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M. Schablik

*University Medical School of Debrecen*

A. Zsindely

*University Medical School of Debrecen*

J. Aradi

*University Medical School of Debrecen*

*See next page for additional authors*

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## Changes of the ratio of *inl+* and *inl-* nuclei in heterocaryons of spontaneous revertant and by DNA-induced *inl+* revertant *Neurospora crassa* strains

### Abstract

Changes of the ratio of *inl+* and *inl-* in heterocaryons of spontaneous revertant and by DNA-induced *inl+* revertant *Neurospora* strains

### Authors

M. Schablik, A. Zsindely, J. Aradi, and G. Szabo

of  $inl^-$  and  $inl^+$  nuclei in heterocaryons of spontaneous revertant and by DNA-induced  $inl^+$  revertant *Neurospora crassa* strains.

progeny (Mishra and Tatum 1973 Proc. Nat. Acad. Sci. U.S. 70: 3875; Mishra 1976 Nature 264: 251). This non-Mendelian behaviour of the newly acquired trait was explained with the exosome hypothesis (Fox et al. 1971 in, Informative Molecules in Biological Systems, Ed. L. Ledoux, North-Holland, Amsterdam o. 313). However, our observations (Szabo and Schablik 1975 *Neurospora Newsletter* 22: 11) suggests that the results might instead originate from a heterocaryotic nature of the reverted strains.

In the following we present data for crosses between  $inl^+$  revertants of spontaneous origin and of revertants after allo-DNA treatment with the same  $inl^-$  (89601) strain. The revertants were isolated and after one transfer on inositol containing medium, they were crossed with  $inl^-$ .

In Table 1 the number and the proportion of  $inl^+$  ascospores from random spore analysis are indicated. Strains 1-4 are spontaneous revertants, while strains 5-10 were obtained after allo-DNA treatment of the recipient  $inl^-$  (R2506-5-101 a) strain. In neither group do any of the strains exhibit the Mendelian pattern of inheritance (expected 1:1 ratio of the  $inl^+$  and  $inl^-$  spores). Since this deviation from 1:1 ratio occurred in both groups of revertants there is no reason to invoke the exosome model. These results can be interpreted to indicate that both kinds of revertants are heterocaryotic, containing  $inl^+$  and  $inl^-$  nuclei.

When the revertants were instead transferred six times on minimal medium so that most of the  $inl$  nuclei were lost and then crossed to the  $inl^-$  strain, we often obtained the expected 1:1 ratio (Table 2) in crosses with both groups of revertants. If, however, the revertants were transferred six

Table 1

Random spore analysis of  $inl^+$  revertant strains of *N. crassa*

| Revertants                     | No. of strains | Number of sexual progeny |                  |           |
|--------------------------------|----------------|--------------------------|------------------|-----------|
|                                |                | $inl^+$                  | $inl^-$          | $inl^+$ % |
| Spontaneous                    | 1              | 500<br>631               | 36 500<br>19 250 | 2.27      |
|                                | 2              | 3 050                    | 32 950           | 8.47      |
|                                | 3              | 260<br>131               | 36 240<br>36 949 | 0.53      |
|                                | 4              | 3<br>3                   | 34 247<br>47 412 | 0.008     |
| Allo-DNA induced transformants | 5              | 5 500                    | 16 500           | 25.00     |
|                                | 6              | 2 600                    | 27 400           | 8.67      |
|                                | 7              | 842<br>335               | 28 158<br>29 165 | 1.14      |
|                                | 8              | 4 866                    | 108 434          | 4.29      |
|                                | 9              | 8<br>200                 | 20 332<br>26 330 | 0.40      |
|                                | 10             | 3 300                    | 44 700           | 6.23      |

\*Revertant,  $inl^- \times inl^-/89601/$ ; other loci involved in the crosses were  $rg^- a/rg^+ A$ .

When an inositol requiring, colonial ( $inl^-$ ) strain (Mishra and Tatum 1970 Proc. Nat. Acad. Sci. U.S. 66:628) of *N. crassa* was treated with DNA from wild type (allo-DNA), it yielded inositol independent ( $inl^+$ ) revertants in significant higher number than controls. When the  $inl^+$  revertants, however, were crossed with an  $inl^-$  strain (89601), the results often deviated from expected Mendelian ratios and gave a very low proportion of  $inl^+$

Table 2

Random spore analysis of  $inl^+$  revertants of *N. crassa* strains transferred on minimal medium and inositol containing medium

| Revertants                     | No. of strains | Per cents of $inl^+$ progeny after transfers on minimal medium |       | Per cents of $inl^+$ ascospores after transfers on $inl^-$ containing medium |        |
|--------------------------------|----------------|--|-------|--|--------|
|                                |                | No. of passages  |       | No. of passages  |        |
|                                |                | 1  | 6     | 1  | 6      |
| Spontaneous                    | 1              | 16.86  | 36.03 | 2.27   | 0.000  |
|                                | 2              | 18.18  | 53.24 | 8.470  | 39.470 |
|                                | 3              | 8.48   | 9.92  | 0.530  | 0.000  |
|                                | 4              | 7.05   | 11.95 | 0.008  | 0.000  |
| o-Allo-DNA treated transformed | 5              | 32.56  | 51.25 | 25.000   | 37.040 |
|                                | 6              | 46.89  | 47.34 | 8.670  | 0.989  |
|                                | 7              | 8.74   | 18.50 | 1.140  | 0.058  |
|                                | 8              | 15.67  | 36.48 | 4.290  | 15.340 |
|                                | 9              | 10.91  | 14.19 | 6.230  | 10.009 |

times on inositol containing medium, the  $int^+$  nuclei disappeared from three out of four strains in the revertants of spontaneous origin, but were retained in substantial number with the  $\overline{allo-DNA}$  treated strains (Table 2). We do not have an explanation for this behaviour.

Thirty ordered tetrads were also analysed for each revertant group and the results showed that there was no difference between them. If the ascus originated from  $\overline{int^+}$  nucleus it gave the expected 4:4  $int^+ : int$  ratio. Tetrads with the non-mendelian ratio of 0:8 /  $\overline{int^+} : \overline{int}$  as expected for the heterocaryotic state were also found. Aberrant tetrads of  $\overline{2:6}$  or  $\overline{3:5}$  were only rarely observed, and were not more frequent among the DNA-treated strains than in the control group.

We conclude that the non-Mendelian behaviour of inositol independent revertants can be explained without using the exosome hypothesis. The DNA-induced revertant heterocaryotic hyphae seem, however, to be different from the revertants of spontaneous origin. Their  $\overline{int^+}$  nuclei were not lost even after six transfers on complete medium. - - - Departments of Biology and Biochemistry, University Medical School of Debrecen, H-4012 Debrecen, Hungary.