G_2 repair in Nijmegen breakage syndrome: G_2 duration and effect of caffeine and cycloheximide in control and X-ray irradiated lymphocytes

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Abstract

Lymphocytes from a patient with the Nijmegen breakage syndrome (NBS/NBS) and his parents (NBS/+) have been analyzed to identify possible disturbances in chromosomal G_2repair. The study included the determination of G_2 duration and the analysis of the chromosomal aberration frequencies in lymphocytes with/without caffeine and cyclohexemide (CHM) treatments during G_2, under control and X-irradiated conditions. Under control conditions, NBS/NBS lymphocytes showed that the basal chromosomal damage as well as the damage detected in G_2, with caffeine treatment, and the G_2duration were higher than cells from an age-matched control. In X-irradiated NBS/NBS lymphocytes. the basal and G_2 chromosome aberration frequencies were higher than in the controls; however, no significant differences in G_2 duration were detected between these two type of cells.

Under X-irradiated conditions, NBS/+ lymphocytes showed that while the level of chromosomal damage in G_2 and the duration of this cell cycle phase were similar to the control cells, the frequency of unrepaired chromosomal lesions was higher than in the control lymphocytes. No significant differences in chromosomal damage and G_2 duration were detected in NBS/+ lymphocytes compared to the control cells, under control conditions.

CHM treatment, which induces an increase in G_2 duration, decreased the basal spontaneous and X-ray induced chromosome aberration frequency in NBS/NBS and NBS/+ lymphocytes. These results suggest that NBS lymphocytes might be affected by some disturbances in their ability to extend the G_2 duration, which may be influencing their DNA repair efficiency in this phase of the cell cycle.