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1. Chromosome aberrations produced by 5-bromodeoxyuridine (BUdR) and 5-fluorodeoxyuridine (FUdR) with concurrent exposure to U.V. in Zea mays L. root tips.

We studied the influence of bromodeoxyuridine (BUdR) replacement for thymidine on the pattern and level of chromosome damage in corn root tip cells. High wavelength ultraviolet light (350 nm) was employed to convert the bromodeoxyuridine in DNA to its photoproduct. BUdR was introduced during a single generation cycle (10 hr) and during that period the mitotic index was severely depressed but recovered to near control level within the next cycle following removal of the inhibitor. A short ultraviolet treatment following removal of BUdR from the medium had no markedly different influence on the mitotic index than did the use of the chemical alone. Nevertheless, the pattern of chromosome breakage was markedly different in the roots treated with BUdR and BUdR plus ultraviolet. Root tips treated with BUdR showed a high yield of chromosome breakage for two generation cycles following the replacement by BUdR of DNA thymine, but breakage was greatly reduced during the third post replacement replication.

In the nuclei treated with BUdR and then converted to the photoproduct with ultraviolet light, the level of chromosome breakage was not significantly different from the BUdR treated culture during the first post treatment generation, but during the second generation the U.V. effect was pronounced and during the third post treatment generation the U.V. enhancement of chromosome breakage had grown threefold greater than that observed in nuclei exposed to BUdR alone (Table 1). Root tips exposed to U.V. alone showed little or no chromosome damage during the period when the U.V. enhancement of BUdR induced breakage was most pronounced (Table 2).

We conclude from this experiment that BUdR treatment followed by high wavelength ultraviolet treatment provides a tool for

Table 2

Types and frequency of chromosome aberrations induced by UV
(350mu; 51uW/Cm² x 100) alone at 25°C.

Fixation time (hrs) after treatment	No. of metaphases analyzed	No. (or %) of abnormal metaphases	Aberrations of each type per 100 cells scored					
			Fragment at meta.	Centromere break	Chromatid break	Ring Chromosomes	Endomitotic cells	Bridge at anaphase
5	180	0 (0%)	-	-	-	-	-	-
10	169	19 (11.24%)	8.87	-	1.77	0.59	-	-
15	190	36 (18.94%)	14.74	0.53	1.58	-	1.53	1.58
20	188	8 (4.25%)	4.25	-	-	-	-	-
25	170	0 (0%)	-	-	-	-	-	-

specifically damaging newly replicated chromosome or chromosome regions.

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2. Precise chromosome movements prior to somatic metaphase in maize.

Light and electron microscope observations of early somatic prophase have shown that the chromosomes of maize are attached to the nuclear membrane. The numerous attachment points are apparently randomly distributed along the chromosomes but include the telomeres and centromeres of the chromosomes observed.

The somatic chromosomes were clearly visible during early prophase where they were organized in a polarized bouquet arrangement reminiscent of their previously held anaphase configuration. The chromosome arms were projected toward one end of the nucleus and the centromeres were found located at the other pole of the nucleus.

The centromeres of the prophase chromosomes were observed to move in a coordinated fashion from the "centromere pole" of the nucleus, along the nuclear membrane, to occupy an equatorial position by late prophase. The chromosomes then moved inward toward one another along the equatorial axis of the nucleus to form the new metaphase plate. This chromosome movement established the plane of the new metaphase plate at right angles and equatorial to the long axis of polarization of the prophase nucleus. Consequently, the plane of cell division was established along the axis of the polarization of the nucleus.

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3. The absence of nonhomologous associations of somatic chromosomes in maize.

All possible distance combinations of the ten pairs of somatic chromosomes of maize were accumulated for four cold arrested stocks