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# ZEHRA BATOOL

**Current position:** Assistant Professor

**Current address:** Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi-75270, Pakistan

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## **PROJECTS AND GRANTS**

- 2023**      **Title:** Electrophysiology, Patch-clamp technique, in-vivo animal modeling, drug discovery  
**Funding body:** International Brain Research Organization  
**Funds:** 5000 EUR
- 2022**      **Title:** Development of nanocarrier-based nasal spray for potent monoterpenoid for the treatment of anxiety disorders  
**Funding body:** Sindh Higher Education Commission  
**Funds:** 4.0 million PKR
- 2021**      **Title:** Determination of anti-amnesic effects of monoterpenoids: in vitro-, in silico-, and in vivo-based studies  
**Funding body:** International Society of Neurochemistry  
**Funds:** 5000 USD  
**Role:** Principal Investigator
- 2019**      40% ScienceBeam equipment grant up to \$10,000 for contributing to the innovative lab on neuroscience and electrophysiology as a part of the 5<sup>th</sup> STEP.
- 2018**      **Title:** Role Of M1 muscarinic receptor-associated signaling pathway in different phases of memory formation”  
**Funding body:** International Centre for Chemical and Biological Sciences for the establishment of new laboratories  
**Funds:** 0.5 million PKR.  
**Role:** Principal Investigator
- 2015**      **Title:** Protective role of magnesium in amelioration of multiple alterations associated with depression  
**Funding body:** Higher Education Commission of Pakistan  
**Funds:** 4.7 million PKR  
**Duration:** 3 years  
**Principal Investigator:** Prof. Dr. Saida Haider  
**Role:** Researcher
- 2015**      **Title:** Flavonoids and curcuminoids as a protective line of defense against aluminum and D-galactose induced neurodegeneration in rats  
**Funding body:** Higher Education Commission of Pakistan  
**Funds:** 5.3 million PKR  
**Duration:** 3 years  
**Principal Investigator:** Prof. Dr. Saida Haider  
**Role:** Researcher

## **ACADEMIC CAREER**

### **2010 - 2015 Ph.D Biochemistry**

**From University of Karachi, Karachi, Pakistan**

- Neurochemistry and Biochemical Neuropharmacology Research Unit, Department of Biochemistry, University of Karachi under the supervision of Prof. Dr. Saida Haider (December-2015)
- **Thesis title:** “Effects of long term walnut and almond supplementation in rats on memory functions and other psychological conditions”
- MS/Ph.D course work 2014 **(CGPA 3.7)**

### **2008 M.Sc Biochemistry**

**From University of Karachi, Karachi, Pakistan**

- **First Division (80.7%)**
- Neuropharmacology and Molecular Biology
- **Thesis titled:** “Effect of Lithium on behavioral & Neurochemical changes following repeated restraint stress” under the supervision of Prof. Dr. Tahira Perveen

### **2005 - 2007 B.Sc Hons. in Biochemistry**

**From University of Karachi, Karachi, Pakistan**

- **First Division (75%)**
- Chemistry & Microbiology

## **PROFESSIONAL POSITIONS**

**5<sup>th</sup> March  
2019-Till  
date**

### **Assistant Professor**

Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan.

**30<sup>th</sup> Jan  
2018-4<sup>th</sup>  
March 2019**

### **Research Officer**

Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan.

**Jan 2016 –  
June 2017**

### **Teaching Associate**

Department of Biochemistry, University of Karachi, Karachi, Pakistan.

- Teaching and conducting labs of following courses: Introductory Biochemistry I and II, Metabolism I and II, Biochemistry of drug action.
- Arranging seminar and symposium as well as extracurricular activities of students
- Conducting research projects.

**Aug 2012 -  
Jan 2016**

### **Lecturer**

Department of Biochemistry, Jinnah University for Women, Karachi, Pakistan.

- Teaching and conducting labs of following courses: Introductory Biochemistry I and II, Metabolism I and II, Endocrinology, Advance Intermediary Metabolism.
- Arranging seminar and symposium as well as extracurricular activities of students
- Working as a member of “Quality enhancement cell” at Jinnah University for Women

## **MEMBERSHIP OF SCIENTIFIC SOCIETIES**

- Society for Neuroscience
- European Society for Neurochemistry
- International Society for Neurochemistry
- Federation of European Neuroscience Societies
- American Society for Neurochemistry

## **AWARDS**

**Indigenous Scholarship for the completion of PhD awarded by Higher Education Commission of Pakistan.**

## **RESEARCH PROJECT SUPERVISED**

Supervised research projects to the M.Phil. students

1. Rida Nisar (MPhil), 2022

Supervised research projects to the graduating students

1. Urooj Fatima, 2014
2. Nida Iqbal, 2013
3. Mehwish Iqbal, 2013
4. Uroosa Tariq, 2012
5. Mahira Afzal, 2012

## **RESEARCH PROJECT Co-SUPERVISED FOR PhD STUDENTS**

1. Sidrah Shahzad, PhD, 2021
2. Sahar Rafiq, PhD, 2021
3. Asia Afzal, PhD, 2021
4. Faiza Agha, PhD, 2021

## **RESEARCH STUDENTS UNDER SUPERVISION**

Research students under supervision

1. Aimen Inamullah (MPhil), since 2020
2. Asad-ullah Faiz Ghalib (PhD), since 2020

## **JOURNAL PUBLICATIONS**

- 2023**
1. *Humna Asghar, Alveena Siddiqui, Laraib Batool, Zehra Batool, Touqeer Ahmed.* Post-exposure self-recovery reverses oxidative stress, ameliorates pathology and neurotransmitters imbalance and rescues spatial memory after time-dependent

- aluminum exposure in rat brain. *Biometals*. 2024. doi: 10.1007/s10534-023-00570-1. Epub ahead of print.
2. *Syeda Madiha, Zehra Batool\**, Sidhrah Shahzad, Saiqa Tabassum, Laraib Liaquat, Asia Afzal, Sadia Sadir, Irfan Sajid, Bushra Jabeen Mehdi, Saara Ahmad, Saida Haider. Naringenin, a functional food component, improves motor and non-motor symptoms in animal model of parkinsonism induced by rotenone. *Plant Foods Hum Nutr*. 2023
  3. *Sarwat Yousuf, Shaista Emad, Mohammad Misbah ur Rehman, Zehra Batool, Sara Qadeer, Yusra Sarfaraz, Sheeza Sheikh, Sana Sadaf, Tahira Perveen*. Dose Dependent Effects of Lemon Peel Oil on Oxidative Stress and Psychological Behaviors in Rats. *Pakistan Journal of Zoology*, 2023;55(4):1627.
  4. *Rida Nisar, Zehra Batool\**, Saida Haider. Electric foot-shock induces neurobehavioral aberrations due to imbalance in oxidative status, stress hormone, neurochemical profile, and irregular cortical-beta wave pattern in rats: A validated animal model of anxiety. *Life Sciences*. 2023;323:121707.
  5. *Sheeza Sheikh, Shaista Emad, Yusra Sarfaraz, Sana Sadaf, Zehra Batool, Sarwat Yousuf, Sara Qadeer, Tahira Perveen*. Protective effects of camellia oil in unpredictable stress induced behavioral and neurochemical changes in rats. *Pakistan Journal of Pharmaceutical Sciences*. 2023;36.
  6. *Fahad Jibrin Siyal, Rehan Ahmed Siddiqui, Zahida Memon, Zehra Batool, Rahman, Aneela Atta ur, Arsalan Humayun*. Eugenol and its Liposomal Based Nano-Carrier Protects Against Anxiety Disorder in Mice. *Latin American Journal of Pharmacy*. 2023;42(3):681-690.
  7. *Saara Ahmad, Saad Bilal Ahmed, Asra Khan, Muhammad Wasim, Saiqa Tabassum, Saida Haider, Fatima Ahmed, Zehra Batool, Saima Khaliq, Hamna Rafiq, Prashant Tikmani, Anwar-ul-Hassan Gilani*. Natural remedies for Alzheimer's disease: A systematic review of randomized controlled trials. *Metabolic Brain Disease*. 2023;38(1):17-44.
  - 2022 8. *Rida Nisar, Zehra Batool\**, Aimen Inamullah, Asad Ullah Faiz Ghalib, Hareem Nisar, Shaista Emad, Saida Haider. Dose-dependent alteration of neurobehavioral activities by geraniol a component of essential oil: A study in rats. *Pakistan Journal of Pharmaceuticals Sciences*, 2022;35(1):239-245.
  9. *Sidrah Shahzad, Zehra Batool\**, Asia Afzal, Saida Haider. Reversal of oxidative stress, cytokine toxicity and DNA fragmentation by quercetin in dizocilpine-induced animal model of Schizophrenia. *Metabolic Brain Disease*. 2022;37(8):2793-2805.
  10. *Saara Ahmad, Hamna Rafiq, Asra Khan, Parshant Tikmani, Zehra Batool, Saiqa Tabassum, Fazal Arain, Salman Siddiqi, Saima Khaliq, Faiq Amin, Muhammad Wasim, Saida Haider*. Ameliorative effects of half-dose saffron and chamomile combination on Psycho-endocrinological changes in a diabetic murine model. *PLoS One*. 2022;17(10):e0276236.
  11. *Sarwat Yousuf, Shaista Emad, M.M. Rehman, Zehra Batool, Sara Qadeer, Yusra Sarfaraz, Shiza Sheikh, Sana Sadaf, Tahira Perveen*. Dose dependent effects of lemon peel oil on oxidative stress and psychological behaviors in rats. *Pakistan Journal of Zoology*. 2023;55(4):1627.
  12. *Saara Ahmad, Saad Bilal Ahmed, Asra Khan, Muhammad Wasim, Saiqa Tabassum, Saida Haider, Fatima Ahmed, Zehra Batool, Saima Khaliq, Hamna Rafiq, Pershant Tikmani, Anwar-Ul-Hassan Gilani*. Natural remedies for Alzheimer's disease: A systematic review of randomized controlled trials. *Metabolic Brain Disease*. 2023;38(1):17-44.

- 2021**
13. *Saida Haider, Sidrah Shahzad, Zehra Batool\*, Sadia Sadir, Laraib Liaquat, Saiqa Tabassum, Tahira Perveen.* "Spirulina platensis reduces the schizophrenic-like symptoms in rat model by restoring altered APO-E and RTN-4 protein expression in prefrontal cortex" *Life Sciences*. 2021;277:119417.
  14. *Asia Afzal, Zehra Batool\*, Sadia Sadir, Laraib Liaquat, Sidrah Shahzad, Saiqa Tabassum, Saara Ahmad, Noor Kamil, Tahira Perveen, Saida Haider.* "Therapeutic Potential of Curcumin in Reversing the Depression and Associated Pseudodementia via Modulating Stress Hormone, Hippocampal Neurotransmitters, and BDNF Levels in Rats". *Neurochemical Research*. 2021;46(12):3273-3285.
  15. *Sadia Saleem, Fizza Naqvi, Asma Batool, Sajjad Haider Naqvi, Faizan Naqvi, Zehra Batool, Saiqa Tabassum, Saida Haider.* Neuroprotective role of a monoterpene (thymol) on diazepam induced withdrawal symptoms in rats. *Pakistan Journal of Pharmaceutical Sciences*. 2021;34(4):1615-1620.
  16. *Syeda Madiha, Zehra Batool, Saiqa Tabassum, Laraib Liaquat, Sadia Sadir, Sidrah Shahzad, et al.* Quercetin exhibits potent antioxidant activity, restores motor and non-motor deficits induced by rotenone toxicity. *PLoS ONE* 2021;16(11):e0258928
- 2020**
17. *Sahar Rafiq, Zehra Batool, Laraib Liaquat, Saida Haider.* "Blockade of muscarinic receptors impairs reconsolidation of older fear memory by decreasing cholinergic neurotransmission: A study in rat model of PTSD". *Life Sciences*. 2020;256:118014.
  18. *Saida Haider, Syeda Madiha, Zehra Batool.* "Amelioration of motor and non-motor deficits and increased striatal APOE levels highlight the beneficial role of pistachio supplementation in rotenone-induced rat model of PD". *Metabolic Brain Disease*. 2020;35(7):1189-1200.
  19. *Saiqa Tabassum, Saara Ahmad, Syeda Madiha, Sidrah Shahzad, Zehra Batool, Sadia Sadir, Saida Haider.* "Free l-glutamate-induced modulation in oxidative and neurochemical profile contributes to enhancement in locomotor and memory performance in male rats." *Scientific Reports*. 2020;10(1),1-13.
  20. *Saida Haider, Laraib Liaquat, Saara Ahmad, Zehra Batool, Rafat Ali Siddiqui R, Saiqa Tabassum, Sidrah Shahzad, Sahar Rafiq, Narjis Naz.* "Naringenin protects AIC13/D-galactose induced neurotoxicity in rat model of AD via attenuation of acetylcholinesterase levels and inhibition of oxidative stress." *PLoS One*. 2020;15(1):e0227631.
  21. *Saara Ahmad, Iftikhar Ahmed, Saida Haider, Zehra Batool, Laraib Liaquat, Fatima Ahmed, Asra Khan, Tahira Perveen, Mirza Jawad-ul-hasnain, Saima Khaliq, Saad Bilal Ahmed.* "Effects of Feed Additives on Chicken Growth and Their Residues in Meat Instigating Deleterious Consequences on the Liver Health of Consumers - A Prospective Human Study". *Pakistan Journal of Zoology*. 2020;52(3):909-916.
  22. *Saida Haider, Irfan Sajid, Zehra Batool, Syeda Madiha, Sadia Sadir, Noor Kamil, Laraib Liaquat, Saara Ahmad, Saiqa Tabassum, Saima Khaliq.* Supplementation of Taurine Insulates Against Oxidative Stress, Confers Neuroprotection and Attenuates Memory Impairment in Noise Stress Exposed Male Wistar Rats. *Neurochemical Research*. 2020;45(11):2762-2774.
  23. *Sidrah Shahzad, Zehra Batool, Saiqa Tabassum, Saara Ahmad, Noor Kamil, Saima Khaliq, Amber Nawaz, Saida Haider.* Spirulina platensis (Blue-green algae): A miracle from sea combats the oxidative stress and improves behavioral deficits in an animal model of Schizophrenia. *Pakistan Journal of Pharmaceutical Sciences*. 2020;33(4):1847-1853.
  24. *Wajahat Nadeem, Saima Khaliq, Maria Arshad, Tabinda Ruby, Madiha Sajid, Shazia*

- Nawaz, Azizuddin, Saida Haider, **Zehra Batool**, Rashid Ali Khan. Neuroprotective and antioxidant potential of Ficus carica leaves extract in scopolamine induced memory impairment. *Pakistan Journal of Pharmaceutical Sciences*. 2020;**33**(3):1315-1320.
25. Saara Ahmad, Asra Khan, **Zehra Batool**, Malik Hassan Mehmood, Saima Khaliq, Saiqa Tabassum, Shafiq Naeem Rajput, Saida Haider. Medicinal effects of saffron and chamomile on diabetes mellitus and associated hyperlipidemia and memory impairment. *Pakistan Journal of Pharmaceutical Sciences*. 2020;**33**(3):1191-1198.
26. Saida Haider, **Zehra Batool**, Sahar Rafiq. Method for the identification of pharmacological intervention for the disruption of fear memory in PTSD-rat model. *MethodsX*. 2020;**7**:101059.
27. Faiza Agha, **Zehra Batool**, Tuba Sharf Batool, Rida Nisar, Fizza Naqvi, Sadia Saleem, Irfan Sajid, Saida Haider. Tree nuts supplementation instigates the oxidative status and improves brain performance in male rats. *Pakistan Journal of Pharmaceutical Sciences*. 2020;**33**(6):2785-2791.
- 2019** 28. Laraib Liaquat, Sadia Sadir, **Zehra Batool**, Saiqa Tabassum, Sidrah Shahzad, Asia Afzal, Saida Haider. Acute aluminum chloride toxicity revisited: Study on DNA damage and histopathological, biochemical and neurochemical alterations in rat brain. *Life Sciences*. 2019;**217**:202-211.
29. Fizza Naqvi, Saida Haider, Faizan Naqvi, Sadia Saleem, Tahira Perveen, **Zehra Batool**. A comparative study showing greater effects of curcumin compared to donepezil on memory function in rats. *Pakistan Journal of Pharmaceutical Sciences*. 2019;**32**:053-060.
30. Sadia Sadir, Saiqa Tabassum, Shaista Emad, Laraib Liaquat, **Zehra Batool**, Syeda Madiha, Sidrah Shehzad, Irfan Sajid, Saida Haider. Neurobehavioral and biochemical effects of magnesium chloride (MgCl<sub>2</sub>), magnesium sulphate (MgSO<sub>4</sub>) and magnesium-L-threonate (MgT) supplementation in rats: A dose dependent comparative study. *Pakistan Journal of Pharmaceutical Sciences*. 2019;**32**(Suppl):277-283.
31. Saida Haider, Amber Nawaz **Zehra Batool**, Saiqa Tabassum, Tahira Perveen. Alleviation of diazepam-induced conditioned place preference and its withdrawal-associated neurobehavioral deficits following pre-exposure to enriched environment in rats. *Physiology and Behavior*. 2019;**208**:112564.
32. **Zehra Batool**, Faiza Agha, Saiqa Tabassum, Tuba Sharf Batool, Rafat Ali Siddiqui, Saida Haider. Prevention of cadmium-induced neurotoxicity by essential nutrient present in nuts. *Acta Neurobiologiae Experimentalis*. 2019;**79**(2):169-183.
33. Fizza Naqvi, Sadia Saleem, Faizan Naqvi, **Zehra Batool**, Sadia Sadir, Saiqa Tabassum, Saara Ahmed, Laraib Liaquat, Saida Haider. Curcumin lessens unpredictable chronic mild stress-induced depression and memory deficits by modulating oxidative stress and cholinergic activity. *Pakistan Journal of Pharmaceutical Sciences*. 2019;**32**(4(Supplementary)):1893-1900.
- 2018** 34. Laraib Liaquat, **Zehra Batool**, Sadia Sadir, Sahar Rafiq, Sidrah Shahzad, Tahira Perveen, Saida Haider. Naringenin-induced enhanced antioxidant defence system meliorates cholinergic neurotransmission and consolidates memory in male rats. *Life Sciences*. 2018;**194**: 213-223.
35. **Zehra Batool**, Saiqa Tabassum, Rafat Ali Siddiqui, Saida Haider." Dietary Supplementation of Almond Prevents Oxidative Stress by Advocating Antioxidants and Attenuates Impaired Aversive Memory in Male Rats." *Plant Foods for Human Nutrition*. 2018;**73**(1):7-12
36. Saara Ahmad, Iftikhar Ahmed, Saida Haider, **Zehra Batool**, Fatima Ahmed, Saiqa

- Tabassum, Syeda Madiha, Tahira Perveen, Saad Bilal Ahmed.* "Effects of consumption of caged and un-caged chicken meat on ovarian health of female Wistar rats." *Pakistan Journal of Zoology.* 2018;50(2):487-493.
37. *Sahar Rafiq, Saara Ahmad, Fatima Ahmed, Zehra Batool, Saad Bilal Ahmed, Sadia Saleem, Fizza Naqvi, Laraib Liaquat, Asia Afzal, Saida Haider.* "Anticholinergic drug atropine diminishes newly formed fear memory in male rats" *Pakistan Journal of Pharmaceutical Sciences.* (2018); 31(3(Supp)): 1075-1079.
  38. *Saara Ahmad, Rehana Rehman, Saida Haider, Zehra Batool, Fatima Ahmed, Saad Bilal Ahmed* "Hyperlipidemias, Diabetes and Depression" *Journal of Physiology.* 2018;13(3):8-1.
  39. *Saida Haider, Zehra Batool, Saara Ahmad, Rafat Ali Siddiqui, Darakhshan Jabeen Haleem.* "Walnut supplementation reverses the scopolamine-induced memory impairment by restoration of cholinergic function via mitigating oxidative stress in rats: A potential therapeutic intervention for age related neurodegenerative disorders." *Metabolic Brain Disease.* 2018;33(1):39-5.
  40. *Amber Nawaz, Zehra Batool, Sidrah Shazad, Sahar Rafiq, Asia Afzal, Saida Haider.* Physical enrichment enhances memory function by regulating stress hormone and brain acetylcholinesterase activity in rats exposed to restraint stress. *Life Sciences.* 2018;207:42-49.
  41. *Tahira Perveen, Shaista Emad, Saida Haider, Sana Sadaf, Sara Qadeer, Zehra Batool, Yousra Sarfaraz, Sheeza Sheikh.* "Role of cyclooxygenase inhibitors in diminution of dissimilar stress-induced depressive behaviour and memory impairment in rats". *Neuroscience.* 2018;370:121-129.
  42. *Syeda Madiha, Zehra Batool, Saiqa Tabassum, Laraib Liaquat, Sadia Sadir, Tahira Perveen, Saida Haider.* "Therapeutic effects of curcuma longa against rotenone-induced gross motor skill deficits in rats." *Pakistan Journal of Zoology.* 2018;50(4):1245-1256.
  43. *Asia Afzal, Saara Ahmad, Faiza Agha, Zehra Batool, Saiqa Tabassum, Laraib Liaquat, Sadia Sadir, Amber Nawaz, Saida Haider.* Administration of 5-HT-1B agonist ameliorates pseudodementia induced by depression in rats. *Pakistan Journal of Pharmaceutical Sciences.* 2018;31:2179-2184.
  - 2017 44. *Zehra Batool, Faiza Agha, Saara Ahmad, Laraib Liaquat, Saiqa Tabassum, Saima Khaliq, Lubna Anis, Irfan Sajid, Shaista Emad, Tahira Perveen, Saida Haider* "Attenuation of cadmium-induced decline in spatial, habituation and recognition memory by long-term administration of almond and walnut supplementation: Role of cholinergic function". *Pakistan Journal of Pharmaceutical Sciences.* 2017;30(Suppl 1): 273-279.
  45. *Saara Ahmad, Iftikhar Ahmed, Saida Haider, Zehra Batool, Saad Bilal Ahmed* "Daily consumption of commercial chicken feed and meat lead to alterations in serum cholesterol and steroidal sex hormones in female rats". *Pakistan Journal of Pharmaceutical Sciences.* 2017;30(Suppl 1):257-261.
  46. *Nudrat A. Zuberi, Mukhtiar Baig, Shazia Bano, Zehra Batool, Saida Haider, Tahira Perveen* "Assessment of atherosclerotic risk among patients with epilepsy on valproic acid, lamotrigine, and carbamazepine treatment". *Neurosciences.* 2017; 22(2):114-118.
  47. *Laraib Liaquat, Saara Ahmad, Sadia Sadir, Zehra Batool, Saima Khaliq, Saiqa Tabassum, Shaista Emad, Syeda Madiha, Sidrah Shahzad, Saida Haider* "Development of AD like symptoms following co-administration of AICl<sub>3</sub> and D-gal in rats: A neurochemical, biochemical and behavioural study". *Pakistan Journal of Pharmaceutical Sciences.* 2017;30 (Suppl 1): 257-261.

48. *Syeda Madiha, Saiqa Tabassum, Zehra Batool, Laraib Liaquat, Sadia Sadir, Sidrah Shahzad, Tahira Perveen, Saida Haider* "Assessment of gait dynamics in rotenone-induced rat model of Parkinson's disease by footprint method". *Pakistan Journal of Pharmaceutical Sciences*. 2017;30 (Suppl 1):943-948.
49. *Saiqa Tabassum, Saara Ahmad, Syeda Madiha, Saima Khaliq, Sidrah Shahzad, Zehra Batool, Saida Haider* "Impact of oral supplementation of Glutamate and GABA on memory performance and neurochemical profile in hippocampus of rats". *Pakistan Journal of Pharmaceutical Sciences*. 2017;30(3(Suppl.):1013-1021.
50. *Tahira Perveen, Shaista Emad, Saara Ahmad, Zehra Batool, Sarwat Yousuf, Sheeza Sheikh, Sara Qadeer, Saida Haider* "Fennel oil treatment mimics the anti-depressive and anxiolytic effects of fluoxetine without altering the serum cholesterol levels in rats." *Pakistan Journal of Zoology*. 2018;49(6):2291-2297.
51. *Amber Nawaz, Zehra Batool, Saara Ahmed, Saima Khaliq, Irfan Sajid, Lubna Anis, Saida Haider*. "Attenuation of restraint stress-induced behavioral deficits by environmental enrichment in male rats." *Pakistan Veterinary Journal*. 2017;37(4):435-439.
52. *Irfan Sajid, Saara Ahmad, Shaista Emad, Zehra Batool, Saima Khaliq, Lubna Anis, Saiqa Tabassum, Syeda Madiha, Laraib Liaquat, Sadia Sadir, Tahira Perveen, Saida Haider*. Enhanced physical endurance and improved memory performance following taurine administration in rats. *Pakistan Journal of Pharmaceutical Sciences*. 2017; 30(5(Supplementary)):1957-1963.
53. *Amber Nawaz, Zehra Batool, Saara Ahmed, Saiqa Tabassum, Saima Khaliq, Bushra Jabeen, Irfan Sajid, Shoaib Ahmad, Sadia Saleem, Fizza Naqvi, Faizan Naqvi, Saida Haider*. "Enriched environment palliates nicotine-induced conditioned place preference and associated neurobehavioral deficits in rats". *Pakistan Journal of Pharmaceutical Sciences*. 2017;30(6(Supp)):2375-2381.
54. *Shaista Emad, Sara Qadeer, Sana Sadaf, Zehra Batool, Saida Haider, Tahira Perveen*. "Attenuation of stress induced memory deficits by nonsteroidal anti-inflammatory drugs (NSAIDs) in rats: Role of antioxidant enzymes". *Pharmacological Reports*. 2017;69(2):300-305.
55. *Zehra Batool, Saida Haider*. "Long-term supplementation of almond and walnut alleviates the scopolamine-induced oxidative stress and improves memory performance in rats". *MDSRC – (2017) Proceedings, 27-28 December, Wah/Pakistan*.
- 2016**
56. *Zehra Batool, Sadia Sadir, Laraib Liaquat, Saiqa Tabassum, Syeda Madiha, Sahar Rafiq, Sumayya Tariq, Tuba Sharf Batool, Sadia Saleem, Fizza Naqvi, Tahira Perveen, Saida Haider*. "Repeated administration of almonds increases brain acetylcholine levels and enhances memory function in healthy rats while attenuates memory deficits in animal model of amnesia". *Brain Research Bulletin*. 2016;120:63–74.
57. *Saida Haider, Sadia Sadir, Fizza Naqvi, Zehra Batool, Saiqa Tabassum, Saima Khaliq, Lubna Anis, Irfan Sajid, Darakhshan J. Haleem*. "Magnesium treatment palliates noise-induced behavioral deficits by normalizing DAergic and 5-HTergic metabolism in adult male rats". *Metabolic Brain Disease*. 2016;31(4):815-25.
58. *Fizza Naqvi, Zehra Batool, Saida Haider*. "Repeated administration of curcumin attenuates the behavioral deficits induced by lead toxicity in rats". *Pakistan Journal of Biochemistry and Molecular Biology*. 2016;49(1):01-8.
59. *Laraib Liaquat, Saida Haider, Zehra Batool, Amna Suleman, Nousheen Gul, Shumaila Jabbar* "Memory Enhancement and Reduction in Lipid Peroxidation by Dietary



- Antioxidants in Brain". *Pakistan Journal of Biochemistry and Molecular Biology*. 2016;49(3):53-59.
- 2015**
60. *Saida Haider, Lubna Anis L, Zehra Batool, Irfan Sajid, Fizza Naqvi, Saima Khaliq, Sarah Ahmed*. "Short term cadmium administration dose dependently elicits immediate biochemical, neurochemical and neurobehavioral dysfunction in male rats". *Metabolic Brain Disease*. 2015;30(1):83-92.
61. *Saida Haider, Laraib Liaquat, Sidrah Shahzad, Sadia Sadir, Syeda Madiha, Zehra Batool, Saiqa Tabassum, Sadia Saleem, Fizza Naqvi, Tahira Perveen*. "A high dose of short term exogenous d-galactose administration in young male rats produces symptoms simulating the natural aging process". *Life Sciences*. 2015;124:110-119.
62. *Saida Haider, Fizza Naqvi, Zehra Batool, Saiqa Tabassum, Sadia Sadir, Laraib Liaquat, Faizan Naqvi, Nudrat A Zuberi, Hina Shakeel, Tahira Perveen*. "Pretreatment with curcumin attenuates anxiety while strengthens memory performance after one short stress experience in male rats". *Brain Research Bulletin*. 2015;115:1-8.
- 2014**
63. *Saida Haider, Sadia Saleem, Tahira Perveen, Saiqa Tabassum, Zehra Batool, Sadia Sadir, Laraib Liaquat, Syeda Madiha*. "Age-related learning and memory deficits in rats: role of altered brain neurotransmitters, acetylcholinesterase activity and changes in antioxidant defense system". *Age (Dordr)*. 2014;36(3):9653.
- 2013**
64. *Saida Haider, Fizza Naqvi, Saiqa Tabassum, Sadia Saleem, Zehra Batool, Sadia Sadir, Sumaira Rasheed, Darakhshan Saleem, Amber Nawaz, Saara Ahmad* "Preventive Effects of Curcumin against Drug and Starvation Induced Gastric Erosions in Rats". *Scientia Pharmaceutica*. 2013;81(2):549–558.
65. *Saida Haider, Sadia Saleem, Saiqa Tabassum, Saima Khaliq, Saima Shamim, Zehra Batool, Tahira Parveen, Qurat-ul-ain Inam, Darakhshan J. Haleem* "Alteration in plasma corticosterone levels following long term oral administration of lead produces depression like symptoms in rats" *Metabolic Brain Disease*. 2013;28(1):85-92.
66. *Tahira Perveen, Saida Haider, Sadia Saleem, Nudrat Anwar Zubari and Zehra Batool* "Increased 5-HT levels following repeated administration of Nigella sativa L. (black seed) oil produce antidepressant effects in rats". *Scientia Pharmaceutica*. 2013;82(1):161-167.
- 2012**
67. *Saida Haider, Saara Ahmad, Saima Khaliq, Saiqa Tabassum, Zehra Batool, Darakhshan J Haleem*. "Greater prevalence of depression in type I diabetic patients: correlation with decreased plasma tryptophan" *IOSR Journal of Pharmacy*. 2012;2(1)051-061.
68. *Saida Haider, Fizza Naqvi, Zehra Batool, Saiqa Tabassum, Tahira Perveen, Sadia Saleem, Darakhshan Jabeen Haleem* "Decreased Hippocampal 5-HT and DA Levels Following Sub-Chronic Exposure to Noise Stress: Impairment in both Spatial and Recognition Memory in Male Rats " *Scientia Pharmaceutica*. 2012;80(4):1001-1011.
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70. *Tahira Perveen, Saida Haider, Nudrat A. Zubairi, Waseem Ahmed, Zehra Batool and Sumreen Begum* "Effect of herbal combination on biochemical and behavioral responses in rats". *Pakistan Journal Biochemistry and Molecular Biology*. 2012;45(1):20-22.
71. *Saida Haider, Zehra Batool and Darakhshan J. Haleem* "Nootropic and hypophagic effects following long term intake of almonds (Prunus amygdalus)in rats". *Nutricin*

hospitalaria. 2012;27(6):2109-2115.

- 2011** 72. *Tahira Perveen, Zehra Batool, Saida Haider and Darakhshan J Haleem* "Enhancement of Memory by Lithium in Animal Model of Stress". *Journal of Basic and Applied Sciences*. 2011;7(2): 85-88.
73. *Saida Haider, Zehra Batool, Saiqa Tabassum, Tahira Perveen, Sadia Saleem, Fizza Naqvi, Huma Javed, Darakhshan J Haleem* "Effects of walnuts (*Juglans regia*) on learning and memory functions." *Plant Foods for Human Nutrition*. 2011;66:335-340.

### **BOOK CHAPTERS**

- 2018** 1. *Saida Haider, Zehra Batool, Saiqa Tabassum*. Pomegranate: Health Benefits on Brain Functions. In: Siddiqui, R. Pomegranate: Cultivation, composition, antioxidant properties, and health benefits. Nova Science Publishers, USA, 2018. PP, 147-202.
- 2021** 2. *Laraib Liaquat, Zehra Batool, Saida Haider*. Developmental toxicity of Aluminum and other metals; areas unexplored. In: *Biochemical Mechanisms of Aluminum Induced Neurological Disorders*. Bentham Science Publishers, 2021. pp: 97-146 (50).
3. *Zehra Batool, Laraib Liaquat, Tuba Sharf Batool, Rida Nisar, Saida Haider*. Aluminum and other metals exposure cause neurological disorders. Evidence from clinical/human studies. In: *Biochemical Mechanisms of Aluminum Induced Neurological Disorders*. Bentham Science Publishers, 2021. pp: 147-177 (31).
- 2022** 4. *Asia Afzal, Sadia Sadir, Zehra Batool, Laraib Liaquat, and Saida Haider*. *Iron and Neuropathies*. In: *Brain-Iron Cross Talk*, pp. 263-280. Singapore: Springer Nature Singapore, 2022.
- 2023** 5. *Zehra Batool, Asia Afzal, Laraib Liaquat, Sadia Sadir, Rida Nisar, Aimen Inamullah, Asad Ullah Faiz Ghalib, and Saida Haider*. *Receptor tyrosine kinases (RTKs): from biology to pathophysiology*. In: *Receptor Tyrosine Kinases in Neurodegenerative and Psychiatric Disorders*, pp. 117-185. Academic Press, 2023.

### **CONFERENCE ABSTRACT AND PRESENTATIONS**

- 2021** 1. *Rida Nisar, Zehra Batool, Saida Haider*. Geraniol reduced anxiety-like effects in rats exposed to single electric shock. International conference on biological research and applied sciences, Organized by Jinnah University for Women, Karachi, Pakistan, January 21, 2021.
2. *Rida Nisar, Zehra Batool, Saida Haider*. A single electric shock induces considerable anxiety-like symptoms in rats: An animal model to screen putative anti-anxiety drugs. IBRO-APRC Associate School of Neurosciences "Untangling the Degenerating Brain; from Neurobiology to Psychopathology" Organized by IBRO, July 31, 2021.
3. *Zehra Batool, Rida Nisar, Saida Haider*. Potential of geraniol to reduce anxiety-like symptoms and abnormal EEG wave pattern. Neuroscience 2021 conference organized by Society for Neuroscience, November 8-11, 2021.

- 2020**
4. **Zehra Batool, Saida Haider.** "Promising effects of naringenin to attenuate cadmium neurotoxicity". 6th Annual Neuroscience Conference (6ANC), Pakistan Society of Basic and Applied Neuroscience (PASBAN), Pakistan, October 17, 2020.
  5. **Saara Ahmad Muddasir Khan, Haman Rafiq, Shafiq Naeem Raput, Asra Khan, Zehra Batool, Saiqa Tabassum, Saida Haider.** "The efficacy of herbal interventions in the pathogenesis of diabetes and neuropsychological deficits on Streptozotocin-induced diabetic rats". Virtual Mini-Conference Molecular mechanisms of cognitive impairment and intellectual disability, European Society for Neurochemistry (ESN), In Collaboration with Federation of European Neuroscience Societies (FENS), July 11-15, 2020.
- 2019**
6. **Zehra Batool, Faiza Agha, Saida Haider.** "Supplementation of almond and walnut reduces cadmium-induced hepatotoxicity and hypercholesterolemia". Asian network of research on anti-diabetic plants (ANRAP) 9th international seminar "from plant to patient: identification of new drugs for metabolic disorders organized by International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan, 25th Jan-27th Jan, 2019.
  7. **Zehra Batool, Saida Haider, Shabana U Simjee.** "Role of M1 receptor in the retrieval of old consolidated memory in rats". The 10th IBRO World Congress of Neuroscience, Daegu, South Korea, 21-25th Sep, 2019.
  8. **Saida Haider, Syeda Madiha, Zehra Batool** "Pistachio supplementation effectively rescued PD-like motor and non-motor symptoms and attenuated the behavioral, neurochemical and biochemical deficits induced by rotenone toxicity in rats." The 10th IBRO World Congress of Neuroscience, Daegu, South Korea, 21-25th Sep, 2019.
  9. **Zehra Batool, Saida Haider, Maha Shahid, Shabana U Simjee, Faiza Agha** "Remediation of cadmium-induced neurotoxicity by naringenin". 7th International Symposium-cum-Training Course on Molecular Medicine and Drug Research, organized by International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan, November 4 – 7, 2019.
  10. **Zehra Batool, Amber Nawaz, Saida Haider.** "Environmental enrichment reduces caffeine-induced addiction and other associated neurobehavioral deficits" at STEP-5 Conference, organized by International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan, 27 Feb-2<sup>nd</sup> March, 2019.
- 2018**
11. **Zehra Batool, Irfan Sajid, Saida Haider.** "Neuroprotective role of taurine supplementation in rats sub-chronically exposed to noise stress by modulating neurotransmission and oxidative stress in brain" at 3<sup>rd</sup> International Symposium on Advances in Molecular Biology of Plants and Health Sciences, organized by CEMB, University of Punjab, Lahore, 19-21 December 2018.
  12. **Sumbal Zehra, Zehra Batool, Saida Haider.** "Novel semi-synthetic diterpenoids PGEA-AN and PGEA-4FAN inhibits the growth of human glioblastoma cell line U87" at 3<sup>rd</sup> International Symposium on Advances in Molecular Biology of Plants and Health Sciences, organized by CEMB, University of Punjab, Lahore, 19-21 December 2018.
  13. **Zehra Batool, Amber Nawaz, Saida Haider.** "Effects of environmental enrichment on dependence & withdrawal induced by abstinence of nicotine, caffeine and diazepam in rats" Program No. 236.26. 2018 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2018. Online
- 2017**
14. **Zehra Batool, Saida Haider.** "Attenuation of cadmium-induced neurotoxicity by nutritional supplementation of almond and walnut in rats" at Neurotransmission; Bridging gaps... making synapse" Jointly organized by AEIRC and IBRO, Karachi, July 20-22, 2017.

15. Sahar Rafiq, **Zehra Batool**, Saida Haider "Disruption of post-traumatic stress-associated older fear memory by atropine and propranolol" at Neurotransmission; Bridging gaps... making synapse" Jointly organized by AEIRC and IBRO, Karachi, July 20-22, 2017.
16. **Zehra Batool**, Irfan Sajid, Saida Haider "Taurine supplementation improves spatial and recognition memory in rats sub-chronically exposed to noise stress via normalizing neurotransmitter levels and antioxidant enzyme activity" 3<sup>rd</sup> Annual Neuroscience Meeting Building Bridges Through Neuroscience jointly organized by Advance educational institute and research Centre (AERIC) and Agha Khan University. 28<sup>th</sup> Oct, 2017.
- 2016** 17. **Zehra Batool**, Saida Haider. "Eating brain-boosting walnuts prevents memory loss: a study in rats." at "Molecular Basis of Behaviour" Organized by IBRO-APRC Associate School of Neuroscience, Islamabad, Pakistan, March 14 - 18, 2016
- 2015** 18. **Zehra Batool**. Sadia Sadir, Laraib Liaquat, Saida Haider. "Repeated administration of almond increases brain acetylcholine levels and enhances memory function in healthy rats while attenuates memory deficits in animal model of amnesia." at 2<sup>nd</sup> international conference on psychophysiology 'Building a better Brain jointly organized by Advance educational institute and research Centre (AERIC)and Agha Khan University. 29<sup>th</sup> Dec, 2015.
19. Syeda Madiha, **Zehra Batool**, Laraib Liaquat, Sadia Sadir, Saida Haider. "Pretreatment with curcumin ameliorates the Parkinson's like symptoms in rotenone induced rat model of Parkinson's disease." at 2<sup>nd</sup> international conference on psychophysiology 'Building a better Brain jointly organized by Advance educational institute and research Centre (AERIC)and Agha Khan University. 29<sup>th</sup> Dec, 2015.
20. Laraib Liaquat, Saida Haider, Sadia Sadir, syeda madiha, **Zehra Batool**, Saiqa tabassum. "Memory boosting properties of antioxidants Naringenin, Quercetin and curcumin: A comparative study." at 51<sup>st</sup> Golden jubilee symposium Jinnah post graduate medical centre (JPGMC). 17<sup>th</sup> Dec, 2015
21. Laraib Liaquat, Saida Haider, Sidrah Shahzad, Sadia Sadir, Syeda Madiha, **Zehra Batool**, Saiqa Tabassum. "A high dose of short term exogenous D-galactose administration in young male rats produces symptoms simulating the natural aging process." at advance educational institute & research centre (AERIC).15<sup>th</sup> Mar, 2015.
- 2014** 22. Saiqa tabassum, **Zehra Batool**, Saida Haider. "Curcumin administration ameliorates the stress-induced behavioral and neurochemical deficits in rats". 50 years of Research and Development: A continuous Pledge to serve, JPMC, Karachi, Pakistan 23-29 March 2014.
23. **Zehra Batool**, Saida Haider. "Amelioration of cadmium induced toxicity by repeated administration of almond in albino rats." 50 years of Research and Development: A continuous Pledge to serve, JPMC, Karachi, Pakistan 23-29 March 2014.
- 2013** 24. Syeda Sumayya Tariq, Sahar Rafique, **Zehra Batool**, Saida Haider. "Attenuation of cadmium induced anxiety and depression by prunus amygdalus (almonds)". ASOMPS XIV (14th Asian Symposium on Medicinal Plants, Spices and other natural products) December 9-12, 2013.
- 2012** 25. Syeda Sumayya Tariq, **Zehra Batool**, Saida Haider "Attenuation of cadmium induced anxiety by prunus amygdalus (almonds)". `Biocon, Department of Biochemistry, University of Karachi. July 7-11, 2012

26. **Zehra Batool**, huma Javaid, Saida Haider, Darakhshan J Haleem. "Assessment of memory function in rats following long term intake of walnut (*Juglans regia*) by Elevated plus Maze. BIOCON-2012 Biochemistry in the post-genomic era" July 9-11, 2012

2010 27. **Zehra Batool**, Saida Haider, Darakhshan Jabeen Haleem. "Altered Brain Serotonergic Neurotransmission Following Caffeine Withdrawal Produces *Behavioral Deficits in Rats.*" (2010) PCMD-WWN, Developing of network of women neuroscientists in Pakistan, pp:42

### INVITED TALKS

2016 1. "**19<sup>th</sup> National Health Sciences Research Symposium (NHSRS) – Theme: Mind and Brain: Neuroscience today and tomorrow**" Organized by Agha Khan University. November 4-6, 2016.  
**Topic:** Nourishing brain: An approach to mental well being

### TRAININGS

2020 1. **Workshop on "EEG and epilepsy held as part of 11<sup>th</sup> Paediatric Neurology Conference: Exploring new Frontier"** Organized by The Aga Khan University, Karachi, Pakistan. February 28, 2020.

2019 2. "**Innovation lab on Neuroscience and Electrophysiology**" jointly organized by ScienceBeam and PCMD, ICCBS, University of Karachi, Karachi, Pakistan, February 27-March 2, 2019.

- **Electrophysiological recording in vivo experiment using rat animal model to determine:**
  - Single-unit action potential (spikes)
  - Local Field Potential (LFP)
  - EEG
  - Signal modulation by external digital events

2018 3. "**4<sup>th</sup> National Workshop on Classical Protein Chemistry**" Organized by PCMD, ICCBS, University of Karachi, Karachi, Pakistan, November 20-22, 2018.

- SDS PAGE
- HPLC/UPLC
- FPLC

4. "**Cell Cultural Techniques**" Organized by PCMD, ICCBS, University of Karachi, Karachi, Pakistan, July 2018.

2016 5. "**Molecular Basis of Behaviour**" Organized by IBRO-APRC Associate School of Neuroscience, NUST, Islamabad, Pakistan, March 14-18, 2016

- 2D PAGE
- RT-PCR

6. "**2<sup>nd</sup> National workshop on Recombinant DNA Technology**" Organized by School of Biological Sciences, University of Punjab, Lahore, Pakistan, April 25-30, 2016

- Techniques related to recombination of DNA

7. **“The CAJAL advanced neuroscience training programme: nutrition & brain functions”**  
Organized by International Research Organization and Federation of European Neuroscience Societies, at University of Bordeaux, **Bordeaux, France**, Sept 19-Oct 8 2016
    - Project title: Deleterious effects on omega-3 deficiency on neurogenesis and related spatial memory. Focus on microglial cells
    - Technical approaches: FACS and cell sorting, RTqPCR on extracted cells, confocal analysis, confocal microscopy, behavior (Morris water maze)
  8. **“3<sup>rd</sup> National Workshop on Classical protein Chemistry”** Organized by Panjwani Center for Molecular Medicine and Drug Research, ICCBS, University of Karachi, **Karachi**, December 19-20, 2016.
  9. **“Two-Dimensional gel electrophoresis”** Organized by National Center for Proteomics, University of Karachi, **Karachi**, December 29-30, 2016.
- 2015**
10. **10 Days workshop on Biochemical and Molecular techniques in Plant Breeding and Genetics**, Organized by Nuclear Institute of Agriculture and Biology, **Faisalabad**, Oct 6-16, 2015.
    - Gel Electrophoresis of proteins
    - Amplification DNA fragment by PCR
    - Electrophoretic techniques for amplified DNA fragments
    - Gel documentation and analysis

### **SEMINARS/WORKSHOP ATTENDED**

- 2018**
1. **6<sup>th</sup> International Conference on Endorsing Health Science Research”** organized by Advance educational institute and research Centre (AERIC), 7<sup>th</sup> April, 2018.
- 2017**
2. **3<sup>rd</sup> Multi Disciplinary Student Research Conference – 2017**, on 29-30 November - 2017 at University of Wah, Wah Cantt, Pakistan.
  3. **“Neurotransmission; Bridging gaps... making synapse”** Jointly organized by AEIRC and IBRO, Karachi, July 20-22, 2017.
  4. **3<sup>rd</sup> Annual Neuroscience Meeting Building Bridges Through Neuroscience** jointly organized by Advance educational institute and research Centre (AERIC) and Agha Khan University. 28<sup>th</sup> Oct, 2017.
- 2016**
5. **“19<sup>th</sup> National Health Sciences Research Symposium (NHSRS) – Theme: Mind and Brain: Neuroscience today and tomorrow”** Organized by Agha Khan University. November 4-6, 2016.
- 2015**
6. **“2nd international conference on psychophysiology: Building a better Brain”** jointly organized by Advance educational institute and research Centre (AERIC) and Agha Khan University. 29<sup>th</sup> Dec, 2015
  7. **International conference on endorsing health science research**, organized by Advance Educational Institute & Research Centre (AEIRC), 21<sup>st</sup> March 2015.
- 2014**
8. **“Course on Research Communication Skills Development”** organized by Office of Research Innovation & Commercialization, University of Karachi, from September 2-3, 2014.
  9. **Postgraduate research symposium for prospective graduate students and enrolled**

- research fellows**, organized by ORIC at University of Karachi, 23 June 2014
10. **National workshop on chemical and biological safety**, organized by HEJ research Institute of Chemistry, International Centre for Chemical and Biological Sciences, in collaboration with National Academy of Young Scientist, Pakistan and American Society of Microbiology, 23-24 September 2014.
  11. **World diabetes day “role of ethnopharmacology in metabolic disorders”**, organized by Phytopharmacology and Biotechnology Research Laboratory, Department of Biochemistry, University of Karachi, 18 Nov 2014
  12. **50 years of Research and Development: A continuous Pledge to serve**, organized by BMSI Jinnah Postgraduate Medical College, 23-29 March 2014
  13. **“03 Days Workshop on Analytical Techniques”** organized by Department of Chemistry, Jinnah University for Women in collaboration with University of Karachi, from September 9-11, 2014.
  14. **“One day Symposium “Depression, Anxiety and Stress: Exploring and Management”** organized by Department of Biochemistry, Jinnah University for Women, on November 22, 2014.
  15. **“1<sup>st</sup> International Conference on Psychophysiological- theme: Seven Strings of Stress”** organized by Advanced Educational Institute & Research Centre (AEIRC) at AQ Khan centre- Institute of Behavioral Sciences, Karachi, Pakistan. On December 20, 2014.
- 2013**
16. **“Exploring Biochemistry Molecular innovations and Beyond”**, organized by Department of Biochemistry, University of Karachi on December 5, 2013
  17. **“Is it in my gene?” A Neuro-psychological perspective to evaluate & manage the cause of young depression**, held at ICCBS & AEIRC, Karachi on October 21, 2013
- 2012**
18. **“BIOCON-2012 Biochemistry in the post-genomic era”** July 9-11, 2012
- 2011**
19. **“Workshop cum Symposium on Tools in Biomedical Research”** held at University of Karachi from March 1-3, 2011
  20. **“Workshop on Statistical Tools in Biomedical Research”** held at University of Karachi on 30<sup>th</sup> July, 2011
  21. **“8<sup>th</sup> National seminar on Health, Safety and Environment”** held at IEP, Karachi, Pakistan from October 21-22, 2011.
- 2010**
22. **“WWN Symposium entitled “Development of Network Women Neuroscientist in Pakistan”** held at PCMD (ICCBS), University of Karachi on 1-2<sup>nd</sup> July, 2010.

## **SKILLS AND LABORATORY TECHNIQUES**

### **Technical skills**

1. Handling animals and rat’s behavioral techniques
2. **Spectroscopy**
3. **HPLC Skills:** Experienced in HPLC technique
4. **Electrophoresis**
5. **PCR**
6. **Cell cultural technique**
7. **Immunohistochemistry**

8. **Field potential**
9. **Single Unit potential**
10. **EEG recording**

### **Organizational Skills**

1. Organize administrative work regarding research projects
2. Organize seminars and conferences
3. Extracurricular activities of students