Glossary

Common terms in molecular biology – part 3 (r–z)

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Ras – A GTP-binding regulatory protein involved in growth factor stimulation (see G protein). Capable of oncogenic activation.

Receptor – Cell surface protein which binds a specific molecule (ligand) and transmits a signal.

Recombinant DNA – A DNA molecule constructed by joining fragments of DNA from different sources. By using restriction enzymes that cut DNA at specific base sequences, a DNA fragment is generated which is then joined with a vector such as a circular bacterial plasmid. This vector DNA complex is then opened again at a specific site, a DNA fragment from another source is inserted and the circle is closed. This recombinant DNA is then amplified in a host cell.

Recombination – ‘Crossing over’, a mechanism of exchange of genetic material between a pair of homologous chromosomes.

Renaturation of DNA – The ability of denatured DNA to resume its normal double-stranded conformation.

Repetitive sequence – Approximately 30% of genomic DNA consists of repeated, noncoding nucleotide sequences such as tandem repeats.

Replication – Duplication of genomic DNA during S phase.

Reporter gene – A gene whose activity can be easily assayed. It is often used as a marker of gene expression in transcription or translation systems.

Restriction enzymes – A group of endonucleases each of which cleaves double-stranded DNA at a specific ‘recognition site’ (‘restriction site’) determined by the exact DNA sequence. Names indicate the bacterium of origin, eg, the endonuclease *EcoRI* originates from *E coli*.

Restriction fragments – The products of digesting DNA with restriction endonucleases.

Restriction fragment-length polymorphism – A polymorphism in the size of restriction fragments of DNA or proteins due to a sequence difference between alleles, usually in noncoding regions. This technique is useful in population-based studies, and gene identification.

Restriction map – Schema showing the positions of cutting sites of specific restriction enzymes in DNA; often used as a way of characterising specific genomic sequences.

Retrovirus – An RNA genome virus that is reverse transcribed into DNA during infection and replication. The DNA copy then integrates into host chromosomal DNA.

Reverse genetics – Application of linkage map to clone the gene responsible for a disease when the biochemical basis of the disease is unknown.

Reverse transcriptase – An enzyme used by retroviruses. The purified enzymes are useful in synthesis of cDNA *in vitro*.

Ribozyme – RNA with catalytic enzymatic activity. These are ‘hammerhead’ in shape and can be engineered to cleave or repair homologous RNA.

RNAse protection – Detection of small quantities of RNA using nucleic acid hybridization with specific probes followed by digestion of single-stranded species.

Senescence – When cell division stops.

Signal pathway – Sequence of chemical interactions that selectively amplify and transmit messages (eg, growth stimulus) across the cell.

Sister chromatids – Copies of a chromosome produced by its replication.

Somatic mutation – Mutation arising *de novo* in a somatic cell. It is not inherited.

Southern blot – Standard technique for identifying specific DNA sequences; typically chromosomal DNA is digested with a restriction enzyme and the DNA fragments separated by gel electrophoresis. The separated fragments are denatured and transferred (blotted) onto special membrane (nitrocellulose filter). A radioactively labelled probe will hybridize to a complementary sequence on the filter which is detected by autoradiography.

Splicing – The process whereby introns are removed from freshly transcribed RNA (hnRNA) to produce messenger RNA (mRNA). Alternate splicing pathways lead to multiple mRNAs from a single coding region.

Start/stop codons – The AUG sequence in mRNA coding for the amino acid methionine marks the starting point of translation. UAA, UAG and UGA are stop codons which signal the end of the protein synthesis.

Superfamily – Structurally related genes arising by duplication and divergence of ancestral genes.

Supercoiling – Increase or decrease in the number of turns of one strand of DNA about the other in the double helix due to twisting of the DNA about its own axis. DNA packed on a nucleosome is supercoiled, and the degree of supercoiling is altered *in vivo* by topoisomerases.

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Suppressor genes – Genes that normally prevent cancer or tumourous growth; loss of both copies of the gene leads to initiation of cancer. Common suppressor genes in cancer include retinoblastoma (Rb) on chromosome 13q14, Wilm's tumour (WT) on 11p13, and p53 on chromosome 17p. The latter is involved in over 50% of different tumours and is involved in the cell cycle, apoptosis and DNA repair; it has been called the 'guardian angel' of DNA.

Tandem repeat – Multiple copies of the same DNA sequences lying in series.

Taq polymerase – The heat-stable enzyme used in the polymerase chain reaction, isolated from algae that live in hot springs.

TATA boxes – A conserved A-T rich septamer found upstream from the start site of transcription in many, but not all genes.

Telomere – Specific DNA sequences located at both ends of a chromosome.

Transcription – Synthesis of RNA on DNA template.

Transcription factors – Specific regulatory proteins that control gene expression (transcription) by recognising and binding to specific DNA promoter/enhancer sequences nearby.

Transduction – The transfer of a bacterial gene from one bacterium to another by a bacteriophage.

Transfection – Uptake of foreign DNA by a eukaryotic cell.

Transgenic mouse – A mouse generated by injecting a recombination DNA molecule at the one-cell embryo stage. The founder mouse is then able to transmit the acquired gene in a mendelian fashion.

Translocation – Exchange of chromatin between non-homologous chromosomes.

Transposons – Fragments of DNA that can change position within the genome of the organism that carries them.

Translation – Synthesis of protein on the mRNA template.

Tumour suppressor genes – A class of genes, inactivation of which contributes to oncogenesis.

Upstream – Beyond the 5' end of a gene sequence, ie, preceding the start of coding sequence, *cf* downstream.

Viral oncogenes – A viral gene that can acutely transform the host cell. They are important in cellular proliferation and serve as growth factors.

Western blot – A technique for identifying specific protein species, analogous to Southern and Northern blotting.

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