TOPIC : TUMOUR SUPPRESSOR GENE

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1. Function of Tumor Suppressor Genes: They maintain normal cell growth and prevent cancer by regulating the cell cycle, repairing DNA, and initiating apoptosis.

2. Two-Hit Hypothesis: Both alleles of a tumor suppressor gene must be inactivated (mutated or silenced) to lose its protective function and allow cancer to develop.

3. Classes of Tumor Suppressor Genes:

    - Gatekeepers: Directly regulate cell growth (e.g., RB, TP53).

    - Caretakers: Maintain genomic stability via DNA repair (e.g., BRCA1, BRCA2).

4. RB Gene: Encodes retinoblastoma protein that controls the G1/S checkpoint. Its loss leads to uncontrolled proliferation.

5. TP53 Gene: Known as the “guardian of the genome”, detects DNA damage and induces repair or apoptosis. Mutated in over 50% of human cancers.

6. BRCA1 & BRCA2: Involved in homologous recombination repair of DNA. Mutations increase the risk of breast, ovarian, and other cancers.

7. MMR Genes (MLH1, MSH2): Involved in DNA mismatch repair; their mutations cause Lynch syndrome (hereditary nonpolyposis colorectal cancer).

8. APC Gene: Regulates the Wnt signaling pathway by degrading β-catenin. Mutations seen in familial adenomatous polyposis (FAP) and colorectal cancers.

9. PTEN Gene: Antagonizes PI3K/AKT signaling, suppressing cell growth and survival. Loss is linked to breast and endometrial cancers.

10. NF1 & NF2 Genes: Regulate the RAS pathway and cytoskeleton. Mutations cause neurofibromatosis types 1 and 2.


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