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Reciprocal and non-reciprocal recombination between closely linked markers

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Abstract
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Boone, D. M. and D. R. Stadler. Reciprocal and non-reciprocal recombination between closely linked markers.

Reciprocal recombination (RR) may result from a different kind of event from non-reciprocal recombination (NRR; also called gene conversion). Stadler and Towe (1968 Genetics 58:327) found that inbreeding raised the frequency of recombinants between two closely linked but non-allelic cysteine mutants of Neurospora, and the marker combinations suggested that the increase was mainly in the RR class, with NRR remaining constant. This report deals with a similar analysis of recombination between closely linked genes of unrelated phenotype. All crosses were his+-2; col-4, arg-2 a x his+-2; pdx-1 mtr A. The order of the four linked loci (with approximate map distances) is pdx-1 - (2) - mtr - (1) - col-4 - (0.2) - arg-2.

Random ascospores were plated on minimal sorbose medium supplemented with histidine, pyridoxine and an excess of arginine. This medium was selective for mtr+, because the uptake of the required histidine depended upon the function of this gene. The mtr+ colonies were counted, and the 1-2% which were non-colonial (col-4+) were selected visually, counted, isolated and scored for the unselected markers.

No tetrad analyses were included, but an attempt war made to distinguish RR between mtr and col-4 from NRR at either of there sites by the marker combinations accompanying them. It war assumed that the marked intervals were so short that progeny which were double exchange types for adjacent intervals could only arise by NRR.

The first five crosser differed only in their mtr alleles. All of there alleles hod been inserted by mutation into the same his+-2; pdx-1 A strain, so the genetic background was identical in there crosses. As expected, the results show relatively constant frequencies of RR and of NRR at the col-4 locus. The fluctuations in NRR rates at mtr ore presumed to represent the different conversion frequencies for the different mutant alleles.

From the cross involving mtr-119, four progeny of the genotype his-2; pdx-1, mtr A (designated 119-1, 119-2, 119-3 and 119-4 in the table below) were isolated and back-crossed to their his-2; col-4, arg-2 a parent. Two his+-2; pdx-1, mtr A progeny (designated 119-I-1 and 119-I-2 in the table below) from one of there back-crosser were back-crossed to the same parent. The results from the back-crosses do not reveal any simple trends. Some show an increase in RR, but

one shows a pronounced decrease (although the number analyzed was small in this cross). The expected uniformity of conversion rates is not observed, and the fluctuations represent both increases and decreases.

mtr parent	total mtr^+ colonies	RR pdx^+ mtr^+ col^+ arg^+	NRR at mtr pdx mtr^+ col^+ arg^+	NRR at col pdx^+ mtr^+ col^+ arg
mtr 112	15,670	152 (9.7)	4 (0.26)	27 (1.7)
mtr 116	13,400	127 (9.5)	IO (0.75)	29* (2.2)
mtr 117	11,630	142 (12.2)	16 (1.4)	30* (2.6)
mtr 119	14,530	201 (13.8)	6 (0.41)	25* (1.7)
mtr 121	12,420	145 (11.7)	9 (0.72)	32* (2.6)
mtr 119-I	8,770	168 (19.2)	11 (1.3)	32** (3.6)
mtr 119-2	1,720	17 (9.9)	0	1 (0.58)
mtr 119-3	1,390	60 (43.1)	3 (2.2)	6 (4.3)
mtr 119-4	1,010	5 (5.0)	0	3 (3.0)
mtr 119-I-I	5,490	75 (13.7)	1 (0.18)	4 (0.73)
mtr 119-1-Z	3,540	62 (17.5)	1 (0.28)	3 (0.85)

Numbers in parentheses are frequencies per thousand mtr^+ colonies.
* One of there war pdx mtr^+ col^+ arg.
** Three of there were pdx mtr^+ col^+ org.

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