1

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter** | **Receptor** | **Relation** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| GFR | PI3K | Activates | Activates | Activates | Activates | Activates |
| PI3K | PIP3 | Activates | Activates | Activates | Activates | Activates |
| PIP3 | AKT | Activates | Activates | Activates | Activates | Activates |
| AKT | mTOR | activates |  |  |  |  |
| mTOR | S6K1 | Activates | Activates | Activates | Activates | Activates |
| S6K1 | rpS6 | Activates | Activates | Activates | Activates | Activates |
| AKT | TSC2 | Inhibits |  |  |  |  |
| TSC2 | mTOR | Inhibits | Inhibits | Inhibits | Inhibits | Inhibits |
| AKT | GSK3β | Inhibits | Inhibits | Inhibits | Inhibits | Inhibits |
| GSK3β | β-catenin | Inhibits |  |  |  |  |
| WNT | Frizzled | Activates | Activates | Activates | Activates | Activates |
| Frizzled | Dishevelled | Activates | Activates | Activates | Activates | Activates |
| Dishevelled | GSK3β | Inhibits | Inhibits | Inhibits | Inhibits | Inhibits |
| β-catenin | TCF/LEF | Activates | Activates | Activates | Activates | Activates |
| TCF/LEF | Cell growth and proliferation genes | Activates |  |  |  |  |
| mTOR | Cell growth and proliferation genes | Indirectly activates | activates | activates | activates | activates |
| PTEN | PIP3 | Inhibits | Inhibits | Inhibits | Inhibits | Inhibits |
| PDK1 | AKT | Activates | Activates | Activates | Activates | Activates |

2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| GFR | SOS | activates | activates | activates | activates | activates |
| SOS | RAS | activates | activates | activates | activates | activates |
| RAS | RAF | activates | activates | activates | activates | activates |
| RAF | MEK | activates | activates |  | activates | activates |
| MEK | ERK | activates | activates | activates | activates | activates |
| ERK | p90RSK | activates | activates | activates | activates | activates |
| ERK | Cyclin D CDK4/6 | activates |  | activates |  | activates |
| GFR | PI3K | activates | activates | activates |  | activates |
| PI3K | AKT | activates | activates | activates | activates | activates |
| AKT | GSK3B | activates | activates |  | activates | activates |
| GSK3B | Cyclin D CDK4/6 | inhibits |  | inhibits | inhibits | inhibits |
| TSC1 TSC2 | mTOR | inhibits | inhibits | inhibits |  |  |
| AKT | TSC1 TSC2 | inhibits | inhibits | inhibits |  | inhibits |
| mTOR | Cyclin D CDK4/6 | activates | activates | activates | activates |  |
| mTOR | RHEB | activates | activates |  | activates | activates |
| RHEB | mTORC1 | activates |  | activates |  | activates |
| mTORC1 | p70S6K | activates | activates | activates |  | activates |
| Steroid hormone receptors | Cyclin D CDK4/6 | activates | activates | activates | activates | activates |
| RB | E2F | activates | activates | activates | activates | activates |
| Cyclin D CDK4/6 | RB | inhibits | inhibits | inhibits |  | inhibits |
| E2F | S-phase progression | activates | activates | activates | activates | activates |
| p70S6K | S-phase progression | activates | activates | activates | activates | activates |

3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| TLR4 | TIRAP | activates | activates | activates | activates | activates |
| TLR4 | MyD88 | activates | activates | activates | activates | activates |
| IL-1R1 | MyD88 | activates | activates | activates | activates | activates |
| ST2 | MyD88 | activates | activates |  | activates | activates |
| MyD88 | IRAK4 | activates |  | activates | activates |  |
| IRAK4 | IRAK1 | activates | activates | activates | activates | activates |
| IRAK1 | TRAF6 | activates | activates | activates | activates |  |
| TRAF6 | TAK1 | activates | activates | activates | activates | activates |
| TAK1 | IKK complex | activates | activates | activates | activates | activates |
| IKK complex | NF-κB | activates | activates | activates | activates | activates |
| NF-κB | Pro-IL-1β | activates | activates | activates |  | activates |
| NF-κB | NLRP3 | activates |  | activates | activates |  |
| TAK1 | MAPKs | activates | activates |  | activates | activates |
| MAPKs | AP-1 | activates | activates | activates |  | activates |
| AP-1 | Pro-IL-1β | activates |  | activates | activates | activates |
| AP-1 | NLRP3 | activates | activates |  | activates | activates |
| NLRP3 | ASC | activates | activates | activates |  | activates |
| ASC | Caspase-1 | activates |  |  | activates | activates |
| Caspase-1 | IL-1β | activates | activates | activates | activates | activates |
| IL-1β | IL-1R1 | activates | activates | activates | activates | activates |
| Pannexin1 | NLRP3 | activates | activates | activates |  | activates |
| P2X7 | NLRP3 | activates | activates | activates | activates | activates |

4

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| lepRb | JAK2 | activates | activates | activates | activates | activates |
| JAK2 | STAT3 | activates | activates | activates | activates | activates |
| JAK2 | SHP2 | activates | activates | activates | activates | activates |
| SHP2 | ERK | activates | activates |  | activates | activates |
| ERK | FOXO1 | inhibits |  | inhibits | inhibits | inhibits |
| STAT3 | SOCS3 | activates | activates | activates | activates | activates |
| SOCS3 | JAK2 | inhibits | inhibits |  |  |  |
| STAT3 | POMC | activates | activates | activates | activates | activates |
| FOXO1 | POMC | inhibits |  | inhibits |  | inhibits |
| STAT3 | AgRP | inhibits | inhibits | inhibits | inhibits | inhibits |
| FOXO1 | AgRP | activates | activates | activates | activates | activates |
| PI3K | AKT | activates | activates |  | activates |  |
| AKT | FOXO1 | inhibits | inhibits | inhibits |  | inhibits |
| FOXO1 | PGC1α | activates | activates | activates | activates | activates |
| PGC1α | Autophagy | activates | activates | activates | activates | activates |
| mTORC1 | S6K1 | activates | activates | activates | activates |  |
| S6K1 | IRS | inhibits |  | inhibits | inhibits | inhibits |
| STAT3 | Nucleus | inhibits | inhibits | inhibits |  | inhibits |

5

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| TLR2 | MyD88 | activates | activates | activates | activates | activates |
| TLR4 | MyD88 | activates |  | activates | activates | activates |
| TLR5 | MyD88 | activates | activates | activates | activates | activates |
| MyD88 | IRAK | activates | activates | activates | activates | activates |
| IRAK | TRAF6 | activates | activates | activates | activates |  |
| TRAF6 | TAK1 | activates |  | activates | activates | activates |
| TAK1 | IKK | activates | activates | activates | activates | activates |
| IKK | IκB | activates | activates |  | activates | activates |
| IκB | NF-κB | inhibits | inhibits | inhibits | inhibits | inhibits |
| NF-κB | Nucleus | activates | activates | activates | activates | activates |
| TAK1 | MKK | activates | activates | activates | activates | activates |
| MKK | p38 | activates | activates | activates | activates | activates |
| MKK | JNK | activates | activates | activates | activates | activates |
| p38 | AP-1 | activates | activates | activates | activates | activates |
| JNK | AP-1 | activates | activates | activates | activates | activates |
| AP-1 | Nucleus | activates | activates | activates | activates | activates |
| NF-κB | Proinflammatory cytokines | activates | activates | activates | activates | activates |
| AP-1 | Proinflammatory cytokines | activates | activates | activates | activates | activates |

6

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| HGF | HGF-R | activates | activates | activates | activates | activates |
| NRG | HER4 | activates | activates | activates | activates | activates |
| HGF-R | JAK | activates | activates |  | activates | activates |
| HER4 | JAK | activates | activates | activates | activates | activates |
| JAK | STAT | activates | activates | activates | activates | activates |
| STAT | STAT | activates | activates | activates | activates | activates |
| STAT dimer | Nucleus | activates | activates | activates |  | activates |
| STAT dimer | DNA | binds to | binds to | binds to | binds to | binds to |
| HGF-R | SHC | activates | activates | activates | activates | activates |
| SHC | Grb2 | activates | activates | activates | activates |  |
| Grb2 | SOS | activates | activates | activates |  | activates |
| SOS | Ras | activates | activates | activates | activates | activates |
| Ras | Raf | activates | activates | activates | activates |  |
| Raf | MEK | activates | activates | activates | activates | activates |
| MEK | ERK | activates | activates | activates |  | activates |
| ERK | Nucleus | activates | activates | activates | activates | activates |
| ERK | DNA | activates | activates | activates | activates | activates |

7

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Nicotine/nAChR | α7 nAChR | activates | activates | activates | activates | activates |
| α7 nAChR | Src | activates | activates | activates | activates | activates |
| Src | JAK2 | activates | activates | activates | activates | activates |
| JAK2 | STAT3 | activates | activates | activates | activates | activates |
| STAT3 | STAT3 | activates | activates | activates | activates | activates |
| STAT3 dimer | Nucleus | activates |  |  | activates |  |
| α7 nAChR | PI3K | activates | activates | activates | activates | activates |
| PI3K | AKT | activates | activates | activates | activates | activates |
| AKT | NF-κB | activates | activates | activates | activates | activates |
| NF-κB | Nucleus | translocates to |  | activates |  | activates |
| α7 nAChR | Raf-1 | activates | activates | activates | activates | activates |
| Raf-1 | MEK1/2 | activates | activates | activates | activates | activates |
| MEK1/2 | ERK1/2 | activates | activates |  | activates | activates |
| ERK1/2 | Nucleus | activates | activates | activates | activates | activates |
| ERK1/2 | AP-1 | activates | activates | activates | activates |  |
| NF-κB | XIAP | activates | activates |  | activates | activates |
| NF-κB | BCL2 | activates | activates |  | activates | activates |
| NF-κB | Cyclin D1 | activates |  | activates | activates | activates |
| AP-1 | Cyclin D1 | activates | activates | activates | activates | activates |

8

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| RAS | RAF | activates | activates | activates | activates | activates |
| RAF | MEK | activates | activates | activates | activates | activates |
| MEK | ERK | activates | activates | activates | activates | activates |
| ERK | RSK | activates | activates | activates |  | activates |
| RSK | TSC1/TSC2 | inhibits |  | inhibits | inhibits | inhibits |
| LKB1 | AMPK | activates | activates | activates | activates | activates |
| AMPK | TSC2 | activates | activates | activates |  | activates |
| WNT | GSK3 | inhibits | inhibits |  | inhibits | inhibits |
| PI3K | PtdIns(4,5)P2 | activates | activates | activates | activates | activates |
| PI3K | PtdIns(3,4,5)P3 | activates | activates | activates | activates | activates |
| PTEN | PtdIns(3,4,5)P3 | inhibits | inhibits | inhibits | inhibits | inhibits |
| PtdIns(3,4,5)P3 | PDK1 | activates | activates | activates | activates | activates |
| PDK1 | AKT | activates | activates | activates | activates | activates |
| AKT | TSC2 | inhibits | inhibits | inhibits | inhibits | inhibits |
| AKT | GSK3 | inhibits | inhibits | inhibits | inhibits | inhibits |
| AKT | FOXO3 | inhibits | inhibits |  | inhibits | inhibits |
| TSC1/TSC2 | RHEB-GDP | activates | activates | activates | activates | activates |
| RHEB-GTP | mTORC1 | activates | activates | activates |  | activates |
| REDD1 | mTORC1 | inhibits | inhibits | inhibits | inhibits | inhibits |
| Rag GTPase | mTORC1 | activates | activates | activates | activates | activates |
| mTORC1 | 4E-BP1 | inhibits | inhibits | inhibits | inhibits | inhibits |
| mTORC1 | S6K1 | activates | activates | activates | activates | activates |
| mTORC2 | AKT | activates | activates | activates | activates | activates |
| mTORC2 | PKC | activates | activates | activates | activates | activates |
| FKBP12/Rapamycin | mTORC1 | inhibits | inhibits | inhibits | inhibits | inhibits |
| HIF-1α | Glucose metabolism | activates | activates | activates | activates | activates |

9

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| **Starter Gene** | **Receptor Gene** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Hypoxia | HIF1α | activates | activates | activates | activates | activates |
| HIF1α | CD39 | activates | activates | activates | activates | activates |
| HIF1α | CD73 | activates | activates | activates | activates | activates |
| HIF1α | ADA | inhibits |  | inhibits | inhibits | inhibits |
| CD73 | ADO | activates | activates | activates | activates | activates |
| A2AR | Gα | activates | activates |  | activates | activates |
| A2AR | Gβ | activates | activates | activates |  | activates |
| A2AR | Gγ | activates |  | activates | activates |  |
| Gα | cAMP | activates | activates | activates | activates | activates |
| cAMP | Rap1 | activates | activates | activates | activates | activates |
| Rap1 | PI3K | activates | activates | activates | activates | activates |
| PI3K | Akt | activates | activates | activates | activates | activates |
| CD38 | ADPR | activates | activates | activates | activates | activates |
| AC | cAMP | activates | activates | activates | activates | activates |
| cAMP | PKA | activates | activates | activates |  | activates |
| PKA | mTORC1 | inhibits | inhibits |  | inhibits | inhibits |
| PKA | CREB | activates | activates | activates | activates | activates |
| PKA | NF-κB | inhibits | inhibits | inhibits | inhibits | inhibits |
| CREB | CRE | activates | activates | activates | activates |  |
| mTORC1 | S6 | activates | activates | activates |  | activates |
| NF-κB | IL-1 | activates | activates | activates | activates | activates |
| NF-κB | IL-6 | activates | activates | activates |  | activates |
| NF-κB | TNF-α | activates | activates | activates | activates | activates |
| NF-κB | IFN-γ | activates | activates | activates | activates | activates |
| CRE | IL-10 | activates | activates | activates | activates | activates |
|  |  |  |  |  |  |  |

10

11

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter** | **Receptor** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Wnt Receptor | B-catenin | activates | activates | activates | activates | activates |
| BMP Receptor | Smad 1/5/8 | activates | activates | activates |  | activates |
| BMP Receptor | TAB/TAK | activates | activates | activates | activates | activates |
| FGF/PDGF Receptor | Ras | activates | activates | activates | activates | activates |
| FGF/PDGF Receptor | PI3K | activates | activates |  |  | activates |
| TAB/TAK | MKK3/6 | activates | activates | activates | activates | activates |
| Ras | Raf | activates | activates | activates | activates | activates |
| Raf | MEK1/2 | activates | activates | activates | activates | activates |
| PI3K | PDK1 | activates | activates |  | activates | activates |
| MKK3/6 | P38 | activates |  | activates | activates | activates |
| MEK1/2 | ERK1/2 | activates | activates | activates |  | activates |
| PDK1 | AKT | activates | activates | activates | activates | activates |
| B-catenin | TCF/LEF | activates | activates | activates | activates | activates |
| Smad 1/5/8 | Runx2 | activates | activates | activates | activates | activates |
| P38 | Runx2 | activates | activates | activates | activates | activates |
| ERK1/2 | Runx2 | activates | activates | activates | activates | activates |
| P38 | Dlx5 | activates | activates | activates | activates | activates |
| ERK1/2 | Dlx5 | activates | activates | activates | activates | activates |
| AKT | Dlx5 | activates | activates | activates | activates | activates |
| TCF/LEF | Gene induction | activates | activates | activates | activates | activates |
| Runx2 | Gene induction | activates | activates | activates | activates | activates |
| Dlx5 | Gene induction | activates | activates | activates | activates | activates |
| Gene induction | ALP | activates | activates | activates | activates | activates |
| Gene induction | OCN | activates |  | activates | activates | activates |
| Gene induction | Runx2 | activates | activates |  | activates | activates |
| Gene induction | COLII | activates | activates | activates | activates | activates |
| Gene induction | Osx | activates | activates | activates |  | activates |
| Gene induction | BSP | activates | activates | activates | activates | activates |
| Gene induction | SCUBE3 | activates | activates | activates | activates | activates |
| Gene induction | BAP 1 | activates | activates | activates | activates | activates |

1 2

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| --- | --- | --- | --- | --- | --- | --- |
| **Starter** | **Receptor** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| HDAC | Open chromatin | inhibits | inhibits | inhibits | inhibits | inhibits |
| HDAC Inhibitors | HDAC | inhibits | inhibits | inhibits | inhibits | inhibits |
| RNA Pol II | Transcription | activates |  | activates | activates | activates |
| SWI/SNF | Chromatin Remodeling | activates | activates | activates | activates | activates |
| Chromatin Remodeling | Transcription | activates | activates | activates |  | activates |
| DNMT | Condensed chromatin | activates | activates | activates | activates | activates |
| DNMT Inhibitors | DNMT | inhibits | inhibits | inhibits | inhibits | inhibits |
| HAT | Open chromatin | activates | activates | activates | activates | activates |
| Open chromatin | Transcription |  |  |  |  | permits |
| Condensed chromatin | Transcription | inhibits | inhibits | inhibits | inhibits | inhibits |

13

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Starter** | **Receptor** | **Relationship** | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| EGF | EGFR | activates | activates | activates | activates | activates |
| Ins/IGF | IR/IGFR | activates | activates | activates | activates | activates |
| EGFR | IRS1/2 | activates | activates | activates | activates | activates |
| IR/IGFR | IRS1/2 | activates | activates |  | activates | activates |
| IRS1/2 | PI3K | activates | activates | activates | activates | activates |
| PI3K | PDK-1 | activates | activates | activates | activates | activates |
| PDK-1 | AKT | activates | activates | activates | activates | activates |
| AKT | PTEN | inhibits |  | inhibits | inhibits | inhibits |
| PTEN | PI3K | inhibits | inhibits | inhibits | inhibits | inhibits |
| AKT | TSC2 | inhibits | inhibits |  | inhibits | inhibits |
| TSC2 | Rheb-GTP | inhibits | inhibits | inhibits | inhibits | inhibits |
| Rheb-GTP | mTORC1 | activates | activates | activates | activates | activates |
| mTORC1 | S6K | activates | activates | activates | activates | activates |
| S6K | IRS1/2 | inhibits | inhibits | inhibits | inhibits | inhibits |
| LKB1 | AMPK | activates |  |  | activates | activates |
| AMPK | TSC2 | activates | activates | activates | activates |  |
| AMPK | mTORC1 | inhibits | inhibits | inhibits | inhibits | inhibits |
| Amino acids | mTORC1 | activates | activates | activates | activates | activates |
| mTORC1 | FOXO | inhibits | inhibits | inhibits | inhibits | inhibits |
| mTORC2 | AKT | activates |  | activates | activates | activates |
| EGFR | Grb2 | activates | activates |  | activates | activates |
| Grb2 | SOS | activates | activates | activates | activates |  |
| SOS | Ras | activates | activates | activates | activates | activates |
| Ras | Raf | activates | activates | activates |  | activates |
| Raf | MEK | activates |  | activates | activates | activates |
| MEK | ERK | activates | activates | activates | activates | activates |
| ERK | RSK | activates | activates |  |  |  |
| RSK | TSC2 | inhibits | inhibits | inhibits | inhibits | inhibits |
| ERK | mTORC1 | activates |  | activates | activates | activates |
| PDGFR | mTORC1 | activates | activates | activates | activates |  |
| PI3K | Rac | activates | activates | activates | activates | activates |
| Rac | PAK1 | activates | activates | activates |  | activates |
| EGFR | PKCα | activates | activates | activates | activates | activates |
| PKCα | mTORC2 | activates | activates |  | activates | activates |
| mTORC2 | SGK1 | activates | activates | activates | activates | activates |
| HER3 | mTORC2 | activates | activates | activates | activates | activates |
| IGFR | mTORC2 | activates | activates | activates | activates | activates |
| InsR | mTORC2 | activates | activates | activates | activates | activates |

14

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| RTK | IRS | activates | activates | activates | activates | activates |
| IRS | PI3K | activates | activates | activates | activates | activates |
| PI3K | PIP2 | activates | activates | activates | activates | activates |
| PIP2 | PIP3 | activates | activates |  | activates | activates |
| PIP3 | PTEN | activates | activates | activates |  | activates |
| PTEN | AKT | activates | activates | activates | activates | activates |
| PDK1 | AKT | activates | activates | activates |  | activates |
| AKT | GSK3B | inhibits | inhibits |  | inhibits |  |
| AKT | Forkhead | inhibits | activates | inhibits |  | inhibits |
| AKT | BAD | inhibits | activates | inhibits | inhibits | inhibits |
| AKT | mTOR | inhibits | inhibits | inhibits | inhibits | inhibits |
| AKT | TSC1 | activates | activates | activates |  | activates |
| AKT | TSC2 | activates | activates |  | activates |  |
| Raf | MEK | inhibits | inhibits | inhibits |  | inhibits |
| MEK | Erk | activates | activates | activates | activates | activates |
| Erk | CyclinD1 | activates | activates | activates | activates |  |
| mTOR | Rictor | inhibits | inhibits |  | inhibits | inhibits |
| mTOR | Raptor | activates | activates | activates | activates | activates |

15

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| PTEN | PI3K | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| PI3K | PIP3 | Activation | Activation | Activation | Activation | Activation |
| PIP3 | AKT | Activation | Activation |  | Activation | Activation |
| AKT | mTOR | Activation | Activation | Activation | Activation |  |
| SOCs | JAK2 | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| JAK2 | STATs | Activation | Activation | Activation | Activation | Activation |
| RAS | RAF | Activation |  |  |  | Activation |
| RAF | MEK | Activation | Activation | Activation | Activation | Activation |
| MEK | ERK | Activation | Activation | Activation | Activation | Activation |
| AXIN | APC | Activation | Activation | Activation |  | Activation |
| APC | GSK3Î² | Activation | Activation | Activation | Activation |  |
| GSK3Î² | Î²-Catenin | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |

16

17

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| GF | RTK | Activation | Activation | Activation | Activation | Activation |
| RTK | RAS | Activation | Activation | Activation | Activation | Activation |
| RAS | RAF | Activation | Activation |  | Activation | Activation |
| RAF | MEK1/2 | Activation | Activation | Activation | Activation |  |
| MEK1/2 | ERK1/2 | Activation | Activation | Activation | Activation | Activation |
| ERK1/2 | Gene Transcription | Activation |  | Activation | Activation | Activation |
| SRC | RTK | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| RAF inhibitors | RAF | Inhibition |  | Inhibition |  |  |
| MEK inhibitors | MEK1/2 | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| ERK inhibitors | ERK1/2 | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| Cytoplasmic DUSP | ERK1/2 | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |
| Nuclear DUSP | ERK1/2 | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |

18

19

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| BCR | Btk | activation | activation | activation | activation | activation |
| Btk | SHIP-1 | activation |  | activation | activation |  |
| Btk | N-WASP | activation | activation | activation |  | activation |
| Btk | WASP | activation | activation | activation | activation | activation |

20

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4 | Claude-3 | GEMINI | pathway |
| CD28 | MEK | activation | activation | activation | activation | activation |
| CD2 | PI3K | activation |  | activation | activation | activation |
| PI3K | PP1/PP2A | activation | activation | activation | activation |  |
| PIP2 | DAG | activation | activation |  | activation | activation |
| PIP2 | IP3 | activation | activation | activation | activation | activation |
| PLC | PIP2 | activation | activation | activation |  | activation |
| DAG | PLC | activation | activation | activation | activation | activation |
| PIP2 | Cofilin | activation | activation | activation | activation | activation |
| PP1/PP2A | Cofilin | activation | activation | activation |  | activation |
| ROS | Cofilin | activation | activation | activation | activation | activation |
| Cofilin | Filament | activation |  |  | activation | activation |
| Cofilin | Actin | activation | activation | activation | activation | activation |
| Actin | RNA pol II transcription | activation | activation | activation | activation | activation |

21

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| LPS | TLR4 | activation | activation | activation | activation | activation |
| HS | TLR4 | activation | activation | activation | activation | activation |
| Heparanase | TLR4 | activation | activation | activation | activation | activation |
| Detergents | TLR4 | activation | activation | activation |  | activation |
| LTA | TLR2 | activation | activation | activation | activation | activation |
| TLR4 | MyD88 | activation | activation |  | activation | activation |
| TLR4 | TRAM | activation | activation |  | activation | activation |
| MyD88 | MAL | activation | activation | activation | activation | activation |
| TRAM | TRIF | activation | activation | activation |  | activation |
| TLR2 | MyD88 | activation |  | activation | activation | activation |
| MyD88 | MAL | activation | activation | activation | activation | activation |
| MyD88 | TRAF6 | activation | activation | activation | activation | activation |
| TRAF6 | IKK | activation | activation | activation |  | activation |
| TRAF6 | TBK1 | activation | activation | activation | activation | activation |
| IKK | IRF3/7 | activation | activation | activation | activation | activation |
| TBK1 | IRF3/7 | activation | activation | activation | activation | activation |
| TRAF6 | RIP1 | activation | activation | activation | activation | activation |
| IRAK4 | TRAF6 | activation | activation | activation | activation | activation |
| RIP1 | IÎºB | activation | activation | activation | activation | activation |
| RIP1 | NFÎºB | activation | activation | activation | activation | activation |
| IÎºB | NFÎºB | activation | activation | activation | activation |  |
| NFÎºB | Cytokines (IL-1, IL-6, TNF-Î±) | activation | activation | activation | activation | activation |
| IRF3/7 | IFN-inducable genes | activation | activation | activation | activation |  |
| IFN | IFN-inducable genes | activation | activation | activation | activation | activation |

22

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| PMA | PKC | activation | activation | activation | activation | activation |
| PKC | RIPK4 | activation | activation | activation | activation | activation |
| RIPK4 | IKKs | activation | activation | activation | activation | activation |
| RIPK4 | DVL2 | activation | activation | activation | activation | activation |
| RIPK4 | IRF6 | activation |  | activation | activation | activation |
| RIPK4 | JNK | activation | activation | activation | activation | activation |
| RIPK4 | PIP5K1 | activation | activation | activation | activation |  |
| PIP5K1 | PEBP1 | activation | activation |  | activation | activation |
| PEBP1 | Raf1 | inhibition | inhibition | inhibition | inhibition |  |
| Raf1 | Erk | activation | activation | activation | activation | activation |
| JNK | GRHL3 | activation | activation | activation |  | activation |
| JNK | Erk | activation | activation | activation | activation | activation |
| IRF6 | GRHL3 | activation | activation | activation |  | activation |
| IRF6 | TCF/LEF | activation |  | activation | activation |  |
| IKKs | IÎºBÎ± | activation | activation | activation | activation | activation |
| IÎºBÎ± | NF-ÎºB | inhibition | inhibition | inhibition | inhibition | inhibition |
| NF-ÎºB | Î²-catenin | activation |  | activation |  | activation |
| DVL2 | Î²-catenin | activation | activation | activation | activation | activation |
| Î²-catenin | TCF/LEF | activation | activation | activation | activation | activation |
| GRHL3 | Epidermal homeostasis and differentiation | activation | activation | activation | activation | activation |

23

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| HAV | 3CD | activation | activation | activation | activation | activation |
| 3CD | TRIF | inhibition | inhibition | inhibition | inhibition | inhibition |
| HAV | 3ABC | activation | activation | activation | activation | activation |
| 3ABC | RIG-I | inhibition |  | inhibition |  | inhibition |
| 3ABC | MDA5 | inhibition | inhibition | inhibition | inhibition | inhibition |
| 3ABC | TRAF6 | inhibition | inhibition |  | inhibition |  |
| HAV | 3C^pro | activation | activation | activation |  | activation |
| 3C^pro | NEMO | inhibition | inhibition |  | inhibition | inhibition |
| HAV | 2B | activation | activation | activation | activation | activation |
| 2B | MAVS | inhibition | inhibition | inhibition | inhibition | inhibition |
| HAV | MAVS | activation | activation | activation |  | activation |
| MAVS | IRF3 | activation |  | activation | activation |  |
| TRAF6 | IRF3 | activation | activation | activation | activation | activation |
| TRAF6 | NF-ÎºB | activation |  | activation |  | activation |
| IRF3 | IFN-Î² | activation | activation | activation | activation |  |
| NF-ÎºB | IFN-Î² | activation | activation | activation | activation | activation |

24

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4 | Claude-3 | GEMINI | pathway |
| HAV | 3CD | activation | activation | activation | activation | activation |
| 3CD | TRIF | inhibition | inhibition | inhibition | inhibition |  |
| HAV | 3ABC | activation | activation | activation | activation | activation |
| 3ABC | RIG-I | inhibition | inhibition | inhibition |  | inhibition |
| 3ABC | MDA5 | inhibition | inhibition |  | inhibition | inhibition |
| 3ABC | TRAF6 | inhibition | i | inhibition | inhibition | inhibition |
| HAV | 3C^pro | activation | activation | activation | activation | activation |
| 3C^pro | NEMO | inhibition | inhibition | inhibition | inhibition | inhibition |
| HAV | 2B | activation | activation | activation | activation | activation |
| 2B | MAVS | inhibition |  | inhibition | inhibition |  |
| HAV | MAVS | activation | activation | activation |  | activation |
| MAVS | IRF3 | activation | activation |  | activation | activation |
| TRAF6 | IRF3 | activation | activation | activation | activation | activation |
| TRAF6 | NF-ÎºB | activation |  | activation | activation |  |
| IRF3 | IFN-Î² | activation | activation |  |  | activation |
| NF-ÎºB | IFN-Î² | activation | activation | activation | activation | activation |

2 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Ca^2+ | PERK | activation | activation | activation | activation | activation |
| PERK | eIF2Î± | activation | activation | activation | activation | activation |
| eIF2Î± | cellular translation | inhibition | inhibition | inhibition | inhibition | inhibition |
| Ca^2+ | IRE1 | activation | activation | activation | activation |  |
| IRE1 | p50ATF-6 | activation |  | activation | activation | activation |
| p50ATF-6 | Rheb | activation | activation | activation |  | activation |
| Rheb | mTOR | activation | activation |  | activation | activation |
| mTOR | ERAD genes | activation | activation | activation | activation |  |
| ROS | Leakage of Ca^2+ | activation | activation | activation | activation | activation |
| Leakage of Ca^2+ | TRAF2 | activation | activation | activation | activation | activation |
| TRAF2 | NF-ÎºB | activation | activation | activation | activation | activation |
| TRAF2 | AP1 | activation | activation |  | activation | activation |
| AP1 | JNK | activation | activation | activation | activation | activation |
| NF-ÎºB | Inflammatory genes | activation | activation | activation | activation | activation |
| JNK | Apoptotic genes | activation | activation | activation | activation | activation |

2 6

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| RA | GÎ±q | activation | activation | activation | activation | activation |
| GÎ±q | GTPases | activation | activation | activation | activation | activation |
| GTPases | p38MAPK | activation | activation | activation | activation | activation |
| p38MAPK | MSK1 | activation | activation | activation | activation | activation |
| RA | RARÎ± | activation | activation | activation | activation | activation |
| RARÎ± | PI3K | activation |  | activation | activation | activation |
| PI3K | ERK1/2 | activation | activation |  | activation | activation |
| ERK1/2 | MSK1 | activation | activation | activation | activation | activation |
| ERK1/2 | ? | activation |  | activation | activation |  |
| RA | RARÎ³ | activation | activation | activation | activation | activation |
| RARÎ³ | Src | activation | activation |  | activation | activation |
| Src | ERK1/2 | activation | activation | activation |  | activation |
| RA | GÎ±s | activation |  | activation | activation |  |
| GÎ±s | Adenylyl cyclase | activation | activation | activation | activation | activation |
| Adenylyl cyclase | ATP | activation | activation | activation |  | activation |
| ATP | cAMP | activation | activation | activation | activation | activation |
| cAMP | PKA | activation |  | activation | activation |  |
| MSK1 | HAT/SMCC complex | activation | activation | activation |  | activation |
| PKA | HAT/SMCC complex | activation | activation |  | activation | activation |
| HAT/SMCC complex | Pol II | activation | activation | activation | activation | activation |
| Pol II | gene transcription | activation | activation | activation | activation | activation |
| RARÎ± | HDAC/N-CoR | activation | activation | activation | activation | activation |
| HDAC/N-CoR | HAT/SMCC complex | inhibition | inhibition | inhibition | inhibition | inhibition |

27

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| HER4-HER3 Dimer | JAK | activation | activation | activation | activation | activation |
| HER4-NRG-JAK Dimer | JAK | activation | activation | activation | activation | activation |
| JAK | STAT | activation | activation |  | activation | activation |
| STAT | SOCS | activation |  | activation |  | activation |
| HER4-NRG-JAK Dimer | SHP |  | activation | activation | activation | activation |
| HER4-s80 | SHP | activation | activation | activation | activation | activation |
| SHP | STAT |  | inhibition | inhibition |  | inhibition |
| HER4-NRG | STAT | activation | activation | activation | activation | activation |
| STAT Dimer | PPN | activation | activation | activation | activation | activation |
| STAT Dimer | DNA transcription | activation | activation | activation | activation | activation |
| SHP | STAT Dimer | inhibition | inhibition | inhibition |  | inhibition |
| SOCS | STAT Dimer | inhibition | inhibition | inhibition | inhibition | inhibition |
| STAT | mRNA | activation | activation | activation | activation | activation |
| mRNA | STAT Dimer | activation | activation | activation | activation | activation |

28

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4 | GPT-4o | Claude-3.5 | Gemini-1.5 |
| HAV | 3CD | activation | activation | activation | activation | activation |
| 3CD | TRIF | inhibition | inhibition | inhibition | inhibition | inhibition |
| HAV | 3ABC | activation | activation |  | activation | activation |
| 3ABC | RIG-I | inhibition | inhibition | inhibition | inhibition |  |
| 3ABC | MDA5 | inhibition |  | inhibition | inhibition | inhibition |
| 3ABC | TRAF6 | inhibition | inhibition | inhibition | inhibition |  |
| HAV | 3C^pro | activation | activation | activation |  | activation |
| 3C^pro | NEMO | inhibition | inhibition |  | inhibition | inhibition |
| HAV | 2B | activation | activation | activation | activation | activation |
| 2B | MAVS | inhibition | inhibition | inhibition |  | inhibition |
| HAV | MAVS | activation |  |  | activation | activation |
| MAVS | IRF3 | activation | activation | activation | activation |  |
| TRAF6 | IRF3 | activation | activation |  | activation | activation |
| TRAF6 | NF-ÎºB | activation | activation | activation |  | activation |
| IRF3 | IFN-Î² | activation | activation |  | activation |  |
| NF-ÎºB | IFN-Î² | activation | activation | activation | activation | activation |

29

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| TNF-Î± | TNFR | activation | activation | activation | activation | activation |
| TNFR | NEMO | activation | activation | activation | activation | activation |
| NEMO | IKKÎ± | activation | activation |  | activation | activation |
| NEMO | IKKÎ² | activation | activation | activation |  | activation |
| IKKÎ± | IÎºBÎ± | activation |  | activation | activation | activation |
| IKKÎ² | p65 | activation | activation |  | activation |  |
| IKKÎ² | p50 | activation | activation | activation | activation | activation |
| IÎºBÎ± | NF-ÎºB | inhibition | inhibition | inhibition |  | inhibition |
| NF-ÎºB | MMP-13 | activation |  | activation | activation | activation |
| TNFR | JNK | activation | activation | activation |  | activation |
| JNK | c-jun | activation | activation |  | activation |  |
| JNK | c-fos | activation | activation | activation | activation | activation |
| c-jun | AP-1 | activation | activation | activation |  | activation |
| c-fos | AP-1 | activation | activation | activation | activation | activation |
| AP-1 | MMP-13 | activation |  | activation | activation | activation |
| DXM | MMP-13 | inhibition | inhibition | inhibition | inhibition | inhibition |

30

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Death receptors | Tradd | activation | activation | activation | activation | activation |
| Tradd | Fadd | activation | activation | activation | activation | activation |
| Fadd | Casp 8 | activation | activation | activation | activation | activation |
| Casp 8 | Bcl-2 | inhibition | inhibition | inhibition | inhibition | inhibition |
| Casp 8 | Bax | activation |  | activation | activation | activation |
| Casp 8 | Bak | activation | activation | activation |  | activation |
| Casp 8 | Bad | activation | activation | activation | activation | activation |
| Bax | Mitochondrion | activation | activation | activation | activation | activation |
| Bak | Mitochondrion | activation | activation |  | activation | activation |
| Bad | Mitochondrion | activation |  | activation |  | activation |
| Mitochondrion | Cyt C | activation | activation | activation | activation | activation |
| Mitochondrion | AIF | activation | activation | activation | activation |  |
| Mitochondrion | EndoG | activation | activation | activation | activation | activation |
| Cyt C | APAF1 | activation | activation |  | activation | activation |
| APAF1 | Casp 9 | activation |  | activation | activation | activation |
| Casp 9 | Casp 3 | activation | activation | activation |  | activation |
| Casp 3 | fragmentation of cytoskeleton and membranes | activation | activation | activation | activation | activation |
| Casp 3 | fragmentation of DNA | activation | activation |  | activation | activation |
| AIF | fragmentation of DNA | activation | activation | activation | activation | activation |
| EndoG | fragmentation of DNA | activation | activation | activation | activation |  |
| Neurotrophin receptors | Rac | activation | activation | activation | activation | activation |
| Rac | MEKK | activation | activation | activation | activation | activation |
| MEKK | MEK | activation |  | activation |  | activation |
| MEK | SAPK/JNK/p38 | activation | activation | activation | activation | activation |
| IRS | PI3-K | activation | activation | activation | activation | activation |
| PI3-K | AKT | activation | activation | activation |  | activation |
| AKT | Bax/Bak/Bad | inhibition | inhibition | inhibition | inhibition | inhibition |
| AKT | many targets (e.g., mTOR) | activation | activation | activation | activation | activation |
| p53 | gene expression | activation | activation | activation | activation | activation |

31

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| RTK | Î²Cat^WT | activation | activation | activation | activation | activation |
| Cadherin | Î²Cat^mut | activation | activation | activation |  | activation |
| Î²Cat^WT | Destruction Complex | activation | activation |  | activation |  |
| Destruction Complex | Proteasome degradation | activation | activation | activation | activation | activation |
| PTP | Î²Cat^WT | inhibition |  | inhibition | inhibition | inhibition |
| Destruction Complex | Î²Cat^mut | inhibition | inhibition | inhibition |  | inhibition |
| Î²Cat^mut | TCF | activation | activation | activation | activation |  |
| TCF | AXIN2 | activation | activation | activation | activation | activation |

32

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| LPS | MD-2 | activation | activation | activation | activation | activation |
| MD-2 | TLR4 | activation | activation | activation | activation | activation |
| TLR4 | IRAK-4 | activation | activation |  | activation | activation |
| IRAK-4 | IRAK-1 | activation | activation | activation | activation | activation |
| IRAK-1 | IRAK-2 | activation | activation | activation | activation | activation |
| IRAK-1 | TOLLIP | activation | activation | activation | activation | activation |
| IRAK-2 | FAADD | activation |  | activation | activation | activation |
| FAADD | Caspase-8 | activation | activation | activation | activation | activation |
| Caspase-8 | Apoptosis | activation | activation | activation | activation | activation |
| IRAK-1 | Ubc13 | activation | activation |  | activation |  |
| Ubc13 | TRAF6 | activation | activation | activation |  | activation |
| TRAF6 | ECSIT | activation |  | activation | activation | activation |
| ECSIT | IKKÎ³ | activation | activation | activation | activation | activation |
| IKKÎ³ | IKKÎ² | activation | activation | activation | activation | activation |
| IKKÎ³ | IKKÎ± | activation | activation | activation |  | activation |
| IKKÎ± | P65/RELA | activation | activation | activation | activation |  |
| IKKÎ² | P65/RELA | activation | activation | activation | activation | activation |
| P65/RELA | NF-ÎºB | activation | activation | activation |  | activation |
| NF-ÎºB | transcription factors | activation | activation | activation | activation | activation |
| TRAF6 | TAB1 | activation | activation | activation | activation |  |
| TAB1 | TAK1 | activation | activation | activation | activation | activation |
| TAK1 | MKK4/7 | activation | activation |  | activation | activation |
| MKK4/7 | JNK | activation | activation | activation | activation | activation |
| JNK | IL-6 | activation | activation | activation | activation | activation |
| JNK | TNF-Î± | activation | activation | activation | activation | activation |
| JNK | IL-8 | activation | activation | activation | activation | activation |
| JNK | IL-1Î² | activation | activation | activation | activation | activation |
| JNK | IL-23 | activation | activation | activation | activation | activation |

33

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| HBx | PPM1A | activation | activation | activation | activation | activation |
| HCV NS3 | PPM1A | activation | activation | activation | activation | activation |
| TRIM25 | PPM1A | activation | activation | activation | activation | activation |
| TÎ²RI | Smad complex | activation | activation | activation | activation | activation |
| TÎ²RII | Smad complex | activation | activation | activation | activation | activation |
| PPM1A | Smad complex | inhibition | inhibition | inhibition |  | inhibition |
| TIF1Î³ | Smad complex | inhibition | inhibition | inhibition |  | inhibition |
| NEK6 | Smad complex | inhibition | inhibition | inhibition | inhibition | inhibition |
| FHL1 | linker region phosphorylation of R-Smads | activation | activation | activation | activation | activation |
| NCX1 | linker region phosphorylation of R-Smads | activation | activation |  | activation | activation |
| TRPC6 | linker region phosphorylation of R-Smads | activation |  | activation |  | activation |
| ELF | linker region phosphorylation of R-Smads | activation | activation | activation | activation | activation |
| GRK2 | JNK | activation |  | activation | activation |  |
| IL-37 | JNK | inhibition | inhibition | inhibition | inhibition | inhibition |
| TNF-Î± | JNK | activation |  | activation |  | activation |
| IL-1Î² | JNK | activation | activation | activation | activation | activation |
| JNK | TF | inhibition | inhibition | inhibition | inhibition |  |
| Smad complex | PPAR-Î³ | activation | activation | activation | activation | activation |
| Smad complex | CXXC5 | inhibition | inhibition | inhibition | inhibition | inhibition |
| Smad complex | KLF17 | inhibition | inhibition | inhibition | inhibition | inhibition |
| Smad complex | FoxO3 | inhibition | inhibition | inhibition |  | inhibition |
| SRF | PPAR-Î³ | inhibition | inhibition | inhibition | inhibition | inhibition |
| HCV core | PPAR-Î³ | inhibition | inhibition | inhibition | inhibition |  |
| EVI | PPAR-Î³ | inhibition | inhibition | inhibition | inhibition | inhibition |
| cPLA2Î± | PPAR-Î³ | inhibition | inhibition | inhibition | inhibition | inhibition |
| TF | Co-activator | activation | activation | activation | activation | activation |
| Co-activator | gene expression | activation | activation | activation | activation | activation |

34

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| MK2206 | AKT | inhibition | inhibition | inhibition | inhibition | inhibition |
| Sorafenib Resistance | AKT | inhibition |  | inhibition | inhibition | inhibition |
| AKT | PTEN | inhibition | inhibition | inhibition | inhibition | inhibition |
| PTEN | PIP3 | inhibition | inhibition | inhibition |  | inhibition |
| PTEN | PIP2 | activation | activation |  | activation | activation |
| PTEN | DHHC16 | inhibition | inhibition | inhibition | inhibition | inhibition |
| PIP2 | PIP3 | activation |  | activation | activation |  |
| DHHC16 | Palmitoylation | activation | activation | activation | activation | activation |
| Palmitoylation | PCSK9 | activation | activation | activation | activation | activation |
| CPPtat | Palmitoylation of Endogenous PCSK9 | inhibition | inhibition | inhibition | inhibition | inhibition |
| Palmitoylation | PCSK9 | inhibition | inhibition | inhibition | inhibition | inhibition |
| PCSK9 | Tumor Cell Hydrolysis | inhibition | inhibition | inhibition | inhibition | inhibition |
| PCSK9 | Lysosome Hydrolysis | inhibition | inhibition |  | inhibition | inhibition |
| CPPtat-PCSK9 | Transcription | activation | activation | activation | activation | activation |
| Transcription | Cell Nucleus | activation | activation | activation | activation | activation |

35

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Cdh1 | Skp2 | activation | activation | activation | activation | activation |
| Importin | Skp2 | activation | activation |  | activation | activation |
| p300 | Skp2 | activation | activation | activation | activation |  |
| Skp2 | Cdh1 | inhibition | inhibition | inhibition |  | inhibition |
| SIRT3 | Skp2 | inhibition |  | inhibition | inhibition | inhibition |
| SIRT3 | Deacetylation | activation | activation |  | activation | activation |
| Deacetylation | Substrates | inhibition | inhibition | inhibition |  | inhibition |
| Skp2 | E-cadherin | inhibition |  | inhibition | inhibition |  |
| E-cadherin | Cell Migration | inhibition | inhibition | inhibition | inhibition | inhibition |

36

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| EGF | Src | activation | activation | activation | activation | activation |
| Src | FAK | activation | activation | activation | activation | activation |
| FAK | RhoA | activation |  | activation | activation | activation |
| RhoA | Stress fibers | activation | activation |  | activation | activation |
| Stress fibers | Cell migration | activation | activation | activation |  | activation |
| DIRAS3 | Src | inhibition | inhibition | inhibition | inhibition |  |
| IL-6 | STAT3 | activation | activation | activation | activation | activation |
| STAT3 | Transcription of cell adhesion molecules | activation | activation | activation | activation | activation |
| Transcription of cell adhesion molecules | Target genes | activation | activation | activation | activation | activation |
| DIRAS3 | STAT3 | inhibition | inhibition | inhibition | inhibition | inhibition |

37

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| LPS | iNOS | activation | activation | activation | activation | activation |
| Cytokine production | iNOS | activation | activation |  | activation | activation |
| GSTP1 | iNOS | inhibition | inhibition | inhibition | inhibition | inhibition |
| iNOS | NO | activation |  | activation |  | activation |
| NO | MRP1 | activation | activation | activation | activation | activation |
| MRP1 | Transport | activation | activation | activation | activation | activation |
| GSH | DNIC | activation |  | activation |  | activation |
| GSTP1 | Storage | activation | activation | activation | activation | activation |
| Labile iron pool | Fe^2+ | activation | activation | activation | activation | activation |

38

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Insulin | INSR | activation | activation | activation | activation | activation |
| INSR | IRS1 | activation | activation | activation | activation | activation |
| IRS1 | PI3K |  | activation | activation | activation | activation |
| PI3K | AKT2 | activation | activation |  | activation |  |
| AKT2 | AS160/TBC1D4 | activation | activation | activation | activation | activation |
| AKT2 | GSK3Î±/Î² |  | inhibition | inhibition | inhibition | inhibition |
| GSK3Î±/Î² | Glycogen synthase | inhibition | inhibition | inhibition |  | inhibition |
| AKT2 | Rac1 | activation | activation |  | activation | activation |
| Rac1 | GSV fusion/GLUT4 insertion | activation | activation | activation | activation |  |
| Rab | GSV fusion/GLUT4 insertion | activation | activation | activation | activation | activation |
| Glycogen phosphorylase | Glycogen synthesis | inhibition | inhibition |  | inhibition | inhibition |
| Glycogen synthase | Glycogen synthesis | activation | activation | activation | activation | activation |
| PP1 | Phosphorylase kinase | inhibition | inhibition | inhibition | inhibition | inhibition |
| Phosphorylase kinase | Glycogen synthase | inhibition | inhibition | inhibition | inhibition | inhibition |

39

40

41

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| TNFÎ± | Death Receptor | activation | activation | activation | activation | activation |
| FASL | Death Receptor | activation | activation | activation | activation | activation |
| TRAIL | Death Receptor | activation | activation | activation | activation | activation |
| Death Receptor | FADD | activation | activation | activation | activation | activation |
| FADD | Caspase-8 | activation | activation | activation | activation | activation |
| Caspase-8 | Caspase-3 | activation | activation |  | activation | activation |
| Caspase-8 | Caspase-7 | activation |  | activation |  |  |
| Caspase-3 | Apoptosis | activation | activation | activation | activation | activation |
| Caspase-7 | Apoptosis | activation | activation |  |  | activation |
| Bid | tBid | activation |  | activation | activation |  |
| tBid | BAX/BAK | activation | activation |  | activation | activation |
| BAX/BAK | MOMP | activation | activation | activation | activation | activation |
| MOMP | cyt c | activation | activation | activation | activation |  |
| MOMP | smac | activation | activation | activation | activation | activation |
| cyt c | APAF1 | activation | activation | activation | activation | activation |
| APAF1 | Apoptosome | activation | activation |  | activation | activation |
| Apoptosome | Caspase-9 | activation | activation | activation | activation | activation |
| Caspase-9 | Apoptosis | activation |  | activation | activation | activation |
| smac | XIAP | inhibition | inhibition | inhibition | inhibition | inhibition |

42

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Virus | Endosome | activation | activation | activation | activation | activation |
| Viral DNA | Endoplasmic reticulum | activation | activation | activation | activation | activation |
| ssRNA | Endosome | activation | activation | activation | activation | activation |
| dsRNA | MDA5 | activation | activation | activation | activation | activation |
| dsRNA | LGP2 | activation | activation |  | activation | activation |
| TRIF | IRF3 | activation |  | activation | activation |  |
| TRIF | TBK1 | activation | activation | activation | activation | activation |
| TBK1 | IRF7 | activation | activation | activation | activation | activation |
| MAVS | TBK1 | activation | activation | activation | activation | activation |
| MAVS | IRF3 | activation |  | activation | activation |  |
| MAVS | IRF7 | activation | activation | activation | activation | activation |
| TBK1 | ISRE | activation |  | activation | activation | activation |
| IRF3 | ISRE | activation | activation |  | activation | activation |
| IRF7 | ISRE | activation |  | activation | activation | activation |
| MyD88 | IRF1 | activation | activation | activation | activation | activation |
| MyD88 | IRF3 | activation |  | activation | activation | activation |
| MyD88 | IRF7 | activation | activation | activation | activation | activation |
| FOXO3 | IRF1 | activation | activation | activation | activation | activation |
| FOXO3 | IRF3 | activation | activation | activation | activation | activation |
| FOXO3 | IRF7 | activation | activation | activation | activation | activation |
| STAT6 | TBK1 | inhibition | inhibition | inhibition | inhibition | inhibition |

43

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| C1 complex | C4d | activation | activation | activation | activation | activation |
| HLA | Src | activation | activation | activation | activation | activation |
| HLA | FAK | activation |  | activation | activation | activation |
| Src | MEK | activation | activation | activation | activation | activation |
| FAK | PI3K | activation |  | activation | activation | activation |
| PI3K | Akt | activation | activation | activation | activation | activation |
| Akt | mTORC1 | activation | activation | activation | activation | activation |
| Akt | mTORC2 | activation | activation | activation |  | activation |
| MEK | ERK | activation | activation | activation | activation | activation |
| mTORC1 | PRAS40 | activation | activation | activation |  |  |
| mTORC1 | S6K | activation | activation |  |  |  |
| mTORC1 | S6RP | activation | activation |  | activation | activation |
| ERK | Cell proliferation, protein translation | activation | activation | activation | activation | activation |
| PI3K | Cell migration, Cell survival | activation | activation | activation | activation | activation |
| mTORC2 | Cell migration, Cell survival | activation | activation | activation | activation | activation |
| ERK | Tissue factor MCP1, RANTES | activation | activation | activation | activation | activation |
| PI3K | by LY294001 | inhibition | inhibition | inhibition | inhibition | inhibition |
| mTORC2 | by MK-2206 | inhibition | inhibition | inhibition | inhibition | inhibition |
| mTORC1 | by Rapamycin | inhibition | inhibition | inhibition | inhibition | inhibition |

4 4

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| FGF | FGFR | activation | activation | activation | activation | activation |
| FGFR | FGFRL1 | activation | activation | activation | activation | activation |
| FGFR | FRS2 | activation | activation | activation | activation | activation |
| FGFR | PLC-Î³ | activation | activation | activation | activation | activation |
| FGFR | STAT | activation |  | activation | activation |  |
| FGFR | PIP2 | activation |  | activation | activation | activation |
| PIP2 | IP3 | activation | activation |  | activation | activation |
| IP3 | DAG | activation | activation | activation | activation | activation |
| DAG | PKC | activation | activation |  | activation | activation |
| FRS2 | GRB2 | activation | activation | activation | activation | activation |
| GRB2 | SOS | activation | activation | activation |  | activation |
| GRB2 | GAB1 | activation | activation | activation |  | activation |
| GAB1 | PI3K | activation | activation | activation | activation | activation |
| PI3K | AKT | activation | activation | activation | activation |  |
| SOS | RAS | activation | activation | activation | activation |  |
| RAS | RAF | activation | activation | activation | activation | activation |
| RAF | MEK | activation | activation | activation | activation | activation |
| MEK | ERK | activation | activation | activation | activation | activation |
| ERK | MKP3 | activation | activation | activation | activation | activation |
| ERK | Nucleus | activation | activation | activation | activation | activation |
| Nucleus | Transcription of target genes | activation | activation | activation | activation | activation |
| Transcription of target genes | Proliferation and survival | activation | activation | activation |  | activation |
| Transcription of target genes | Resistance to anticancer agents | activation |  | activation | activation | activation |
| Transcription of target genes | Neoangiogenesis | activation | activation | activation | activation | activation |

4 5

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Globular adiponectin | AdipoR1 | activation | activation | activation | activation | activation |
| AdipoR1 | DAPK1 | activation | activation | activation | activation | activation |
| AdipoR1 | PP1/PP2A | activation |  | activation | activation | activation |
| AMPKÎ±1 | FoxO3A | activation |  | activation | activation | activation |
| FoxO3A | TTP | activation | activation |  | activation | activation |
| TTP | Bcl-2 gene | inhibition | inhibition | inhibition | inhibition | inhibition |
| Bcl-2 gene | Bcl-2 mRNA | inhibition | inhibition | inhibition |  | inhibition |
| Bcl-2 transcript instability | Bcl-2 gene | inhibition | inhibition | inhibition | inhibition |  |
| Bcl-2 decrease | Bcl-2 mRNA | inhibition | inhibition | inhibition | inhibition | inhibition |
| Bcl-2 decrease | Autophagosome | indirect activation | indirect activation | indirect activation | indirect activation | indirect activation |
| Beclin-1 | Autophagosome | activation | activation | activation | activation | activation |
| LPS | TLR4 | activation | activation | activation | activation |  |
| TLR4 | TRAF6 | activation | activation | activation |  | activation |
| TRAF6 | NF-ÎºB | activation | activation | activation | activation | activation |
| NF-ÎºB | IL-1Î² | activation | activation | activation | activation | activation |
| NF-ÎºB | TNF-Î± | activation | activation | activation | activation | activation |

4 6

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Salvicine | ROS | activation | activation | activation | activation | activation |
| ROS | SRC | activation | activation | activation | activation | activation |
| ROS | ASK1 | activation |  |  | activation | activation |
| ROS | MKPs | activation | activation | activation | activation | activation |
| ROS | FGFR3 | activation |  | activation |  | activation |
| ROS | Ras | activation | activation | activation | activation | activation |
| SRC | JNK | activation | activation |  | activation |  |
| ASK1 | JNK | activation | activation | activation | activation | activation |
| MKPs | JNK | inhibition | inhibition | inhibition | inhibition | inhibition |
| FGFR3 | P38/MAPK | activation | activation | activation | activation | activation |
| Ras | P38/MAPK | activation | activation | activation | activation | activation |
| P38/MAPK | NRF2 | indirect activation | indirect activation | indirect activation |  |  |
| JNK | NRF2 | activation | activation | activation | activation | activation |
| ROS | KEAP1 | activation | activation | activation | activation | activation |
| KEAP1 | NRF2 | inhibition | inhibition |  | inhibition | inhibition |
| NRF2 | Detoxification of exogenous carcinogens | activation | activation | activation |  | activation |
| NRF2 | Inflammation and Cell apoptosis | activation | activation | activation | activation | activation |
| Detoxification of exogenous carcinogens | Anticancer Potential | indirect activation | indirect activation |  | indirect activation | indirect activation |

4 7

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Growth factor | TKR | activation | activation | activation | activation | activation |
| TKR | PI3K | activation | activation | activation | activation |  |
| PI3K | AKT | activation | activation | activation | activation | activation |
| AKT | mTOR | activation |  | activation |  | activation |
| mTOR | S6K | activation | activation |  | activation | activation |
| S6K | HIF-1Î±/HIF-1Î² | activation |  | activation | activation | activation |
| HIF-1Î±/HIF-1Î² | HRE | activation | activation | activation |  | activation |
| HRE | miR-26a | activation | activation | activation | activation |  |
| mTOR | Autophagy induction | inhibition | inhibition |  | inhibition | inhibition |
| miR-26a | mRNA ULK1 | inhibition | inhibition | inhibition | inhibition | inhibition |
| Autophagy induction | Apoptosis induction | inhibition | inhibition | inhibition | inhibition | inhibition |

4 8

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| IL-6 | HSP27 | activation | activation | activation | activation | activation |
| HSP27 | STAT3 | activation | activation | activation | activation | activation |
| Hedgehog | PTCH1 | activation |  | activation | activation | activation |
| Wnt | Frizzled | activation | activation |  | activation | activation |
| Frizzled | Î²-catenin | activation | activation | activation | activation | activation |
| RTK | Ras | activation |  | activation | activation | activation |
| Ras | MEK | activation | activation |  | activation | activation |
| MEK | ERK | activation | activation | activation | activation | activation |
| RTK | PI3K | activation | activation | activation | activation | activation |
| PI3K | Akt | activation | activation | activation | activation | activation |
| Akt | Pten | inhibition | inhibition |  | inhibition | inhibition |
| E-cadherin | N-cadherin | inhibition | inhibition | inhibition | inhibition | inhibition |
| N-cadherin | Vimentin | inhibition | inhibition |  | inhibition | inhibition |
| Vimentin | Transcription | indirect inhibition | indirect inhibition | indirect inhibition | indirect inhibition |  |
| AR | Zeb1 | activation | activation | activation | activation | activation |
| AR | Slug | activation | activation | activation |  | activation |
| AR | Twist | activation | activation | activation | activation | activation |
| Transcription | Sox2 | activation | activation | activation | activation | activation |
| Transcription | Nanog | activation | activation | activation | activation |  |
| Transcription | Bmi-1 | activation | activation | activation | activation | activation |
| Transcription | NKX3.1 | inhibition | inhibition | inhibition | inhibition |  |

4 9

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| VEGFR | Src | inhibition | inhibition | inhibition | inhibition | inhibition |
| Src | PLCÎ³ | activation | activation | activation | activation |  |
| PLCÎ³ | Ras | activation | activation | activation |  | activation |
| Ras | Raf1 | activation | activation |  | activation | activation |
| Raf1 | MEK 1/2 | activation | activation | activation | activation | activation |
| MEK 1/2 | ERK 1/2 | activation | activation | activation | activation | activation |
| VEGFR | Shc | inhibition | inhibition | inhibition | inhibition | inhibition |
| Shc | Ras | activation | activation |  |  | activation |
| FGFR | PI3K | inhibition | inhibition | inhibition | inhibition | inhibition |
| PI3K | AKT | activation | activation | activation | activation | activation |
| AKT | mTOR | activation | activation | activation | activation | activation |
| mTOR | IKK | inhibition | inhibition | inhibition | inhibition | inhibition |
| mTORC1 | NF-ÎºB | indirect activation | indirect activation | indirect activation | indirect activation | indirect activation |
| AMPK | FOXO | activation | activation | activation | activation | activation |
| mTOR | AMPK | inhibition | inhibition | inhibition | inhibition | inhibition |
| Frizzled receptor | Î²-catenin | activation | activation | activation | activation | activation |
| Wnt | GSK3Î² | inhibition | inhibition | inhibition | inhibition | inhibition |
| GSK3Î² | Î²-catenin | inhibition | inhibition | inhibition | inhibition | inhibition |
| DVL | AXIN | inhibition | inhibition | inhibition | inhibition | inhibition |
| NF-ÎºB | Transcription | activation | activation | activation | activation | activation |

50

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| --- | --- | --- | --- | --- | --- | --- |
| Starter | Receptor | Relationship | GPT-4o | Claude-3.5 | Gemini-1.5 | Llama-3.2 |
| Myd88 | TIRAP | Activation | Activation | Activation | Activation | Activation |
| IKKs | IKK | Activation | Activation | Activation | Activation |  |
| MAPKs | p50 | Activation |  |  | Activation | Activation |
| IKKs | p65 | Activation | Activation | Activation | Activation | Activation |
| MAPKs | Punicalagin | Inhibition | Inhibition | Inhibition | Inhibition |  |
| PLA2 | Arachidonic acid | Activation | Activation |  | Activation | Activation |
| COX2 | PGE2 | Activation | Activation | Activation | Activation | Activation |
| p50 | tlr4 | Activation |  | Activation | Activation |  |
| p65 | inos | Activation | Activation | Activation | Activation | Activation |
| Punicalagin | Proteasome degradation | Inhibition | Inhibition | Inhibition | Inhibition | Inhibition |