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β-HCG as a Tumor Biomarker with Special Reference to Breast Cancer

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Introduction

Human chorionic gonadotropin (HCG) is a placental protein hormone initially secreted by cells (syncitiotrophoblasts) from the implanting conceptus. It supports the ovarian corpus luteum, endometrial lining and consequently maintains pregnancy [1]. The hormone can be detected in blood and urine, as it is the basis of many pregnancy tests. HCG plays many other roles including stimulating the onset of fetal gonadal steroidogenesis, promotion production of corpus luteal progesterone, immuno-suppression and blockage of phagocytosis of invading trophoblast cells, cytotrophoblast differentiation, growth and differentiation of fetal organs [2]. It is well known that a biomarker is any molecular and chemical changes that can be measured and used to study normal or abnormal process in the body. A tumor marker, like a biomarker, is a naturally occurring substance in the body. A tumor marker can be made by cancer cells or by the body in response to cancer. Tumor markers can provide information that can be used to screen and diagnose cancer as well as identify the stage of cancer to monitor a treatment [3].

It was reported that although mammography, ultrasonography, computed tomography, magnetic resonance imaging scans, and tumor marker assays help in the staging and treatment of cancers, they are usually not definitive diagnostic tests. The diagnosis is mostly confirmed by biopsy [4]. Human chorionic gonadotropin is a glycoprotein composed of 237 amino acids, with α subunit (92 amino acids) and β subunit contains 145 amino acids. It can be used as a tumor marker, as its β subunit is secreted by cell tumor [5]. Breast cancer is the most often diagnosed tumor of women and one of the leading causes of death. The effect of human chorionic gonadotropin on development of cancer is controversial. In fact, for breast cancer there is evidence that this hormone has a protective effect against tumor genesis due the differentiation of the mammary tissue after a full term pregnancy through the down regulation of estrogen receptors. The mechanisms that explain the pro- and anti-carcinogenic effects are not fully understood yet [6].

HCG increases uterine arterial blood flow and stimulates angiogenesis in the ovary by stimulating the proliferation of vascular endothelial cells and the expression of vascular endothelial growth factor [7]. It was concluded that high expression of β-HCG is seen more frequently in infiltrative ductal carcinoma with higher grade. There was a high β -HCG expression in high grade tumors of more than 5-cm diameter [8]. The beta subunit of human's chronic gonadotropin is markedly over expressed by neoplastic cells of differing histological origin including those present in colon, breast, prostate and bladder tumors [9].

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