Supplementary Table S2. Publications from which the pathway activation gene sets were obtained.

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| **Pathway Name** | **Description** | **# of genes** | **PubMed ID.** |
| Androgen receptor (AR) | Three sets of up-regulated genes by AR in human patient tissues and prostate cancer cells | 1367 | 23260764 |
| 253 | 9289629 |
| 100 | 12185249 |
| AR-Variant (AR-V) | Two sets of up-regulated genes by presence or high expression of AR-variant in bone metastasis tissues or prostate cancer cells. | 114 | 21552559 |
| 24 | 22710436 |
| Deletion of phosphatase and tensin homolog (PTEN) | Genes up-regulated by loss of PTEN. | 113 | 17452630 |
| TMPRSS2–ERG fusion (ERG) | Gene expression signature up-regulated by TMPRSS-ERG fusion. | 140 | 18283340, 18505969, 17079440 |
| Forkhead box A1 (FOXA1) | Two gene sets up-regulated by FOXA1 with chromatin binding of FOXA1 in their regulatory regions of DNA. | 447 | 23539448 |
| 175 | 24292680 |
| Mutation of speckle-type POZ protein (SPOP) | Genes significantly up-regulated in all LNCaP-abl cell with three different SPOP mutations and down-regulated in cells with wildtype SPOP compared to cells with control vector treatment (FDR<0.05). | 35 | 25274033 |
| Enhancer of zeste 2 (EZH2) | EZH2-stimulated genes bound by EZH2 solo peaks | 84 | 23239736 |
| Inactivation by polycomb repression complex 2 (PRC) | Two sets of genes repressed by polycomb repression complex from human embryonic stem cell study and prostate cancer patients. | 654 | 16630818 |
| 87 | 18006806 |
| Rat sarcoma viral oncogene homolog (RAS) | Genes up-regulated by oncogenic RAS activation. | 179 | 16273092 |
| Stemness (ES) | Genes highly expressed in human embryonic stem cells according to 5 or more out of 20 profiling studies | 380 | 17204602 |
| Aggressive PC with neuroendocrine differentiation (AV) | Genes up-regulated in metastatic neuroendocrine (NE) prostate cancer compared to primary prostate cancer without NE phenotype. | 464 | 22389870 |
| Pro-neural (PN) | Genes reflecting neuronal differentiation (Pro-neural) activity. | 242 | 16530701 |
| Epithelial-mesenchymal transition (MES) | Genes represent activation of mesenchymal transition. | 141 | 16530701 |
| Poliferation (PRF) | Genes represent active proliferation. | 183 | 16530701 |