PROBLEM OF SINGLE CELL VERSUS MULTICELL ORIGIN OF A TUMOR

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1. Introduction

Cell markers have been used to study the cell population which gives rise to tumors. These traits are presumed to be transmitted to daughter cells and so set apart a cell or group of cells from surrounding cells of like type. Chromosome markers have been used to study experimentally induced and naturally occurring tumors [1], [8]. Such markers are usually considered chance findings, primarily serving to follow the growth of a particular cell line. The chromosomal variant itself may also be involved in tumor formation as strongly suggested by finding a consistently abnormal chromosome, the Philadelphia chromosome, in the leukocytes of individuals with chronic myelogenous leukemia [14]. Antigenic specificity of cells has also been employed to differentiate otherwise similar cells within a tumor [10], [16].

We have used a fixed and natural cell marker, the electrophoretic variant of glucose-6-phosphate dehydrogenase (G6PD) to study the cell population of leiomyomas of the uterus. G6PD is an enzyme whose gene locus in man lies on the X chromosome. Females heterozygous for G6PD have two cell populations each expressing one of the two alleles, that is to say, an individual heterozygous for G6PD has a mixture of cells some of which show one or the other but not both characteristics. The two cell populations breed true throughout somatic cell growth. This is presumed to be due to random inactivation of all or part of one of the two X chromosomes early in development. The inactive X chromosome remains inactive in all daughter cells and prevents the phenotypic expression of the G6PD locus on that particular X chromosome [2], [4], [13], [17].

If tumors from individuals heterozygous for G6PD arise from single cells, they should have a single phenotype and with this idea in mind, we have studied normal tissues and tumors from such people [7], [11], [12]. Several genetic variants of this enzyme are known. Some of these are quantitative variants while others are variants demonstrable by electrophoresis [3], [9]. We chose the

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