Introduction

Deregulation of programmed cell death contributes to leukemogenesis as well as blast cell survival. Cells resistant to apoptosis are prone to accumulate genetic aberrations, acquire the capacity to survive independently from growth factor stimulation and escape from immune system control **(Thompson, 1995).**

Apoptosis can be induced by two distinct pathways: the intrinsic mitochondrial pathway and a death-receptor-mediated extrinsic pathway. Besides the primary response to chemotherapeutic agents, which is mainly facilitated by the mitochondrial pathway, immunological control mechanisms involving death-receptor-mediated apoptosis are critical for disease control and also influence treatment outcome **(Schimmer et al., 2003).**

Altieri (2003) mentioned that, both apoptotic pathways commonly result in activation of the effectors caspases 3 and 7. A group of apoptosis inhibitor molecules called inhibitor of apoptosis proteins (IAP) interact with these downstream caspases blocking their activation. One member of the IAP family is survivin.

Physiologically survivin is transiently expressed during embryonic development but barely detectable in normal, differentiated adult tissue. Still even at this comparatively low level, in normal hematopoietic cells survivin has been shown to be involved in cell cycle control. In contrast to expression in normal tissue, survivin has been found to be over expressed in a number of different tumor tissues indicating that it has a role in carcinogenesis **(Velculescu et al., 1999).**

Tanaka et al., (2000) reported a high level of survivin expression in tumor cells correlates with poor outcome. Similarly, in malignant hematological diseases, over expression of survivin correlates with

reduced remission rates and survival in adult patients with acute myeloid and adult T-cell leukemia as well as diffuse large B-cell lymphoma **(Adida et al., 2000).**

In children, data on the prognostic role of Survivin over expression are only available for acute myeloid leukemia. In this disease over expression is strongly correlated with poor overall survival, while in adult acute lymphoblastic leukemia, variable Survivin over expression has been documented in a small scale study, there is no information available on the prognostic relevance of increased Survivin levels in B cell precursor acute lymphoblastic leukemia (BCP-ALL), the most common pediatric malignancy **(Mori, et al., 2002).**

Despite the very good overall prognosis of children with ALL, whose long-term survival is now 70-80%, treatment of relapsed disease remains a challenge. Early identification of patients with poor prognosis allows for the prospective evaluation of new consolidating treatment elements at an early stage of the disease. Survivin over expression has been implicated as a poor prognostic marker in a variety of cancers including hematological malignancies of the B-lineage **(Harms et al., 2000).**