A new report concerning nuclear DNA content and premeiotic DNA synthesis in fungi

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R. Duran and P. M. Gray have published results of considerable interest that may escape notice because of the title and the journal ("Nuclear DNA, an adjunct to morphology in fungal taxonomy". Mycotaxon 36:205-219, 1989). Data are presented on nuclear DNA content of species of Neurospora and smut fungi and on the time of premeiotic DNA synthesis.

1. What is the 1C DNA value for *Neurospora crassa*?

Three estimates have previously been published for Neurospora, based on chemical extraction of microconidia (28 x 10(9) daltons, ~42 megabases. Horowitz and Macleod 1960), renaturation kinetics (18 x 10(9) daltons, ~27 megabases. Krumlauf and Marzluf 1980), and electrophoretic karyotyping (31x 10(9) daltons, ~47 megabases. Orbach et al. 1988). Duran and Gray provide yet another estimate based on microfluorometric measurements of individual nuclei stained with Schiff reagent. This method appears to have distinct advantages over absorbance microphotometry. Saccharomyces strain ATCC 26109 was used as reference standard and was assigned a 1C value of 1.05 x 10(10) daltons based on the work of others. The value they report for Neurospora microconidia, 27 x 10(9) daltons (~40 megabases per nucleus), is close to that obtained 30 years earlier by Horowitz and Macleod. This is about 1.5 times greater, however, than the estimate of Krumlauf and Marzluf. The discrepancy might perhaps be rationalized if renaturation kinetics gave the correct basic 1C value and if the higher values from microconidia resulted because half the nuclei were post- S rather than pre-S. But the measurements of Duran and Gray suggest that the genome is unreplicated in microconidia. Histograms for individual microconidial nuclei show a unimodal rather than bimodal distribution, and the mean DNA value for mycelial nuclei is greater than that for microconidia, as expected for a population with nuclei undergoing replication. The concordance of estimates other than that based on reassociation kinetics seems to favor the 40 megabase 1C value and suggests that the value obtained using C_0t curves may be too low.

2. When does premeiotic DNA synthesis occur in fungi?

Duran and Gray also used their microfluorometric method to determine the DNA content of nuclei after karyogamy in young asci of *N. teterasperma* and in teleospores of seven species of smut fungi. DNA appeared to be replicating still in the diploid fusion nuclei. DNA values for nuclei after karyogamy ranged from 2C to 4C in all eight species. This is contrary to accepted wisdom that premeiotic DNA synthesis has already been completed in the haploid pronuclei before karyogamy, a conclusion based on microphotometric absorbance measurements of Feulgen-stained nuclei in *Neotiella* (Rossen and Westergaard 1966 Compt. Rend. Trav. Lab. Carlsberg 35:261-386), *Sordaria fimicola* (Bell and Thierrien 1977 Can. J. Genet. Cytol. 19:359-370), *Neurospora crassa* (Iyengar et al. 1977 Genet. Res. 29:1-8), and *Schizophyllum* (Carmi et al. 1978 Genet. Res. 31:215-226). Similarly, completion of synthesis before fusion was shown by 32P incorporation in *Coprinus cinereus* (Lu and Jeng 1975 J. Cell Sci. 17:461-470) and by fluorescence of propidium iodide stained nuclei in wild-type *Coprinus macrorhizus* (Oishi et al. 1982 Arch. Microbiol. 132:372-374). In contrast, Bayman and Collins (1990 Mycologia 82:170-

174), using fluorescence of mithramycin stained nuclei, have found that premeiotic DNA synthesis follows karyogamy in a homothallic isolate resembling *Coprinus patouillardii*. Postfusion synthesis was also found by Oishii et al. in a mutant of *C. macrorhizus* in which the nuclei undergoing fusion are identical.