# ICBSI

## International Conference on Biomedical Science and Instrumentation

*Organized by*

***Joint Academic Programme on Biomedical Instrumentation***
***University of Calcutta & The West Bengal University of Health Sciences***
***www.japbmi.in***

***November 25 & 26, 2016***

***Venue:***
***Fermion Seminar Hall***
***S. N. Bose National Centre for Basic Sciences***

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# Messages

**Professor Ashutosh Ghosh**
*Vice-Chancellor*
*University of Calcutta*

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No. M-3/34 6/2-16

Date November 15, 2016

## Message

I am happy to learn that the International Conference organized by Joint Academic Programme on Biomedical Instrumentation (JAP-BMI) is going to be held on 25th & 26th November, 2016.

I am sure this event will focus on newer trends in the field of modern Medical Technology to update the knowledge of the Biomedical Engineers with the latest techniques that have been introduced in the field of Medical Science.

I take this opportunity to congratulate the organizers of this conference and wish the conference a grand success.

Ghosh 15/11/16
(Ashutosh Ghosh)

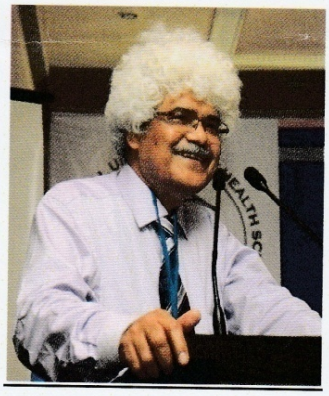
# The West Bengal University of Health Sciences

DD-36, Sector-I, Bidhan Nagar (Salt Lake), Kolkata-700 064,W.B., India

**Prof. (Dr.) Bhabatosh Biswas**
M.S. M. Ch., D.N.B., F.I.A.C.S.
L.L.B.,L.L.M., M.B.A.,M.S.W.,M.A. (Education)
**Vice Chancellor**


Memo No.: Messag./ PA-VC/WBUHS/2016-17/011

Date: 16.11.2016



***MESSAGE***

I am delighted to note that the "International Conference on Bio-Medical Science and Instrumentation" is going to be held on 25th & 26th November, 2016 at Salt lake, Kolkata

The two days conference on Bio-Medical Science and Instrumentation will surely be a great experience for the Bio-Medical Engineers.

I convey my heartiest thanks & greetings to the Organizers on this happy occasion.

I wish a grand success of the conference.

Bhabatosh Biswas

**Prof. (Dr.) Bhabatosh Biswas**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JOINT ACADEMIC PROGRAMME

# BIOMEDICAL INSTRUMENTATION (BMI)

University of Calcutta & The West Bengal University of Health Sciences

Website(s): www.caluniv.ac.in, www.wbuhs.ac.in, www.wbhealth.gov.in

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Phone : 033-2350 8386, 033-2321 3461,E-mail : bmi_jap@hotmail.com

Date: November 17, 2016

## MESSAGE FROM THE COORDINATOR

I am happy to say that International Conference on Biomedical Science & Instrumentation organized by University of Calcutta and The West Bengal University of Health Sciences will be held on 25th and 26th November 2016.

Biomedical Science & Instrumentation Involved developing new devices and procedures that solve medical and health related problems by combining their recent advanced knowledge in Engineering, Biology & Medicine to improves human health through cross disciplinary activities that intricate the engineering principles and design concepts to medicines and biology for health care purposes.

I wish the event a grand success.

Anima Sen

(Dr. Anima Sen)

Coordinator ICBSI-2016
&
Member Secretary
Joint Academic Programme on Biomedical Instrumentation (JAP-BMI)
University of Calcutta & The West Bengal University of Health Sciences
Kolkata, W.B

**INTERNATIONAL CONFERENCE ON BIOMEDICAL SCIENCE AND INSTRUMENTATION – 2016**

# PROGRAM SCHEDULE

**DAY 1: 25th NOVEMBER, 2016**

| PERIOD | PROGRAM | |
|---|---|---|
| 09.30-10.30am | **REGISTRATION** | |
| 10.30-11.30am | **INAUGURATION:**<br>**DELEGATES:**<br>• **SMT. CHANDRIMA BHATTACHARYA,CHAIRPERSON, W.B MEDICAL SERVICES CORPORATION LIMITED,GOVT.OF WEST BENGAL**<br>• **PROF. SUKUMAR MUKHERJEE,CHIEF MEDICAL ADVISOR, GOVT.OF W.B**<br>• **PROF. SUBIR KUMER DUTTA,FORMER DEAN OF MEDICINE,C.U**<br>• **VICE-CHANCELLOR,UNIVERSITY OF CALCUTTA**<br>• **VICE-CHANCELLOR,W.B.U.H.S**<br>• **PROF.P.A.KYRIACOU,CITY UNIVERSITY, LONDON,U.K**<br>• **PROF. R.K.PODDAR,FORMER VICE-CHANCELLOR,C.U**<br>• **PROF. N.BASU,DIRECTOR, SCHOOL OF TROPICAL MEDICINE,GOVT. OF W.B**<br>• **PROF. S ROY,DIRECTOR, S.N.BOSE NATIONAL CENTRE FOR BASIC SCIENCES,KOLKATA,W.B** | |
| 11.30-11:45.am | **TEA BREAK** | |
| 11:45-12.45pm | **KEY NOTE ADDRESS BY**<br>**PROF. S. C. ROY, Editor, Applied Radiation and Isotopes (Elsevier Journal)**<br>**Former Professor and Chairman, Dept. of Physics, Bose Institute, Kolkata** | |
| **PERIOD** | **PROGRAM** | **SESSION-CHAIR** |
| 12.45-1.45pm | Lecture on **Optical sensors in medicine** by **Prof. P. A. Kyriacou, City university, London, U.K** | Prof. R.K.Poddar, Former VC,C.U |
| 1.45-2.30pm | **LUNCH BREAK** | |
| **PERIOD** | **PROGRAM** | **SESSION-CHAIR** |
| 2.30-3.00pm | Lecture by a **representative of ICON Analytical Instrument** | Prof. C.K.Dasgupta,<br>Former professor, C.U |
| 3.00-4.00pm | Lecture by **Prof. G. C. Das, Baylor College of Medicine, Houston , Texas** | Prof.U.Dasgupta,<br>Former professor, C.U |
| 4.00-4.30pm | Lecture by a **representative of SIEMENS HEALTHCARE PRIVATE LTD.** | Prof. B.K. Chatterjee, Senior Professor, Bose Institute, Kolkata |
| 4.30-5.00pm | **REFRESHMENT** | |

**DAY 2: 26th NOVEMBER, 2016**

| PERIOD | PROGRAM | SESSION-CHAIRS |
|---|---|---|
| 11.00-01.00pm | Technical Paper presentation; 15min each | Dr. I. Dhar, School of Tropical Medicine, Kolkata **&**<br>Dr. Rajat Choudhuri, IPGMER. |
| 01.00-01.30pm | **VALEDICTORY SESSION:** | |
| | **Prof. D. N. Bose, Former Dean, IIT-Kharagpur**<br>**Prof. A. S. Chakraborty, Dept. Of Biophysics & Molecular Biology, C.U** | |
| 01.30-01.45pm | **VOTE OF THANKS** | |
| 01.45-02.45pm | **LUNCH** | |

# Plenary Talks

# Optical Sensors in Medicine

*Panicos A Kyriacou*[*]

[*]*Professor of Biomedical Engineering, School of Mathematics, Computer Science and Engineering, Northampton Square, London*

Throughout human history, light has played an important role in medicine. New optical technologies, many involving light emitting diodes, laser diodes, lasers, fibre optics or nanotechnologies providing sensitive and compact electronic like devices are revolutionising many fields. Applications of new optical technologies to medicine might be described as in an adolescent stage, where their power and potential can be recognised but are still developing rapidly, and much is yet to come. The development of optical sensors used for either invasive or non-invasive physiological measurements is a current strength of the UK. The focus of this presentation will be mainly in the application of optics in the development of medical sensors. The talk will cover examples of application areas including real-time physiological and biochemical monitoring using optical techniques and spectral analysis. Mathematical modelling of optical propagation in tissue, as well as signal-processing techniques developed or adapted specifically for extraction of biomedical information arising from optical techniques also lie within the scope of the presentation.

# Progress in Biomedical Instrumentation and Recent Trends

*S.C. Roy*[*]

**Editor, Applied Radiation and Isotopes*

*Formerly Professor and Chairman, Department of Physics, Bose Institute, Kolkata, India*

This talk presents a historical review of the progress made in the areas of biomedical instrumentation since the discovery of X-rays. Development of biomedical instruments essentially depends on the knowledge of physics, chemistry, nuclear science, computers, information science etc. Concepts and knowledge of physics applied to medical science generated a new discipline which is now known as Medical Physics. Medical Physics works in three different areas: Diagnostics, Protection and Therapy. Diagnostics dates back almost to the origin of human beings on the earth. All human beings are subjected to some kind of illness during their lifespan. Diagnostics initially started with observing the symptoms, their appearance and sensing problems by physical touch, examination etc. which underwent a revolutionary change after the discovery of X-rays. Therapy and protection followed thereafter. Convenience, accuracy and commercial viability are the three factors which control the advancement of biomedical instruments. Each of the three topics mentioned above will be discussed briefly and concluded with the trends of future research in biomedical instrumentation.

# Integration of Advanced Technology and Approaches to Probe Complex Human Diseases

*Gokul C Das**

** Professor, Department of Medicine, Baylor College of Medicine, Houston, TX, USA*

Human genome is now an open book. We can read the information hidden in the genome and edit it when required. Functional genomics has enabled us to understand vast wealth of data on gene function and interaction thus revolutionizing the outcome of biomedical research. This includes, but not limited to, probing complex human disease and to develop more precise therapeutic strategy or gene therapy. A combination of next generation sequencing technology (RNA-seq) followed by real-time RT-PCR (q-RT PCR) for validation, genome editing by CRISPR-Cas9 system, or proteomics study along with the tools of bioinformatics not only determine the genetic network, but also have placed the idea of curing of human disease in the forefront of current thought. I will present an overview of the state-of-the art technology and approaches applied in our research with reference to HIV associated nephropathy and/or Hep C induced Type II diabetes.

# Abstracts

# Automatic Detection of White Matter and Gray Matter from MRI Image for Diagnosis of Neurological Diseases

*Arani Mazumdar[1] and Anima Sen[1]**

*[1] Joint Academic Programme on Biomedical Instrumentation, University of Calcutta & The West Bengal University of Health Sciences, Kolkata, India*

**Background**: The brain is the most complex organ which acts as the centre of the nervous system of the human body. Quantitative analysis of Gray Matter (GM) and White Matter (WM) is vital part for detection of multiple brain diseases such as asymptomatic unruptured aneurysms, Alzheimer's disease, vascular dementia, and multiple sclerosis. Magnetic Resonance Imaging (MRI) is a very useful medical imaging technique that helps the doctor for diagnosis and therapy of these kinds of complex neurological disease. Quantification of white matter lesions is necessary for drug treatment assessment of multiple sclerosis, while volumetric analysis of gray matter, white matter and cerebrospinal fluid (CSF) is important to characterize morphological differences between subjects in epilepsy and schizophrenia. Manual segmentation is too time consuming since vast amounts of data are required for such studies. Moreover, such manual segmentations show large inter and intra observer variability. Hence, there is a need for automated segmentation tools. This paper proposes an efficient algorithm for automatic segmentation of brain tissues such as gray matter and white matter regions from MRI images. After pre-processing, thresholding and edge detection methods are used to extract the gray matter and white matter. The experimental result and validation indicate the accurate detection and segmentation from MRI brain image.

**Purpose:** MR Imaging segmentation method is used for quantitative analysis of anatomical brain tissues such as GM, WM to serve the purpose of diagnosis of some complex disease such as Epilepsy, stroke, Alzheimer's disease, brain tumor, brain infection and multiple sclerosis.

**Methods:** Computer-Aided Detection and Diagnosis method has been developed that allows rapid, user-friendly determination of gray matter and white matter for diagnosis of different kind of brain diseases. First the image is converted into gray scale and then image is preprocessed by enhancing the intensity of gray scale image, then median filter of window [3 X 3] has been applied for removing the noise from the MRI image. Then edge detection and morphological operation have been taken place on the resulting image. Threshold segmentation with threshold value 50 is applied and then watershed transform is applied to the image to localize the white matter and gray matter.

# Therapeutic Potential of Surface Functionalized $Mn_3O_4$ Nanoparticles against Chronic Liver Diseases in Murine Model

*Aniruddha Adhikari[1] and Samir Kumar Pal[1]**

*[1]Department of Chemical, Biological and Macro-molecular Sciences, S. N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

**Abstract:** Currently there is a great deal of interest on health benefits of inorganic nanoparticles. Although they have been successfully introduced against several diseases, their direct use in treatment of chronic diseases are sparse in literature. Chronic liver diseases are the fifth most common cause of death, affecting around 400 million people per year worldwide and have no effective medication. Our studies have shown that citrate functionalized $Mn_3O_4$ nanoparticles (C-$Mn_3O_4$ NPs) can degrade bilirubin directly both in *in vitro* as well as *in vivo* conditions. Potential use of this NPs for symptomatic treatment of hyperbilirubinemia in preclinical mice model and human blood (*ex vivo*) have successfully been tested. In further studies, oral treatment of C-$Mn_3O_4$ NPs effectively reduced severe chronic liver damage even fibrosis in $CCl_4$-induced mice model. Additional investigations revealed that C-$Mn_3O_4$ NPs show increased antioxidant activity upon acid treatment (both *in vitro* and *in vivo* i.e. stomach), which is in turn responsible for its hepatoprotective nature. Assessment of various liver function parameters along with histopathology and immunohistochemistry were performed to evaluate pathophysiological condition of the liver. To unravel the mechanisms involved in attenuation of liver injury by NPs, various antioxidant parameters (like superoxide dismutase, catalase, glutathione peroxidase, reduced glutathione etc.) were also examined. An in depth study of the effect of C-$Mn_3O_4$ NPs on mitochondria, the cellular mediator of oxidative stress further revealed the molecular mechanism behind its therapeutic efficacy. To best of our knowledge, this is the first study that demonstrates direct oral treatment of an inorganic NPs (i.e. C-$Mn_3O_4$ NPs) without any delivery system can efficiently reduce chronic hepatotoxicity and liver fibrosis through its antioxidant activity.

# Clinical Validity of Hydrogen Sulphide breath test for non-invasive diagnosis of Small Intestinal Bacterial Overgrowth in IBS

*Gourab Dutta Banik[1] and Manik Pradhan[1]**

*[1] Department of Chemical, Biological and Macromolecular Sciences, S. N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

**Abstract:** Small Intestinal Bacterial Overgrowth (SIBO) is a common gastrointestinal disorder characterized by an increased number of abnormal types of bacteria in the small intestine, exceeding $10^5$ colony forming units (CFU) per mL in jejunal aspirate which is done by means of endoscopy followed by culture.Currently Hydrogen breath tests (HBT) are widely used for diagnosis of SIBO. But the conclusion drawn from these studies are highly controversial and several discrepancies exist in the result. In the present work we have demonstrated an alternative methodology for diagnosis of SIBO in diarrhea predominant irritable bowel syndrome patients by tracking the change in level of hydrogen sulphide in exhaled breath after ingestion of normal glucose. It is observed that $H_2S$ level in exhaled breath are distinctly altered for diarrhea-predominant IBS individuals with and without SIBO by the activity of sulphur reducing bacteria (SRB). Moreover $H_2S$ signalling can precisely track the bacterial overgrowth when HBT fails in presence of non-hydrogen producing colonic bacteria in small intestine. An optimal diagnostic cut-off value of $\Delta H_2S\% \geq 1.74\%$ in breath sample is considered to be an indication of presence SIBO and this corresponds to 93.6% sensitivity and 89.4% specificity with 91.3% diagnostic accuracy. Monitoring molecular $H_2S$ level in breath can also preciously track the evolution of bacterial overgrowth even after eradication of SIBO. Our findings suggest that change in $H_2S$ level in exhaled breath may contribute as a potential marker for non-invasive assessment of SIBO.

# Silver Nanoparticle Impregnated Polymer Based Sensor for Potential Application in Biomedically Relevant Environments

*Probir Kumar Sarkar[1] and Samir Kumar Pal[1]**

*[1]Department of Chemical, Biological and Macro-molecular Sciences, S. N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

**Abstract:** Mercury (Hg) is an environmental pollutant which is detrimental to the health of living beings due to the toxicity in its oxidation states. To control mercury pollution and reduce mercury damage to human health, development of a low cost, efficient and highly sensitive mercury sensor remains a challenge. In the present work we have proposed a low cost prototype based on silver nanoparticles-impregnated poly (vinyle alcohol) (Ag-NPs-PVA) thin film for mercury detection. The thin film fabricated through a facile protocol is shown to be a fast, efficient and selective sensor for $Hg^{2+}$ in aqueous medium with a detection limit of 10 ppb. In the presence of $Hg^{2+}$, the yellowish thin film turned to colorless due to the loss of intense surface plasmon resonance (SPR) absorption band of the silver nanoparticles (Ag-NPs) through amalgamation. We have utilized the amalgamation of Ag-NPs with $Hg^{2+}$ to develop the low cost, highly efficient and feasible prototype mercury sensor. This sensor has high selectivity for $Hg^{2+}$ ions over a wide range of other competing heavy metal ions, generally present in water of natural sources. The sensor response is found to be linear over the $Hg^{2+}$ ions concentration regime from 10 ppb to 5 ppm. The proposed technique has been successfully demonstrated for the determination of trace $Hg^{2+}$ ions in real water samples.

# Exploration of Biomedically Relevant Spectroscopic Techniques for Potential Biomedical applications

*Nabarun Polley[1] and Samir Kumar Pal[1]**

[1] *Department of Chemical, Biological and Macro-molecular Sciences, S. N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

**Abstract:** Interaction of light with matter always fascinates human since ancient times. The term 'spectroscopy' was originated in the 17$^{th}$ century through the study of visible light dispersed according to its wavelength, by a prism. Spectroscopy in the medical science is popularized in the early 20$^{th}$ century. However, its glorious presence in the diagnosis of diseases is still evident since the earliest times. Primitive medical diagnoses made by ancient physicians were based on what they could observe with their eyes and ears, which sometimes also included the examination of human specimens. Herein, we have utilized spectroscopic tools and techniques for the development of novel clinical diagnostic and therapeutic approaches. We have demonstrated that the conjunctiva could be a target organ to diagnose jaundice independent of race, age, and sex by using a simple diffused reflection measurement technique. Based on the aforementioned principle, we have also developed a noninvasive, easy, expeditious, reliable, and practical device for routine measurement of bilirubin levels. We have also demonstrated the efficacy of evanescent field based strategy in maintenance of controlled bilirubin level in a blood-phantom solution (mixture of hemoglobin and Human Serum Albumin ((HSA)). In a prototype experiment we have designed a way to detect the level of bilirubin (diagnosis) and its photodegradation (therapy) simultaneously, using a single fiber. The present research also includes the validation of resonance type energy transfer scheme in a model Förster Resonance Energy Transfer (FRET) based fiber optic sensor for the first time using picosecond resolved Time Correlated Single Photon Counting (TCSPC) technique. The efficacy of the designed fiber sensor for the detection of various dielectric constants of a liquid medium has also been established.

# Measurement of oxygen-18 isotope of exhaled breath $CO_2$: A new non-invasive method to distinguish type 1 and type 2 diabetes

*Santanu Mandal[1], Chiranjit Ghosh[1], Prabuddha Mukhopadhyay[2], Shibendu Ghosh[3] and Manik Pradhan[1]**

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*[2] Department of Medicine, Vivekananda Institute of Medical Sciences, 99 Sarat Bose Road, Kolkata-700027, India*

*[3] Department of Medicine, Raipur Institute of Medical Sciences, Raipur-492006, Chhattisgarh, India*

**Background**: Type 1 diabetes (T1D), a chronic autoimmune disorder resulting from destruction of insulin-producing β-cells in the pancreatic islets of Langerhans. There is a pressing need to develop a new and an effective strategy for early detection of T1D and to precisely distinguish T1D from type 2 diabetes (T2D). The aim of the present study was to find out the potential link between the erythrocytes carbonic anhydrase (CA) activity and $^{18}O$-isotopic exchange of breath $CO_2$ in T1D and T2D.

**Methods**: Fasting and post-dose breath and blood samples were collected simultaneously after ingestion of 75-gm normal glucose dissolved in 150-mL water. Blood samples were analysed to measure the CA activity. The breath samples were utilised to measure the carbon dioxide isotopes ($^{12}C^{16}O^{16}O$, $^{13}C^{16}O^{16}O$ and $^{12}C^{16}O^{18}O$) by a laser based high-precision carbon dioxide isotope analyzer.

**Results:** The CA activities are markedly altered during metabolism of T1D and T2D and this facilitates to oxygen-18 ($^{18}O$) isotopic fractionations of breath $CO_2$. In our observations, T1D exhibited considerable depletions of 18O-isotopes of $CO_2$, whereas T2D manifested isotopic enrichments of $^{18}O$ in breath $CO_2$, thus unveiling a missing link of breath$^{18}O$-isotopic fractionations in T1D and T2D**.** The optimal diagnostic cut-off points were determined to be $\delta_{DOB}{}^{18}O‰ = 2.1‰$ and $\Delta CA = 3.15$ U/min/mL for screening T1D and T2D individuals.

**Conclusions:** Our findings suggest the changes in erythrocytes CA activities may be the initial step of altered metabolism of T1D and T2D, and breath $^{18}O$-isotope regulated by the CA activity is a potential non-invasive diagnostic biomarker that can selectively and precisely distinguish T1D from T2D and thus may open a potential unifying strategy for treating these diseases.

# Fabrication of Enhance Graded High Sensitive Ultra-Thin Electro- responsive Membrane for Potential Applications in Biomedical Science

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**Abstract:** Latest trend of research and development in science and engineering is portability which relies with smallest in size. Apart from other applications there is widespread interest in the development of low cost, practical diagnostic tools that are amenable to rapid screening of specific target analytes in the healthcare sector. A number of Polymer thin film based piezoelectric materials have already been used in medical applications, such as Self-Powered Cardiac Pacemaker, PVDF Film-based physiological sensing belt for a complementary respiration and heartbeat monitoring system, Lab on Chip (LOC), Health Care with Wellness Wear etc.[1-3].Although, the sensitivity, size, weight, flexibility, toxicity, and body compatibility restrict the use of conventional thin film based in vivo /in vitro, invasive or non-invasive device realizations. In this perspective, high sensitive lightweight polymer thin films are most desirable. Polydimethylsiloxane (PDMS) is one of the most popular silicone elastomers which is permeable to gasses, impermeable to water and nontoxic to cells, temperature stability from−50◦C to +200◦C, chemical inertness, low cost and simple fabrication making it attractive for a variety of biological and biomedical applications [4-5].In this present work Sensitive and sophisticated electro-responsive thin film (SSEF) is fabricated with a completely simple, precise &homemade technique where PDMS is the agent for electro-responsive means with aluminium foil as substrate and gold deposition has made on the PDMS. Deposited gold is co-operating to attract the molecular $–CH_2/−SiO$ dipoles of PDMS causing sensitive electro-responsivity without mechanical stressing. The SSEF is capable of sensing effects from a very tiny change of mechanical stress such as breathing, heart sound, blood flow, intercostal movement and muscle tremor. The generated output can be viewed and analyse in a wide scale for the design of sensitive, self-powered portable devices.

**Keywords:** Medical film, PDMS, Thin film, Polymer thin film, Gold-PDMS film, Electro-responsive film.

# Application of Glucose Metabolism in Pathogenesis of *Helicobacter pylori* Infection

*Suman Somand* [1] *and Manik Pradhan* [1]*

[1] *Department of Chemical, Biological and Macro-Molecular Sciences, S.N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

**Abstract:** *Helicobacter pylori (H. pylori)* is the most common gastric pathogen living in gastrointestinal (GI) tract and causative agent for chronic gastritis and gastric ulcers and can lead to the development of gastric cancers. The gastric pathogen *H. pylori* uses glucose as an energy source but the underlying mechanism remains inadequately understood. We have studied the isotopic fractionation of $^{18}$Oand $^{13}$C isotope of exhaled breath $CO_2$for elucidation of glucose metabolism in pathogenesis of *H. pylori*by utilizing integrated cavity output spectroscopy (ICOS) method. We have found that for *H. pylori* positive individuals exhibited significant isotopic enrichments of $^{18}$O(expressed as $\delta_{DOB}{}^{18}O$ ‰) in exhaled breath $CO_2$in response of ingested $^{13}$C-enriched glucose compared to *H. pylori* negative individuals due to role of *H. pylori* carbonic anhydrase (CA) activity whereas the excretion dynamics of $\delta_{DOB}{}^{13}C$(‰) for individuals with *H. pylori* positive shows higher isotopic enrichments of $^{13}$C isotope compared with individuals with *H. pylori* negative due to bi-phasic glucose metabolism of the micro-organism. To distinctively track the *H. pylori* infection we have deduced an optimal diagnostic cut-off value using receiver operating characteristic (ROC) curve analysis. So, in this present study we have explored the plausible metabolic pathways underlying the glucose utilization in the pathogenesis of *H. pylori* infection and the mechanism linking to breath$^{18}$O and $^{13}$C isotopic fractionation of $CO_2$to the gastric pathogen *H. pylori*.

# Structural Characterization of Blood Cells (Normal & Diseased) Using Scanning Electron Microscope

*Triparna Datta* [1] *and U Roychudhury* [1]*

[1] *Department of Chemical Technology, University of Calcutta, Kolkata, India*

**Abstract:** Scanning electron microscopy studied the surface structure of any cell in high resolution so that one can interpret the characteristic behavior of normal and diseased cells by using it. It is well known from the earlier study that the micro structural analysis of diseased blood sample was examined by SEM and it reveals more information than that of light microscope. Cancer metastasis is a major cause of cancer-induced deaths in patients. The cancer cell is distinguished by its acceleration of the cell cycle, genomic alterations, invasive growth, increased cell mobility, changes in the cellular surface, secretion of lytic factors, etc. Morphological analysis of cancer cells is significant in studying the changes in cellular organization and the physiological state of the cells, and thus it can be used as a qualitative and quantitative measure of the medical treatment. Sometime Cancer cells of different types are analogous with anaemic cells. So for the present study cells are observed under ZEISS SEM with different magnification and applied potential of 80kV range. The novel study concerns with some features of red cell morphology and variation of shape and sizes in the red cell membrane in different types of cancer cells. Alterations in red cell morphology sometime be a cause of changes in haemoglobin stability. The electron microscopic data indicate that there was a distinctive change in the red cells in different disease patients.

**Keywords:** Electron Microscopy, Blood Cells, Microstructure.

# Natural $^{18}O$ and $^{13}C$-urea in gastric juice track selectively peptic ulcer disease, non-ulcerous dyspepsia and *Helicobacter pylori* infection

*Mithun Pal[1], Abhijit Maity[1], Suman Som[1], Sanchi Maithani[1], Sujit Chaudhuri[2] and Manik Pradhan[1]**

[1] *Department of Chemical, Biological and Macromolecular Sciences, S. N. Bose National Centre for Basic Sciences, Salt Lake, JD Block, Sector III, Kolkata-700106, India*

[2] *Department of Gastroenterology, AMRI Hospital, Salt Lake City, JC-16 & 17, Kolkata-700106, India*

**Background:** The role of gastric juice urea in the pathogenesis of *Helicobacter pylori* (*H. pylori*) infection in human stomach is still poorly understood. Here, we aimed to explore a novel strategy exploiting the natural $^{13}C$ and $^{18}O$-isotopic signatures of urea inherently present in gastric juice for the non-invasive diagnosis of the actual disease state i.e. peptic ulcer disease (PUD) or non-ulcerous dyspepsia (NUD) associated with *H. pylori* infection.

**Method:** Gastric juice samples were extracted from each patient for spectroscopic detection of isotopic abundances of gastric juice urea. To exploit the gastric juice urea for non-invasive diagnosis of the disease state, only a citric acid meal was administered to the patients after an over-night fasting and subsequently post-dose breath samples were collected and analysed utilizing Integrated Cavity-Output Spectroscopy technique.

**Results:** We observed a statistical significant difference of total gastric juice urea between the sub-groups of *H. pylori* positive individuals i.e., between NUD ($2.17 \pm 0.37$(SE) mM) and PUD ($0.65 \pm 0.20$(SE) mM). The isotopic analysis of gastric juice urea revealed the natural abundances of the individual isotopes i.e. $^{12}C$ (98.4%), $^{13}C$ (1.11%) and $^{18}O$ (0.45%) of urea inherently present in gastric juice. The $^{13}C$ and $^{18}O$-isotopic fractionations of exhaled breath $CO_2$ were enriched for NUD, but depleted for PUD individuals in the direct exploitation of gastric juice urea by *H. pylori*. Receiver operating characteristics curve analyses showed that PUD and NUD individuals can effectively be diagnosed with ~96% sensitivity and 100% specificity.

**Conclusion:** This study offers novel opportunities for a simple, cost-effective and non-toxic global strategy devoid of any $^{13}C$-enriched external urea for treating simultaneously PUD, NUD and *H. pylori* by a single breath test.

With Best Compliments from:

***Scientific Clinical Research Laboratory Pvt. Ltd. (Kolkata)***

*2 Ram Chandra Das Row, Kolkata – 700013, Email: scrllab1986@yahoo.in*

With Best Compliments from:-

μ

# MICROTECH INDUSTRIES

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