation mechanism, one might, furthermore, expect a difference between aerobically and anaerobically grown cells.

Diploid yeast Saccharomyces cerevisiae, strain 211, originally obtained from W. LASKOWSKI, was used for this investigation. The cells were grown to the stationary phase in Wickerham medium bubbled with air or nitrogen. They were irradiated in open Petri-dishes under continuous stirring at room temperature. Survivors were counted as macrocolonies on Wickerham agar (2 %) after 3 days incubation at 30 °C in the dark. The irradiation source was a low pressure mercury lamp, Osram HNS 12. Photoreactivation was performed by exposing the cell suspension in glass tubes to a Madza Al/215 bulb, operated at 10 V at a distance of about 10 cm. During this treatment, which lasted one hour, air or N₂ were continuously bubbled through the suspension. The nitrogen sample was equilibrated for 15 minutes before the start of the illumination. The nitrogen used contained less than 10 ppm oxygen as checked by Hersch-cell measurements. All handling was carried out under subdued light.

It is clear from the results shown in the Table that there is neither an effect of the preirradiation culture conditions nor of the gaseous environment on the extent of photoreactivation.

As far as the method of incubation is concerned, this is in agreement with other observations which appear to rule out cytochrome b as a possible candidate for the photoreactivating enzyme. On the other hand, the independence of the gaseous conditions does not necessarily exclude the possibility that photosensitisation may play a role in photoreactivation.

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<table>
<thead>
<tr>
<th>Culture</th>
<th>surviving fractions [%]</th>
<th>without PR*</th>
<th>PR* in air</th>
<th>PR* in N₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>aerobic</td>
<td>0.26</td>
<td>16.9</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>anaerobic</td>
<td>0.47</td>
<td>28.6</td>
<td>21.5</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 1. Photoreactivation in air and nitrogen of aerobically and anaerobically grown cells.

* PR: photoreactivation.

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