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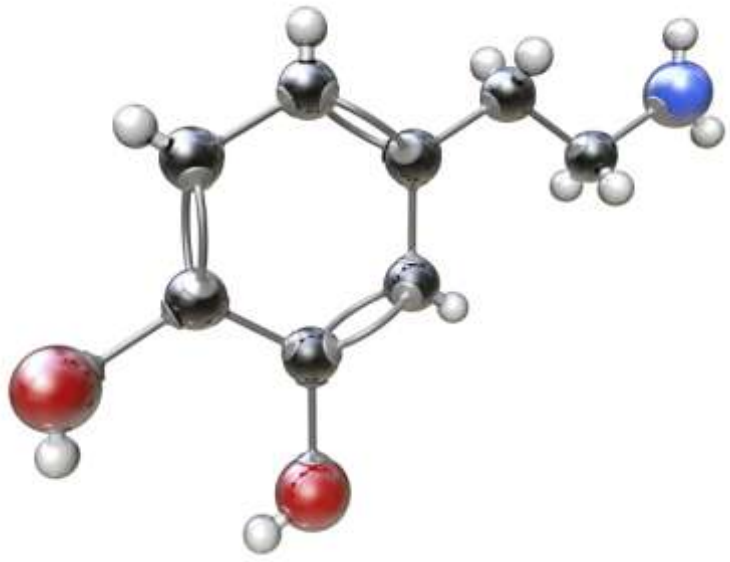
Chemistry News

An Academic Publication of the Chemical Society and the Department of Chemistry



Department of Chemistry
N. N. Saikia College
Titabar-785630

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Titabar-785630, Jorhat, Assam

December, 2022

The Department at a Glance

The Department of Chemistry is one of the oldest Science departments of Nanda Nath Saikia College started in 1971. The Department has been offering three years degree course in Chemistry (B.Sc.) with honours provision along with two certificate courses. From 2019 onwards, CBCS has been implemented in the Department. Decorated by well-trained and extremely motivated faculties as well as bright students, the Department constantly strives to maintain a culture of excellence and uphold the highest standards in chemical education. The Department is housed with a research laboratory, two general laboratories and a well-equipped smart classroom. Along with teaching, the faculty members are actively engaged in research in the area of chemical sciences as well as interdisciplinary topics. Our alumni are well placed across the globe and have contributed significantly in their respective domains.

- ## Academic Programmes

Undergraduate Degree Course (B.Sc.)

Type: CBCS (honours)

Intake capacity: 30

Certificate course

1. Basic Chemistry Softwares and Online Chemistry Database
   Intake capacity: 25
2. Water Analysis

   Intake capacity: 25

- **Faculty Strength:** 05

Current Faculties

Dr. Partha Pratim Saikia
M.Sc., NET, PhD
Teaching expertise: Organic Chemistry

Dr. Dhrubajit Borah
M.Sc., NET, PhD
Teaching expertise: Inorganic Chemistry

Dr. Jayanta Madhab Borah
M.Sc., SLET, B.Ed., PhD
Teaching expertise: Physical Chemistry

Dr. Bhaskar Jyoti Saikia
M.Sc., SLET, GATE, PhD
Teaching expertise: Physical Chemistry

Dr. Amlan Puzari
M.Sc., SLET, PhD
Teaching expertise: Inorganic Chemistry

Library

The department has a well-maintained library with reading room facility which has a collection of around 300 text and reference books.

Research Highlights

The Department of chemistry has been actively pursuing research activities in a number of research fields like coal chemistry, synthetic organic chemistry, material science, catalysis, polymer chemistry, surface chemistry etc. In spite of limited facilities and infrastructure, the Department has been dedicatedly engaged in different research-based works. So far, the Department has succeeded in securing research grants from UGC, DST, SERB and ministry of environmental science. The present areas of ongoing research are catalysis, material science and polymer chemistry.

List of research projects ongoing/recently completed in the Department

Sl. No.	**Name of the PI**	**Funding agency**	**Title of the Project**	**Duration**	**Total Grant**
1	Dr. Partha Pratim Saikia	DST-SERB	Extraction of electrical energy from hydrological cycle through two-dimensional nanofluidic channels	2021-*(Ongoing)*	8,25,000/-
2	Dr. Partha Pratim Saikia	DST	*In situ* generation of cyanide from novel non-toxic source: application in a few important C-C bond forming reaction and possible extension to the synthesis of bioactive natural products	2013-16	23,00,000/-

- **Research Publications of the Faculties**

Environmental Research
Volume 209, June 2022, 112875

Biodegradation of hazardous naphthalene and cleaner production of rhamnolipids – Green approaches of pollution mitigation

Rupshikha Patowary [a], Kaustuvmani Patowary [a], Mohan Chandra Kalita [b], Suresh Deka [c], Jayanta Madhab Borah [d], Sanket J. Joshi [e], Ming Zhang [f], Wanxi Peng [g], Gaurav Sharma [h i], Jörg Rinklebe [h g h i], Hemen Sarma [m]

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scientific reports

OPEN

Synthesis of salicylic acid phenylethyl ester (SAPE) and its implication in immunomodulatory and anticancer roles

Arup Jyoti Das[1], Monoj Kumar Das[1], Salam Pradeep Singh[1], Partha Pratim Saikia[1], Neelu Singh[1], Johirul Islam[1], Aftab Ansari[1], Pronobesh Chattopadhyay[1], Paulraj Rajamani[2], Tatsuro Miyaji[3] & Sankar Chandra Deka[1]

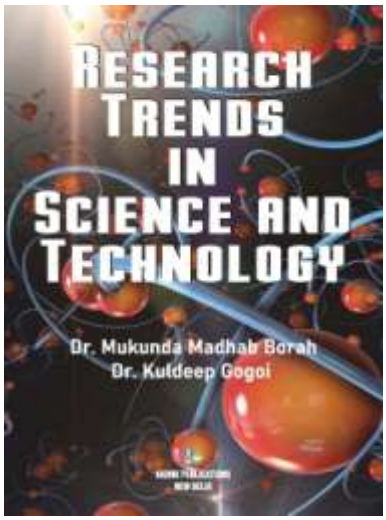
Salicylic acid phenylethyl ester (SAPE) was synthesized by $Zn(OTf)_2$-catalyzed selective esterification of salicylic acid and phenylethyl alcohol and studied for its role as an immunomodulatory and anticancer agent. Low toxicity and favorable physical, Lipinski-type, and solubility properties were elucidated by ADME-tox studies. Molecular docking of SAPE against COX-2 revealed favorable MolDockscore, rerank score, interaction energy, internal pose energy, and hydrogen bonding as compared to ibuprofen and indomethacin. An average RMSD of ~ 0.13 nm for the docked complex with stable dynamic equilibrium condition was noted during the 20 ns MD simulation. A low band gap predicting a strong bindingaffinity at the enzyme's active site was further predicted by DFT analysis. The ester caused a reduction in the percentage of erythrocyte hemolysis and was shown to be non-cytotoxic against human lymphocytes, CaCo-2, and HepG-2 cells by the MTT assay. Moreover, it's in vitro efficacy in inhibiting COX-2 enzyme under both LPS stimulated intestinal cells and direct sequestration assays was found to be higher than salicylic acid and indomethacin. The anticancer activity of SAPE was tested on the breast cancer cell line MCF-7, and potential efficacy was exhibited in terms of decreased cell viability. Flow cytometry analysis exhibited the arrest of the cell cycle at G1/G0 and S phases, during which induction of autophagic vesicle formation and decrease in mitochondrial membrane potential was observed owing to increased ROS production. Furthermore, at these phases, the onset of apoptosis along with DNA damage was also observed. Pre-treatment with SAPE in colitis induced Wistar rats displayed low disease activity index and reduction in the extent of intestinal tissue disruption and lipid peroxidation. A marked increase of anti-oxidative enzymes viz., catalase, GGT, and GST, and a decrease of pro-inflammatory cytokines IL-6 and TNF-α in the intestinal tissue extracts of the treated groups was noted. The results of this study have sufficient credence to support that the synthesized ester (SAPE) be considered as an anti-oxidative and anti-inflammatory compound with therapeutic potential for the effective management of cancer.

- ❖ Synthesis of salicylic acid phenylethyl ester (SAPE) and its implication in immunomodulatory and anticancer roles; Arup Jyoti Das, Monoj Kumar Das, Salam Pradeep Singh, **Partha Pratim Saikia**, Neelu Singh, Johirul Islam, Aftab Ansari, Pronobesh Chattopadhyay, Paulraj Rajamani, Tatsuro Miyaji & Sankar Chandra Deka, Scientific Reports, 2022, 12, 1 *(Nature Portfolio).*
- ❖ Biodegradation of hazardous naphthalene and cleaner production of rhamnolipids-Green approaches of pollution mitigation; Rupshikha Patowary, Kaustuvmani Patowary, Mohan Chandra Kalita, Suresh Deka, **Jayanta Madhab Borah**, Sanket J Joshi, Ming Zhang,

Wanxi Peng, Gaurav Sharma & Jörg Rinklebe, Environmental Research, 2022, 209, 112875 *(Elsevier)*.

- **Chapters Contributed to Edited Book by the Faculties**

❖ Synthesis of layered double hydroxide nanosheets: A short review; Tumpa Paul, **Dhrubajit Borah**, **Bhaskar Jyoti Saikia**, **Jayanta M Borah** & P**artha Pratim Saikia**, *Research Trends in Science and Technology* (AkiNik Publications, New Delhi) 2022, 277-293.

1. 

- **Workshop Participated by the Faculties**

1. **Dr. Jayanta Madhab Borah** participated in the workshop *'Disester Management'* organized by the UGC-Human Resource Development Centre, Himachal Pradesh University, Shimla, Himachal Pradesh during 24-29th January, 2022.
2. **Dr. Amlan Puzari** participated in the international workshop *'Academic Research Writing, Copyright & Plagiarism'* organized by the Nanda Nath Saikia College, Titabar, Assam during 14-19th November, 2022.

- **FDP/RC/ Participated by the Faculties**

1. **Dr. Bhaskar Jyoti Saikia** carried out the UGC sponsored short term course on *'Disaster Management'* organized by Kumaun University, Nainital, Uttarakhand; a UGC-Human Resource Development Centre during 16th -22th February, 2022.
2. **Dr. Dhurbajit Borah** attended an interdisciplinary Refresher Course on *'Academic Writing and Research'* during 16-30th May, 2022.

3. **Dr. Jayanta Madhab Borah** carried out the '*National Faculty Development Programme'* organized by Guru Angad Dev Teaching Learning Centre, a Centre under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching of Ministry of Education, SGTB Khalsa College, University of Delhi, New Delhi during 19 -25th July, 2022.
4. **Dr. Bhaskar Jyoti Saikia** carried out the *'National Faculty Development Programme*' organized by Guru Angad Dev Teaching Learning Centre, a Centre under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching of Ministry of Education, SGTB Khalsa College, University of Delhi, New Delhi during 19-25th July, 2022.
5. **Dr. Jayanta Madhab Borah** carried out the Refresher Course '*Recent Advancement of Materials Science & Technology*' University of North Bengal, Siliguri, West Bengal; a UGC-Human Resource Development Centre during 9-23rd November, 2022.
6. **Dr. Bhaskar Jyoti Saikia** carried out the Refresher Course '*Recent Advancement of Materials Science & Technology*' University of North Bengal, Siliguri, West Bengal; a UGC-Human Resource Development Centre during 9-23rd November, 2022.

Activities in the Department

1. Dr. Panchali Bharali, Assistant Professor, Department of Chemistry Kendriya Mahavidyalaya, Jorhat interacted with our students & delivered a lecture on *Organic Polymers* on 3rd February, 2022 as a part of the MoU between N. N. Saikia College and Kandriya Mahavidyalaya, Jorhat.

2. Mr. Tarun Saikia, Assistant Professor, DCB Girls' College, Jorhat interacted with the students on 17th November, 2022 as a part of the ongoing Alumni Lecture Series.

3. Ms. Khirod Ch. Deka, Assistant Professor, Mariani College, Mariani interacted with the students on 18th November, 2022 and conducted a class on *Coordination Chemistry* as a part of the MoU between N. N. Saikia College and Mariani College, Mariani.

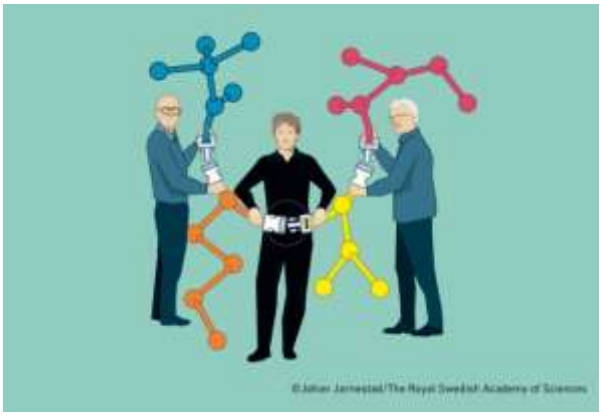
4. Ms. Mridula Neog, Assistant Professor, Kakojan College, Kakojan interacted with our students on 19th November, 2022 and conducted a class on *Green Chemistry* as a part of the MoU between N. N. Saikia College and Kakojan College, Kakojan.

Nobel Prize in Chemistry-2022

https://www.nobelprize.org/prizes/chemistry/2022/summary/

It just says click– and the molecules are coupled together

The Nobel Prize in Chemistry 2022 is about making difficult processes easier. Barry Sharpless and Morten Meldal have laid the foundation for a functional form of chemistry – *click chemistry* – in which molecular building blocks snap together quickly and efficiently. Carolyn Bertozzi has taken click chemistry to a new dimension and started utilising it in living organisms. Chemists have long been driven by the desire to build increasingly complicated molecules. In pharmaceutical research, this has often involved artificially recreating natural molecules with medicinal properties. This has led to many admirable molecular constructions, but these are generally time consuming and very expensive to produce.



Facts to know

Air bags are not inflated from some compressed gas source but rather from the products of a chemical reaction. The chemical at the heart of the air bag reaction is called sodium azide, or NaN_3. Under normal circumstances, this molecule is quite stable. If heated, though, it will fall apart. Decomposition of sodium azide (NaN_3) into sodium (Na) and nitrogen gas (N_2) describes exactly how it falls apart. A handful (130 g) of sodium azide produces 67 liters of nitrogen gas, which is enough to inflate a normal air bag. Sodium is a very reactive metal that will react rapidly with water to form sodium hydroxide; as a result, it would be quite harmful if it got into your eyes, nose or mouth. So to minimize the danger of exposure, air bag manufacturers mix the sodium azide with other chemicals that will react with the sodium and, in turn, make less toxic compounds. [Airbag makers also add potassium nitrate and silicon dioxide to react with the resulting sodium metal. That reaction produces potassium silicate and sodium silicate, both of which stop the sodium from reacting with moisture in the air to form corrosive sodium hydroxide.]

There are sensors in the front of the automobile that detect a collision. These sensors send an electric signal to the canister that contains the sodium azide and the electric signal detonates a small amount of an igniter compound. The heat from this ignition starts the decomposition of the sodium azide and the generation of nitrogen gas to fill the air bag. What is particularly amazing is that from the time the sensor detects the collision to the time the air bag is fully inflated is only 30 milliseconds, or 0.03 second. Some 50 milliseconds after an accident, the car's occupant hits the air bag and its deflation absorbs the forward-moving energy of the occupant.

Source: https://www.scientificamerican.com/article/how-do-air-bags work/#:~:text=CRASHES%20trip%20sensors%20in%20cars,though%2C%20it%20will%20fall%20apart.]

Magnetic Resonance Imaging (MRI)

Magnetic Resonance Imaging (MRI) is a non-invasive imaging technology that produces three dimensional detailed anatomical images. It is often used for disease detection, diagnosis, and treatment monitoring. It is based on sophisticated technology that excites and detects the change in the direction of the rotational axis of protons found in the water that makes up living tissues.

MRIs employ powerful magnets which produce a strong magnetic field that forces protons in the body to align with that field. When a radiofrequency current is then pulsed through the patient, the protons are stimulated, and spin out of equilibrium, straining against the pull of the magnetic field. When the radiofrequency field is turned off, the MRI sensors are able to detect the energy released as the protons realign with the magnetic field. The time it takes for the protons to realign with the magnetic field, as well as the amount of energy released, changes depending on the environment and the chemical nature of the molecules. Physicians are able to tell the difference between various types of tissues based on these magnetic properties.

To obtain an MRI image, a patient is placed inside a large magnet and must remain very still during the imaging process in order not to blur the image. Contrast agents (often containing the element Gadolinium) may be given to a patient intravenously before or during the MRI to increase the speed at which protons realign with the magnetic field. The faster the protons realign, the brighter the image.

MRI scanners are particularly well suited to image the non-bony parts or soft tissues of the body. They differ from computed tomography (CT), in that they do not use the damaging ionizing radiation of x-rays. The brain, spinal cord and nerves, as well as muscles, ligaments, and tendons are seen much more clearly with MRI than with regular x-rays and CT; for this reason MRI is often used to image knee and shoulder injuries.

Although MRI does not emit the ionizing radiation that is found in x-ray and CT imaging, it does employ a strong magnetic field. The magnetic field extends beyond the machine and exerts very powerful forces on objects of iron, some steels, and other magnetizable objects; it is strong enough to fling a wheelchair across the room. People with implants, particularly those containing iron should not enter an MRI machine.

An Introduction to *Trans* Fat

Dr. Partha P Saikia
Assistant Professor
Department of Chemistry
Nanda Nath Saikia College

It is long known that, carbohydrate, protein and fats are the three major nutrients in the daily diet of any individual. Of the three major nutrients, fats have the highest available energy at 9 k cal/g. Infact, oils and fats are the primary source of energy for the body. Fat serves as the body's store of energy. They also act as carriers of different vitamins like nutritionally significant fat-soluble compound, vitamin E and flavours and thus, heightening the flavour of the food. They also contribute to the feel of food in the mouth. Again, in food processing and in various food products, the oils and fats play numerous functions.

Chemically, a fat or oil is made up of a mixture of different triglyceride molecules, each derived from different combinations of three fatty acids. The Fatty acids fall into two main groups – saturated and unsaturated. Carbon atoms are tetravalent i.e. they can form four covalent bonds with other atoms and Hydrogen atoms can bond with only one other atom. In saturated fatty acids all carbon atoms are joined by single bonds and the remaining valency bonds are occupied by hydrogen except for the carboxyl group. When all the carbon atoms in the molecule are joined by double bond as they are missing a hydrogen atom and enabling each carbon atom to participate in four bonds, it is said to be unsaturated.

In nature, unsaturated fatty acids usually have *cis* configurations i.e. in most naturally occurring unsaturated fatty acids, the hydrogen atoms are on the same side of the double bonds of the carbon chain *cis* configuration but, as only a double bond can be locked in *cis-trans* orientation hence, unsaturated fats may have *trans* configuration also unlike, the saturated ones as they have no double bond in their molecules and their single bonds can rotate freely. Because of the different properties of fats and oils like sensory, functional and nutritional, fats can perform as a heat transfer medium, lubricant, release agent and texturing agent in manufacturing food also and these properties of fats are determined by the levels of palmitic (C16:O) and stearic(C18:O) saturated fatty acids, oleic (C18:1) monounsaturated fatty acids (MUFA),

polyunsaturated fatty acids (PUFA) and also trans fatty acids. There are two broad types of *trans* fats found in foods: naturally-occurring and artificial *trans* fats. Naturally-occurring *trans* fats are produced in the gut of some animals and foods made from these animals (e.g., milk and meat products) may contain small quantities of these trans fats. Artificial *trans* fats (or trans fatty acids) are created in an industrial process that adds hydrogen to liquid vegetable oils to make them more solid. Likewise, in manufacturing food also, liquid cis-unsaturated fats like vegetable oils are hydrogenated to produce saturated, which have more desirable physical properties e.g. they melt at a desirable temperature(30-40 $^{\circ}$C).

All fats contain a mixture of saturated, mono-unsaturated and poly-unsaturated fatty acids, but in widely varying proportions depending on the source. The presence of large amounts of unsaturated fatty acids affect the physical as well as the chemical properties of a fat as it can make it liquid at room temperature. Primarily, *trans* fats originate from partially hydrogenated vegetable oils industrially, to produce semi-solid fat (Hardening process) whereas, milk, butter, cheese and meat from cows and other ruminants contain naturally occurring *trans* fat which may vary from 3-8%. In these animals, it is produced by enzymatic hydrogenation of unsaturated fats. In addition, small amount of *trans* fat is also formed during deodorization and prolong deep frying. *Trans* fat which occur naturally in trace amount in meat and dairy products from the ruminants mainly consists of Vaccency and conjugated linoleyl (CLA). Natural and artificial or industrially produced *trans* fats are chemically different, but there is no scientific consensus about differences in their health effects such as risk of heart diseases and strokes. But, the *trans* fat level may vary from 0-60% of the total fat based upon the food product. But, the degree of utilization by normal individuals of dietary fat is greater than 90 per cent. Wide and different intakes of fat, amount and type of fat consumed by different populations can determine their ability to stay in good shape and health condition. However, with changing life style and affluence, a previously healthy population can get exposed to various health hazards like diabetes, hypertension and coronary artery disease. A large part of the various forms of fat consumed by an individual in his various forms of food may have increased amount of *trans* fat and hence, further increasing such risks. Metabolic Syndrome, a comorbidity, is characterized by the co-occurrence of obesity (especially central obesity) high levels of triglycerides in the blood combined with low levels of high density lipoprotein cholesterol, hyperglycemia, and

hypertension. The frequent presence of artificial *trans* fat in different food items in varying degrees and served in restaurants and other such venues and outlets, poses an unnecessary, unsafe and preventable health risk to the customers and other consumers. . The primary source of cholesterol earlier, like in 1960s and 70s in food was animal fats but, research established that increased cholesterol leads to cholesterol deposit in the blood streams which was again linked to cardiovascular diseases. Again, that lead to a increased acceptance among people to decrease the cholesterol level in their diet and other food items and equally an increased interest for its alternatives, with the same food functionality but, at the same time with no or acceptable levels of cholesterol. Hence, demand for the vegetable oils increased significantly as, it was also inexpensive. But, soon it was found to be of poor quality as compared to animal fats. But, due to its low cost and increased demand, gradually, cholesterol containing animal fats was displaced from the market by the cholesterol-free vegetable oil manufacturers and as hydrogenation was the core technology used extensively, to produce the cholesterol-free vegetable oils by its manufacturers which, then resulted in increased presence of *trans* fat in the food supply system. Earlier research revealed that the saturated fatty acids were similar in action to the cholesterol in causing hazard to human health but, their increased replacement with polyunsaturated fatty acids (PUFA) had significant health benefits. It was also considered that the metabolism of *trans* fatty acids was different from that of its *cis* isomers or the natural forms of the same fatty acids. Again, there were also some believers that, the *trans* fatty acids behave like the saturated fatty acids in human body. Before 1990, very little was known about how *trans* fat can harm human health. In the 1990s, research began identifying the adverse health effects of *trans* fats although, in the 1940s, Catherine Kousmine researched the effects of *trans* fats on cancer. Consuming a diet high in *trans* fats can lead to high cholesterol levels in the blood, which can lead to health conditions such as heart disease, heart attacks and strokes. *Trans* fat are generally edible but, its consumption as food has shown to increase the risk of coronary heart diseases as it raises the levels of low density lipoprotein (LDL or bad Cholesterol), lowering levels of the high density lipoprotein (HDL or good cholesterol) which directly leads to increased probability of cardiovascular diseases, increasing triglycerides in the blood stream and promoting systemic inflammation. More precisely, actually cholesterol has nothing to do with heart diseases except when it is oxidised. Again, oxidation is a process purely chemical in nature that occurs widely in human body and contributes to aging and development of degenerative chronic diseases. During

commercial frying of food items at food joints and other such commercial venues, high temperature is used which causes inherently polyunsaturated fatty acids and oils to oxidise and eventually, these oxidised unsaturated fatty acids become the destructive and damaging part of the Low-density lipoprotein or LDL particles. Even without frying also, oxidation may occur inside the body in soybean and corn oils. Increased incidence of cardiovascular diseases was linked to obesity which is again due to excess content of fat in the diet of the victims. The deleterious effects of *trans* fat consumption have also been scientifically accepted but, the exact bio-chemical process by which *trans* fat affects human health, posing thereby, considerable threat, is still of much interest and draws increasing attention for continuing research. Several theories have been suggested but, it has not yet been fully established. Such theories are mainly based on the modus operandi of the Human Lipase Enzyme on the unsaturated fatty acids. It has been well understood and accepted that, the increasing risk of coronary heart diseases is due to human body's inability to metabolize essential fatty acids (EFA) including Omega-3 when, it is affected by increased consumption of dietary *trans* fatty acids and hence, the phospholipid fatty acid composition in the main artery of the human heart or aorta is changed. *Trans* fatty acid are considered to impair the metabolism rate of long chain polyunsaturated fatty acids (LCPUFAs). The other negative attributes of increased *trans* fat intake include various other chronic health problems and disorders which have also been scientifically asserted. During scientific researches, *trans* fat have been found to impair memory and learning ability which may later lead to diseases like Alzeimer's but, not yet fully confirmed. Various such scientific studies and researches have tried to establish the correlation between higher intake of dietary *trans* fatty acids and its consequences on human body, causing diseases and disorders like, Diabetes, Obesity, Liver dysfunction, cancer, infertility in women, major Depressive Disorders, behavioural irritability and increased aggression etc. A mechanism has been proposed that, *trans* fat substitutes docosahexaenoic acid or more commonly, DHA levels in the orbitofrontal cortex (OFC) thereby reducing DHA levels in brain and causing depressive disorders that may even lead to suicide which is fatal. *Trans* unsaturated fatty acids are associated with increased risks of ovulatory infertility.

Specific Ion Effect: Hofmeister Ion Series

Dr. Jayanta M Borah
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Department of Chemistry
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Ions are everywhere. Simple ions (inorganic and organic) play an important role in all living organisms, major role in the properties of sea water as well as they influence industrial processes (Kunz, 2006). Ions plays vital role in nerve signaling as well as metabolic process. Over a hundred years ago, Franz Hofmeister (1988), who was a professor of pharmacology at the University of Prague, ranked various ions towards their ability to precipitate hen egg white proteins. Hofmeister arranged the ions in a series (anions and cations) according to their ability to stabilize protein solutions and water withdrawing power as:

$Citrate^{3-} > SO_4^{2-} > PO_4H^{2-} > F^- > CH_3COO^- > Cl^- > Br^- > I^- > NO_3^- > ClO_4^- > SCN^-$

$Mg^{2+} < Ca^{2+} < H^+ < Na^+ < K^+ < Rb^+ < Cs^+ < NH_4^+ < N(CH_3)_4^+$

Accordingly, ions are classified into two groups. The ions on the left side of Cl^-, reduce the solubility of proteins by inducing crystallization. They are generally called salting out or water structure-maker or kosmotropes. Salting out is greatest in the case of strongly hydrated anions and results from the interfacial effects of strongly hydrated anions near the protein surface. The structure-maker ions produce aqueous solutions with higher viscosities, lower conductivities, lower self-diffusion co-efficients (Ohtaki and Radnai, 1993) and have greater hydration enthalpies. The ions on the right side of Cl^- in the series disrupt the water structure and are called structure-breaker or chaotropes or salting in. Protein 'salting-in' arises from the counter ion binding resulting in higher charged proteins. The cations are also arrange from left to right as polarisable soft cations to unpolarisable hard cation. Pearson (1963) unified the ions according to their 'softness' and 'hardness'.

The relative effectiveness of different anions in ion specificity follows a reverse Hofmeister ion sequence for pH < IEP and direct Hofmeister sequence for pH > IEP (Parsons and Ninham, 2010). Oxide materials with a high IEP such as alumina or rutile are typified by

inverse series whereas direct series are shown for oxides with a low IEP such as silica (Parsons and Ninham, 2010).

The origin of Hofmeister effect is due to ion polarisabilities (Jungwirth and Tobias, 2006) Polarisibility plays a crucial role in ion specificity. Ion polarisabilities have been recently used in *ab initio* quantum chemistry calculation by the groups of Ninham and co-worker and Jungwirth and his co-workers to examine the ion specificity. The ion specificity at the solid/liquid interface is also due to the dispersion forces reported in literature. The thumb rule "like seeks like" as given by Collins (2004) is based on the matching water affinities of ions and demonstrates that bigger ions preferentially associate with big counter ions and small ions associate with small counter ions.

The Hofmeister or specific ion effects have remakable application in the field of surface chemistry, biology, biochemistry, polymer, colloid and interface science. Hofmeister effect is well observed in solubility of salts, electrolyte activities, surface tension, ion exchange resin, zeta potentials, buffers, micelles, microemulsion, cloud point of non-ionic surfactant, ion binding to micelles, proteins and membranes, ion-macromolecule interaction, metal oxide/liquid interface, molecular forces and colloid stability. Mentioning the ubiquitous application of Hofmeister phenomenon, Ninham (2006) state that "Hofmeister effects are as important in the scheme of things as Mendel's work was to genetics".

Works on the specific ion effects has been developed in air-water, solid-solution, and liquid-solution interfaces. Literatures related to experimental studies, computational simulation and theory gives an insight to the molecular mechanism of ion specificity at the air-water interface (Jungwirth and Tobias, 2006). Craig and Henry (2009) reported that the surface tension of water rised upon addition of NaCl but lowered in addition of HCl. Recent studies reveals that the surface tension of some inorganic electrolytes and discussed their dependence on the ion type and concentration on the basis of dispersion forces between ion and air/water interface and polarisability.

Ion specificity exhibits its influence on the adsorption of surface-active agent onto metal-oxide surfaces. Nevertheless a change of surface charge of metal oxide may affect the adsorption process. For example, inorganic ions compete with humic acid and its analogues on the

adsorption processes (Ali and Dzombak, 1996). The adsorption density of humic acid and other surface-active agents on metal oxide surfaces is decreased in the presence of polyvalent inorganic anions (e.g. SO_4^{2-}, PO_4^{3-}) (Ali and Dzombak, 1996). On the other hand the amount of humic acid adsorbed on metal oxide surfaces increases in the presence of divalent cations (e.g. Ca^{2+}, Mg^{2+}). So, the effect of ions in chemical and biological system remarked as immense.

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Drug Treatment in Depression: Antidepressant or Tranquilizer

Pinki Chutia, B.Sc.1st Semester

Life is a fusion of happiness and sorrow. Everyone experiences joy as well as sadness at times.But depression is something more than that which is a part of life.It results in extreme sadness that lasts more than days or weeks and sometimes even years.

Depression is a common psychiatric condition worldwide. People of all ages are affected by depression. However,it is twice as frequent in women as in men. It is at high risk which results in suicidal thoughts. To get rid of ,people use neurologically active drugs viz. tranquilizers .Tranquilizers are a class of chemical compounds that acts on the Central Nervous System(CNS) used for treatment of anxiety, stress, irritation, excitement, mild or even severe mental diseases. It induces a sense of well-being in a person.

Different types of drugs perform different mechanisms. Tranquilizers are classified mainly into two categories; major and minor. Major tranquilizers, which are also known as antipsychotic agents, or neuroleptics are used to treat major states of mental disturbance in schizophrenics and other psychotic patients. While minor tranquilizers which are also known as anti-anxiety agents or anxiolytics are used to treat milder states of anxiety and tension in healthy individuals or people with less serious mental disorders.

Nowadays tranquilizers have been used extensively. Though major tranquilizers are used to treat schizophrenia it doesn't cure the patients but merely suppress its symptoms, and they are usually prescribed on a long-term basis. The basic types are the phenothiazines, thioxanthines, butyrophenones, clozapine, and rauwolfia alkaloids. The phenothiazines are the most widely used of these and include the drug chlorpromazine . They are thought to work by blocking the neurotransmitter dopamine in the brain. This results in reduction of psychotic symptoms but can also lead to side effects such as tremors of the limbs, rigidity, restlessness, and involuntary spasms of the facial muscles, tongue, and lips.The thioxanthines and the butyrophenones, chief among which is haloperidol (Haldol), are similar to the phenothiazines.

The minor tranquilizers are the benzodiazepines, among which are diazepam (Valium), chlordiazepoxide (Librium), and alprazolam (Xanax). These drugs have a calming effect and eliminate both the physical and psychological effects of anxiety or fear. Besides the treatment of anxiety disorders, they are widely used to relieve the strain and worry arising from stressful

circumstances in daily life. Because of this, benzodiazepines are among the most widely prescribed drugs in the world. Benzodiazepines work by enhancing the action of the neurotransmitter gamma-aminobutyric acid (GABA), which inhibits anxiety by reducing certain nerve-impulse transmissions within the brain. However,excessive use of Benzodiazepines results in: sleepiness, drowsiness, reduced alertness, and unsteadiness of gait. It can produce physical dependency even in moderate dosages, and the body develops a tolerance to them, necessitating the use of progressively larger doses. The drugs are thus intended for short-term and also medium-term use.

B. Sc. Results-2022

Appeared: 16

Passed: 16 **(100 %)**

1st class holders in B.Sc. 2022

Sl. No.	Name
1	Tanzila Jebin
2	Dibyajyoti Saikia
3	Debasish Boruah
4	Manash Jyoti Polong
5	Neelkaml Rajkhowa

Students' Progression

- Tanzila Jebin, Dibyajyoti Saikia and Debasish Boruah got selected in Kaziranga University of for pursuing *M.Sc.*

Notable Alumni of the Department

Sl. No.	Name	Designation &Address
1	Dr. Dipu Borah	Research Fellow, Trinity College Dublin, Ireland
2	Dr. Kula Kamal Senapati	Scientific Officer, IIT, Guwahati
3	Dr. Pranjal Saikia	Associate Professor, Gauhati University
4	Mr. Ananta Saikia	Scientist, DRDO
5	Mr. Tarun Saikia	Asst. Professor, DCB Girls' College
6	Dr. Subhangsu Dutta	Asst. Professor, DR College
7	Mrs. Nandita Dutta	Branch Manager, State Bank of India
8	Mr. Niranjan Dutta	Numaligarh Refinery Limited
9	Mr. Utpal Goswami	Numaligarh Refinery Limited
10	Mr. Biraj Das	APS, Govt. of Assam
11	Dr. Anjan Bora	Assistant Professor, Lovely Professional University
12	Mrs. Bornali Hazarika	Development Officer, LICI
13	Monuj Bihani	Established Businessman
14	Dr. Manisha Bihani	Post Doctoral Fellow, University of Louisville, USA
15	Dr. Bishwapran Kashyap	Tocklai Tea Research Institute, Silliguri campus
16	Mr. Anupam Konwar	Department of Chemistry, POWIET
17	Mr. Bishwajyoti Sarmah	Faculty, Pragjyotika Academy & notable Assamese writer

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