



Opinion

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HeLa is not a Cervical Carcinoma but a Human Breast Cancer Cell Line

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Human cancer cell lines, such as the HeLa line established in culture by George Otto Gey and associates [1], are of paramount importance in biomedical research. HeLa is the first human cancer cell line ever established in culture from the so-called cervical biopsy obtained from a 31-year-old African American woman named, Henrietta Lacks. Henrietta died within eight months of her widespread cancer diagnosis. From the very beginning, the pathology of HeLa was in doubt. Howard W. Jones, Jr, the original gynecologist who examined Henrietta first, wrote a reappraisal 20 years later on the origin of HeLa and said, "On palpation, the lesion was so soft that it was scarcely recognizable to the examining finger. The remainder of the pelvic examination was unrevealing. The examiner, who considered himself not without experience in the appearance of cervical cancer, was quite concerned that the unusual appearance of this lesion was not consistent with the diagnosis of cancer. At a loss for a proper diagnosis, the possibility of a primary cancer of the cervix was considered, although neither before nor since has the examiner ever seen one." In the same article Jones and associates [2] further wrote, "However, many of the cells show a telltale acinous formation with clear gland cells growing directly from the ordered glandular cords into sheets which were misinterpreted and mislabeled two decades ago as epidermoid carcinoma. HeLa is without a doubt, in the opinion of Dr. J. Donald Woodruff and this gynecologist, a very aggressive adenocarcinoma of the cervix." This was the second time the histopathology of HeLa was changed.

HeLa cells known to contaminate several human and other mammalian cell lines because of their aggressiveness in cell cultures. HeLa cell contamination to other human heteroploid cell lines is based on three characteristics: (i) presence of the characteristic HeLa marker chromosomes [3], (ii) presence of glucose-6-phosphate dehydrogenase (G6PD) a isoenzyme [4] and (iii) the absence of Y chromosome in male-derived human cancer cell lines with multiple X chromosomes [5]. In February 1979, a paper entitled, "A Human Breast Adenocarcinoma with Chromosome and Isoenzyme Markers Similar to those of the HeLa Line" was published on the directly processed pleural effusion obtained from a 51-year-old black woman for chromosomal and isoenzyme analysis [6]. From the same effusion, a continuously growing permanent breast cancer cell line (MDA-MB-468) was also available for its chromosomal and isoenzyme evaluation. Presence of six typical HeLa marker chromosomes and isoenzyme A type G6PDH mobility in this sample questioned the origin of HeLa cell pathology. Further analyses of additional breast cancer samples harvested directly or from the established breast cancer cell lines have revealed the presence of some of these characteristic typical HeLa chromosome markers [5, 7-18]. This does not mean that HeLa has not contaminated human cancer cell lines originating from other organs. Unfortunately, it has contaminated many human cancer cell lines [4, 5, 13-16 & 19-25]. Human cervical cancer cell lines studied by other investigators for their chromosomal characteristics have shown their own common markers but have no similarity and

commonality with any HeLa marker chromosomes [26-30]. There is hardly any human cervical cancer cell line described in the literature that contaminated with HeLa. On the other hand, a large number of human breast cancer cell lines are shown to be contaminated with HeLa.

If the HeLa cell line has originated from the cervical biopsy of Henrietta Lacks then, it must show some similarity of markers with the marker chromosomes of other cervical cancer cell lines, but it does not [27-30]; rather it showed similarity and commonality of marker chromosomes with the bona fide breast cancer cell lines and directly processed pleural effusions from breast cancer patients.

Breast cancer cells are known to metastasize to cervixes but it is a rare phenomenon (Personal communications with many expert Pathologists of the world). There are very few cervical carcinoma cell lines available as compared to breast cancer because of the difficulty of growing such cells in culture. We, therefore, conclude that HeLa has its origin from the breast cancer. Henrietta Lacks died at the tender age of 31 years within 8 months of diagnosis with wide spread disease.

Our conclusion based on the following similarities between HeLa and other human breast cancer cell lines:

- i. Both have 5 to 6 common marker chromosomes
- ii. Both HeLa and MDA-MB-648 cell lines share common G6PDH mobility of A type
- iii. Another Isoenzyme MGM1 is present in both
- iv. Cervical tumor is very rare compared to breast cancer in USA
- v. More breast cancer cell lines as compared to cervical cancer lines are contaminated with HeLa
- vi. Both cell lines HeLa and MDA-MB-468 originated from African American patients
- vii. HeLa and MDA-MB-468 have identical 12 isoenzymes
- viii. Breast cancer does metastasize into human cervical area as HeLa
- ix. Both HeLa and MBA-MB-468 cell lines are derived from metastatic and very aggressive samples and established in culture rather easily
- x. According to the grand- and great granddaughters of Henrietta Lacks, more breast cancers compared to cervical, have occurred in members of her family [31]

It is, therefore recommended that investigators as an example of human breast cancer and not a representative of cervical cancer should use original HeLa cell line. It is unfortunate that despite our

warning, some investigators are still using HeLa in the name of cervical cancer.

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