The basic design of CAR includes a tumor-associated antigen (TAA) binding region (usually scFv), an extracellular hinge region, a transmembrane region and an intracellular signal. The first chimeric TCR was constructed by replacing the V\(\alpha\) and V\(\beta\) extracellular domains of the TCR chains. Single chain antibody links the CD3\(\zeta\) for the first generation. Costimulatory molecule, such as CD28, has been engineered to the signal transduction region for the second generation. Another costimulatory molecule based on the second generation for the third generation has been engineered to the signal transduction region. The cytokines based on the second generation for the fourth generation has been engineered to the signal transduction region. The cytokines based on the second generation for the fourth generation has been engineered to the signal transduction region.

A dual CAR T cell expresses two separate CARs with different ligand binding targets. Dual CAR T cell activation requires co-expression of both targets on the tumour. A conditional CAR T cell is by default unresponsive until the addition of a small molecule to complete the circuit. A tandem CAR T cell expresses a single CAR consisting of two linked scFvs that have different affinities. The physiological CAR consists of an antigen receptor and a CD3\(\zeta\) intracellular signaling domain with/without a transmembrane and a spacer region. The universal CAR utilizes biotin or anti-FITC scFv as targeting region fused with the transmembrane domain. Marked CAR T cells express a CAR plus a tumour epitope to which an existing monoclonal antibody agent binds.