Physical Inactivity Has a Potentially Tumorigenic Effect

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Abstract—Studies show that serum level of tumor markers is influenced by several factors. The main aim of this study was to determine the effects of physical inactivity on serum level of CEA in rats. Male Wistar rats were randomly divided into control and immobilized (8h/day for 8 days) animals of 10 in each group. After 8 days, blood samples were collected using cardiac puncture method. Following serum collection, CEA levels were measured by radioimmunoassay method. Data were statistically analyzed and compared between groups using ANOVA. The results indicated that serum CEA levels were significantly increased in immobilized rats compared with control animals (P<0.001). Our findings show that immobilization stress enhances serum levels of CEA.

Keywords—Inactivity, CEA, Rat.

I. INTRODUCTION

Tumor markers are substances that are produced by cancer or by other cells of the body in response to cancer or certain benign (noncancerous) conditions. Most tumor markers are made by normal cells as well as by cancer cells. These substances can be found in the blood, urine, stool, tumor tissue, or other tissues. Most tumor markers are proteins [1].

More than four decades has passed since Gold and Freedman first described the tumor associated antigen carcino embryonic antigen CEA in human colon cancer tissue extracts. CEA is a glycoprotein involved in cell adhesion. It is a glycosyl phosphatidyl inositol (GPI) cell surface anchored glycoprotein whose specialized sialofucosylated glycoforms serve as functional colon carcinoma L-selectin and E-selectin ligands [2-3].

It was hypothesized that CEA was an oncofetal antigen with a relative molecular mass of 180,000, expressed during fetal life, absent in the healthy adults and re-expressed in cancer. We now know that this concept does not apply to CEA. CEA is actually also expressed in normal adult tissue [4].

Carcinoembryonic antigen (CEA) is considered to be an effective target for a DNA vaccine because it is overexpressed by most colorectal, gastric, and pancreatic carcinomas [5], and 50% of breast cancers, and by 70% of non–small cell lung carcinomas [6]. This increased expression of CEA also promotes an increase in intercellular adhesions that may contribute to metastasis [7]. Circulating CEA can also be detected in the blood of most patients with CEA-positive tumors and has been used to monitor responses to therapy and disease progression [8-11] and used in clinical trials [12-13].

Physical inactivity remains among the most prevalent of chronic disease risk factors in different nations such as; Anxiety [14], Cardiovascular disease [15], Diabetes [16], Colon cancer [17], High blood pressure [18].

In different organisms, acute and chronic immobilization considered as stress and may be have different effects on the physiology of animals in different areas [19]. However, recent studies shown that some of stress have a significant role in tumorigenesis and progression of malignant tumors [20]. Immune suppression by stress in experimental animals based on this relationship [21]. Since cancer cause of high mortality in the world , 7 million deaths annually according to the report World Health Organization (WHO) [22], and immobilization lifestyle of people in both the developed and developing world, evaluation the effects of immobilization on serum tumor marker proposes. This study examined the effects of immobilization stress on serum tumor marker in rats.

II. MATERIAL AND METHODS

A. Animlas

Adult male Wistar rats weighting 200±30g were purchased and raised in our colony from an original stock of Pasteur Institute (Tehran, Iran). The temperature was at 23±2 °C and animals kept under a schedule of 12h light: 12h darkness with free access to water and standard laboratory chow.

B. Protocol of Study

Male Wistar rats were randomly divided into control and immobilized animals (8h/day for 8 days) of 10 in each group. For immobilizing the animals, a standard restrainer was used. After 8 days blood samples were collected using cardiac puncture method. The blood samples were kept 15 minutes at room temperature. In order to obtain serum, samples were centrifuged at 2500 rpm for 20 min. After separation of serum CEA levels were measured using commercially available kits [IMMUNOTECH A, BECHMAN COULTER/REF 2121].

C. Statistical Analysis

All values are presented as mean±SEM. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using...
Game-s Howell significant for the exact P values and significant differences are noted in the results. Differences with P<0.05 were considered significant.

III. RESULTS

The results indicated that serum CEA levels were significantly increased in immobilized rats compared with control animals (P<0.001). (Table I and Fig I).

<table>
<thead>
<tr>
<th>Groups</th>
<th>CEA (ng/dl)</th>
<th>P</th>
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<tbody>
<tr>
<td>Control</td>
<td>0.52±0.002</td>
<td></td>
</tr>
<tr>
<td>Immobilized</td>
<td>0.61±0.001</td>
<td>&lt;0.001</td>
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Fig. 1 Serum CEA level in control and immobilized rats.

IV. DISCUSSION

The results of current research show that the serum CEA level was significantly increased in immobilized rats compared with control animals. Studies also show that stress enhances expression of tumor markers and tumor growth [23]. Also, studies indicate that chronic stress with increased serum levels of tumor necrosis factor alpha (TNF-a) in rats may be the cause of pancreatic disorders development [24]. Research has shown that chronic stress may reduce serum levels of IgA, by which the immune system is attenuated and may be the cause of pancreatic disorders development [24].

Further research are required to determine the mechanism by which inactivity affects on tumor markers.

V. CONCLUSION

Our findings show immobilization and physical inactivity with negative effects on activity and expression CEA serum lead to increase secretion CEA production.

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REFERENCES


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