Department of Zoology, Dr. H.S. Gour University, Sagar, Madhya Pradesh

International Webinar

on

Neuronal and Hormonal Intervention in Stress Integrated Behavior

November 29-30, 2021

Abstract Booklet-IW-NHISIB

First Published in Month December, 2021

Convener

Prof. Subodh Kumar Jain

Organizers'

Dr. Deepali Jat

Dr. Rashmi Srivastava

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NHISIB-2021

International Webinar on Neuronal and Hormonal Intervention in Stress Integrated Behaviour

29-30 th November-2021

Sponsored by

Indian Academy of Neuroscience

National Academy of Sciences India

Department of zoology, Dr. H.S. Gour University, Sagar, M.P.-India

DEPARTMENT OF ZOOLOGY

DR. HARI SINGH GOUR UNIVERSITY, SAGAR

M.P.-INDIA

CONVENER ADDRESS

It gives me an immense pleasure to convene An International Webinar on "Neuronal and Hormonal Intervention in Stress Integrated Behavior" is being held at Dr. H.S. Gour University, Sagar.

Current advances in molecular neurobiology and genetics have encouraged the neurobiologists and endocrinologists to make strides in revealing more about gene expression in nervous system, elucidating nervous system development and understanding the genetic basis of stress physiology. The genomics revolution has brought about the ability to analyze the genes and proteins of the nervous system and understand their structure, function and role in neuronal and hormonal behavior.

Behavior is regulated by the brain and the spinal cord based on a set of muscular contractions. Thus, understanding of the basic mechanisms of stress inducers that makes elementary attributes is essential so that students shall be provided basic overviews on the stress physiology and their molecular interventions integrated to hormones and neurons.

In this booklet, the abstract given to expect gaining basic knowledge on environmental stressors and their effects on animal physiology and biochemistry with the importance of structure function relationships. Here we aim, to let the students and learners know the language of biochemistry of neurons and hormones also their reactivities and pathways which they operate, get exposed to the themes related to stress physiology.

Prof. Subodh Kumar Jain

HOD, Zoology

Dr. H.S.Gour University, Sagar, M.P.-India

Organizers' Address

Dr. Deepali Jat and Dr. Rashmi Srivastava

Organizing secretary

IW-NHISIB-2021

We are excited and grateful to organize the first live international webinar dated 29-30th November 2021, in an interdisciplinary aspect "Neuronal and Hormonal Intervention in Stress Integrated Behaviour" at Zoology Department Dr. H.S. Gour University, Sagar-M.P.-India.

Neurons and hormones play a key role in the biology of stress physiology, also, with significant advances in science and technology over the past few decades, Neuroscience and Endocrinology have emerged as fields of its own dedicated branches to the study functional, anatomical, physiological and behavioral aspects. Both the branches are in-depth study of molecular phenomena of the scientific and technological experiments and tests.

Research and development in Neuroscience and Endocrinology ranges from understanding the nervous system at the cellular, biochemical and molecular level all the way to human behavior. For this reason, these are the highly interdisciplinary field that involves a multitude of subjects, ranging from the pure sciences such as Chemistry, Biology, Physics to medical studies such as Anatomy and Physiology to engineering and technology.

One of the most significant achievements in the development of fields were the discovery of neuroplasticity, the ability of the brain to rewire itself by forming new neural connections throughout life. Hormones confer neuroplasticity during life stage transformations in males and females. Before the discovery of neuroplasticity, scientists were under the assumption that once the brain reaches a certain age, it ceases to develop (or rewire) new neural connections. However, a series of experiments by a team of renowned scientists proved that the brain rewires itself by forming new neural connections and neural pathways in response to injury and changes in the environment. Hence the neuroplasticity allows brain to adapt and change. Also, the ability to enhance our existing cognitive capabilities.

Thus, this webinar booklet is a nice compilation of piece of efforts put forward by students and delegates with experiment-based knowledge of stress inducers in the environment, their biochemical, physiological and behavioral mechanisms to resolve stress mechanisms and its integration to the cells and biomolecules.

Dr. Deepali Jat

Neuroscience Research Lab.

Zoology Department

Dr. Rashmi Srivastava

Endocrinology Research Lab.

Zoology Department

MANAGEMENT AND SUPPORT

CONVENER

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ORGANIZING SECRETARIES

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Dr. Rashmi Srivastava (Avian Endocrinology and physiology Lab., Zoology Dept.)

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International webinar on
"Neuronal and Hormonal Interventions in Stress integrated Behaviour"
November 29-30, 2021
Webinar Schedule

Organising Secretaries: Dr. Deepali Jat, and Dr. Rashmi Srivastava, Dept. of Zoology.

S.No.	Chairman and Reporter	Speaker and Title of the talk	Time
1.	Inaugural Session	Introduction of the Webinar: **Prof. Subodh Jain, HoD, Zoology Convener**	10.30-10.35 AM
		Inaugural speech of the Chief Guest: **Prof. Neelima Gupta** **Hon'ble Vice Chancellor** Dr. Harisingh Gour Vishwavidyalaya, Sagar	10.35-10.50 AM
2.	Session 1. Chairperson: Prof. Janak D. Ahi Rapporteur: Dr. Rajkumar Koiri	**Key Note Speaker:** **Prof. U.C.Srivastava, FNASc.** Allahabad University, Prayagraj **"Management of Stress"**	10.-50-11.50 AM
		Invited Speaker: **Prof. Dora Zelena,** University of Pec's, Hungary **"Does eating sweets help us to deal with stress?**	11.50 AM - 12.30 PM
3.	Session 2 Chairman: Prof. D.K.Gupta Rapporteur: Dr. Rashmi Srivastava	**Invited Speaker:** **Dr. Kiran Maheshwari,** Medical Officer, Dr. H.S.Gour University, Sagar **"Neuronal and Hormonal Intervention in Stress Integrated Behaviour among Students"**	12.30 PM-01.00 PM
4.		Vote of Thanks: **Dr. Deepali Jat**	01.00-01.05 PM
5.		LUNCH BREAK	01.05-02.00 PM
6.	Session 3: Chairman: Dr. Malvika Sikdar Rapporteur: Dr. Divya Rawat	**Research Paper Presentation**	2.00 – 4.00 PM

Webinar Schedule: November 30, 2021

S.No.	Chairman and Reporteur	Speaker and Title of the talk	Time
1.		**Program Information:** Prof. Subodh Jain	8.50-9.00 AM
2.	Session 4: Chairperson: Prof. Versha Sharma Rapporteur: Dr. Deepali Jat	**Key Note Speaker:** **Dr. R. Vetrivelan,** BIDMC, Harvard Medical School, Boston, USA **"Sleep-Wake Behavior"**	9.00-9.45 AM
		Invited Speaker: **Prof. Ishan Patro,** Jiwaji University, Gwalior **"Early life adversities, brain and behaviour"**	9.45-10.15 AM
3.	Session 5: Chairperson: Prof. Shweta Yadav Rapporteur: Swati Jain	**Invited Speaker:** **Prof. Suman Jain,** AIIMS, New Delhi **"Role of sucrose ingestion and magnetic field exposure on noxious stressful stimuli"**	10.-15-10.45 AM
		Invited Speaker: **Dr. Rakesh Sengupta** SR University, Warrangal, Telangana **"Relationship of neural plasticity with stress regulation and coping"**	10.45-11.15 AM
4.		Vote of Thanks: **Dr. Rashmi Srivastava**	11.15-11.20 AM
5.		Tea Break	11.20 – 11.30 AM
6.	Session 6: Chairperson: Dr. Siddharth Mishra, CSJM University, Kanpur Rapporteur: Dr. Payal Mahobia	**Research Paper Presentation**	11.30 AM-01.30 PM
7.		Valedictory Program: **Dr. Rashmi Srivastava**	01.30 PM-01.40 PM
8.		Vote of Thanks: **Dr. Deepali Jat**	01.40 PM-0 1.45 PM
9.		National Anthem	01.45 PM - 01.50 PM

Technical Support Team: Dr. Divya Rawat (Guest Faculty), Dr. Juli Jain, Neelam Sharma, Vinodinee Dubey, Shashank Shakyawal (Research Scholars).

Webinar Support: Swati Jain, Zaved Ahmad, Abhishek Jain, Samrendra Singh, Debabrata Das.

29.11.2012	**30.11.2012**
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2. **Debashree Mazumdar** Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur-495009, India. Biochemical alterations in brain tissue of NA-STZ induced type 2 diabetic rat	8. **Manish K. Tripathi** Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, Chhattisgarh, IndIA Pesticide mediated immunotoxicity in snakehead fish, Channa punctatus
3. **Deepti Tomar** Govt. Degree College, Nainpur (M. P.) Effect of Lantana camara essential oils on Epilachna varivestis	**9. Narendra Namdev** DHSGSU, SAGAR Cypermethrin induced thyroid dysfunction and their amelioration by Ashwagandha and Quercetin: A haematological study
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5. **Gayatri Rai** DHSGSU, SAGAR Curative effect of Curcumin against the alteration in the Estrous Cycle via UVB Induced Hyperthyroidism of Female Wistar Rat	11. **Swati Singh Thakur** DHSGSU, SAGAR Arsenic Trioxide Induced Neurodegeneration in Zebrafish Brain (*Danio rerio*)
6**. Manisha** DHSGSU, SAGAR Therapeutic effects of vitamin-B12 against chronic exposure of alcohol in cerebellum of adult zebrafish	12**. Kalpana Baghel** DHSGSU, SAGAR Interaction of Stress with Estradiol Benzoate on hypothalamic-pituitary-gonadal (HPG)-axis arbitrated by estrogen receptor alpha (ERα) and antioxidants system in immature male Gallus gallus domesticus

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Biochemistry & Molecular Biology Lab, Department of Zoology, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur-495009, India

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Effect of 2.45GHz MW radiation on male reproductive health of immature Gallus gallus domesticus arbitrated by ER-α and possible involvement of antioxidant system

Vaibhav Gupta and Rashmi Srivastava

Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, M.P

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Interaction of Stress with Estradiol Benzoate on hypothalamic-pituitary-gonadal (HPG)-axis arbitrated by estrogen receptor alpha (ERα) and antioxidants system in immature male Gallus gallus domesticus

Kalpana Baghel and Rashmi Srivastava

Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, M.P

kalpanabaghel107@gmail.com

Abstract

Estrogen has crucial role in the regulation of neuroendocrine system as well as in controlling reproductive behavior in both male and female. However, if exogenous estrogen is not in a balanced quantity, it causes a harmful effect on the male reproductive system and produces feminized characters. Besides damaging the reproductive system, exogenous estrogen causes stress in vertebrates including birds. Stress prominently affects the reproductive activity of animals. Water and food restriction act as potential stressors and have negative effect on reproductive performance of animals. To illuminate the mechanism by which estrogen modulates its receptor alpha (ERα) in hypothalamic-pituitary-gonadal (HPG) axis in immature male chickens during stress the study has been undertaken. The experiment was designed to examine the effect of ecological stressors like water and food restriction on male reproductive physiology mediated by ERα. To acquire this, immature male chickens were randomly assigned into six groups (n=6). First group served as control (C) in which 0.9% saline was administered for 12 days, food and water were provided ad libitum. The second group was administered with Estradiol Benzoate (EB) (Sigma-Aldrich) at a dose of (0.5 mg/100g body weight/day) intraperitoneally for 12 days continuously. The third group was water restricted (WR) for 9 hours/day from sixth day till the last day of experiment. But the fourth group was treated with EB followed by water restriction (EB+WR) of 9 hrs/day from sixth day till last day of experiment. The fifth group was food restricted (FR) for 9 hours/day from sixth day till the last day of experiment. The sixth group was treated with EB followed by food restriction (EB+FR) of 9 hrs/day from sixth day till last day of experiment. Immunofluorescent localization of ERα was chiefly reduced in the pre-optic area of hypothalamus, anterior pituitary gland and testes after WR and FR but increased after EB administration. EB+FR and EB+WR reflects a diminishing pattern in the increment after EB. FR and WR decreased plasma estradiol whereas EB augmented it. Plasma corticosterone, hydrogen peroxide, malondialdehyde increased and anti-oxidant enzymes decreased in brain and testis of all groups compared to control group reflecting oxidative stress. These findings validate the impact of estradiol benzoate administration in male chicks generates stress which further disrupts the normal reproductive physiology modulated by the expression of ERα in HPG- axis.

Keywords:

Stress, Estradiol Benzoate, Estrogen receptor alpha, Hypothalamus and Antioxidants system

Biochemical evaluation of Coenzyme Q10 on Microcystin-LR induced cardiotoxicity

Roshni Rajpoot, Raj Kumar Koiri

Biochemistry Laboratory, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar - 470003, Madhya Pradesh, India. Email: rajpootroshni03@gmail.com

Abstract

Cyanobacterial blooms are hazardous for humans, animals and other aquatic organisms due to the production of toxic secondary metabolites known as microcystins which is a cyclic heptapeptide. Studies have suggested that besides liver, the heart may be another target organ of Microcystin-LR (MC-LR) intoxication. Coenzyme Q10 (CoQ10) is an important vitamin-like substance that has been reported to be important for proper functioning of many organs and biochemical reactions in a living system. Recent reports have indicated that CoQ10 supplementation may have a positive effect in various pathophysiology. The present study was undertaken to investigate the biochemical mechanism of MC-LR induced cardiotoxicity and evaluate the therapeutic efficacy of CoQ10. The biochemical experiments were performed with heart tissue obtained from animals (normal, MC-LR and MC-LR+CoQ10) treated for two weeks. In the current study, CoQ10 normalized various antioxidant parameters in heart that were altered due to MC-LR-induced toxicity. Thus, the results suggest that coenzyme Q10 has the potential to be developed as preventive therapeutic agent against Microcystin-LR induced toxicity. Suggesting that this drug has the potential to alleviate MC-LR induced cardiotoxicity in mammalian systems.

Keywords: Microcystin, Microcystin-LR, CoenzymeQ10, Antioxidant, Oxidative stress, Cardiotoxicity

Therapeutic role of Andrographis paniculata in modulation of oxidative and nitrosative stress in different organs of rats with acute liver failure

Dusmanta Podh and Santosh Singh

Biochemistry and Molecular Biology Lab, Department of Zoology, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, 495009.

Abstract

Liver failure or hepatic insufficiency is the inability of the liver to perform its normal synthetic and metabolic function during normal physiology. It may be caused due to oxidative stress induced by variety of agents like, alcohols, drugs, viral infections, and environmental factors. Acute liver failure (ALF) is a rare condition which occurs rapidly (in as little as 48 hours) and can be difficult to detect initially. It can be defined as the rapid development of hepatocellular dysfunction, specifically coagulopathy and mental status changes (Hepatic encephalopathy) in a patient without known prior liver disease. Despite having major progress in the liver disease management during the past 30 years, millions of people worldwide still suffer from an acute liver condition. Andrographis paniculata (Kalmegh) is an herbaceous plant of family Acanthaceae. In India, China, Malaysia, and Thailand, this plant has been widely used for treating sore throat, flu, and upper respiratory tract infections. The bio-active component Andrographolide has wide range of biological functions including anti-inflammatory, antiallergic, anticancer, and hepatoprotective functions. The aim of the present investigation is to find out whether Kalmegh ameliorate the oxidative and nitrosative stress during ALF in different organ. Study was carried out in male albino rats with ALF induced by thioacetamide (TAA). The result of our experiment shows that A. paniculata has significant effect on the antioxidant enzymes like SOD, and catalase in the liver, spleen, and testis, where it significantly increases the activity of antioxidant enzymes to counteract the oxidative damage caused by free radicals. Whereas the GR assay shows no significant changes in liver tissue but have significant changes in spleen and testis. Our data also reveals that A. paniculata reduces NO and MDA level in liver, spleen and testis. So therefore, it is suggested that the andrographolide may be used as therapeutic drug and used for treatment of liver diseases.

Keywords:

Acute liver failure, Oxidative stress, Nitrosative stress, Andrographis paniculata, Hepatic encephalopathy

Pesticide mediated immunotoxicity in snakehead fish, Channa punctatus

Manish Kumar Tripathi

Department of Zoology, School of Studies in Life Sciences, Guru Ghasidas Vishwavidyalaya

(A Central University), Bilaspur, Chhattisgarh, India

Email - manish10.t@ggu.ac.in

Abstract

Organophosphate insecticides such as triazophos suppress the acetylcholinesterase enzyme and causes death of insects. Residual pesticides reach to the aquatic bodies through run off and adversely affect the aquatic fauna. Effect of the pesticides on immune responses has rarely been investigated in fishes. The present study aimed to analyze the immunotoxic role of pesticide to the leucocytes in Channa punctatus. After exposure to pesticides, leucocyte phagocytosis, superoxide production, nitrite release, and lymphocyte proliferation were assessed. Dose-dependent suppression of various immune responses was observed. Superoxide production and nitrite release were reduced in cultures incubated with triazophos. Phagocytosis and proliferation of lymphocytes were also inhibited. Triazophos directly affect the immune cells and suppresses immune responses of these cells. The pollution of water bodies has become a major threat in recent years. Pesticides affect the non-target organisms like fishes and lead to heavy mortality by weakening immune responses. These investigations are helpful in understanding the immunotoxicity in fish. Substantially more researches are required to help design the measures to combat ecotoxicity in freshwater bodies.

Keywords: Pesticide; Immunotoxicity; immune cells; Lymphocyte proliferation; Fish

Regular exercise and physical activities help protect postmenopausal osteoporosis

Zaffar Azam, Versha Sharma*

Osteoimmunology lab, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P.)-470003, India

*sharma.versha77@gmail.com

Introduction: In postmenopausal women severe bone loss is noticed during and after menopause. All the remedies including Selective estrogen receptor modulators (SERMs), calcium supplementation with vitamin D3, Hormone replacement therapy (HRT) with estrogen, parathyroid hormone and growth hormone involves entail severe side effects like breast, ovarian and endometrial cancer. This also involves the huge social and economic load worldwide. Hence alternative methods like regular exercise and physical activities may prove effective in maximizing and maintaining the peak bone mass and maintaining bone loss in elderly females with postmenopausal conditions.

Aims and Objective: The aim of the present study is to summarize the current evidences in maintain and preventing the bone mass and bone loss respectively in postmenopausal elderly women with higher risk of bone associated fractures.

Materials and Methods: The systemic reviews and meta-analysis was taken into consideration. Also, to summarize the evidences for the effect of physical activities and exercises interventions in postmenopausal elderly women various search engines viz., PubMed, EMBASE, Google scholar, Cochrane library databases were considered. The search terms include the post-menopause, bone health, bone loss, physical exercise and females etc.

Results: The results obtained from various search items and engines suggested that remarkable osteoprotective effects are seen in the postmenopausal elderly women having routine regular exercise and physical activities. Results from various other studies also indicated it as the best choice in maintain and improving the bone health.

Conclusion: Taken together our results established the fact that regular exercise and physical activities help protect bone loss and maintain bone health in postmenopausal elderly women.

Key words: Post-menopause, Bone health, Bone loss, Exercise, Females

Therapeutic effects of vitamin-B12 against oxidative stress and anxiety induced by chronic exposure of alcohol in cerebellum of adult zebrafish.

Manisha1*, Raveena Rai, Deepali Jat1

*1Neuroscience Research Laboratory, Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh 470003, India

Abstract

Alcohol is a known depressant, which, on reaching the brain, slows down the body's integrated response, mainly breathing, leading to a lack of oxygen supply to the brain which causes deleterious effects such as physiological and neuronal alterations leading to behavioral impairments. Vitamin B12 is essential for optimal growth and health of cells. Vitamin B12 deficiency in human induced deregulation in growth, megaloblastic anemia and abnormal behaviors. Present study investigated the therapeutic potential of vitamin-B12 in alcohol-induced alteration in zebrafish's cerebellum of brain. In present study, our hypothesis that the 120 min exposure to the 0.40% alcohol would impact on group or locomotion behavior as in swimming behavior test and individual behaviors in thigmotaxis and novel tank test with some oxidative stress parameters and antioxidant activity on adult zebrafish. Exposures comprised measured concentration of 0.40% alcohol and co-treated with 5mg/kg-food vit-B12 as supplement. In our results, we found that in swimming behavior, alcohol-treated zebrafish appeared more clustered with less travelled distance between each of its nearest neighboring fish and also occupying less area of the test tank. The control group of zebrafish swim freely and near the wall of the tank but the alcohol-treated zebrafish was more clustered with less active and more appeared in the middle zone of thigmotaxis test tank. In the novel tank test, the zebrafish of control group demonstrated a free and unison swimming pattern in both the top and bottom zone. However, the alcohol-treated zebrafish was more clustered with less travelled distance and more presence of fish in the bottom zone of the novel tank but co-treatment of vitamin-B12 along with alcohol improved the swimming pattern and anxiety behavior of zebrafish. A significant increase in lipid peroxidation, nitric oxide and decreased activity of AChE, reduced glutathione, superoxide dismutase and catalase were observed in alcohol-treated zebrafish while co-treatment of vitamin-B12 with alcohol significantly increased AChE activity and protected against oxidative stress. Alcohol exposed zebrafish showed degenerations in purkinje cells while co-treatment of vitamin-B12 with alcohol recovered against alcohol-induced cellular damage in cerebellum. These result show that the vitamin-B12 showed protective effects against chronic alcohol induced cerebellar degeneration in adult zebrafish.

Key words: Alcohol, Vitamin-B12; Cerebellum; Oxidative stress; Behavioral alterations; Purkinje cells.

Cypermethrin induced thyroid dysfunction and their amelioration by Ashwagandha and Quercetin: A haematological study

Narendra Namdev1, Payal Mahobiya2

1,2 Endocrinology Lab, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya Sagar (M.P.), India 470003

narendra.nnamdev95@gmail.com

Abstract

Thyroid hormones play an important role in haematopoiesis and the blood disorders are frequently seen in thyroid patients. The present study designed to investigate the effect of cypermethrin on thyroid hormone disturbance and their alteration on haematological parameters with amelioration by antioxidants ashwagandha and quercetin in mice.

Mice were divided into four groups control, cypermethrin treated, cypermethrin and ashwagandha treated, cypermethrin and quercetin treated. The body weight and thyroid gland weight was taken. Blood was collected by direct cardiac puncture. Thyroid hormone was measured using ELISA and haematological parameters were analysed by haematocytometer.

The increased body and decreased thyroid gland weight in cypermethrin treated group as compared to control and decreased body and increased thyroid gland weight in ashwagandha and quercetin administered groups as compared to cypermethrin treated group. The serum T3 and T4 concentration was decreased and TSH increased in cypermethrin treated group and increased T3 and T4, and TSH decreased in ashwagandha and quercetin administered groups significantly. The hemoglobin percentage and total erythrocytes count was decreased in cypermethrin treated groups and increased in ashwagandha and quercetin treated groups significantly. The total and differential leukocyte counts were increased in cypermethrin treated group and showed significant decreased in ashwagandha and quercetin supplemented groups.

Increased body and decreased thyroid gland weight indicate induced stress. The decreased serum T3 and T4 and increased TSH concentration after cypermethrin intoxication resulting in hypothyroidism. In hypothyroidism are the hemoglobin percentage, total erythrocyte counts, total and differential leukocyte count are affected mostly. Thyroid hormones directly affect blood parameters by stimulating the precursors of erythrocyte and indirectly by increasing erythropoietin production. The decreased hemoglobin and total erythrocyte count indicated bone marrow suppression and increased total and differential leukocyte count indicated the immune system at alarm.

Keywords: Cypermethrin, Ashwagandha, Quercetin, Thyroid gland, Haematology.

Arsenic Trioxide Induced Neurodegeneration in Zebrafish Brain (Danio rerio)

Swati Singh Thakur, Subodh Kumar Jain

Department of Biotechnology, Dr Harisingh Gour University

Sagar, Madhya Pradesh 470003, India

swatibiotechresearch@gmail.com

Arsenic trioxide is an eminent environmental contaminant that causes pernicious effects on animal health. Despite increasing research in the traditional manner, information about the arsenic induces neurodegeneration in aquatic animals is still scarce. In this context, we aimed to examine the effects of environmentally relevant concentrations of arsenic on the zebrafish brain by using a series of biochemical, morphological, and molecular analyses.

Zebrafish were exposed to 50 and 500 ppb arsenic trioxide during the adult stage for 90 days. The neurodegenerative effect was assessed via FluroJade-C staining a neuronal death marker. In order to elucidate the underlying molecular mechanisms of arsenic-induced neurodegeneration, various other markers were also assessed such as lipid peroxidation (MDA) was examined by biochemical assay, activation of 8-OHdG (a marker of DNA damage) was evaluate by immunofluorescence assay. Additionally, the gene expression levels of MnSoD, Catalase, and Bdnf were measured using qRT-PCR and Morpho structural change via histopathological analysis.

At the end of the exposure period, arsenic administration was determined to cause a significant increase in FlouroJade-C positive cells, level of lipid peroxidation was also increased, strong signs of immunofluorescence reaction for 8-OHdG were detected in zebrafish brain after both high and low levels of exposure to arsenic trioxide. Furthermore, we found that arsenic trioxide exposure significantly increases the expressions of catalase in 50ppb and 500ppb treated groups, but in the case of MnSOD and bdnf expression, a biphasic response was observed.

We observed histopathological degeneration in the optic tectum of zebrafish brain after high-level exposure while there were minor changes observed in the other treatment group. Based on the presented results, we conclude environmental exposure levels of arsenic trioxide can cause histopathological alteration, induce neuronal oxidative stress, neuronal DNA damage and resultant in neurodegeneration in the zebrafish brain. Therefore, we can propose that arsenic trioxide is highly neurotoxic to fish, specifically to the optic tectum region in the brain where neurodegeneration was found. Possibly arsenic trioxide exposure influences the visual, sensorimotor function, and Scototaxis behavior of fish.

Key Words: Arsenic trioxide, FlouroJade-C, Neurodegeneration, 8-OHdG, zebrafish

A compendium study on hippocampal and cortex regions of brain in terms of Alzheimer's disease

Ravina Rai, Whidul Hasan and Deepali Jat1

*1Neuroscience Research Laboratory, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh 470003, India

Abstract

Over the several decades, globally researchers are working towards neurodegenerative diseases and improving clinical treatment for better adaptability and tolerance in term of neurodegeneration. Before several decades to recent time, all over the world suffering from dementia and this is increasing day by day. According to recent research of world health organization (WHO) around 50 million people have dementia, which have 10 million new cases every year worldwide. Alzheimer's disease (AD) is the most common form of neurodegeneration and may contribute to 60–70% of cases which is financially draining disease to the society. Learning memory neurobehaviors such as Morris water test, novel objective recognition, T-Maze, Y-maze and elevated plus maze, histopathological alterations like immunohistochemistry, western blotting, RT-PCR and DNA damage assays for tau and beta amyloid aggregation and gene profiling expression study are the methods adapted for this investigation. AD affects some specific areas of brain include cortex (frontal and parietal) and hippocampus which are directly associated with neurobehavioral and neuropathological hallmarks together with severe cognitive deficits, and short-term memory (STM). Most promising clinical sign of AD are deterioration in memory, thinking, behavior and the ability to perform everyday activities. There are many causes for neurodegeneration disease included neurofibrillary tangles, aggregations of tau protein and Aβ plaques are the product of β and γ secretase activities which is formed inside and outside the neuron cells and influences in oxidative stress and antioxidant level. We have a lot exploration towards neurodegeneration but still cure is not permanent. Finally, we have obtained bulk data from the specific region of brain such as hippocampus, frontal cortex, parietal cortex and hypothalamus using AD cases and controls as well.

Key words: Oxidative stress; Behavioral alterations; neurodegenerative diseases; Morris water test

Effect of Lantana camara essential oils on Epilachna varivestis

Deepti Tomar

Assistant Professor, Department of Zoology, Govt. Degree College, Nainpur (M. P.) 9479949607, diptitomar24@gmail.com

ABSTRACT

Epilachna varivestis (Mexican bean beetle) is a serious, injurious, destructive, major, notorious, agricultural pest. They damage up to 80 % of plants. Yield losses of greater than 50 percent have been reported by several. Considerable measures have been implemented at screening plants so as to develop new bio-insecticides as alternative option to the chemical's insecticides. The insecticidal properties of plant extracts can be further developed as ecofriendly bio-pesticides of the future. So, present investigation has been taken to study the effect of essential oils extracted from Lantana camara to control the progeny of Epilachna varivestis. So, to evaluate the testicular and ovarian malfunctioning (hormonal behavior), viability, fecundity and various aspects of reproductive performance of these experimental insect pests were done. Experiments were performed with different concentrations of essential oils of Lantana camara plant parts and the values of LC100, LC50, LC0 and sub lethal concentration were detected out for each group separately and data was summarized. Three replicates of at least four concentrations causing 0-100 % mortality was tested with each plant essential oil concentration. In the present investigation the experimental findings proved the efficacy of Lantana camara leaf, flower and fruit essential oils in controlling the insect population while control groups showed the high viability rate in adult male and adult female stages of Epilachna varivestis. In the present investigation toxicity levels of essential oils is as follows: Lantana camara fruit > Lantana camara leaf > Lantana camara flower. This particular intoxication caused stress in experimental pests as was seen in behavior of insect pests. Most of the research work has been done on the reproductive physiology of pest insects after treatment with toxicants e.g. Synthetic pesticides but these synthetic pesticides are non-biodegradable, persistent type and their residues accumulated in food chains, so they are hazardous to non-target animals also while insecticides of plants origin are biodegradable, non-persistent, not accumulated in food chain and non-toxic to higher animals but they are more effective to control the insect pests by altering their reproductive physiology hence decline the fertility of test insect pests.

Key Words: Epilachna varivestis, Lantana camara, Essential oil.

Alteration in Renal Tissue of Hyperthyroidism in female Wistar Rat Induced by UVB Radiation

Shashank Shakyawal1, Gayatri Rai2, Payal Mahobiya3

1, 2, 3Endocrinology Lab, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya

(A Central University),

Sagar, Madhya Pradesh, 470003, India.

1Email: shakyawal.shashank.shashank22@gmail.com

Abstract

In today's changing global scenario, radiation is considered the most potent cause of oxidative stress-mediated by free radical flux which induces severe damage at various hierarchical levels in the living organisms. These radiations emit and transmitted by different sources which are absorbed by the animal body. UV radiations are present in sunlight and have that much energy by which it can easily penetrate body cells and causes alteration in chemical and biological activities. The thyroid gland is an endocrine gland present in the neck consisting of two connected lobes. The thyroid gland secretes triiodothyronine (T3), thyroxine (T4) and calcitonin hormones. The kidney is among the more radiosensitive late responding critical organs. Irradiation of both kidneys to a modest dose has resulted in nephropathy with arterial hypertension and anemia and the radiation damage develops slowly and may not become evident for months. This study was investigated to analyze the effect caused in renal tissue by exposing UVB radiation that induced hyperthyroidism on female Wistar rat.

Rats were randomly divided in two groups with 6 rats in each group. The body weight of rat was taken at interval of 0, 5, 10, 15 days, thyroid and kidney weight were taken after exsanguinations. Blood was collects by direct cardiac puncture. Thyroid hormones were measured by ELISA and thyroid and renal tissue analysis was done by H&E staining.

UVB radiations make significant alteration in body weight and organ weight in diseased group as compared to control group. Thyroid hormonal alteration was seen i.e., T3 and T4 concentration level increased and TSH level decreased that cause hyperthyroidism in rat. The disruption of glomerular and tubular structure was seen in renal tissue along with the alteration in follicular cells in thyroid gland of diseased group.

Key words: UVB Radiation, Hyperthyroidism, Kidney, Wistar rat, Toxicant

Biochemical alterations in brain tissue of NA-STZ induced type 2 diabetic rat

Debashree Mazumdar2 and Santosh Singh1

Biochemistry & Molecular Biology Lab, Department of Zoology, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur-495009, India. 1santoshbhu@gmail.com Mob. no: +91-9406296914. 2debashree21m@gmail.com Mob. no: +91-9938110806

Abstract:

Introduction: Diabetes mellitus (DM) is a chronic hyperglycaemic condition represented by a set of complex and systemic metabolic disorders. It is one of the most spread non-communicable diseases of any population. Studies have described the underlying mechanism to be oxidative/nitrosative stress for various diabetes related complications affecting kidney, retina and peripheral nervous system described well as diabetic nephropathy, diabetic retinopathy, and diabetic peripheral neuropathy, respectively. But the possible pathophysiological mechanism by which it affects the central nervous system (CNS) directly or indirectly needs to be defined more clearly. CNS impairment caused by this prolonged diabetic condition in case of type 2 diabetes mellitus (T2DM) involves decline in cognitive and motor function and is known as diabetic encephalopathy (DE). The brain constitutes abundant lipid content, delicate antioxidant capacity and elevated energy demand, becoming a target of oxidative stress induced damage.

Materials and method: The present study was aimed to study that whether T2DM induce the oxidative stress in rat brain. For understanding this, NA (nicotinamide)-STZ (streptozotocin) induced rat model of T2DM is used. For this we have administered STZ intraperitoneally 30 minutes after giving an intra-peritoneal injection of NA.

Result: We have noticed augmented level of oxidative stress markers like lipid peroxidation (LPO) and reduced glutathione (GSH) coincided with decreased antioxidant enzymes activities (superoxide dismutase (SOD) and catalase (CAT)) were observed in brain of T2DM rats. This suggests that T2DM in rat may induce oxidative stress in brain and hence involve in the pathogenesis of DE.

Discussion and further direction: From the observed results we can infer that T2DM induced by STAZ-NA induced oxidative stress in the whole brain of rat by decreasing the antioxidant enzymes activities. Hence, may involve in the pathogenesis of DE.

Key Words: Type 2 diabetes mellitus, nicotinamide, streptozotocin, Diabetic Encephalopathy, Oxidative stress, Antioxidant enzymes.

Ameliorative effects of quercetin against rotenone - induced anxiety and stress in mice

Juli Jain1*, Deepali Jat1

*1Neuroscience Research Laboratory, Department of Zoology,

Dr. Harisingh Gour Vishwavidyalaya (A Central University), Sagar, Madhya Pradesh 470003, India

Today's environment continuously exposed to various types of toxic agents like heavy metals and pesticides, these harms to people who contacted with them. This exposure leads to the development of numerous kinds of neurodegenerative and psychiatric symptoms such as stress, anxiety depression and fear. Rotenone is the organic pesticide and well-known inhibitor of complex I of electron transport chain extensively used to develop Parkinson's disease model. The present study was designed to explore the effect of rotenone on neuroinflammation and its deleterious effect on behavior of mice. Together with this we also investigated the protective efficacy of quercetin against rotenone – induced neurotoxicity. Quercetin is a plant flavonoid that is amply present in vegetables and fruits and has been displayed numerous forms of biological activity comprising antioxidant and anti-inflammatory properties. The finding of the study clearly indicated that rotenone 5 mg / kg body weight for 60 days through oral gavage leads to release of inflammatory markers in blood serum like IL- 6, astrocytes activation in substantia nigra and hippocampus and subsequent decreased density of dopaminergic fibres in striatum. Rotenone also altered the memory of the mice as indicated by decreased spontaneous alteration in Y-maze test and T-maze test and reduction in exploration time in Novel object recognition test, increased immobility time in Force Swim Test and reduced muscular strength. Co-treatment of quercetin 30 mg/kg/day through oral gavage for 60 days along with rotenone significantly reversed all these adverse effects, suggesting that quercetin have capability to reduced neuroinflammation and improved memory, cognitive function and reduction in anxiety and depression. Briefly, our results exhibit that natural flavonoid like quercetin can be beneficial against pesticide induced various neurological disorders and subsequent behaviour alteration. This study may contribute in the development of therapeutic approach using plant-based flavonoid such as quercetin against neurodegenerative disorders and reduction psychiatric symptoms induced by environmental factors.

Key words: Organic pesticide, neurotoxicity, natural flavonoid, T-maze test.

Effect of multi-kinase inhibitor sorafenib alone and in combination with phosphodiesterase -5 inhibitors on aflatoxin B1 induced hepatocellular carcinoma

Vinodinee Dubey, Raj Kumar Koiri

Biochemistry Laboratory, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, India. Email: vinodineedubey2612@gmail.com

Hepatocellular carcinoma (HCC) is one of the most common liver diseases and the sixth most common cause of cancer and the third leading cause of cancer related death worldwide. The presence of aflatoxin B1 (AFB1) has become an important factor in identifying the genesis of HCC. AFB1 is a genotoxic hepatocarcinogen known to cause cancer by inducing DNA adducts leading to genetic changes in target liver cells. AFB1 is metabolized by cytochrome-P450 enzymes to the reactive intermediate AFB1-8,9-epoxide which binds to liver cell DNA, resulting in DNA adducts. DNA adducts interact with the guanine bases of liver cell DNA and cause a mutational effect in the P53 tumour suppressor gene at the codon 249 hotspot in exon 7, which may lead to HCC. HCC is one of the most frequent human cancers with highest frequencies in areas with hepatitis B virus and hepatitis C virus infections and in regions where food contaminated with AFB1 is consumed. Multi-kinase inhibitor sorafenib is the standard treatment in advanced HCC and preliminary data has demonstrated that sorafenib is active and well tolerated in advanced HCC patients. However, hypoxic cells in tumour limit the diffusion of these drugs to the tumour core resulting into drug resistance. In such scenario, combination therapy of phosphodiesterase-5 inhibitors (PDE-5 inhibitors) with sorafenib could be a relevant strategy wherein PDE-5 inhibitors led efficient delivery of these drugs into the hypoxic drug resistant tumor core may sensitize the tumor cell leading to the induction of apoptosis. In the present investigation effect of multi-kinase inhibitor sorafenib alone and in combination with PDE-5 inhibitors was evaluated on aflatoxin B1 induced HCC. Results suggest that PDE-5 inhibitors were effective in regressing HCC in synergy with multi-kinase inhibitor sorafenib.

Key words: aflatoxin B1, hepatocellular carcinoma, multi-kinase inhibitor, PDE-5 inhibitors

Modulation of antioxidant enzymes and activation of RNA-dependent protein kinase during development of hepatocellular carcinoma

Nidhi Gupta, Raj Kumar Koiri

Biochemistry Laboratory, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya,

Sagar, India. Email: nidhigupta3101@gmail.com

Abstract

Hepatocellular carcinoma (HCC) is one of the most common malignancies worldwide, for which the prognosis remains poor, particularly for those with advanced disease. Oxidative stress is associated with cancer and has a dual role in disease development due to concentration dependent effects of reactive oxygen species (ROS) on cellular processes. ROS levels are associated with oncogenic effects because of their ability to cause damage to biological macromolecules, such as DNA, lipids, and proteins. To counteract these adverse effects, cellular antioxidant defence system plays a major role and includes a series of antioxidant enzymes that maintain homeostasis by neutralizing ROS. RNA-dependent protein kinase (PERK) is a type I endoplasmic reticulum (ER) transmembrane protein containing a stress-sensing luminal domain and a cytosolic kinase domain. Under normal conditions, the ER chaperone GRP78 associates with the luminal domain, thus inhibiting its activation. During stress condition, PERK is activated and phosphorylates the eukaryotic initiation factor 2α (eIF2α). Phosphorylation of eIF2α hinders various downstream effectors & modulate cellular survival pathways which increases upon ER stress. The present study evaluated the status of antioxidant enzymes and PERK during the development and progression of aflatoxin B1 induced HCC. Results from the present investigation suggest that during the development and progression of HCC, level of antioxidant enzymes were altered and PERK is activated.

Key words: aflatoxins, hepatocellular carcinoma, RNA-dependent protein kinase, antioxidant enzymes

Curative effect of Curcumin against the alteration in the Estrous Cycle via UVB Induced Hyperthyroidism of Female Wistar Rat

Gayatri Rai1, Payal Mahobiya2*

1, 2* Endocrinology lab, Department of Zoology, Dr Harisingh Gour Vishwavidyalaya, Sagar (M.P.), 470001, India.

phd008gayatri@gmail.com

Abstract

UVB radiation is the electromagnetic and non-ionizing radiation. It is harmful radiation generate free radical and caused oxidative stress and showed thyroid dysfunction. In present study, curative effects of curcumin against the alteration in the estrous cycle via UVB-induced hyperthyroidism in female Wistar rats.

Twenty-four female Wistar rats' sexually matured older weight 130-150 g and aged 12-16 weeks were arbitrarily divided into four groups. The first group consider as a control group, which received normal food and water ad libitum. The second UVB group was exposed to a dose of 280 nm of UVB radiation for 2 h daily. The third UVB+Cur group received a dose of 280 nm of UVB radiation for 2 h daily and also an oral dose of curcumin (25 mg/kg body weight) daily. The fourth positive curcumin groups (25 mg/kg body weight). All the treatments last for 15 consecutive days. All hormones measured by ELISA.

UVB caused oxidative stress generate hyperthyroidism condition and its results the net body weight gains significantly decreased (**$p<0.01$) in female wistar rat and the level of T3 and T4 hormones significantly increased (**$p<0.01$) and the level of TSH significantly decreased (***$p<0.001$). UVB induced hyperthyroidism showed effect on estrous cycle and structural alteration of the Estrous phases in the female Wistar rat as compared to the control group. Curcumin showed the antioxidant effect and prevent the estrous cycle and their phases.

Keywords: Curcumin, Hyperthyroidism, Estrous cycle, Wistar rat.

The Modulatory effect of Chaga Mushroom against diethyl nitrosamine and Carbon tetrachloride instigated Hepatocellular Carcinoma in Mice.

Zaved Ahmad1, Pir Mohammad Ishfaq1, Subodh Kumar Jain1, Siddhartha Kumar Mishra2*

1 Molecular Biology Laboratory, Department of Zoology, School of Biological Sciences, Dr. Harisingh Gour Central University, Sagar- 470003 (M.P.), India

2 Department of Life Sciences, Chhatrapati Shahu Ji Maharaj University, Kanpur- 208024 (U.P.), India

*Corresponding authors: Dr. Siddhartha Kumar Mishra, Department of Life Sciences, Chhatrapati Shahu Ji Maharaj University, Kanpur, India. Email: siddharthakm@yahoo.com; Tel: +91-7582-297134

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Abstract

Hepatocellular carcinoma (HCC) is a major threat to human health that has attracted substantial interest recently. The purpose of this study was to investigate the modulatory effect of chaga mushroom against diethylnitrosamine/ carbon tetrachloride (DEN/CCl4) induced HCC in mice. HCC was induced by a single intraperitoneal injection of DEN (1 mg/kg b.w). Six weeks later, CCl4 (0.2 ml/kg) was intraperitoneally injected (twice a week). Chaga mushroom was administered orally at 200 mg/kg b.w. of mice after the induction of HCC. The results showed that chaga mushroom administration significantly increased body weight, decreased liver weight, and relative liver weight compared to those in the HCC-induced group. Moreover, a significant decrease in serum AST, ALT, ALP activities were observed in chaga administered mice compared with those in HCC-induced mice. Also, the hepatic MDA was significantly decreased; in addition, SOD, CAT, and GPx activities were significantly increased in groups treated with chaga compared with those in the HCC-induced group. The liver histopathology alterations caused by DEN/CCl4 injection were significantly ameliorated by chaga treatment. In conclusion, chaga mushroom has remarkable beneficial effects against diethylnitrosamine/ carbon tetrachloride (DEN/CCl4 induced HCC in mice through its antioxidant, anti-inflammatory, antifibrotic, and antimetastatic properties.

Keywords: Hepatocellular; carcinoma; diethylnitrosamine; carbon tetrachloride; antioxidant; anti-inflammatory; antifibrotic; antimetastatic

Kalium Phosphoricum with lower dilution vicissitudes the level of antioxidant and glycolytic enzymes more effectively than higher dilution remedies

Debabrata Dash, Raj Kumar Koiri

Biochemistry Laboratory, Department of Zoology

Dr. Harisingh Gour Vishwavidyalaya, Sagar - 470003 (M.P.)

Email: dashdebabrata97@gmail.com

ABSTRACT

Tissue salts alternatively known as biochemic salts. According to Schussler who introduced biochemic medicines, biochemic salts should be present in our bodies in a perfect balance, which is prerequisite for complete health and well-being. Deficiency in the requisite amount has been suggested to cause disease and the same can be rectified when the requisite equilibrium is re-established by exogenous administration of the lacking mineral salts in small quantities. Tissue salt are prepared in lactose medium over six attenuations called triturations, the result being an easily absorbable pill that contains a minute amount of a specific mineral salt in a lactose base. Kalium Phosphoricum is one of the twelve biochemic tissue salts and is derived from potassium phosphate. Although it is known to repair brain impairment disorders but still the biochemical mechanism is not clear. In the present investigation, an attempt was made to characterize the molecular basis of its therapeutic action. In the in vitro methodology brain extracts were incubated with different potencies of Kalium Phosphoricum for different time intervals. Result from the present investigation suggests that higher concentration of Kalium Phoshoricum remedies were more effective in modulating the level of antioxidant and glycolytic enzymes.

Keywords: Kalium Phosphoricum, brain, antioxidant enzymes, homeopathic tissue salt.

Metabolomic Analysis of Insect Head

Lekhan Lodhi

Department of Zoology (Insect Immunity Lab), Dr. Harisingh Gour Central University, Sagar 470003, Madhya Pradesh, India

Email id. lekhanlodhi5@gmail.com

Mob. No. 6264766283

Abstract:

The body of the Bombyx mori (silkworm) is divided into the head, thorax, and abdomen. The head is the most complicated and important structure of an insect which performs many biological functions including development, locomotory behaviour, food intake, environmental sensing, and signal transduction are all controlled by the insect's head. Besides these functions as a well-studied Lepidopteran insect, the silkworm head has an additional function of spinning silk fibers. To understand which metabolites are involved in these physiological activities, we performed a metabolomic analysis (NMR) of the larval head of the silkworm. We identified various metabolites including amino acids, sugars, organic acids, fatty acids, etc. The identified metabolites and pathways are involved in biological processes such as carbohydrate metabolism, signal transduction, endocrine activities, and sensory activities; reflecting the functions of various structures in silkworm heads. Thus, our study provides references that elucidate the potential functions of the silkworm head and will be of important value for the metabolomics research of silkworms and other insects.

Keywords: Metabolites, Metabolomics, Silkworm, Insect head

Cypermethrin induced Hormonal alterations in thyroid hormone in mice

Surbhi Chourasiya 1, Narendra Namdev2, Payal Mahobiya3*

1, 2, 3 Endocrinology Lab, Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya Sagar (M.P.), India 470003. Surbhichourasiya03@gmail

Abstract:

Over 120 pesticides have been listed as potential endocrine-disrupting chemicals (EDCs). Cypermethrin is one of them called as Synthetic pyrethroid. Currently, Cypermethrin remain one of the most commonly used pesticides. Synthetic pyrethroid insecticides were introduced into widespread use for the control of insect pests and diseases in edible plants crops. Whereas thyroid is the important gland to regulate the metabolism, thermogenesis, immunity, and thyroid hormones plays important role in the regulation of body. The objective of this study was to investigate the acute exposure of pesticide and alteration in thyroid hormones in mice. Twelve adult healthy mice were used, randomly divided into two groups with six mice per group, control and exposed group. In exposed group, the mice were exposed to 1/10 of LD50 of cypermethrin for 28 days by oral gavage daily, but in control group, the mice leave without exposure of cypermethrin. After the completion of treatment all the animals were sacrificed and blood sample were collected to test the level of thyroid hormones in serum, and effect of hormone alterations on body weight and thyroid weight. The findings suggest that exposure to cypermethrin could alter the hormones level T3, T4, and TSH significantly, along with this shows the significant increase in the body weight and thyroid weight of exposed mice. Whereas all these alterations in thyroid hormone level and in body weight gain reveals the thyroid dysfunction.

Keywords: cypermethrin, thyroid hormones, acute exposure, hypothyroidism, synthetic pyrethroid.

Effect of 2.45GHz MW radiation on male reproductive health of immature Gallus gallus domesticus arbitrated by ER-α and possible involvement of antioxidant system

Vaibhav Gupta and Rashmi Srivastava

Department of Zoology, Dr. Harisingh Gour Vishwavidyalaya, Sagar, M.P

guptavaibhav600@gmail.com

Unparalleled growth in global telecommunication industry has compromised human health to the exposure of microwave radiation (MW) by manifold. The stress in birds is not different from ours. Numerous reports have focused on various aspects of adverse trends in reproductive health by Wi-Fi radiations. The MW radiation acts as a physiological stressor of which 2.45GHz can induce long-term and\or short-term biological alteration in the reproductive system. This experiment was designed to illuminate the effects of MW radiation on estrogen receptor-alpha (ER-α) mediated reproductive performance in immature male chickens. To achieve this, chickens were randomly assigned two groups (n=6) one served as control (c) or sham exposed while the other was exposed to 2.45GHz of MW radiation for 2h/day for 30 days. Reduced body weight, testis weight, testicular volume and gonadosomatic-index were observed in chickens exposed with MW radiation. Expression of ER-α was chiefly reduced in brain and testis after the exposure of 2.45 GHz MW radiations. Significant increase in oxidative stress biomarkers like hydrogen peroxide and malondialdehyde (MDA) was observed in brain. No significant change was observed in the activity of superoxide dismutase (SOD) in brain although significant decrease was noted in other antioxidant enzymes viz. catalase and glutathione (GSH) levels in exposed chicks. A significant increase in MDA levels was observed in testis but no significant changes seen in activity of SOD, catalase and GSH of exposed chicks reflecting oxidative stress. Finally, these findings indicate that decreased ER-α expression and simultaneous testicular regression were affected by the impact of 2.45GHz of mw radiation induced stress. Collectively these data demonstrate that during stress estrogen inhibits the endocrine function of testicular physiology in male chicks through ER-α dependent mechanism.

Keywords: Stress, MW radiation, ER- α, chicken and oxidative stress.


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