12.6: Burkitt's Lymphoma

Burkitt's lymphoma is a solid tumor of B lymphocytes, the lymphocytes that the immune system uses to make antibodies. The genes for making antibodies are located on chromosomes 14 (the heavy [H] chains), 2 (kappa light chains), and 22 (lambda light chains). These genes are expressed only in B lymphocytes because only B cells have the necessary transcription factors for the promoters and enhancers needed to turn these antibody genes "on". In most (approximately 90%) of the cases of Burkitt's lymphoma, a reciprocal translocation (designated t(8;14)) has moved the proto-oncogene c-myc from its normal position on chromosome 8 to a location close to the enhancers of the antibody heavy chain genes on chromosome 14.

![Figure 12.6.1: Chromosome 14](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_Biology_(Kimball)/Unit_12%3A_Cancer/1...

In all the other cases, c-myc has been translocated close to the antibody genes on chromosome 2 or 22. In every case, c-myc now finds itself in a region of vigorous gene transcription, and it may simply be the overproduction of the c-myc product (a transcription factor essential for mitosis of mammalian cells) that turns the lymphocyte cancerous. Uncontrolled mitosis of this cell results in a clone of cancer cells, Burkitt's lymphoma. Many other human cancers involve
chromosome aberrations, such as translocations, at the loci of known proto-oncogenes.

![Karyotype of a cell with Burkitt's lymphoma](image)

**Figure 12.6.2: Karyotype of a cell with Burkitt's lymphoma**

Figure 12.6.2 is an actual karyotype (courtesy of Janet Finan and C. M. Croce) of a cell from the tumor of a patient with Burkitt's lymphoma. The long (q) arm of the resulting chromosome 8 is shorter (8q⁻) than its normal homologue; the long arm of translocated chromosome 14 longer (14q⁺). The heavy chain gene locus on chromosome 14 is a dangerous place. Several other proto-oncogenes produce cancerous B cells — leukemias, lymphomas, and multiple myelomas — when translocated into this locus. The risk of translocations involving the heavy chain gene locus is probably especially high because breaks in its DNA occur naturally during the synthesis of antibodies.

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