

# The MAPK/ERK pathway among Colon Cancer Cells, Colon Cancer Stem Cells, Embryonic Stem Cells and Normal Cells.

## Der MAP-Kinase-Weg unter den Kolonkrebszellen, Kolonkrebs-stammzellen, embryonalen Stammzellen und normalen Zellen.

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**Introduction:** The Map Kinase/ERK pathway is involved in cell development and differentiation. It consists of proteins like mitogen-activated protein kinases and extracellular signal-regulated kinases. This pathway can activate many transcription factors, like myc, c-Jun and c-Fos. Abnormal regulation is implicated with many human carcinomas. The present study aims to demonstrate the different gene expression levels of all genes involved in MAPK/ERK pathway, in normal, embryonic stem cells (ESCs), colon cancer and colon cancer stem cells (CSCs).

**Results:** The cell-surface receptors (EGFR, PDGFR $\alpha$ , PDGFR $\beta$ ) were expressed only in HCT-116. An over-expression was observed in almost all genes in the ESCs population, while under-expression was observed in both colon cancer cell lines. Between HCT-116 and Colon CSCs, the "upstream" proteins were expressed higher in HCT-116 and as we go further down the gene expression is increased in Colon CSCs (Figure 2).

**Conclusion:** The MAPK/ERK pathway is down-regulated in cancer cells, but is up-regulated in undifferentiated normal stem cells. The regulation may be performed by intrinsic factors, and not by the cell-surface receptors. It is therefore clear that there is a cross-talking among different pathways. Targeting genes, that located more downstream in signaling pathways, would contribute more in cancer treatment research.

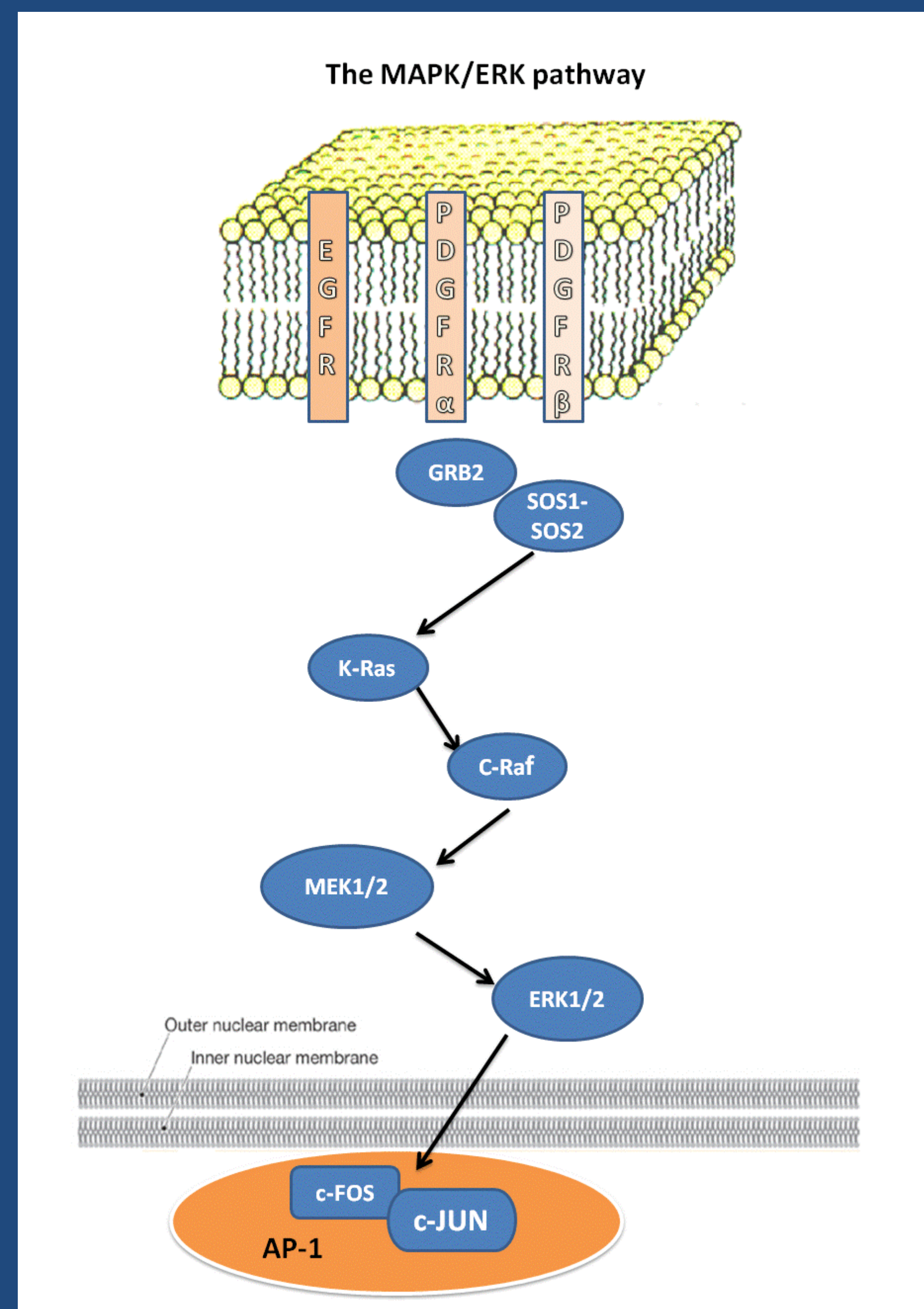


Figure 1: The MAPK/ERK pathway

**Materials & Methods:** The experiments were performed by using RNA isolated from the established human cancer cell lines HCT-116 and Colon CSCs. RNA was also extracted from healthy (non-cancer) donor. Including ESCs' RNA, RT-qPCR reactions with specific primers were followed, for all genes that are presented in figure 1. The data was analyzed according to Livak method, normalized to normal (non-cancer) sample. The 18SrRNA was used as housekeeping gene.

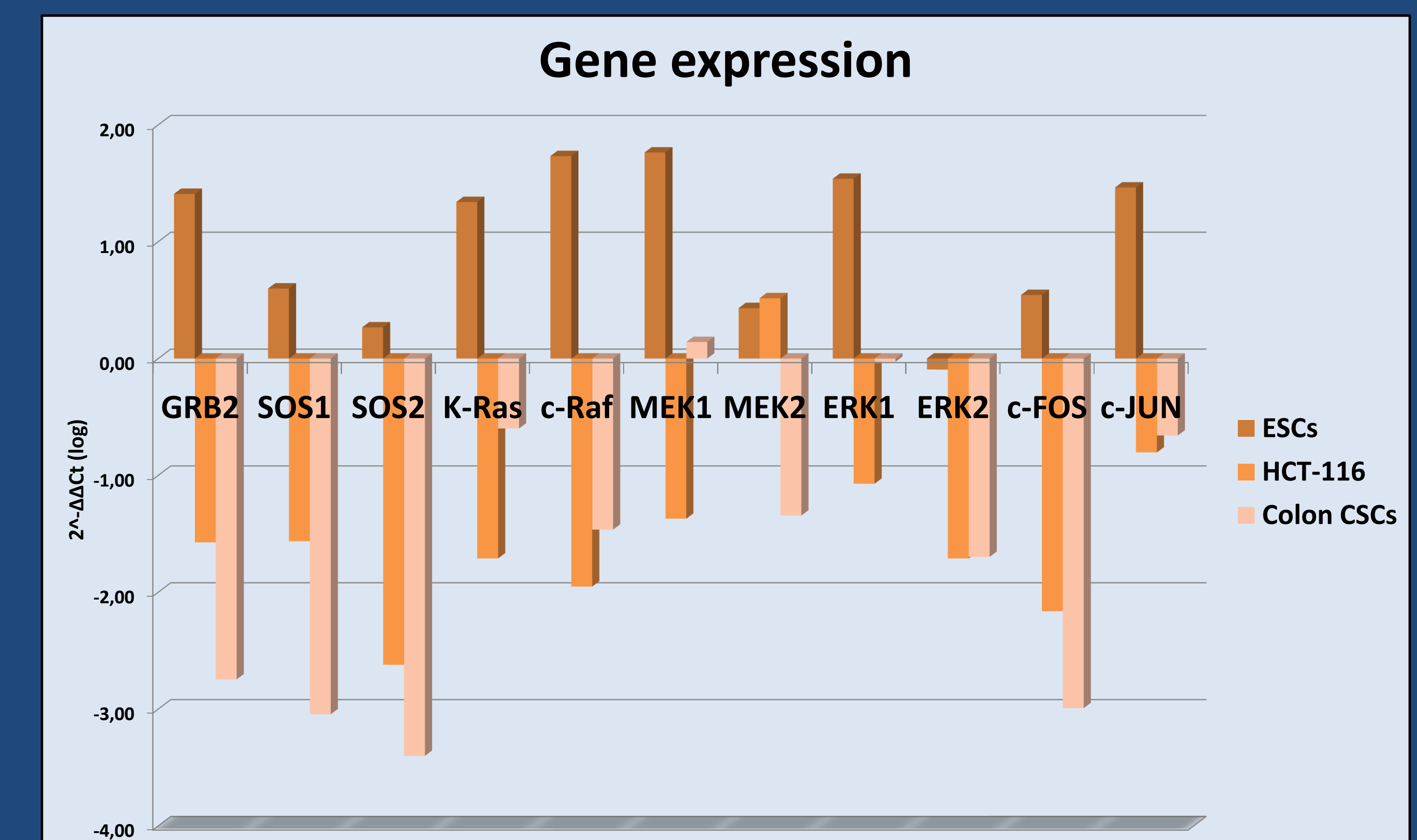


Figure 2: Relative gene expression among ESCs, HCT-116 and Colon CSCs

### Selected References:

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### Disclosure of Potential Conflicts of Interest

None of the authors of the above study has declared any conflict of interest

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