Dominance of the wild-type (sensitive) allele of cyh-1

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Abstract
Dominance of wild-type allele of cyh-1

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Turner, Barbara C. Dominance of the wild-type (sensitive) allele of cyh-1.

In carefully conducted tests reported by K. S. Hsu (1963 J. Gen. Microbiol. 32: 341) the resistant allele of act-1 (now cyh-1) appeared to be dominant to the sensitive (wild-type) allele in forced heterokaryons using pan-1 and int in both coupling phases. In contrast, I have found that in heterozygous duplications (partial diploids) the sensitive allele is dominant.

For cyhR/cyhS duplications, derived from crosses of T(1+V)N103 by normal sequence, transfers from young cultures to cyclo-heximide (CYH) medium (Vogel's medium N plus 10 μg/ml cycloheximide) usually show little or no macroscopic growth by the time cycloheximide controls have begun to conidiate. In the genetic background studied, eventually about half of such duplication transfers grow. Analyses of the cultures that grew after a 3-day log show that the resulting cultures were resistant, having lost the sensitive wild-type allele and become homo- or hemizygous for cyh+R and markers linked to it. This is consistent with our knowledge of the somatic instability of N103 duplications and other heterozygous duplications (Turner 1975 Genetics 80: 811).

In order to study the apparent contradictions with Hsu's results, reciprocal heterokaryons were made on agar slants in 15 cm tubes using pan-2 and nit-3 as forcing markers (Table I). Heterokaryons of (pan-2; cyh-1S) + nci-3; cyhR would not form on CYH medium. A heterokaryon formed on minimal medium when transferred to CYH medium grew briefly and then stopped. This was consistent with the results from duplications. But with the coupling reversed (pan-2; thy1 R) + nci-3; cyhR, heterokaryons formed and grew fairly well on a CYH medium, similar to Hsu's heterokaryons. A set of conidial platings from such a heterokaryon culture suggests the reason for the difference. Only 5% of the conidia carried a pan+; cyhS nucleus, and almost all of these conidia were heterokaryotic. Evidently a culture can tolerate a small proportion of scattered c alleles, and this proportion provides sufficient pan+ alleles to relieve the pan-2 requirement of the cyh-1 R component. On the other hand, the nit-3 requirement is more stringent, and the proportion of nci-3 alleles required in a heterokaryon exceeds the tolerable proportion of cyhR alleles.

Table 1. Growth of forced heterokaryons involving cyh-1S and cyh-1R.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>3-day growth on minimal with</th>
<th>CYH</th>
<th>10 mg/ml CYH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no CYH</td>
<td>10 mg/ml CYH</td>
<td></td>
</tr>
<tr>
<td>1. cyh-1R control</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>2. (nci-3; cyh-1R) + (pan-2; cyh-1R)</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>3. (nci-3; cyh-1R) + (pan-2; cyh-1S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. (nci-3; cyh-1S) + (pan-2; cyh-1R)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: All cultures on no CYH grew better than did the partners on CYH.

For the critical tests of No. 3 and No. 4 on CYH medium, two additional tests each were made. *No. 4 grew almost as well as No. 2 on CYH, although No. 4 didn't cover the medium. Neither grew as well as No. 1 did.

The apparent difference between the original heterokaryon results and the duplication results was not due to a difference in dominance relationships in the two systems. Rather, it is an illustration of the need for caution in drawing conclusions about dominance from heterokaryon experiments where nuclear ratios are not known. **Department of Biological Sciences, Stanford University, Stanford, California 94305.


A series of six single reciprocal translocation stocks that involve linkage groups I and IV were crossed (1) with wild-type, (2) with each other in various intercross combinations, and (3) with multiple genetic marker stocks for both linkage groups.

Data were obtained relative to ascospore abortion frequencies, unordered projected ascospore patterns, linkage between markers, and linkage between markers and translocation breakpoints. The objective of this work was to produce two-chromosome double translocations between linkage groups I and IV (Kowles 1972 Ph. D. Thesis, University of Minnesota, Diss. Abstr. Int. 338: 60-61). In a chromosome rearrangement of this type, each of the two chromosomes would be characterized by two separated breakpoints and two reciprocally exchanged segments. The establishment of these chromosome rearrangements depends upon simultaneous crossovers in the two differential segments formed in intercross between single translocation stocks, each with breakpoints that involve the some two chromosomes. Further tests are needed to determine whether these rearrangements were actually synthesized or whether other aneu- ploid derivatives had occurred.