EDITORIAL

# FLUORESCENT IN SITU HYBRIDIZATION

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Extensive studies of the genetic aberrations related to human diseases were conducted during last two decades to explore the genetic abnormalities that underlie those diseases including many cancerous conditions. Over the time, a series of cutting-edge high-throughput genetic tests, such as microarrays and next-generation sequencing, have been developed and incorporated into routine clinical practice yet the classical low-throughput cytogenetic test, fluorescence in situ hybridization (FISH) has not faded away. On the contrary, it still plays an increasingly important role in detecting specific biomarkers in solid and hematologic neoplasms[1].

FISH enables the position of a marker on a chromosome or extended DNA molecule to be directly visualized. Here the marker is a DNA sequence that is visualized by hybridization with a fluorescent probe. These labels having a combined feature of high sensitivity with high resolution made them ideal for in situ hybridization. Fluorolabels with different colored emissions have been designed, making it possible to hybridize a number of different probes to a single chromosome and distinguish their individual hybridization signals, thus enabling the relative positions of the probe sequences to be mapped.

FISH was originally used with metaphase chromosomes for which only low resolution mapping of the highly condensed metaphase chromosome was possible.To overcome this disadvantage, in 1995, a range of higher resolution FISH techniques have been developed by changing the nature of chromosomal preparation. If metaphase chromosomes are too condensed for fine scale mapping, more extended forms of chromosome are being used to have a high resolution mapping. To improve the resolution of FISH it is therefore necessary to abandon intact chromosomes and instead use purified DNA. This approach, called fiber FISH, makes use of DNA prepared by gel stretching or molecular combing and can distinguish markers that are less than 10 kb apart[2].

For a FISH test, a sample of a person's cells containing DNA is taken. Samples can include blood, bone marrow, amniotic fluid, or tumor cells, depending on the clinical indication. Fluorescent probes are added to the sample. Fluorescent probes are sections of single-stranded DNA that are complementary to the specific portions of DNA of interest. The probe, which is labeled with a fluorescent dye, attaches to the specific piece of DNA.

This technique can be used to show the presence of extra gene copies (duplicated or amplified genes), and genetic sequences that are missing (gene deletions) or have been moved (translocated genes). Increased numbers of chromosomes, as seen in certain genetic disorders, are also diagnosed using FISH technologies (trisomy 21 or Down syndrome, for example). The targeted area(s) or sequences of DNA are determined by the probes that are used. Multiple targeted areas in the DNA can be assessed at the same time using FISH probes labeled with a number of different fluorescent dyes. FISH is used to assess breast tumor cells for the presence of an amplified gene, HER-2. FISH is also used in a particular type of chronic leukemia, chronic myeloid leukemia (CML). The specific probes used in this case detect BCR-ABL, an abnormal gene sequence formed by the translocation of a portion of chromosome 22 with a portion of chromosome 9. The areas

of yellow fluorescence signify the abnormal, fusion gene. Finding the BCR-ABL fusion confirms a diagnosis of CML.

Now FISH is used in Bangladesh to detect a number genetic and chromosomal diseases. More widespread use is necessary due to its ever increasing demand. So it is the high time for our fellow Medical Biochemists to come forward and be a forerunner in this field of Medical Biochemistry.

**References**

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