**Lithium from breast-milk inhibits thyroid iodine uptake and hormone production, which are remedied by maternal iodine supplementation**

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**Abstract**

Lithium is especially taken as a maintenance medication for Bipolar Disorder. In women with bipolar disorder, lithium is often effective during postpartum period, but breast-feeding for medicated mothers is controversial because of harmful effects for her child. At present, the biological mechanisms of lithium are not well-understood, affecting its usage and overall health implications.

We developed a rat lithium and breast-feeding model at human therapeutic levels to study the effects of lithium exposure through breast-milk on pups’ thyroid function and in kidney. Novel laser analytical spectroscopy with machine learning, traditional blood and immunohistochemical tests, were applied to further investigate the mechanisms behind the thyroid dysfunction. Maternal iodine supplementation was evaluated as a therapeutic method to address the pups’ thyroid dysfunction.

Pups exposed to lithium via breastmilk, even with the dam on a sub-therapeutic level, experienced weight gain, reduced blood thyroxine (T4), and elevated blood urea nitrogen, indicating effects on thyroid and kidney function. We show that lithium inhibited iodine uptake by thyroid follicles, initiating a mechanism that reduced iodination of tyrosine, thyroglobulin cleavage, and thyroid hormone production. Importantly, infant thyroid function can be significantly improved by administering supplementary iodine to the medicated dam's diet during breast-feeding. **These results elucidate the mechanisms of lithium assisted by laser spectroscopy and machine learning.**

References

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**Biography**

**Dr. Irfan Ahmed is assistant Professor at Sukkur IBA University, Pakistan.**

Primarily, during Ph.D. he developed methods to study organ and tissues at the elemental and molecular level using laser induced breakdown spectroscopy (LIBS) complemented by machine learning at **City University of Hong Kong**. I also complemented LIBS with other spectroscopic methods such as X-ray fluorescence and mass spectroscopy for sample compatibility other than calibration. Besides, I complemented LIBS along the clinical understanding of the disease at elemental and molecular level.

With findings of bio-distribution of lithium prescribed as medication to bipolar disorder mother, I found traces of lithium in breast milk. In this regard, we adapted some clinical methods along with LIBS to study the side effects of lithium therapy-induced in babies through breast milk. The study is titled “**Lithium from breast-milk inhibits thyroid iodine uptake and hormone production, which are remedied by maternal iodine supplementation**”, is just published with Bipolar Disorder . This study employed the clinical methods of blood testing, immunoassay of the tissues and organ, spectroscopic measurements at elemental at the molecular level, and machine learning to find different dimensions of data. For this whole work, I and Dr. Condon developed a collaboration with Prof. Martin Alda and Dr. Veerle Bergink from Dalhousie University Halifax Canada, and Icahn School of Medicine at Mount Sinai, New York USA, respectively. They both are famous and pioneering guys working on lithium concerning the bipolar disorder. For immunoassay, we collaborated with the oncology lab of Queen Elizabeth Hospital Hong Kong. One can interpret this study as the world's foremost guide on how to manage breast-feeding bipolar disorder patients treated with lithium medicine, and their infant(s)! One can't think of any publication better for doctors go on in such a scenario in current date. The study has both clinical and social benefits for bipolar disorder patients and bipolar disorder mothers. The study opens a up new line and advancement understanding of medication for manic and bipolar disorder patients. It should be noted that as per WHO, the prevalence rate of Bipolar disorder is ~4% of the world population, so certainly this study is going to help these patients with remedy and pre-clinical understanding of the disease.

Visiting Research Scholar, at Key Laboratory for **Physical Electronics and Devices of the Ministry of Education Xi’an Jiaotong University, China** (Since 2015). After completing my Master from XJTU with three publications, I have been working with Professor Yanpeng Zhang since 2015, I have been visiting his lab to conduct the experiments for optimizing the control mechanism and coherence time of nonlinear rare-earth crystals such as Doped Pr:YSO, Pr:YPO and NV centers for the future quantum devices using multi-wave mixing. Since the last 5 years of actively working with Professor Zhang, I have published around **50**+ fifty plus articles impact factor and peer-reviewed journals and few of them are with the corresponding authorship in the field of nonlinear and quantum optics. The most recent publication ***as a corresponding author*** is published in the New Journal of Physics **[New J. Phys. 22 093008, (2020)]**.The pioneering work which I have developed with Prof. Zhang is the concept of hybrid entanglement for quantum hybrid communication **[Sci. Rep. 1–8 (2016) and Sci. Rep. 1–12 (2017)]**. With the concept of hybrid phenomenon, we have developed hybrid communication realization [**Optics communications 127073 (2021)]**. In this, we employed the dressed time energy entangled state using Cross-Kerr nonlinearity to produce a hybrid superposition of two states (coherent and incoherent).