Does Progesterone Influence Hela Cell Proliferation?

1Rahim Ahmadi, 2Zohreh Haghri*, 3Mojgan Shabani
1Department of Physiology, Faculty of Basic Sciences, Islamic Azad University, Hamedan Branch, Hamedan, Iran
2*(Corresponding author) Department of Biotechnology, Faculty of Advanced Sciences & Technology, Pharmaceutical Sciences Branch, Islamic Azad University, Tehran-Iran (IAUPS).
3Department of Physiology, Faculty of Basic Sciences, Islamic Azad University, Hamedan Branch, Hamedan, Iran

Abstract: Progesterone is one of the most important sex steroids that influences proliferation of various cells during our body development. This study was exerted out to assess the effects of progesterone on viability of cervical cancer cells (hela cell line) in cell culture. Hela cells were exposed to 0.0001, 0.001, 0.01, 0.1, 1 and 10 mg/ml of progesterone solution. MTT assay was used to determine cytotoxic effects of the progesterone on Hela cells in cell culture. Control Hela cells were not exposed to progesterone. Our results indicated that administration of 0.1 and 1 mg/ml of progesterone resulted in significant decrease in viability of Hela cells compared to control cells (p<0.05 and p<0.001, respectively). Administration of 0.0001, 0.001 and 0.01 mg/ml of progesterone did not significantly change viability of Hela cells compared to control group. According to our finding, high doses of progesterone have cytotoxic effects on cervical cancer cells.

Keywords: Progesterone, Hela cell line, Viability

1. Introduction

The hela cell line is the oldest, most widely distributed, permanent human cell line. Hela cell, is a cell type in an immortal cell line used in scientific research. The line was derived from cervical cancer cells.[1] Progesterone, the natural progestin, is a major gonadal hormone, also known as pregn-4-ene-3,20-dione. progesterone belongs to a group of steroid hormones called progestogens that is synthesized primarily by the ovary in the female, and the testes and adrenal cortex in the male.[2] In women it helps prepare body for conception and pregnancy it also plays a role in sexual desire and plays important roles in the menstrual cycle and in maintaining the early stages of pregnancy.[3] Progestins are known to modulate cell morphology, adhesion and cytoskeletal composition in cancer cells.[4,5] Furthermore, steroid hormones including estrogen and progesterone significantly impact overall epithelial cell growth, differentiation and adhesion especially in women during maturation, ovulation and menstrual cycles, pregnancy, and are widely used in hormone replacing therapy for pre- and post-menopausal treatment.[6] Adrenocortical hormones have been shown to influence cell proliferation in many tissues.[7]–[9] Sex hormones influence mesangial cell proliferation and collagen generation[10]–[12]. The addition of metabolic inhibitors showed that the effect of estrogens on hela cells was energy dependent.[13] Many studies have shown the connection between sex steroids and female cancers.[14]–[17]

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2. Materials and Methods

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Hela cell (cervical cancer cell line) were purchased from the national cell bank of Iran (Pasteur Institute, Tehran, Iran). The cells were grown and incubated in standard situations. Different concentrations of progesterone (0.0001, 0.001, 0.01, 0.1, 1, and 10 mg/ml) were prepared and used in our study. Cells were subcultured into 75 cm² flasks, 96-well plates, or 6-well plates. Cytotoxicity of different doses of extract was assayed using the MTT method. The MTT assay is a colorimetric assay for assessing cell metabolic activity. Nad(p)h-dependent cellular oxidoreductase enzymes may, under defined conditions, reflect the number of viable cells present. These enzymes are capable of reducing the tetrazolium dye MTT 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide to its insoluble formazan, which has a purple color. Other closely related tetrazolium dyes including xtt, mts, and the wst-1, are used in conjunction with the intermediate electron acceptor, 1-methoxy phenazine methosulfate (pms). With wst-1, which is cell-impermeable, reduction occurs outside the cell via plasma membrane electron transport.[18] Tetrazolium dye assays can also be used to measure cytotoxicity (loss of viable cells) or cytostatic activity (shift from proliferation to quiescence) of potential medicinal agents and toxic materials. Mtt assays are usually done in the dark since the mtt reagent is sensitive to light. All values are presented as mean ±SD. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 20.

3. Results

Our results indicated that administration of 0.1 and 1 mg/ml of progesterone resulted in a significant decrease in viability of Hela cells compared to control cells (p<0.05 and p<0.001, respectively). Administration of 0.0001, 0.001, and 0.01 mg/ml of progesterone did not significantly change viability of Hela cells compared to control group (Figure I).

Fig. I. Viability of Hela cells compared to control group. * and ** indicates significant difference compared to control group at p<0.05 and p<0.0001, respectively.

4. Discussion

According to our finding, high doses of progesterone have cytotoxic effects on cervical cancer cells. In line with our findings, studies show that progesterone has cellular and molecular effects on cells.[19] Progesterone receptor in the prostate is also a potential suppressor for benign prostatic hyperplasia and prostate cancer. [20] Molecular data analysis also revealed the possibility of certain cancer cells proliferation induction via hormone activated pathways. [21] Progesterone also has improving effects in obese women with breast cancer. [22] It has also been suggested that progesterone is a potent hormone which inhibits the growth of human ovarian cancer cells. [23] Studies indicate that progestin-only formulations do not increase the risk of breast cancer. [24] However, despite many studies showing improving effects of progesterone in cancer development, recent evidence suggests that angiogenesis in breast cancer can be regulated by progesterone. [25]

5. Conclusion

According to our finding, different doses of progesterone have different effects on normal kidney cells viability.

6. Acknowledgements
We appreciate all who helped us to exert this study.

7. References


