

## Stannous chloride induced alteration in hormones : protective role of ginseng

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### ABSTRACT

Roughly 50% of the world generation of tin is utilized for plating. Tin coatings are utilized for nourishment\_ holders and nourishment- preparing hardware. Ginseng, which may be a plant having diverse species has been well examined, particularly the ginseng, and has been detailed to have antioxidant properties, improve safe work.. This work explored the defensive impacts of ginseng against stannous chloride ( $\text{SnCl}_2$ ) on hormones in rabbits. Results indicated that treatment with ginseng alone caused significant ( $P<0.05$ ) increase in body weight (BW) and relative weight of testes compared to control animals. On the other hand, significant ( $P<0.05$ ) decrease in BW and relative weight of testes in rabbits treated with  $\text{SnCl}_2$  compared with control. Treatment with  $\text{SnCl}_2$  caused significant ( $P<0.05$ ) decrease activity of testosterone,  $T_3$  and  $T_4$ . While, increase the levels of FSH, LH, estradiol and progesterone in plasma. ginseng caused significant ( $P<0.05$ ) increase in the activity testosterone,  $T_3$  and  $T_4$ . While, decrease the levels of FSH, LH, estradiol and progesterone in plasma compared to control. The presence of ginseng with  $\text{SnCl}_2$  caused significant ( $P<0.05$ ) decrease in the reduction of testosterone , $T_3$  and  $T_4$  as compared to control and the presence of ginseng with  $\text{SnCl}_2$  caused increase in the levels of estradiol , progesterone, FSH and LH as compared to control, and this means that ginseng counteracted the toxic effects of  $\text{SnCl}_2$ .

**Keywords:** Stannous chloride, ginseng, hormones and rabbits

### INTRODUCTION

Tin(II) chloride, too known as stannous chloride, could be a white crystalline strong with the equation  $\text{SnCl}_2$ . It shapes a steady dihydrate, but fluid arrangements tend to experience hydrolysis, especially in the event that hot.  $\text{SnCl}_2$  is broadly utilized as a diminishing operator (in corrosive arrangement ), and in electrolytic showers for tin-plating.  $\text{SnCl}_2$  ought to not be confounded with the other chloride of tin; tin(IV) chloride or stannic chloride ( $\text{SnCl}_4$ ). Within the final 25 a long time, significant endeavors have been made to get it the impact of tin, tin compounds and  $\text{Sn}^{2+}$  on human cells<sup>[1]</sup>. and within the environment<sup>[2]</sup>. The nourishment industry employments stannous chloride as apreservative (e.g., in delicate drinks) and in a few fluoridetoothpastes. Conceivable joint utilization of these compounds,therefore, makes important data on their effect, confined or in interaction, indeed with other organisms used as markers<sup>[3]</sup>.

The tin compounds impact on human wellbeing and the environment are beneath examination due to the complexity of measuring the organic impact of nanoparticles/nanomaterials. Within the natural milieu, the measure and state of agglomeration/aggregation change, influencing the bioavailability of the nanoparticles and their get to and aggregation in cells or their discharge from the body<sup>[4,5]</sup>.

Most long-term thinks about have not detailed histopathological changes in regenerative organs from rats or mice<sup>[6]</sup> with the special case of<sup>[7]</sup>, who detailed an increment in Leydig cell hyperplasia and tubular decay of the testicles in rats treated with triphenyltin. The component by which a few organotins influence propagation isn't known, but there's prove that concealment of uterine decidualization may be a cause of preimplantation misfortunes<sup>[8]</sup>. It would be supportive to illustrate whether impacts such as pre- and postimplantation misfortune happen auxiliary to

maternal poisonous quality or can happen autonomous of maternal harmfulness. Since coordinate impacts on regenerative organs don't appear to have an critical part (but for the discoveries findings discoveries of<sup>[7]</sup>, advance inquire about ought to center on the impacts of organotins on the endocrine control of regenerative capacities in grown-up creatures and on the hormonally-controlled advancement of regenerative organs in creatures uncovered in utero and early in life. Various thinks about in vitro have appeared that organotins can influence the exercises of enzymes included within the amalgamation of steroid hormones, with possibly broad results<sup>[9]</sup>.

<sup>[10]</sup> examined the impacts of the concurrent organization of tributyltin chloride and p,p'-DDE on formative conclusion focuses in rats. Rats were treated orally with tributyltin chloride/kg/day alone (2 mg/kg/day) or tributyltin chloride also p,p'-DDE (10 mg/kg/day) amid development and lactation. Formative parameters inspected within the pups at different times up to 6 weeks of age included sex and net deformities, body and sex organ weights, anogenital separate, eye opening, areola maintenance (in guys), vaginal opening, vaginal opening, preputial division, and serum testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH). Ovary weight was expanded within the combination gather relative to the tributyltin alone gather. Serum testosterone was not influenced in any bunch and serum LH was decreased within the tributyltin group, but not within the combination bunch. Tributyltin did not influence anogenital remove, areola maintenance, or vaginal opening, but deferred eye opening (not watched within the combination bunch).

Herbs have been used for centuries to treat illness and improve health and still account for about 80% of medical treatment in the developing world with approximately one third of drugs being derived from plant sources<sup>[11]</sup>. Panax ginseng C. A. Meyer (Araliaceae) is one of the most widely used medicinal plants, particularly in traditional oriental medicine, for the treatment of various diseases. There are extensive reports that ginseng has many pharmacological effects on the central nervous system, endocrine, immune, and cardiovascular systems<sup>[12]</sup>.

Ginseng, which may be a plant having distinctive species has been well considered, particularly the 'Panax' specie, and has been detailed to have antioxidant properties, improve resistant work and blend of nitric oxide<sup>[13]</sup>. Traditionally, ginseng is being used as an aphrodisiac and it has been reported that Panax ginseng enhances nitric oxide synthesis in corporacavernosa endothelium; and ginsenosides, a major component ginseng, upgrades acetylcholine-induced and transmural nerve stimulation-activated unwinding related with expanded tissue cyclic guanosine monophosphate<sup>[14]</sup>. A study reported that Panax ginseng increased serum levels of luteinizing hormone (LH) and follicle stimulating hormone (FSH) which increased spermatogenesis in the rats<sup>[15]</sup>. Rats that received 5% ginseng experienced increase in blood testosterone level with reduced prostate weight<sup>[16]</sup>. In any case, whereas plant species are connected in animals generation for purposes other than generation, the regenerative impacts of these plants on the creatures is of foremost thought, especially when breeding animals are included and considering that various plants and plant things have been point by point to piece spermatogenesis completely different animal species<sup>[17]</sup>. Improving the rabbit production industry in Nigeria, which has been regarded as emergent or rudimentary<sup>[18]</sup>, It is possible that Panax ginseng may enhance reproductive abilities of rabbit bucks as detailed in mice and rodents treated with Panax ginseng<sup>[19]</sup>. Earlier studies on Panax ginseng with rabbits recorded significant increases in serum levels of follicle stimulating hormone (FSH), testosterone (T), triiodothyronine (T<sub>3</sub>), and tetraiodothyronine (T<sub>4</sub>) of treated rabbit bucks, while milk yield was significantly decreased in rabbit does administered Panax ginseng extracts<sup>[18,20]</sup>.

## MATERIALS AND METHODS

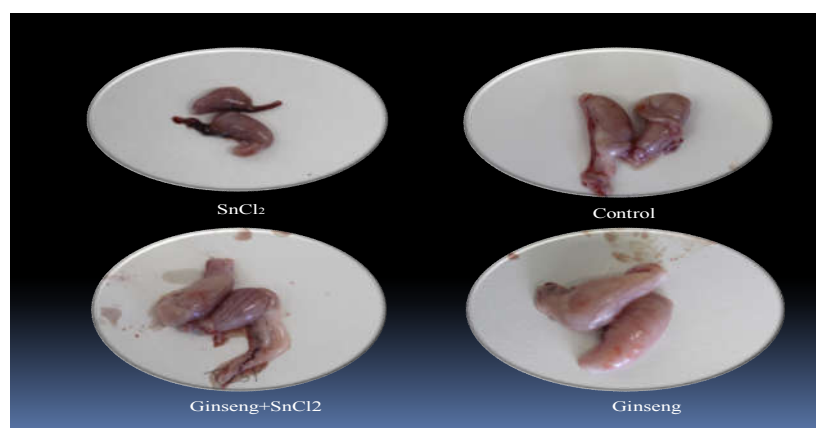
In this study stannous chloride ( $\text{SnCl}_2$ ) and ginseng were used.  $\text{SnCl}_2$  (purity 400g/L) was brought from chemistry department, faculty of science. and Ginseng root extract (Gift from pharmaceutical company, Libya). Develop male Modern Zealand White rabbits (6 months old). Animals were individually housed in cages and weighed weekly throughout 12-weeks experimental period. The objective of this study was to determine the protective role of ginseng (100 mg/kg BW)<sup>[21]</sup> on hormones of male New Zealand White rabbits given sublethal measurements (20 mg/kg BW each other day for 12 weeks) of stannous chloride ( $\text{SnCl}_2$ ). The LD50 of  $\text{SnCl}_2$  when given orally to rabbits was reported to be 10 000 mg/kg BW<sup>[22]</sup>.

respectively. Rabbits were orally administered their respective doses for 3 month. At the conclusion of the exploratory period body weight of rabbits were recorded. Animals were sacrificed by decapitation and testes were immediately removed and weighed then the organs weight ratio was calculated. The relative weight of organs (%) was calculated as g/100 g body weight. Serum was obtained by centrifugation of blood samples at 860×g for 20 min, and was stored at (-20°C) until used for analysis Testosterone, Estradiol and Progesterone hormone concentration were assayed by using commercial kit that was supplied by Coat – A – Count testosterone RIA, from Diagnostic Systems Laboratories (DSL), from Texas, USA. Follicle Stimulating Hormone (FSH), Luteinizing hormone (LH) levels, Thyroxine ( $\text{T}_4$ ) and Triiodothyronine ( $\text{T}_3$ ) hormone concentrations were assayed by using commercial kit that was supplied by Coat - A - Count, from Los Angeles, USA.

Statistical analysis: Where applicable, statistical analysis was carried out in Minitab software (version17) statistical significance was assessed using ANOVA analysis with Tukey multiple comparison test after detection normal distribution to the information and suitable  $P < 0.05$  consider critical.

## RESULTS

Observation of animals  $\text{SnCl}_2$ -fed rabbits showed varying degrees of clinical signs few minutes after dose. the testicular weight in group stannous chloride was significantly lower than in group ginseng ( Figure. 1). This difference in testicular weight was probably ascribable to a selective loss of testicular tissue as a result of  $\text{SnCl}_2$  treatment suggesting that ginseng had both protective and therapeutic effects against the  $\text{SnCl}_2$  induced testicular atrophy.



**Figure 1:** Morphology effect of stannous chloride, ginseng, and/or their combination after 12 weeks on testes of male rabbits

Table 1 represent body weight and relative weight of testes of male rabbits treated with ginseng, stannous chloride ( $\text{SnCl}_2$ ) and their combination. Results indicated that treatment with ginseng alone caused significant ( $P < 0.05$ ) increase in body weight (BW) and relative weight of

testes compared to control animals. On the other hand, significant ( $P < 0.05$ ) decrease in BW and relative weight of testes in rabbits treated with  $\text{SnCl}_2$  compared with control. Treatment with  $\text{SnCl}_2$  caused significant ( $P < 0.05$ ) decrease activity of testosterone,  $T_3$  and  $T_4$ . While, increase the levels of FSH, LH, estradiol and progesterone in plasma. ginseng caused significant ( $P < 0.05$ ) increase in the activity testosterone,  $T_3$  and  $T_4$ . While, decrease the levels of FSH, LH, estradiol and progesterone in plasma compared to control. The presence of ginseng with  $\text{SnCl}_2$  caused significant ( $P < 0.05$ ) decrease in the reduction of testosterone,  $T_3$  and  $T_4$  as compared to control and the presence of ginseng with  $\text{SnCl}_2$  caused increase in the levels of estradiol, progesterone, FSH and LH as compared to control, and this means that ginseng counteracted the toxic effects of  $\text{SnCl}_2$  (Table 1 to 3 and Figs 2-4).

**Table1.** Effect of ginseng, stannous chloride on testosterone, progesterone and estradiol of male rabbits treated with ginseng, stannous chloride ( $\text{SnCl}_2$ ) and their combination..

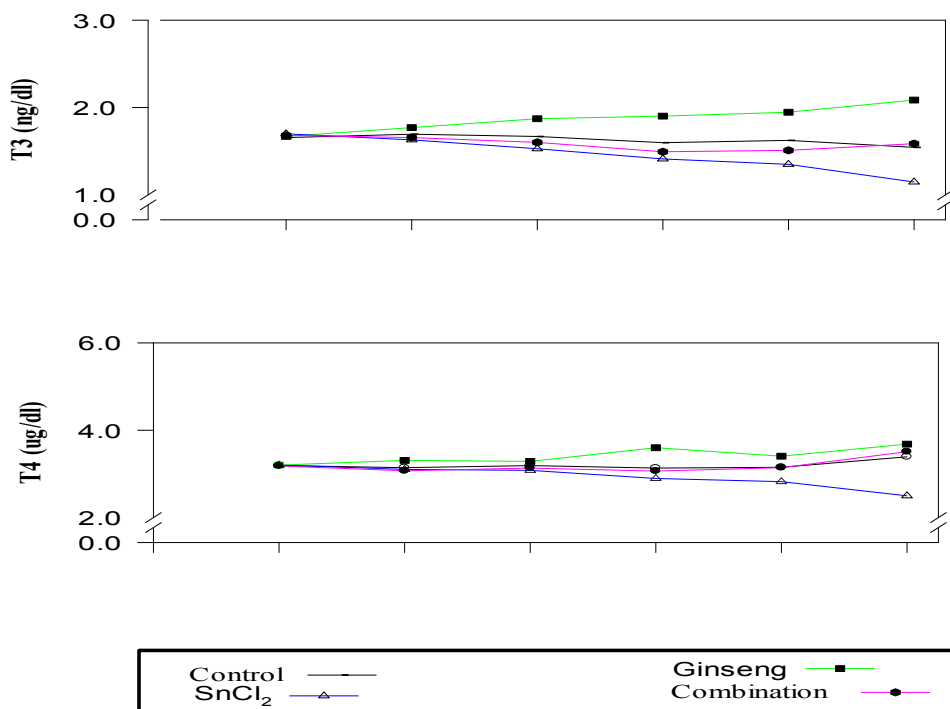
Parameter	Experimental groups			
	C	G <sub>s</sub>	$\text{SnCl}_2$	Ginseng
BW (g)	1.891 ± 35.64 <sup>ab</sup>	2.006 ± 37.13 <sup>a</sup>	1.756 ± 58.65 <sup>b</sup>	1.928 ± 24.92 <sup>a</sup>
RTW (g/100g BW)	4.080 ± 0.972 <sup>a</sup>	6.380 ± 1.00 <sup>a</sup>	3.604 ± 0.713 <sup>a</sup>	4.560 ± 0.509 <sup>a</sup>
Testosterone (ng/ml)	1.570 ± 0.063 <sup>bc</sup>	2.776 ± 0.191 <sup>a</sup>	1.100 ± 0.111 <sup>c</sup>	1.692 ± 0.083 <sup>b</sup>
Estradiol (mg/dl)	9.152 ± 0.011 <sup>b</sup>	9.364 ± 0.025 <sup>a</sup>	8.955 ± 0.086 <sup>c</sup>	9.149 ± 0.031 <sup>b</sup>
Progesterone (g/dl)	7.683 ± 0.063 <sup>b</sup>	8.070 ± 0.107 <sup>a</sup>	7.086 ± 0.115 <sup>c</sup>	7.518 ± 0.049 <sup>b</sup>

Values are expressed as means ± SE; n = 5 for each treatment group. Mean values within a row not sharing a common superscript letters (a, b, c, d) were significantly different,  $p < 0.05$ .

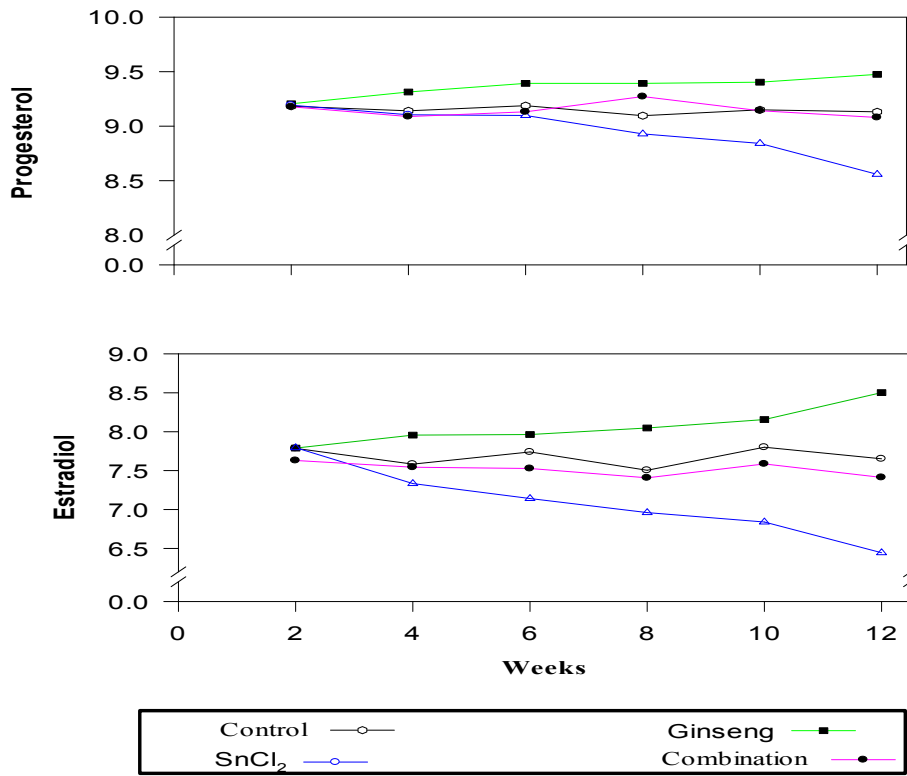
Table 2: Changes in thyroxine ( $T_4$ ), Triiodothyronine ( $T_3$ ), Luteinizing Hormone (LH) and Follicle Stimulating hormone (FSH), of male rabbits treated with ginseng, stannous chloride ( $\text{SnCl}_2$ ) and their combination

Parameter	Experimental groups			
	C	A	CC	A + CC
<b>T<sub>4</sub> (ng/dl)</b>	1.15 ± 0.012 <sup>b</sup>	1.29 ± 0.017 <sup>a</sup>	1.01 ± 0.022 <sup>c</sup>	1.12 ± 0.013 <sup>b</sup>
<b>T<sub>3</sub> (ng/dl)</b>	1.72 ± 0.028 <sup>a</sup>	1.73 ± 0.026 <sup>a</sup>	0.98 ± 0.049 <sup>b</sup>	1.73 ± 0.057 <sup>a</sup>
<b>LH (mIU/ml)</b>	0.77 ± 0.007 <sup>a</sup>	0.87 ± 0.039 <sup>a</sup>	0.75 ± 0.036 <sup>a</sup>	0.70 ± 0.057 <sup>a</sup>
<b>FSH(mIU/ml)</b>	0.805±0.005 <sup>a</sup>	0.807± 0.002 <sup>a</sup>	0.849 ±0.005 <sup>a</sup>	0.819 ± 0.004 <sup>a</sup>

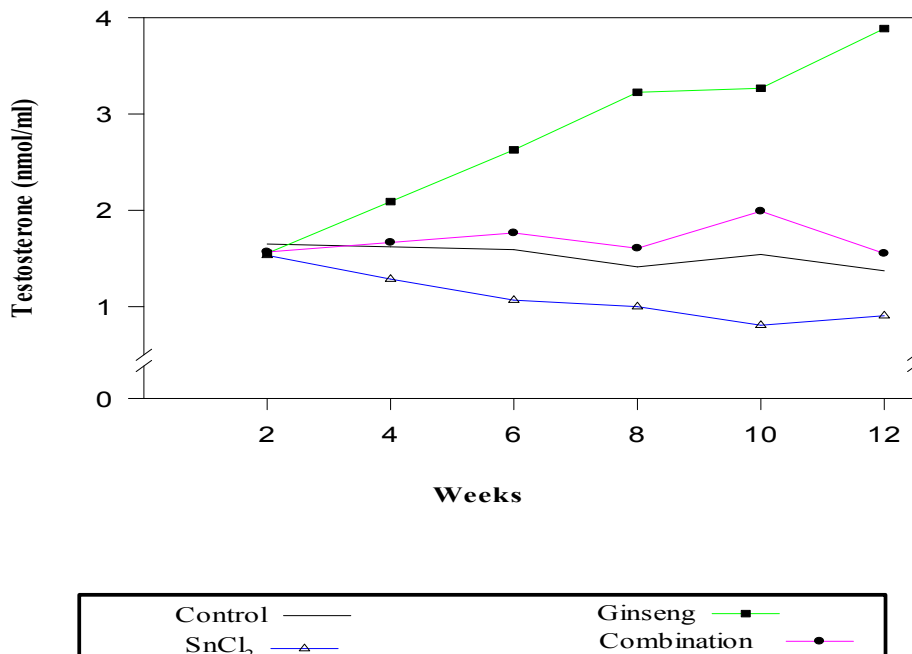
Values are expressed as means ± SE; n = 5 for each treatment group. Mean values within a row not sharing a common superscript letters (a, b, c, d) were significantly different, p<0.05.



**Figure 2.** changes in activity of plasma triiodothyronine (T<sub>3</sub>) and thyroxine (T<sub>4</sub>) during treatment of male rabbits with ginseng, stannous chloride(SnCl<sub>2</sub>) and/or combination



**Figure 3.** changes in Plasma estradiol and progesteron during treatment of male rabbits with ginseng, stannous chloride(SnCl<sub>2</sub>) and/or combination.



**Figure 4.** changes in Plasma testosterone during treatment of male rabbits with ginseng, stannous chloride(SnCl<sub>2</sub>) and/or combination.



## DISCUSSION

The present results indicate that treatment with  $\text{SnCl}_2$  caused significant reductions in body weight (BW) and relative organs weight (ROW) (Table 1). The reduction in BW and RTW of the  $\text{SnCl}_2$  treated rabbits is in agreement with the finding of<sup>[23]</sup>. Relative organs weight (RTW) were reduced by  $\text{SnCl}_2$  treatment. Similar results were obtained by<sup>[24-26]</sup> in rats. Moreover, testicular degeneration was watched in rats accepting 10 mg of tin(II) chloride per kg within the nourish for 13 weeks<sup>[27]</sup>. The increase body weight and relative weight observed in the present study due to treatment with ginseng is agreements with<sup>[28-31]</sup>. A few examiners detailed that utilizing therapeutic and fragrant plants in rabbit diets made strides body weight, body weight pick up and execution file,<sup>[32,33]</sup>. Also ginseng (Araliaceae), too called Asian ginseng, is one of the foremost eminent home grown plants around the world, but especially in Asian nations and has been utilized for thousands of a long time to preserve homeostasis of the body and upgrade imperative vitality<sup>[12,34,35]</sup>.

The results of the present study showed that ginseng has increased relative testes weight in rabbits. Good development of these organs is also considered to be crucial for optimal site of immunoglobulin synthesis<sup>[36]</sup>. In this study, the inclusion of dietary ginseng increased the relative weight of the relative organ weight compared with control treatment, which accords with<sup>[37]</sup> who suggested polysavone (main saponin and polysaccharides) supplementation increased the relative spleen weight and bursa weight in comparison with control treatment.<sup>[23]</sup> appeared that treatment with  $\text{SnCl}_2$  caused regenerative poisonous quality in male rabbits. In the mean time,<sup>[38,39]</sup> detailed that organization of tributyltin chloride at a tall measurements amid exceptionally early pregnancy created a significant and dose-related decrease in richness. In nuclear medicine,  $\text{SnCl}_2$  is used. Numerous studies in vitro have shown that organotins can affect the activities of enzymes involved in the synthesis of steroid hormones, with potentially widespread consequences<sup>[9]</sup>.

The diminish in progesterone levels assention with<sup>[8,40,41,42]</sup>. Moreover, Comes about from a ensuing ponder appeared that the early pregnancy disappointment was due to stifled uterine decidualization and diminished serum progesterone levels<sup>[40]</sup>. In a ensuing consider,<sup>[42]</sup> detailed that subcutaneous organization of progesterone in part avoided the preimplantation misfortunes actuated by dibutyltin and hypothesized that a decrease in progesterone may be a essential instrument for the implantation disappointment initiated by dibutyltin. Comes about from advance ponders by the same bunch of agents proposed that the early embryonic misfortune initiated by dibutyltin is due to hindrance of uterine decidualization, which is caused by restraint of the improvement of uterine affectability due to diminished serum progesterone levels<sup>[8]</sup>.

Concern has been raised that numerous pesticides and mechanical chemicals are endocrineactive compounds able of having far reaching impacts on people and natural life<sup>[43,44]</sup>. Specific consideration has been paid to the plausibility of these compounds imitating or antagonizing the activity of estrogen and showing antiandrogenic properties. Estrogen impacts the development, separation, and working of numerous target tissues, counting female and male regenerative frameworks, such as mammary organ, uterus, vagina, ovary, testicles, epididymis, and prostate. Another way that endocrine-active compounds can influence advancement is by acting on thyroid hormones. Thyroid hormones are basic for the typical improvement of the apprehensive framework, lung, skeletal muscle, and conceivable other organs. The baby is subordinate on maternal thyroid hormones at slightest until the fetal thyroid starts to create  $\text{T}_4$  and triiodothyronine ( $\text{T}_3$ ), which happens in people at around 16– 2 weeks of incubation.

In expansion, light microscopy of the testis uncovered disorganized seminiferous tubules with vacuolization of Sertoli cells and a few misfortune of germ cells. No impacts were seen on spermatogonia, spermatocytes, spermatids, Leydig cells, or the cellar film of the seminiferous tubules; the ponder NOAEL was 2 mg/kg/day. A 2-year consider with tributyltin oxide did not report histopathological modifications in endocrine organs from male and female rats treated with up to 2.1 mg/kg/day, but for a diminish in thyroid follicular epithelial cell stature watched at 12 and 24 months<sup>[6]</sup>. Be that as it may, no noteworthy changes were watched at 12 and 24 months in serum

levels of TSH, LH, FSH, T<sub>4</sub>, or FT<sub>4</sub>. From our result with ginseng, it caused altogether expanded in all parameters (Table 1 and 2). Ginseng-specific saponins (ginsenosides) were considered as the major bioactive compounds for the metabolic exercises of ginseng<sup>[45]</sup>,<sup>[46]</sup> detailed that ginseng roots showed up to encourage survival and neurite expansion of refined cortical neurons. Ginseng has been illustrated to have a broad run of pharmacological impacts on the regenerative, cardiovascular, endocrine, and safe frameworks. Its capacity to decrease weariness, improve blood circulation, help menopausal side effects, boost safe work, and improve concentration has been confirmed in certain nations<sup>[47]</sup>. Ginseng infusion was found to have a great impact on patients with persistent heart disappointment and administrative impact on thyroid hormones<sup>[48]</sup>. Besides, treatment with *Panax ginseng* some time recently, amid or after acrylamide treatment decreased or mostly antagonized expanded serum serotonin, corticosterone, T<sub>3</sub>, T<sub>4</sub>, TSH, estradiol, progesterone and plasma adrenaline initiated by acrylamide towards the typical values of controls<sup>[49]</sup>. The thyroid hormone T<sub>3</sub> shows an broad extend of physiological capacities, which were related to the direction of thermogenesis, digestion system, systemic vascular resistance, heart rate, renal sodium reabsorption and blood volume<sup>[50]</sup>. Thyroid hormones were found to control the expression of chemicals included in all steps of lipid digestion system driving to the advancement of subjective and quantitative changes of lipids in thyroid infection<sup>[51]</sup>. Testosterone might intervene the increased copulatory behavior in ginseng-treated creatures, whereas prolactin changed it. Taken together, these comes about recommend that ginseng species may have coordinate activities on the front pituitary organ and/or on the hypothalamic dopaminergic instruments<sup>[52]</sup>. The male sex steroid, testosterone, is synthesized within the Leydig cells beneath the control of luteinizing hormone (LH), which is delivered by the front pituitary<sup>[53]</sup>. Testosterone levels are unequivocally related with charisma and ponders with *Panax ginseng* in rats have been detailed to essentially increment blood testosterone levels. Ginsenoside Rb1 found in ginseng has been detailed to extend the emission of luteinizing hormone (LH) by acting specifically on the front pituitary organ<sup>[54]</sup>. It has moreover been recommended that ginseng may direct the pituitary-testis pivot at both hormonal and neuronal levels<sup>[55,56]</sup>.

**In conclusion**, the results of the present study convincingly demonstrated that SnCl<sub>2</sub> exposure resulted in varying degree of changes in hormones in plasma of rabbits. Ginseng is broadly utilized in conventional medication to treat sickness. Using ginseng capability to alleviate the harmful effect of SnCl<sub>2</sub>.

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