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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 inl in both coupling phases. In contrast, I have found that in heterozygous duplications (partial diploids) the sensitive allele is dominant.

For cyh^R/cyh^S duplications, derived from crosses of T(I→VI)NM103 by normal sequence, transfers from young cultures to cycloheximide (CYH) medium (Vogel's medium N plus 10 μg/ml cycloheximide) usually show little or no macroscopic growth by the time c/h-1 controls have begun to conidiate. In the genetic backgrounds studied, eventually about half of such duplication transfers grow. Analyses of the transfers that grow after a log show that the resulting cultures are resistant, having lost the sensitive wild-type allele and become homo- or hemizygous for cyh-1R and markers linked to it. This is consistent with our knowledge of the somatic instability of NM103 duplications and other heterozygous duplications (Turner 1975 Genetics 80: s81).

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 1). Heterokaryons of (pan-2; cyh-1S) + (nic-3; cyh-1R) 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; thy-1 R) + (nic-3; cyh-1S), 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+; cyh-1S 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 nic-3+ alleles required in a heterokaryon exceeds the tolerable proportion of cyhS alleles.

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

Genotype	3-day growth on minimal with no CYH	3-day growth on minimal with 10 mg/ml CYH	
1. cyh-1R control	+	+	
2. (nic-3; cyh-1R) + (pan-2; cyh-1R)	+	+	
3. (nic-3; cyh-1R) + (pan-2; cyh-1S)	+	-	(only a few hyphae)
4. (nic-3; cyh-1S) + (pan-2; cyh-1R)	+	+*	

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 form heterokaryon experiments where nuclear ratios are not known.

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