Compiled Biological Knowledge

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Contents

1 Hallmarks of cancer

1.1 Six original hallmarks of cancer

1. Sustain Proliferative Signaling
2. Evading Growth Suppressors
3. Resisting Cell Death
4. Enabling Replicative Immorality

5. Inducing Angiogenesis
6. Activating Invasion and Metastasis

1.2 Additional "enabling" and "emerging" hallmarks

1. Enabling: Genome instability and mutation
2. Enabling: Tumor-promoting inflammation
3. Emerging: Reprogramming energy metabolism
4. Emerging: Evading immune destruction

2 Intracellular circuitry of relevance in cancer

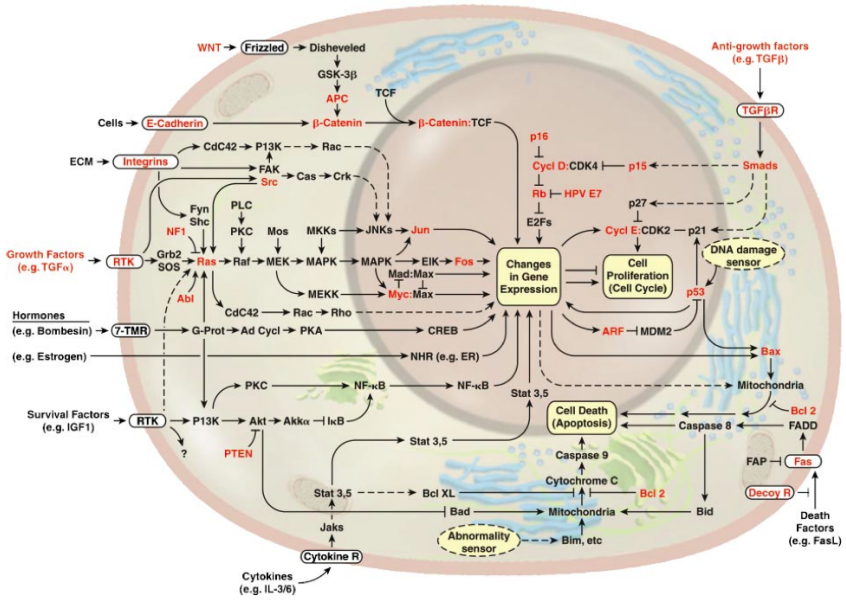

Figure 1: Diagram of biological knowledge dataset.o

Circuit 'outputs' or results:

- Gene Expression
- Cell Proliferation (Cell cycle)

- Cell Death (Apoptosis)

Circuit non-molecular inputs:

- DNA Damage Sensor
- Abnormality Sensor
- Other cells

Note that in the following subsections, an underline indicates an alias for a family of molecules, while **bold** indicates a non-molecular input or output.

2.1 Wnt signaling pathway

Relations:

- WNT + Frizzled -> WNT:Frizzled
- WNT:Frizzled -> Dishevelled
- Dishevelled -> GSK-3Beta
- GSK-3Beta -> APC
- APC -> Beta-Cetenin
- Other-cell + E-Cadherin -> Beta-Catenin
- Beta-Catenin + TCF -> Beta-Catenin:TCF
- Beta-Catenin:TCF -> **Changes-in-Gene-Expression**

2.2 TGF-Beta Pathway

Relations:

- TGF-Beta + TGF-Beta-R -> TGF-Beta:TGF-Beta-R
- TGF-Beta:TGF-Beta-R -> SMADs
- SMADs -> p15
- Cyclin-D + CDK4 -> Cyclin-D:CDK4
- p16 -| Cyclin-D:CDK4

- p15 -| Cyclin-D:CDK4
- Cyclin-D:CDK4 -| Rb
- HPV-E7 -| Rb
- Rb -| E2Fs
- E2Fs -| **Changes-in-gene-expression**
- SMADs -> p27
- Cyclin-E + CDK2 -> Cyclin-E:CDK2
- p27 -| Cyclin-E:CDK2
- Cyclin-E:CDK2 -> **Cell-Proliferation**
- **Changes-in-gene-expression** -> Cyclin-E:CDK2
- SMADs -> p21
- Cyclin-E + CDK2 -> Cyclin-E:CDK2
- p21 -| Cyclin-E:CDK2

2.3 DNA Damage sensing pathway

Relations:

- p53 -> p21
- p53 -> Bax
- p53 -> **Changes-in-gene-expression**
- **Changes-in-gene-expression** -> ARF
- ARF -| MDM2
- MDM2 -| p53
- Bax -> Mitochondria
- Mitochondria + (not Bcl2) -> **Apoptosis**

2.4 Death factor pathway

Relations:

- FasL + Fas + (not FAP) + (not Decoy-Fas) -> FADD
- FADD -> Caspase8
- Caspase8 -> Bid
- Caspase8 -> **Apoptosis**
- Bid -> Mitochondria
- **Abnormality-sensor** -> Bim
- Bim -> Mitochondria
- Mitochondria + (not Bcl2) + (not BclXL) -> CytochromeC
- CytochromeC -> Caspase9
- Caspase9 -> **Apoptosis**

2.5 Cytokine Pathway

Relations:

- Cytokines + Cytokine-R -> Jaks
- Jaks -> Stat3
- Jaks -> Stat5
- Stat3 -> BclXL
- Stat5 -> BclXL
- Stat3 -> **Changes-in-gene-expression**
- Stat5 -> **Changes-in-gene-expression**

2.6 Survival Factor Pathway

Relations:

- Survival-factors + RTK -> P13K
- Survival-factors + RTK -> Ras
- P13K -> Akt
- PTEN -| Akt
- Akt -> Akk-alpha
- Akk-alpha -| IkB
- IkB -> NF-KB
- P13K -> PKC
- PKC -> NF-KB
- NF-KB -> **Changes-in-gene-expression**

2.7 Hormone Pathway

Relations:

- Estrogen -> ER
- ER -> **Changes-in-gene-expression**
- Bombesin + 7-TMR -> G-Protein
- G-Protein -> Ad-Cyclin
- Ad-Cyclin -> PKA
- PKA -> CREB
- CREB -> **Changes-in-gene-expression**

2.8 Growth factor pathway

Relations:

- TGF-alpha + RTK -> Grb2
- TGF-alpha + RTK -> Src
- TGF-alpha + RTK -> SOS
- Grb2 -> Ras
- SOS -> Ras
- NF1 -| Ras
- Abl -| Ras
- Fyn -> Ras
- Shc -> Ras
- Src -> Ras
- Ras -> Raf
- Ras -> CdC42
- PLC -> PKC
- PKC -> Raf
- CdC42 -> Rac
- Rac -> Rho
- Rho -> **Changes-in-gene-expression**
- Raf -> MEK
- Mos -> MEK
- MEK -> MEKK
- MEK -> MAPK
- MAPK -> EIK

- EIK -> Fos
- Fos -> **Changes-in-gene-expression**
- MAPK -> Myc:Max
- MEKK -> Myc:Max
- Myc + Max -> Myx:Max
- Mad + Max -> Mad:Max
- Myc:Max -| Mad:Max
- Mad:Max -| Myc:Max
- MKKs -> MAPK
- MKKs -> JNKs
- JNKs -> Jun
- Jun -> **Changes-in-gene-expression**
- MAPK -> Jun

2.9 ECM Pathway

- ECM + Integrins -> FAK
- ECM + Integrins -> CdC42
- ECM + Integrins -> Fyn
- CdC42 -> P13K
- P13K -> Rac
- Rac -> JKKs
- FAK -> P13K
- FAK -> Cas
- Cas -> Crk
- Crk -> JKKs

3 References

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