

CATALYTIC RECEPTORS

Catalytic receptors are cell-surface proteins, usually dimeric in nature, which encompass ligand binding and functional domains typically in one polypeptide chain. The ligand binding domain is placed on the extracellular surface of the plasma membrane and separated from the functional domain by a single transmembrane-spanning domain of 20–25 hydrophobic amino acids. The functional domain on the intracellular face of the plasma membrane has catalytic activity, giving the superfamily of receptors its name. Endogenous agonists of the catalytic receptor superfamily are peptides or proteins, the binding of which may induce dimerization of the receptor, which is the functional version of the receptor.

Among the catalytic receptors, particular subfamilies may be readily identified dependent on the function of the enzymatic portion of the receptor. The smallest group is the particulate guanylyl cyclases of the natriuretic peptide receptor family. The most widely recognized group include the intrinsic protein tyrosine kinase receptor family, epitomized by the neurotrophin receptor family, where a crucial initial step is the activation of a signalling cascade by autophosphorylation of the receptor on intracellular tyrosine residue(s). A third group is the extrinsic protein tyrosine kinase receptors, where the catalytic activity resides in a separate protein from the binding site. Examples of this group include the GDNF and ErbB receptor families, where one, catalytically silent, member of the heterodimer is activated upon binding the ligand, causing the second member of the heterodimer, lacking ligand binding capacity, to initiate signalling through tyrosine phosphorylation. A fourth group, exemplified by TGF- β and BMP receptors, has intrinsic serine/threonine protein kinase activity in the heterodimeric functional unit.

Additional groups of catalytic receptors have been identified. The phosphotyrosine phosphatases appear to lack cognate ligands, but may be triggered by events such as cell : cell contact. One example is the leukocyte common antigen (LAR, CD44 antigen, PTPRC, ENSG0000081237), which may have particular roles in the hematopoietic and immune system.