

Original Research Article

Some Physiological and Hormonal Effect of Green tea on Female Rats Treated with Lead nitrate

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Abstract

Increased exposure to lead from environmental and industrial pollution have negative impact on health. Green tea has become object of study because of its subservient effects on human health. Thirty-two female rats Sprague Dawley, share out with four groups ,8 rats in every group. Group 1 was given distilled water (control), group 2 was given green tea, group 3 was given lead and group 4 was given Lead and green tea, the dose were given orally to the rats for 8 weeks, hormonal levels was estimated after collecting blood samples . The study found that estradiol, Tri-iodothyronine T3 and cortisol decrease significantly ($p \leq 0.05$) in rats administered green tea alone and rats administered lead nitrate alone. While; level of estradiol and tri-iodo thyronine T3 increase significantly ($p \leq 0.05$) when the rats treated with both lead and green tea. We conclude that there was a significant decrease in the level of estradiol, Tri-iodothyronine and cortisol hormones in the female rats treated with lead nitrate. While the study showed a significant increase in the level of both estradiol and triiodothyronine after the treatment of animals with green tea, while there was no significant difference in the level of cortisol after treatment when compared with control group.

Key Words: Green tea extracts, lead nitrate, hormonal changes, estradiol, cortisol, T3.

الخلاصة

يعد التلوث البيئي والصناعي من العوامل التي تتأثر بها الصحة العامة للإنسان ومن ضمن ذلك التلوث بمركبات الرصاص . أشارت العديد من الدراسات السابقة الى احتمالية تأثير الشاي الاخضر ايجابيا على صحة الانسان .
أستخدم في الدراسة ٣٢ جرذا من اناث الجرذان البيض نوع Sprague-Dawley لمعرفة تأثير الشاي الاخضر على مستوى بعض الهرمونات في اناث الجرذان البيض المجرة بنترات الرصاص .قسمت الى أربعة مجاميع كل مجموعة مكونة من 8 جرذان :استلمت المجموعة الأولى منها ماء مقطر (سيطرة) في حين جرعت المجموعة الثانية بالشاي الاخضر اما المجموعة الثالثة فقد جرعت بنترات الرصاص في حين تم تجريع المجموعة الرابعة بنترات الرصاص ثم معاملتها بالشاي الاخضر .مدة التجريع كانت ثمانية اسابيع ؛اظهرت النتائج وجود انخفاض معنوي في مستوى هرمون الاستراديول ومستوى هرمون التريايودوثيرونين و مستوى هرمون الكورتيزول في اناث الجرذان المجرة بنترات الرصاص في حين اظهرت الدراسة ارتفاع معنوي في مستوى كل من الاستراديول والتريايودوثيرونين بعد معاملة الحيوانات المجرة بنترات الرصاص مع الشاي الاخضر في حين لم يظهر اختلاف معنوي في مستوى الكورتيزول بعد المعاملة عند المقارنة مع مجموعة السيطرة.

الكلمات المفتاحية : الشاي الاخضر ، نترات الرصاص ، تغيرات هرمونية ، استراديول ، كورتيزول ، التريايودوثيرونين .

Introduction

Medical herbs is folk or a classic medicine practice based on the many synthesize substance from plants are helpful to care health in human and animals such as tannis or their aromatic substance most of which are phenols [1, 2].

Green tea is a good source of polyphenols called catechins, vitamin C as anti-oxidant, and to trial to healing a different conditions cancers, cholesterol elevation, liver diseases, diabetes type 2, and bowel inflammatory disorder [4].

Lead is a major industrial by product found in cosmetics, water poop, book printing, petroleum refining, paint pigments, pesticide lining of tools, slugs of gun, x-ray [30]. Lead nitrate as a heavy metal have the ability to accumulate in the tissue of human and animals, cannot be broken through biological degradation and may be produce degrade changes like oxidative stress in the body [3].

Lead can cause indicated endocrine appearance, like rheumatological, neurological, gastrointestinal, and renal in human even on the side of safety [7], endocrine disturbances, hormonal imbalances that affecting different physiological aspect like sexual propagation [12]. The effects of lead cause large number of biological activities at the molecular, intercellular and cellular levels, which cause morphological changes that can stay even after lead level decrease in the body [15]. Lead nitrate consider as an inhibitor of pituitary hormones secretion, especially FSH and LH hormones which results a significant decrease in follicles numbers and size [24, 25].

Estrogen is a reproductive hormone that is responsible for normal sexual and development of women. The risk breast cancer may increase due to high levels of estrogen, heavy metals exposure can reduce or inhibit the secretions of reproductive hormones [11]. Women which take green tea, the levels of estradiol concentration are fallen, throughout whole menstrual cycle. This

may lead to reducing the risk of hormone-related cancer [13].Supplements of green tea may help regulate estrogen levels [5].They are relationship between green tea consumption and estradiol levels [13].

T4 and T3, regulate body temperature and metabolic rate of every cell in the body. pb cause deleterious effects on the function and the structure of thyroid gland [7]. Serum T3 became highly significantly decrease by increasing exposure to lead nitrate [11].

Cortisol is a hormone produced by adrenal glands when extreme stress is present. It give us the emerge of energy required to escape a situation of dangerous [6]. Cortisol Controlled by taking certain complement like Vitamin C, Omega -3 supplements, melatonin. As well as exercise and deep breathing.

Little information around the protective function of green tea to depress harmful effects of Pb toxicity in the level of estradiol, cortisol and thyroid hormones, so objective study was conducted to estimate the effect of toxicity with Pb on the level of these hormones and the preventative function of green tea.

Materials and Methods

Animals buy from Animal House, College of medicine, Babylon University, were placement with usual room temperature and natural light, for two weeks before conducting experiments.. Diet and tap water were supplying. The experiment lasted eight weeks. Thirty two healthy female rats type (Sprague–Dawley) their weight between (185–250 grams). rats were reparative into four groups (8 animals in each group): (Control groups) take distilled water. (GTE group) take Green tea. The Green tea make, by moistening 15 gram of instant grind green tea in one L of hot distilled boiling water for 5 mints [8]. The solution was filtered to made (1.5% GTE, W/Vin water), (W/V mean 1.5g of green tea is present in 100ml of distilled water).(Pb-group) takes 0.5% lead nitrate

solution at filtered water [7]. (GTE +Lead group) take a mixture of Pb and GTE. This solution was supplied to rats as an exporter of drinking water. At the end of experiment 1 day after the end of the treatment and under light mild anesthesia by (diethyl ether), animals of all groups were victimizing. blood sample collected from the heart and put in heparinized tubes. Then put in the centrifuge at 5000 round per mint (rpm) for 10 mints to obtain plasma samples for biochemical analyses (9). We use kits VIDAS®for (estrogen, T3 and cortisol). It is an automated quantitative test of use for the VIDAS family instruments using the ELFA technique (enzyme linked fluorescent Assay) [10].

Data were assessed by one - way analysis of variance ANOVA with mean \pm standard error (SE). (SPSS statistics program).

Differences in groups was (Bonferroni test) using the version5 software Windows package. significance difference was agreeable to ($P \leq 0.05$) [9].

Results

Changes in the estradiol level:

The estradiol hormone was significantly decreased to Lead treated rats evaluation of differences between green tea and controls. Hormone significantly elevated to (Lead + GTE) administering rats comparing with Lead- administer rats (Figure 1).

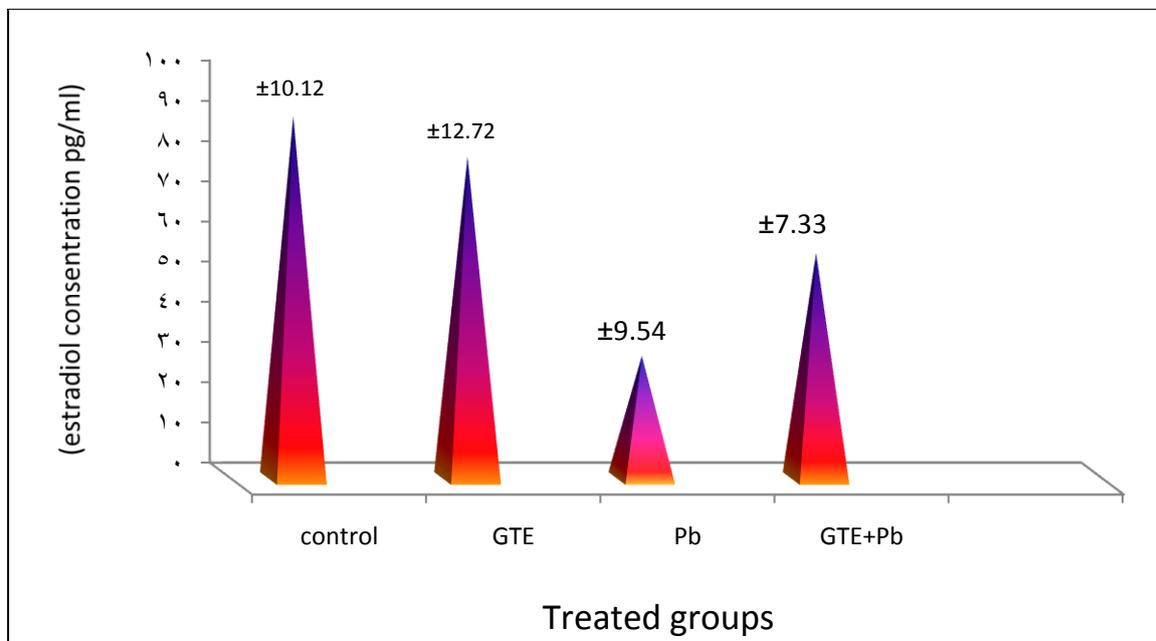


Figure 1: Concentration of estradiol in (control), green tea (GTE), lead nitrate (pb), green tea and lead nitrate (GTE+pb) groups.

Changes in T3 hormone level

The T3 hormone was significantly decreased to green tea and Lead-treated rats evaluation of differences with

controls. Hormone significantly returned to normal in Lead + GTE- administer rats comparing with green tea and Lead-administer rats groups (Figure 2).

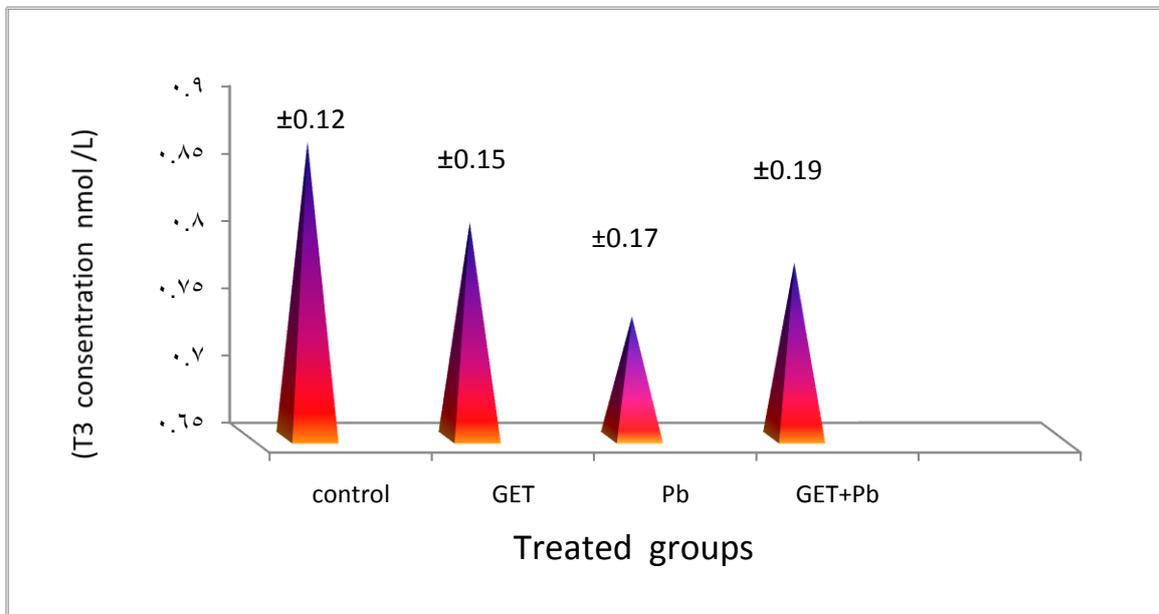


Figure 2 : Concentration of T3 in (control), green tea (GTE), lead nitrate (pb), green tea and lead nitrate (GTE+pb) groups.

Changes in cortisol hormone levels

The Cortisol hormone was significantly decreased to green tea and Lead-treated rats evaluation of differences with

controls. Hormone remained decrease significantly in Lead + GTE-administer rats comparing with the comparing rats groups (Figure-3).

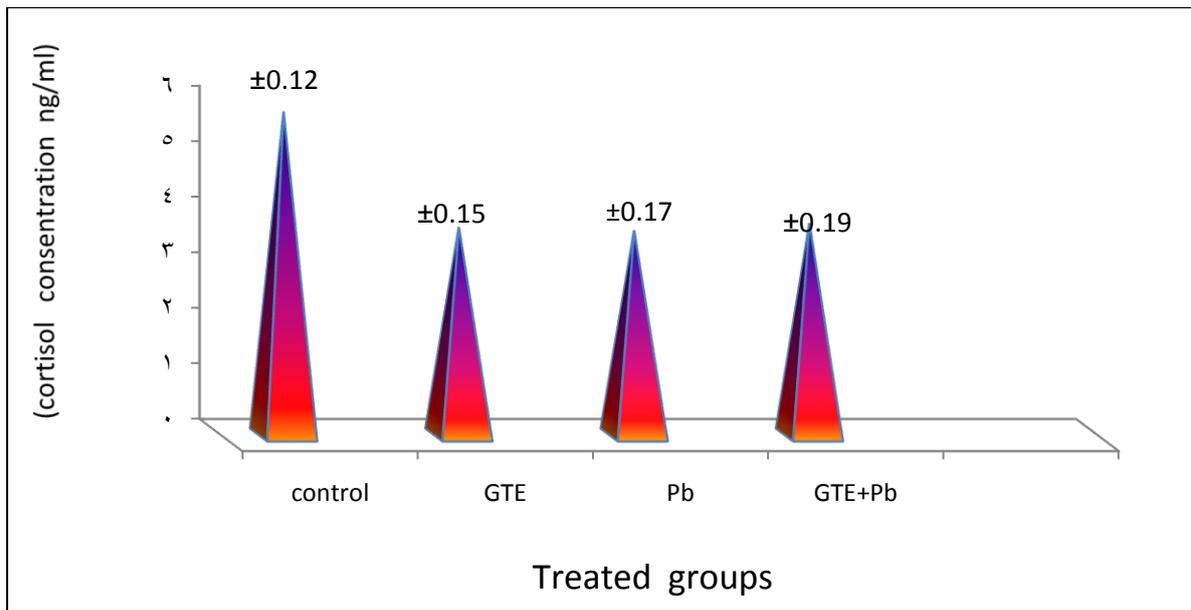


Figure 3: Concentration of cortisol in control, green tea (GTE), lead nitrate (pb), green tea and lead nitrate (GTE+pb) groups.

Discussion

The study showed that lead nitrate makes a significant changes in the hormones levels, and administration of green tea show markedly impact on the estradiol and T3 levels.

Catechins like vitamins C and E as potent free radical scavengers work as antioxidants. The most plentiful catechin in green tea is epigallocatechin-3-gallate (EGCG), which play a crucial function of the green tea's antioxidant and anticancer effects. Green tea contained flavonoids, like catechins and their derivatives [26].

Heavy metals cause hormonal imbalances by cause endocrine disruptors affecting various physiological processes such as reproduction. disruptor of normal follicular steroid genesis [12]. Lead nitrate consider as an inhibitor of pituitary hormones secretion, especially LH and FSH hormones which results a significant decrease in follicles numbers and size. This decrease in a level of estrogen may discuss as the effect of lead nitrate on FSH hormone from pituitary glands and then on estrogen secretion from granulosa cells [17]. The serum FSH and LH became significantly decreased by increasing exposure the *Oreochromis niloticus* of lead nitrate and the estradiol concentration on the control fished was significantly higher than the concentration of estradiol in the other groups that exposed to lead nitrate.

Heavy metals exposure can reduce or inhibit the secretion of reproductive hormones in the *Oreochromis niloticus* [11]. green tea possible reduced urinary condensation of estrone by changes in metabolism or conjugation of estrogens and this possible lead to increase breast cancer risk. Green tea loaded of phytochemicals which react with and control the metabolism of xenobiotic enzymes. Studies will be beneficial to firm that green tea may modify risk of cancer [36].

Antioxidant defense series changes by lead exposure, this will lead to generation of reactive oxygen species in animals and occupationally exposed workers [18].

Some research found that blood estrogen levels decrease 13% in women that orderlies drinks green tea, compared with women who drink irregular green tea. As a result green tea prevention a related conditions of high-estrogen such as breast cancer [4,14].

The significant decrease in the serum (T3, T4) hormones, possible cause by the effect of lead nitrate on the hypothalamic peptides thyroid releasing hormone (TRH) [23]. decrement conversion rated from T4 to T3 according to suppression of type-I iodothyronine 5'-monodeiodinase [5'-D], enzyme dependable for the peripheral deiodination of T4 to T3, efficacy leads to decrease concentricity of serum T3 in rats treated with Lead [19]. Lead cause inhibit 5'-D action by binding to sulfhydryl groups of this enzyme[21]. Research conducted on sheep concludes that dysfunction in the liver occurred secondary to lead treatment which cause decrease of serum T3 concentration in the sheep which treated with lead [20].

serum T3 became highly significantly decrease by increasing exposure the fish *Oreochromis niloticus* to lead nitrate. Lead induced enhanced lipid peroxidase levels and cytotoxicity so that the enzymes activities of the antioxidant were depressed and this is accompanied by decrease equivalents like glutathione [GSH] and an increased cellular oxidative stress and finally essential thiol (-SH) group depleted and causing suppression of deiodination of T4 to T3 which cause by disturbance e of 5-D enzymes designs [24].

After Pb exposure T3 and T4, it is possible that the reason is to lead block release and synthesis of thyroid hormone from gland, through the effect on the TSH release from pituitary gland or TRH release from the hypothalamus or thyroid iodine uptake [31] as result, Pb cause damage of thyroid gland [32]. As well as the inhibition role of Pb for synthesis and release of thyroid hormone from thyroid gland [33].

Lead nitrate have hurtful effects on the thyroid gland and the histological structure [7]. Several authors [27, 28] presented that the extract of green tea (GTE) showed off free radicals and antioxidants scavenger responsibility. [22]occlude that the supply of GTE attenuates cyclosporin A-stimulate oxidative stress in rats.

Lead nitrate at toxicant ingestion level cause decreased the plasma levels of T3 and T4. As well as, other study found that Pb²⁺ inhibition the levels of 3, 5-triiodothyronine (T3) and (T4), with rise in thyroid stimulator hormone levels. The research concludes that exposed to Pb cause increase the risk of damage to the thyroid gland [35].

Black tea and Green tea extract can be alter the physiology and histology of thyroid gland the result found enlargement of thyroid gland. hypertrophy, hyperplasia of the follicles of thyroid gland and decrease of the activity of thyroid peroxidase and 5'-deiodinase I with increase thyroidal Na⁺, K⁺-ATPase function, with significant decrease in serum T4 and T3 and increase in [TSH] serum thyroid stimulating hormone [39]. This explains why T3 descent when giving green tea.

The rising of cortisol may be signal of the stress which cause by metal harm [12]. The serum cortisol elevated by increasing exposure the *Oreochromis niloticus* to lead nitrate [11]. Control cortisol by taking certain supplements like Vitamin C, Omega -3 ,melatonin as well as herbs that are known to reduce cortisol levels include Green Tea [29]. Research suggests that Green Tea can reduce cortisol. Things that lower cortisol [not an exhaustive list] include Green tea (theanine) [16]A green tea study was conducted in 2011 and the results showed it reduced cortisol levels and assisted with weight loss [38]. Green Tea is caffeinated by the way. It is part of the xanthine group. The de-stressing quality of green tea is attributable to its theanine content, which increases GABA concentrations in the brain [37]. This

explains why cortisol descent when giving green tea. And descent cortisol in totals comparison.

Conclusion

This research concluded that lead has a harmful effect and cause hormonal changes that secret from thyroid gland, ovary and adrenal gland and this conceder as a mirror of the work of the glands. When given, Green tea these minimized the damaging effects of lead. We recommend drinking green tea as a way to abolish the harmful effects of the environmental pollution and vocational exposure to lead. In increment we recommend additional histological studies of this organs to show the role of green tea in lead toxicity.

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