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| **Gene** | **Part** | **Function** | **Notes** | | | | | | | | | | | | | | | | | **“Layperson” Function** |
| anti-CD19-CD8TM | A-B | C.A.R Receptor | synthetic logic gates (with mutant Dap10s), overpowered activation receptor(with feedback loops like vav1-pip3), | | | | | | | | |  |  |  |  |  |  |  |  | Does not exist naturally; genetically engineered. Receives cancer antigens to cause NK cells to kill |
| anti-Meso-CD8TM | A-B | C.A.R Receptor | Differentiating between normal and cancerous cells | | | |  |  |  |  |  |  |  |  |  |  |  |  |  | Does not exist naturally; genetically engineered. Can tell difference between cancer and normal cells |
| 4-1BB | B-C | signalling domain |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Phone call |
| CD19 IC | B-C | Activates signaling pathways | Activates the PI3K and Src signaling pathways. Signal amplification | | | | | |  |  |  |  |  |  |  |  |  |  |  | Intermediate phone call |
| CD28 | B-C | activating receptor | recruits SH2-domain proteins, especially PI3K and Grb2 | | | | |  |  |  |  |  |  |  |  |  |  |  |  | Receives cancer cells and activates killing by causing “phone calls” within the NK cell |
| Dap10 | B-C | adaptor (activating) | positive control or part of CAR for antigen found in cancer | | | | |  |  |  |  |  |  |  |  |  |  |  |  | Like an intermediate – receives “phone call” from receptor and makes a call to start killing process |
| Dap10/M882 | B-C | adaptor (activating) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Same for p85 |
| Dap10/N87Q | B-C | adapter | the Grb2 binding site is mutated in this DAP10 adapter, making it impossible for Grb2 to bind. Useful in a logic gate setting | | | | | | | | | |  |  |  |  |  |  |  | Does not exist naturally; mutated Dap10 so it can’t make a “phone call” to Grb2 |
| Dap10/Y85F | B-C | adaptor (activating) | negative control | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Disconnected phone |
| FcRg | B-C | adaptor | ITAM-containing adaptor that induces cytotoxicity and cytokine secretion. Increasing amount of FcRg near/on receptors amplifies signals from the receptor and calls for a stronger immune response form other cells in the immune system. | | | | | | | | | | | | | | | | | Like an intermediate – receives “phone call” from receptor to call in “back up” for more immune cells |
| Granzyme B | B-C | apoptoticeffector | doublegranzyme B-M | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Granzymes are like grenades containing explosives to kill cancer cells |
| Granzyme M | B-C | inhibition inhibitor | doublegranzyme B-M | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Granzymes are like grenades containing explosives to kill cancer cells |
| GRB2 | B-C | adapter protein | contains an SH2 binding domain and 2 SH3 binding domains, used in many signaling pathways, possible positive feedback loop use | | | | | | | | | |  |  |  |  |  |  |  | “That friend who makes things not awkward with other people. Things won’t interact if he’s not there.” |
| KIR3DL1 | B-C | inhibitory receptor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Stops the killing process |
| KIR3DL2 | B-C | inhibitory receptor | part for CAR for antigen found in normal cells, increased regulation in NK cells | | | | | |  |  |  |  |  |  |  |  |  |  |  | Stops the killing process |
| LFA1(integrin beta 2) | B-C | adhesion molecule and activator | Activation of VAV1 and trigger actin rearrangement. Attach intracellular domain with the head of a receptor/CAR part. | | | | | | | | |  |  |  |  |  |  |  |  | Starts building the “highway” to send the granzymes (“grenades”) |
| Ly49 IC | B-C | Inhibits Cytotoxicity | Helps inhibit cytotoxicity. Can be used to make sure our NK cells only kill cancerous cells | | | | | | |  |  |  |  |  |  |  |  |  |  | Stops the killing process |
| OX40 | B-C | tumor necrosis factor recptor | cell communication or increases cell longevity, so possibly attach to activating receptor for increased response | | | | | | | | |  |  |  |  |  |  |  |  | The lunch lady (giving “food”) |
| P85PI3K | B-C | phosphoralater | positive feed back loops like PiP3 - P85PI3k, P85PI3K- Grb2 | | | | |  |  |  |  |  |  |  |  |  |  |  |  | Like putting batteries in a toy car |
| CD3Z IC | BC | Signals several intracellular pathways with antigen recognition | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Sends a kill signal (calls the hit man) |
| CTLA4 | BC | transmits inhibitory signals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Stops the killing process |
| ICOS IC | BC | inducible T-cell co-stimulator | stimulates production of cytokines and enhances cell-cell interaction | | | | | |  |  |  |  |  |  |  |  |  |  |  | More lunch lady (giving “food”/growth) |
| NKG2A IC | BC | IC domain contains 2 ITIM's, inhibitory | Connect to CAR for recognizing normal cell antigens, negative control | | | | | |  |  |  |  |  |  |  |  |  |  |  | Recognizes healthy proteins on healthy, normal cells so they won’t get killed |
| CD3Z IC | CD | Intracellular signalling - has three ITAM motifs | Activating signal - ITAM motifs get phosphoralyzed | | | |  |  |  |  |  |  |  |  |  |  |  |  |  | Same as BC |
| DAP10 | CD | adaptor | Relays info from receptor to IC via signaling of p85 (PI3K) and Grb2. Amplify signal by adding more motifs to DAP10 region or by adding more DAP10s on/near receptors. | | | | | | | | | | | | |  |  |  |  | Same as BC |