

A bright future for breast and colon cancer patients

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Background

The first report of a possible diagnosis for breast cancer using the diffraction pattern of a single hair was published in Nature in 1999 [1]. Over 4500 samples have been reported since then with no false negatives and less than 1% false positives, some of which have later been proved to be positive [2,3], just diagnosed too early that is before they can be seen by mammography. This test has also verified the total removal of the cancers by surgical treatments [3]. Similar diagnostic tests have also been found for colon cancer [4] and Alzheimer's disease [5]. The two main problems with the introduction of this test have been the cost and availability of synchrotron time and the excessive exposure times required by alternative X-ray sources. Here we show new findings that may obviate both these problems.

Text

Recent studies of multiple hair samples, using the synchrotron in Shanghai, China, with a very short sample to detector distance of 100mm, have revealed higher orders of additional "diagnostic" rings associated with breast cancer and colon cancer [4]. These findings were verified using the Bio-Cat Beam-Line, at the Advanced Photon Source, Argonne National Laboratory, USA. These "new" additional rings lie beyond the very strong 5.15Å reflection, the 91st order of the 47nm infinite lattice of keratin.

These "new" rings are illustrated in Figure 1 for breast cancer and Figure 2 for colon cancer. Using these measurements and the most recent value, 5.15 Å for the 91st order [5], the outer breast cancer ring has a spacing of $4.3 \pm 0.5 \text{ \AA}$. The outer colon cancer ring is illustrated

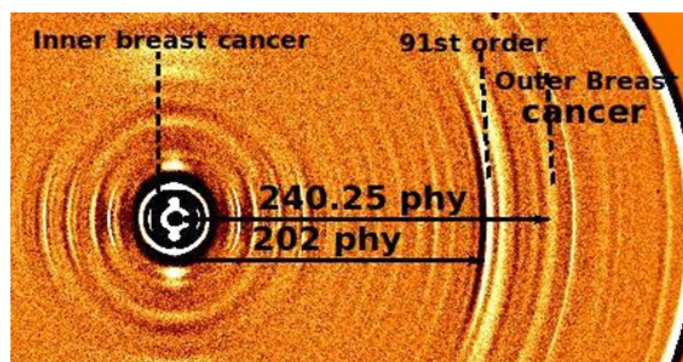


Figure 1. Both inner and outer (11th order) breast cancer rings are identified in this Figure along with the very strong 5.15Å reflection, the 91st order of the 47nm infinite lattice of keratin. These measurements were obtained physically [phy] using the freely available Smithsonian programs, IRAF and SAO, and are in pixels.

in Figure 2 along with the very intense 91st order of the 47nm lattice.

Using these values the spacing for the outer colon cancer ring is $4.14 \pm 0.05 \text{ \AA}$. Some intermediate orders are also present. Since the very strong 5.15Å reflection has been recorded from the earliest studies of hair by Astbury, Fraser, MacRae, Feughelman and numerous others, using all types of X-ray generators, these findings would indicate the possibility that these diagnostic tests could be run with simpler equipment, including rotating anodes given sufficient exposure times.

Potential problems associated with inappropriate collection and loading of samples [6,7], especially multiple hair samples, still exist, however, but detailed instructions on how to avoid these can be supplied.

Not only do these findings make it possible for these tests to be run on much simpler and cheaper X-ray sources but the diagnosis of breast or colon cancers is reduced to a simple proportional action, no lengthy or time-consuming calculations are required. With further focussed efforts, very early, accurate and non-invasive diagnoses of breast and colon cancers could become a medically-routine practical reality. Added to this would be the extra advantages offered by this diffraction diagnostic test, *viz.*

1. Verification by a follow up diffraction test after surgery that the cancer has been totally removed after medical treatments. No waiting around for 15years worrying that the cancer had not been

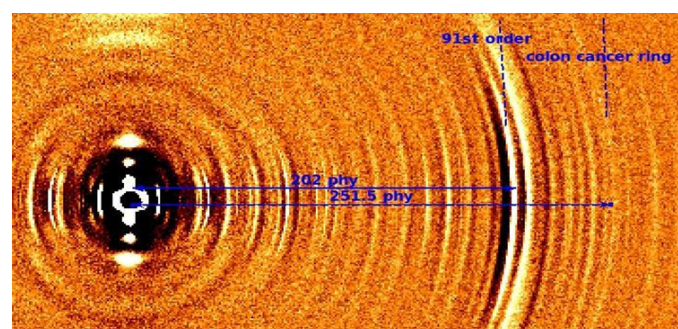


Figure 2. Outer ring for colon cancer and the 91st order of 47nm keratin lattice.

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removed and would reappear [8]. Since the cancer itself produces these changes. If the cancer goes so does the related change.

2. There would be no need in the future for double mastectomies for women with family histories as the cancer can be diagnosed early and removed early by a lumpectomy. Its total removal being verified as in 1.

This removes the problems surrounding these cancers. No need for future mammograms.

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