OBJECTIVE OF THE THESIS
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The literature cited before indicates the severity of the toxic compound, phenylhydrazine, acting as a potent environmental pollutant, causing hemolytic anemia in different animals. The effects of this compound on the non-hematological targets, such as the vital organs like liver, kidney, heart and skeletal muscle are equally alarming. The previous studies have been conducted mostly using adult animals. Thorough investigation needs to be made in animals in juvenile stage to evaluate the relative toxicity of the compound or to understand the differential responsiveness of juvenile and adult animals to phenylhydrazine. Even in adult animals, most of the studies have been performed using chronic type of the drug (PHH) treatment, continuing from four to six weeks, with single or multiple administration of the drug. Subacute nature of treatment with different doses of the drug, monitoring the toxic effects on different physiological parameters, and its recovery after withdrawal of the drug treatment are yet to be conducted in juvenile animals and compared with those of adults.

Role of endocrine factors in the mediation or alteration of toxic effects of PHH in hematological and other parameters have been studied in a few investigation. Thyroid hormone have been found to counteract, to some extent, the severity of PHH-induced anemia in the metamorphosing tadpoles, which may be due to many reasons apart from the stimulation in hemopoiesis. Dexamethasone have been found also to counteract the PHH severity in an immunologic way in adult rats. Such counteraction of the PHH-induced anemia has also been found after introduction of cortisone or adrenocorticotropic hormone (ACTH).

Considering the lack of knowledge regarding the relative toxicity of phenylhydrazine (PHH) in adult and juvenile animals, and the role of thyroid hormone mediating or counteracting the PHH effects in mammalian vertebrates the present study has been
undertaken:

(i) to understand the profile of hemolytic responses of PHH in male rat in sexually immature condition,

(ii) to demonstrate whether there is any role of the thyroid hormone for alteration of the hemolytic responses of PHH,

(iii) to know whether PHH-induced oxidative stress affects thyroid gland morphology and function.

Keeping an eye on the philosophy of the objectives the present thesis is an effort to argue and put forward certain unknown facts regarding the potency of phenylhydrazine hydrochloride in the juvenile hemopoietic system and the simultaneous protective counteraction by thyroid hormone.

The thesis has been designed to contain four chapters as described below:

(I) Phenylhydrazine hydrochloride (PHH)-induced hematological changes in juvenile and adult rat: Evidence of thyroid hormone counteraction of the drug effect.

(II) Changes in blood acetylcholinesterase activity (\textit{in vivo} and \textit{in vitro}) and Heinz body formation (\textit{in vivo}) after phenylhydrazine hydrochloride (PHH) treatments in juvenile rat, and influence of thyroid hormone on these parameters.

(III) Alteration in the serum thyroid hormone levels after phenylhydrazine hydrochloride (PHH) injections in juvenile rat.
(IV) Histological study of the thyroid gland of juvenile rat injected with phenylhydrazine hydrochloride (PHH), thyroid hormone ($T_4$) and PHH plus thyroid hormone treated condition.

In Chapter I, dose-specific effects of phenylhydrazine hydrochloride on the hematological parameters like Red Blood Cell (RBC) count, Hemoglobin (Hb) content, Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC) have been studied in juvenile male rat and compared with adult rat treated with selected dose of PHH. Influence of different doses of thyroxine ($T_4$) on the changes in the blood parameters in the PHH-treated juvenile rats have been demonstrated.

In Chapter II, the effects of injections of different doses of PHH on the blood acetylcholinesterase activity and the Heinz body formation in the juvenile rats have been studied in vivo. Role of thyroxine ($T_4$) in altering the PHH-induced changes in these blood parameters have been investigated.

Efforts have been made to understand the functional state of RBC membrane in various degrees of PHH insult through the assessment of the RBC membrane acetylcholinesterase activity in juvenile rat in an in vitro condition. The protective role of thyroid hormone in the PHH-induced red blood cell damage has also been demonstrated in this in vitro condition.

In Chapter III, thyroid gland function has been assessed in juvenile rats treated with various doses of PHH, through the determination of L-thyroxine ($T_4$) and L-triiodothyronine levels in serum.
In Chapter IV, the histological structure of thyroid gland in the juvenile rats has been studied after different doses of PHH treatment, thyroid hormone and PHH plus thyroid hormone treated condition.

In this thesis an attempt has been made to evaluate the PHH effects in sexually immature male rats, and to compare some of the effects in the adult rats. Identification of the protective role of thyroid hormone on the PHH-induced toxic changes and hypothyroid agent-like action of PHH in the juvenile male rats has been made.