# Transcription Factors Thyroid Hormone Receptor β (TRβ), Runt-Related Transcription Factors 1 and 2 (Runx1, Runx2) are Differentially Expressed in Thyroid Tumorigenesis

**Background:** In contract to most cancers, the global incidence of thyroid cancer has increased over the past three decades; the incidence for women is three-fold higher than for men. Although the mortality rate has not changed, the health care burden has significantly increased and diagnostic biomolecular markers are needed. TRs and Runx factors have recently been postulated to function as tumor repressors and promoters, respectively, with altered expression noted in breast, uterine, and ovarian cancers. Establishing the expression of key initiating events in thyroid tumorigenesis should provide a platform for the development of novel diagnostic and therapeutic interventions. The intent of this work is to determine the expression of these transcription factors, key developmental regulator in human thyroid tumorigenesis

**Methods:** Levels of protein expression for the transcription factors were determined by using cell lines and tissue microarrays (TMAs) by immunofluorescence (IF), immunohistochemistry (IHC), and western blot. Human thyroid cell lines include normal cells through each type of cancer, papillary (PTC), follicular (FTC), and anaplastic (ATC) thyroid cancers, the TMAs represented each type and stage of cancer.

**Results:** There is an inverse correlation between TRβ and Runx factor expression. TRβ expression is high in normal cells or early stage of cancer but decreased significantly with cancer progression. In contrast, Runx2 expression is low in normal cells or benign

tissue and increased significantly with stage of cancer. Runx1 expression is high in FTC suggesting a correlation with thyroid cancer type rather than stage of disease.

**Conclusions:** In conclusion, this experiment demonstrated the existence of correlation between TRβ and Runx2, supplementing the hypothesis that Runx2 is a tumor promoter and TRβ is a tumor suppressor, while Runx1 may be a tumor promoter, but respective to type, not stage.