WHITEPAPER

BAC to Basics:
The Science of BAC Libraries

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Fluorescence In Situ Hybridization (FISH) is a powerful technique used to visualize specific sequences within chromosomes or genomes. It involves the use of fluorescently labeled probes that bind to complementary target sequences, allowing researchers to identify and locate specific genes or regions of interest. Bacterial artificial chromosome (BAC) libraries play a crucial role in the development of fluorescence in situ hybridization (FISH) probes.

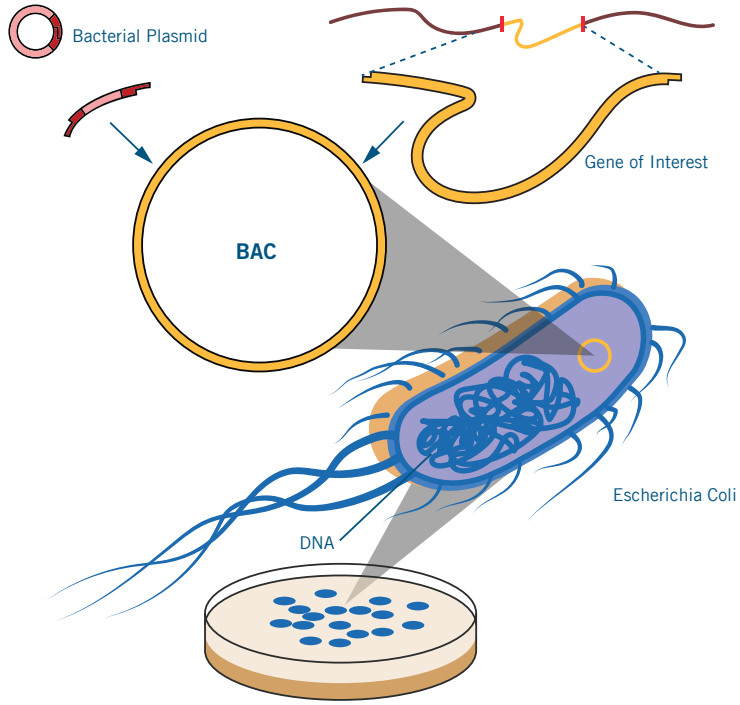
A BAC is created fragmenting genomic DNA (for example, human DNA) and inserting the isolated sequences into the DNA of living bacterial cells, such as E.coli.[2] BAC are kept in BAC libraries, which are collections of these living bacterial colonies, containing a variety of inserted DNA sequences.[2] As these bacterial cells grow and divide, they amplify the BAC clone now contained in their genome, which can then be harvested and isolated for use in molecular testing.[2]

Generating FISH probes from BAC libraries involves several steps. First, BAC clones containing the desired DNA sequence are identified from the library using molecular screening techniques.[4] These clones are then isolated and purified. Next, the target DNA fragment is amplified using polymerase chain reaction (PCR) or other amplification methods.[4] The amplified DNA is then labeled with fluorescent dyes or haptens, such as biotin or digoxigenin.[4] Finally, the labeled DNA is hybridized to chromosomes or other target DNA samples, allowing visualization and localization of the target sequences through fluorescence microscopy.[4]

BAC clones are relatively large, ranging from 100-300kb.[2] The larger insert sizes ensure that the probes span a significant portion of the target DNA sequence, contributing to increased specificity and sensitivity of the hybridization.[4] The ability to provide large, contiguous stretches of genomic DNA is particularly important when studying complex genomes or regions with high gene density.[3] When compared to other artificial chromosome techniques, BAC libraries rarely show chimerism, and the majority of BAC clones are highly stable.[1]

In conclusion, BAC libraries serve as invaluable resources for the development of FISH probes. They provide researchers with access to large, contiguous DNA fragments that can be isolated, labeled, and used to visualize specific sequences within chromosomes or genomes. The use of BAC libraries in FISH probe generation contributes to our understanding of genome organization, gene expression, and the identification of disease-associated genetic alterations.

BAC illustration



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To learn more about Biocare Medical's portfolio of BAC-derived FISH probes, please visit our website at biocare.net or contact our technical support line at 1.800.799.9499, Option 3. To learn more about Empire Genomics porfolio of BAC-derived FISH probes, please visit our website at empiregenomics.com or contact us at 1.800.715.5880.

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