

Using Commercially Available Human Cells in a Chromosome Lab

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Now that having students prepare and analyze metaphase chromosomes from their own lymphocytes is generally regarded as being too potentially hazardous for a teaching lab, human tissue culture cells are a useful alternative source of metaphase chromosomes to use in a karyotyping lab exercise. HeLa cells (human cervical carcinoma cells which have been in culture since 1952) are now commercially available. The cells are shipped ready for the students to drop on slides; they have been cultured, blocked in metaphase with colchicine, swollen in hypotonic solution, and fixed in acetic acid-methanol (the fixative inactivates the human papilloma virus which is present in the cells). Currently HeLa cells in this useful form are available from CellServ (Kit #4; see below). The cells are stable for at least 4 weeks when stored at -20°C ; one order consists of 15 vials of cells (in our experience these are enough for approximately 150 students to do the lab). CellServ sends two stains to use in combination on the chromosome preps (Eosin Y and Methylene Blue/Azure A); additional stain can be ordered from Baxter Healthcare Corp. (Diff-Quick; see below). The chromosomes can also be stained with Wright-Giemsa stain. We ask students to locate complete, non-overlapping metaphase chromosome spreads on their HeLa slides and then make video prints or digitized images of the spreads to analyze. Because HeLa cells are extremely aneuploid and their chromosomes have undergone many rearrangements during years of culture, their chromosomes are not suitable for constructing a karyotype (when G-banded they are not recognizably human). Hence, we ask the students to construct a karyotype using a provided photograph of a normal, G-banded, human lymphocyte chromosome spread and then to compare their HeLa chromosome spread with the normal with respect to total number of chromosomes and numbers of metacentric, submetacentric, and acrocentric chromosomes.

In addition to providing wet-lab experience in a human chromosome lab, using HeLa cells also stimulates thinking about some interesting questions such as: Except for their origin, in what respects are HeLa cells still human? What different selection pressures act on cells in culture vs. cells in organisms? Should donors of cells (or their heirs) receive payment when cell lines are used in research or used to produce marketable substances (perhaps generating considerable profit)?

Sources of Cells and Additional Stain:

CellServ, CATCMB/103 McCort-Ward Bldg., The Catholic University of America, Washington, D.C. 20064; (202) 319-5725; FAX: (202) 319-4467

Baxter Healthcare Corp., Scientific Products Division, 1430 Waukegan Rd., McGaw Park, IL 60085-6787; (708) 689-8410; FAX: (708) 473-2114