Evolution of chromosomal Microarrays

Chromosomal arrays

- Microarray technologies have emerged as a powerful clinical diagnostic tool in the past 20 years.
- They are the most widely used for chromosomal microarray analyses (CMA).
- Chromosomal microarray platforms have the advantage of being able to detect chromosomal anomalies.

Workflow of aCGH and hybrid-SNP arrays

1. **Isolation**
   - Cell lines are cultured in vitro to obtain genomic DNA (gDNA).

2. **DNA Fragmentation**
   - Proteolytic enzymes are used to break the gDNA into fragments, usually ranging from 100 to 300 base pairs (bp).

3. **Adapter Ligation**
   - Fragments are ligated with adapters designed to hybridize to feature oligonucleotides, and the DNA is fragmented again.

4. **Labeling**
   - The labeled DNA is separated through a series of washing steps.

5. **Hybridization**
   - High-density hybrid-SNP arrays are able to detect chromosomal anomalies that aCGH cannot.

6. **Fluorescence Measurement**
   - Fluorescence at each spot on the array is measured.

Benefits of hybrid-SNP arrays

- High-resolution hybrid-SNP arrays contain oligonucleotide DNA probes with sequences in the DNA.
- They are able to detect changes in genome copy number with high specificity.
- The same array design may be used for different applications.

Case studies

- Demonstrate the power of hybrid-SNP arrays.
- They are useful for postnatal analyses.

Conclusion

- Hybrid-SNP arrays are useful for postnatal analyses and have been used in case studies to demonstrate the power of their ability to detect chromosomal anomalies.
- The performance of each array type depends on several features such as design strategy, content coverage, density, and resolution.
- The reference and test sample are hybridized to aCGH array for analysis.