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FROM THE DESK OF PRINCIPAL

BY DR. P. SURESH

I am delighted to note that the Bengal School of Technology is going to release the first issue of scientific newsletter on 12th August, 2024 on the eve of librarian's day. I am happy that the team BST has taken a good initiative in publishing the newsletter with scientific content of current interest, which will be of immense use for the staff and student to keep them abreast with latest development in field of science & technology, in general and Pharmaceutical technology in particular. I wish all success.



BST

FROM THE DESK OF EDITOR

BY DR. SUCHANDRA GOSWAMI

It gives me immense pleasure to release the first issue of BST news letter. This news letter will be released in three issues per year. Our first issue is launched on the eve of Librarian's day. The news letter is amugamated by the thought of academicians as well as industrialists actively involved in Pharmacy profession.

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A BRIEF REVIEW ON IN-SITU GELS FOR NOVEL DRUG DELIVERY

SHREYA DAS, SAUMYA DAS*

DEPARTMENT OF PHARMACEUTICS, BENGAL SCHOOL OF TECHNOLOGY

EMAIL: SAUMYA@BSTPHARMACY.IN

ABSTRACT

The "in situ gel" framework has become one of the best innovative drug delivery methods; because to its unique "Sol to Gel" change include, the medications can be delivered step by step and taken care of. An in situ gelling system is a formulation that, prior to entering the body, is in solution form but, under certain physiological conditions, transforms into gel form. Various polymers can go through in situ gel formation and be employed for different drug delivery routes. The in situ gelling strategy has different advantages and uses in the advanced world. The introduction to in situ gel, its workings, the polymers it uses, and its uses are the primary topics of this review.

Keywords- in situ gel, novel drug delivery system, polymers

INTRODUCTION

Any medication conveyance framework's principal objective is to modify the drug's tissue distribution and pharmacokinetic characteristics. A lot of focus has been placed on the development of controlled and sustained release medication delivery devices throughout the last 60 years. One of the most cutting-edge medication delivery systems has emerged: the "in situ gel" technology. With its unique feature of switching from "sol to gel," the in-situ gel drug delivery system promotes patient compliance, comfort, and a sustained and regulated release of the medication (Khule, 2021). An in situ gelling system is a formulation that, prior to entering the body, is in solution form but, under certain physiological conditions, transforms into gel form. A variety of triggers, including pH changes, temperature changes, and solvent exchanges, combine to transform a solution into gel form (Kumar M. T., 2005). Numerous investigations have been conducted using injectable, parenteral, intraperitoneal, nasal, rectal, oral, and vaginal methods. Numerous polymeric systems with the ability to distribute medications have been created. When these polymers come into contact with physiological stimuli, they go through a sol-gel transition. In situ gel drug delivery methods are developed using a variety of synthetic and natural polymers.

Importance of in situ gelling system (Iyan, 2020)

It helps for the controlled and sustained release of the drug by its special 'Sol - Gel transition'.

·It helps in reducing the frequency of drug administration of the drug in the body.

·Low dose of the drug is required and there will be no drug accumulation and lesser side effects.

·The in-situ gel system decreases wastage of the drug.

·The residence time of the drug will increase due to gel formation.

·The drug's bioavailability will increase.

·The Liquid dosage forms can control the drug release & remain in contact with cornea of eye for a longer period of time.

Advantages of in situ gel (Sonjoy, 2012)

Ø Increased patient compliance and comfort

Ø A controlled and prolonged release of the medication

Ø ease of administration

Ø the ability to provide it to comatose patients

Ø reducing the frequency of doses and toxicity of the medication

Ø Enhanced bioavailability

Ø Utilizing natural polymers promotes both biodegradation and biocompatibility. Naturally occurring polymers possess intrinsic qualities such as biocompatibility, biodegradability, and biologically identifiable moieties that facilitate cellular functions.

Ø It is typically possible to modify the well-defined structures of synthetic polymers to achieve acceptable functionality and degradability.

Ø Additionally, in situ gels can be designed to display bioadhesiveness, which will help with drug targeting—particularly across mucous membranes—for non-invasive drug delivery.

Ø Due to their hydrophilicity, which lengthens the delivery device's in vivo circulation period by thwarting the host immune response and reducing phagocytic activities, in situ gels provide an essential "stealth" feature in vivo.

Disadvantages of in situ gel (Sonjoy, 2012)

Ø High levels of fluids are required.

Ø Possibility of chemical degradation-related stability issues.

Ø After taking the medication, eating and drinking may be prohibited for a few hours.

Ø Specifically, for hydrophobic pharmaceuticals, there can be restrictions on the amount and consistency of drug loading into hydrogels.

Ø Medication that requires a low dosage is only permitted.

Ø Reduced mechanical strength could cause the hydrogel to dissolve or flow away from the intended local site too soon.

Ideal characteristics of polymers used in insitu gel preparation (Phaechamud, 2012 & Budumuru 2020)

Ø The polymer need to possess the ability to stick to the mucosal membrane.

Ø It must be highly compatible and free from any harmful consequences.

Ø It ought to exhibit quasi plastic behavior.

Ø When the shear rate increases, the polymer should be able to decrease viscosity.

Ø Preferred pseudoplastic characteristics of the polymer.

Ø Superior durability and optical purity are increasingly favored.

Ø It ought to affect how tears behave.

Some common polymers used in making in-situ gel (Dibyalochan, 2018)

1.Pectin-

Pectin is a type of polysaccharide whose polymer consists primarily of α -(1-4) D galacturonic acid residues. Low methoxy pectins (degree of esterification <50%) rapidly form gels in aqueous solutions in the presence of free calcium ions and crosslink galacturonic acid chains in an explanation of the eggbox model. Pectin gels generally require the presence of calcium ions as a source of divalent ions in the presence of H⁺ ions to form gels that can be used as drug delivery vehicles. The main reason for the use of pectin in formulations is that it is water soluble, eliminating the need for organic solvents.

When pectin is taken orally, different cations present in the stomach promote gel formation (Sirish, 2010 & Nerkar, 2013).

1. Guar gum-

Guar gum, commonly known as guar gum, is a natural gum obtained from the endosperm of

the seed. Guar gum is soluble in water but insoluble in lipids, alcohol, ketones, hydrocarbons and esters. These revealed its solubility in hot and cold water, indicating that it can dissolve in both types of water to form low concentration colloidal solutions. Derivatives of guar gum are used in the production of hydrogels, nanoparticles and coated matrix systems for delivery purposes. Derivatives of guar gum include grafted polymers with large intestinal capacity, such as polyacrylamide grafted gum. It is also a polymer that can be used in matrix tablets that provide controlled release. (Zhidong, 2006)

2. Carbopol-

A polyacrylic acid (PAA) polymer called Carbopol turns into a gel when the pH increases from

4.0 to 7.4. At acidic pH, the carbomer remains in solution; when HPMC is mixed with the carbomer, the viscosity of the solution increases and its acidity decreases. A comparison of various polyacrylates (Carbopol 940, 934, 941 and 950) shows that Carbopol 940 has better properties and transparency. (Jyothi, 2012)

3. Xyloglucan-

Tamarind gum or xyloglucan is a polymer derived from the endosperm of seeds. Xyloglucan is composed of three different oligosaccharides: heptasaccharides, octasaccharides, and non-saccharides, which differ in their galactose side chains. It is used primarily for oral, rectal, and ophthalmic delivery due to its nontoxicity, biodegradability, and biocompatibility.

Similar to poloxamer, gelation occurs when heated to a lower temperature or cooled from a higher temperature. (Jyothi, 2012)

4. Gellan gum-

The bacterium *Elodea Sphingomonas* secretes gellan gum, an anionic heteropolysaccharide. It contains glucuronic acid, rhamnose, and glucose, which combine to form a tetrasaccharide molecule. Acetylfree gum, or gelrite, is made by placing gellan gum in an alkaline solution that removes the acetyl group from the molecule. The presence of calcium ions can cause gel formation during instillation. The gelation process involves the formation of double helical junctions due to complexation with cations and the formation of hydrogen bonds with water, and the assembly of two helical segments into a three dimensional network. Gellan gum is used in the food industry as a stabilizer and suspending agent. (Nerkar, 2013)

1. Alginic acid-

It is a polysaccharide that is a linear block copolymer, composed of β -D-mannuronic acid and α -L-glucuronic acid residues connected by 1,4-glycosidic bonds. Depending on the algal source, there are differences in each block and the order of blocks along the molecule. When divalent metal ions are added to diluted aqueous solutions of alginates, the sequential glucuronic residues in the α -L glucuronic acid blocks of the alginate chain cooperate to create solid gels. Because alginic acid has advantageous biological qualities such being nontoxic and biodegradable, it is employed as a carrier for ophthalmic preparations. (Qiu, 2001)

2. Xanthan gum-

Xanthan gum has high molecular weight extra cellular polysaccharide which is produced by the fermentation of the gram-negative bacterium *Xanthomonas campestris*. The primary structure of this naturally produced cellulose derivative contains a cellulosic backbone (β -D-glucose residues) and a trisaccharide side chain of β -D-mannose- β -D-glucuronic acid- α -D-mannose attached with alternate glucose residues of the main chain. Xanthan gum is soluble in cold and hot water as well as alkaline and acidic conditions. It exhibits good stability at alkaline conditions (Hong, 2000)

3. Chitosan-

Gelling of chitosan occurs by two changes such as pH responsive change and temperature change. Chitosan is a natural component of shrimp and crab shell which consist of biodegradable, thermosensitive, polycationic polymer obtained by alkaline deacetylation of chitin. Chitosan is a biocompatible pH dependent cationic polymer, which can remain dissolved in aqueous solutions up to a pH of 6.2. Neutralization of chitosan aqueous solution to a pH exceeding 6.2 leads to precipitation by the formation of a hydrated gel. (Hong, 2000)

1. Hydroxypropylmethylcellulose (HPMC)-

HPMC Assets The glucan chain that makes up cellulose has repeated β -(1, 4)-D-glucopyranose units. Temperature-sensitive sol-gel phase transition is exhibited by certain natural polymers, such as HPMC, MC, and EC. When the temperature drops, cellulose material will become more viscous, and when the temperature rises, its derivatives, such as HPMC and MC, will also become more viscous. MC is a naturally occurring polymer consisting of native cellulose with a chain that alternates between methyl substitution groups. A solution is liquid at low temperatures (300 degree centigrade), while gelation occurs at higher temperatures (40-500 degree centigrade) (Saraswat, 2011)

1. Poloxamer-

Poloxamer is a tri-block copolymer that dissolves in water. It is made up of two ABA-configured polyethylene oxide (PEO) and polypropylene oxide (PPO) cores.

Qualities Pluronic, a commercially available form of poloxamer, offers longer drug residence times and good thermal setting properties. Its primary applications are as a solubilizing, emulsifying, and gelling agent. Gel made with poloxamer is translucent and colorless. The distribution and ratio of hydrophilic and hydrophobic chains—which come in a variety of molecular weights and gelling properties determine this. (Calfrs, 2000)

CONCLUSION

Increasing patient compliance is the main prerequisite for a successful controlled release product, and in-situ gels for the controlled release of different medications provide several benefits over traditional dosage forms. The in-situ gel dosage forms are highly dependable due to their characteristics of sustained and prolonged drug release, superior stability, and biocompatibility. Moreover, utilizing water-soluble and biodegradable polymers in in-situ gel compositions can improve their acceptability and make them an excellent drug delivery strategy.

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MIRACLE OF ALPHA LIPOIC ACID AS ANTIOXIDANT.

MR. BISWANATH GHOSH

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY, BENGAL SCHOOL OF TECHNOLOGY

Alpha-lipoic acid is an antioxidant made by the body. It is found in every cell and all foods but especially found in kidneys, heart, liver spinach, broccoli and yeast. for the treatment of diabetic neuropathy.

When there is deficiency of vitamin C and Vitamin E it helps to absorption of these vitamins. The thiol groups dihydrolipoic acid a chelating agent enhance the biliary secretion. Oral supplementation improves functional vision α -Lipoic acid exists as R and S-enantiomers due to the presence of an asymmetric carbon C3 .

It is revealed that the natural cofactor of the complex is the R(p) enantiomer. Moreover, S()-LA acts either as a poor substrate or as an inhibitor of R(p)-LA in its interaction with 2-oxoacid dehydrogenase multienzyme complexes. However, both free LA enantiomers are reduced intracellularly to their respective reduced forms, albeit by different enzymatic interactions: R(p)-LA

Lipoic acid is also found in some fruits, vegetables and meats but only in very small amounts. It is a free-radical scavenger and so it acts as an antioxidant. Antioxidants help reduce inflammation, reduce skin aging, promote healthy nerve function, lower heart disease and diabetes risk factors and slow the progression of memory loss. It can even help slow the promotion of HIV activation.

Lipoic acid exists in two forms: the "R" enantiomer form which is the most biologically active form and the "S" enantiomer form which is still helpful but less active.

But in this recent study, R-lipoic acid also improved some markers of oxidative stress . Reductions in oxidative stress decrease a person's risk of nearly all chronic diseases - including cardiovascular disease, diabetes, cancer, dementia, Alzheimer's, disease.

Lipoic acid has the following benefits: • has a powerful impact on metabolism and can help with weight/fat loss • can reduce oxidative stress • can improve lipid levels • is a promising tool for use in weight management programs

Lipid peroxidation (LPO) products are highly reactive and display marked biological effects, which, depending upon their concentration, cause selective alterations in cell signaling, protein and DNA damage and cytotoxicity • ALA is efficacious in preventing ischemia-reperfusion injuries, and may be important to patients who have strokes, cardiac infarction, and open heart surgery. ALA provides antioxidant protection against LDL's, helping to prevent fatty deposits on arterial walls. ALA is effective in its antioxidant action, preventing complications to patients with compromised immune systems, such as AIDS and HIV patients.

By enhancing antioxidants Vitamins E and C and producing Glutathione, ALA and DHLA enhance the immune response of HIV patients who are deficient in most antioxidants. • These antioxidants scavenge free radicals that are responsible for inactivating white blood cells necessary as a defense against foreign bodies, may help inhibit replication of the virus and also help block the activation of the virus. ALA enhances activity of Glutathione, Ascorbate and Vitamin E levels, which have an effect on cataract prevention. I also decrease Nitric Oxide release, and enhances the uptake of glucose into the muscle, prevents glycation of proteins, and is essential for ATP production. Alpha Lipoic Acid protects the mitochondria of cells in the brain and nervous system, and it may be involved in nerve regeneration. It reduces the amount of oxidative stress in the brain and may enhance memory and mental function. I can Inhibits oxidation and glycation, which cause the accelerated aging process in skin, blood vessels and connective tissue. Alpha Lipoic Acid protects against liver damage from caffeine and alcohol, and may have beneficial effects on those with Hepatitis C and other liver disorders.

Alpha Lipoic Acid combines with other antioxidants (vitamins C, E and Pine bark extract) to potentiate its effectiveness. • Pine bark extract is an antioxidant that helps prevent nitric oxide deficiencies. • Alpha Lipoic Acid Plus is easily absorbed and readily bioavailable. It has no significant adverse effects. With individuals who are thiamin deficient, such as alcoholics, thiamin (B-1) supplements may be advised. Since no studies have been reported on pregnant women, it is not recommended for them.

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Where the mind is without fear and the head is held high
Where knowledge is free
Where the world has not been broken up into fragments by
narrow domestic walls
Where words come out from the depth of truth
Where tireless striving stretches its arms towards perfection
Where the clear stream of reason has not lost its way into
the dreary desert sand of dead habit
Where the mind is led forward by thee into ever-widening
thought and action
Into that heaven of freedom, my Father, let my country
awake.

– Rabindranth Thakur

“How to change your mind” a famous book written by Michael Pollan's novel tells us about the consciousness, dying, addiction, depression, and transcendence on psychedelic drugs. Psychedelic drugs are chemicals unlocking inner realms, where reality melts into vibrant visions. They express the mind with hues of insight and connection, weaving a tapestry of emotional depth and creativity. These substances guide us through kaleidoscopic experiences, revealing the enchanting mysteries of consciousness and the universe. Among all psychedelic drugs empathogens or entactogens are the new class of psychoactive drugs that came after 90's evoke feelings of emotional connection, unity, and openness—essentially, empathy or sympathy—often notably experienced with 3,4-methylenedioxymethamphetamine (MDMA).

In 1983–84, Ralph Metzner coined "empathogen" to refer to drugs like MDMA and phenethylamines that promote empathy. David E. Nichols later preferred "entactogen," meaning "producing a touching within," over "empathogen" to avoid negative associations with the Greek term pathos (suffering; passion) and to prevent any link with "pathogenesis." MDMA is a substituted amphetamine and phenethylamine, related to both stimulants and psychedelics. Its primary distinction is its consistent ability to evoke empathy, emotional communion, and connectedness, unlike the often-transient empathic effects of lysergic acid diethylamide (LSD) emphasising on “I can feel the same”.

Structural and stereochemical differences clearly separate entactogens from classic psychedelic phenethylamines, though they share fewer distinguishing features with psychostimulants like methamphetamine.

Unlike psychostimulants, entactogens exhibit distinct clinical psychoactive properties. .

Early in vitro studies suggested that entactogens primarily act through the release of neuronal serotonin, a process now understood to involve reverse transport via the serotonin transporter (SERT). While the role of norepinephrine (NE) in entactogen action remains underexplored, it may also contribute. Clinical evidence shows that blocking serotonin reuptake can reduce most psychoactive effects of entactogens, suggesting that SERT interaction is crucial but not fully explanatory. Research on MDMA's effects in mice indicates that serotonin release and stimulation of 5-HT_{1B} receptors in the nucleus accumbens drive social behaviours. Overall, entactogens might be considered serotonergic counterparts to psychostimulants, with their mechanism primarily involving serotonin release, and possibly norepinephrine, while psychostimulants act through the release of catecholamines. Key members of this class include MDMA, 3,4-Methylenedioxyamphetamine (MDA), 3,4-Methylenedioxyethylamphetamine (MDEA), 3,4-Methylenedioxy-2-hydroxyamphetamine (MDOH), 3,4-Methylenedioxy-N-methylbenzylamine (MBDB), 5-(2-Aminopropyl)benzofuran (5-APB), 5-(2-Methylaminopropyl)benzofuran (5-MAPB), 6-(2-Aminopropyl)benzofuran (6-APB), 6-(2-Methylaminopropyl)benzofuran (6-MAPB), 3,4-Methylenedioxy-N-methylcathinone (methylone), 4-Methylmethcathinone (mephedrone), Gamma-Hydroxybutyrate (GHB), α -Methyltryptamine (α MT), α -Ethyltryptamine (α ET), and 5,6-Methylenedioxy-2-aminoindane (MDAI), among others. Most entactogens are phenethylamines or amphetamines, though some, like α MT and α ET, are tryptamines. MDxx (substituted methylenedioxyphenethylamines) is commonly used to refer to MDMA and similar substances, excluding methylenedioxypropylvalerone (MDPV). Entactogens are sometimes mistakenly labelled as hallucinogens or stimulants, despite many, such as ecstasy, exhibiting both psychedelic and stimulant effects.

Clinical studies have confirmed early hypotheses about MDMA. SSRIs like citalopram, fluoxetine, and paroxetine reduce MDMA's effects, indicating serotonin's key role. MDMA's distinct impact includes increased empathy, trust, and social responsiveness, unlike traditional stimulants. Recent research in mice highlighted MDMA's prosocial effects through serotonin pathways, separate from its psychostimulant effects. Multidisciplinary association for psychedelic studies has led Phase 3 trials showing robust results for MDMA-assisted posttraumatic stress disorder (PTSD) therapy, with a second trial underway that could

could lead to FDA approval, demonstrating his crucial role in integrating entactogens into medicine.

Several unresolved issues remain regarding entactogens. The precise mechanisms behind their serotonin and norepinephrine release and receptor interactions are not fully understood. Long-term effects on brain function and mental health, as well as individual variability in responses, need further investigation. The impact of combining entactogens with other substances is still unclear, and while promising therapeutic applications are emerging, optimal treatment protocols are yet to be determined. Additionally, the specific neurochemical pathways involved in their unique effects, such as increased empathy, are not fully mapped out.

Recent research unveils the enchanting dance of entactogens, especially MDMA, in weaving intricate tapestries of emotional intimacy and social connection. These substances, like gentle alchemists, heighten trust and empathy, nurturing profound bonds in both therapeutic and personal realms. They stir the soul, evoking tender feelings and, for some, igniting sensual awakenings. As scientists explore this interconnected interplay, they seek to resolve how these psychoactive wonders shape our connections and desires. This unfolding narrative invites deeper exploration into the delicate art of entactogens, revealing their transformative power in the symphony of human interaction and affection.

"CRISPR-CAS9:

REVOLUTIONIZING ALZHEIMER'S RESEARCH AND THERAPY THROUGH PRECISION GENETICS"

MR.ARGHYA BHATTACHARYA
DEPARTMENT OF PHARMACOLOGY,
BENGAL SCHOOL OF TECHNOLOGY

The CRISPR-Cas9 technique is a groundbreaking genetic engineering advancement that offers an accurate and flexible genome editing tool. Inspired by bacteria's natural defense mechanism, CRISPR sequences and proteins function as an adaptive immune system against viral threats, using a guide RNA to modify specific DNA sequences. This custom-designed guide RNA then directs the Cas9 protein, often likened to molecular scissors, to the precise location on the DNA where it induces a double-strand break, initiating the genetic editing process. Subsequently, the cell's inherent DNA repair mechanisms come into play, either by directly reconnecting the severed DNA ends or by integrating new genetic material if supplied externally. This extraordinary capability empowers researchers to

execute targeted genetic alterations, such as inserting, removing, or rectifying particular genes, with an unparalleled level of accuracy and effectiveness. The study and treatment of Alzheimer's disease, a gradual cognitive decline brought on by tau tangles and amyloid-beta plaques in the brain, have greatly improved because to CRISPR-Cas9 technology. AD etiology is associated with genetic changes in key genes, including as APP, PSEN1, PSEN2, and APOE. Utilizing CRISPR, scientists are empowered to fabricate intricate models of AD by precisely altering these genes within cellular or animal platforms, thereby granting them the ability to reproduce and scrutinize the intricate mechanisms of the disease in a controlled environment. With its view into the complex web of elements that contribute to the beginning and progression of Alzheimer's disease, this ground-breaking technology opens up a world of possibilities for investigating new routes in understanding and perhaps treating the illness. Researchers can uncover the intricate interactions between genes and proteins that contribute to AD by utilizing CRISPR to delve deeply into the genetic foundations of the crippling illness. This will open the door to novel treatment approaches to address this prevalent and deadly malady. The precision and versatility of CRISPR-Cas9 provide a powerful tool for unlocking the mysteries of Alzheimer's disease, propelling us towards a future where targeted treatments and preventive measures may offer hope to millions affected by this insidious ailment.

In the future, CRISPR has the enormous potential to change how Alzheimer's illness is treated. The creation of tailored gene treatments to address particular genetic abnormalities known to cause familial types of AD is one exciting application. The advancement of the disease may be stopped or perhaps reversed by researchers using CRISPR to directly correct these mutations in cells taken from patients or animal models. Moreover, CRISPR technology offers the chance to mute genes that exacerbate the illness, including those in charge of excessive amyloid-beta manufacture or abnormal tau phosphorylation. On the other hand, CRISPR may be used to turn on genes that improve cellular repair processes or provide neuroprotection, so reducing the harm that AD causes.

The discovery of innovative therapies and preventative measures is anticipated to speed with the integration of CRISPR technology with modern techniques including real-time imaging, stem cell studies, and high-throughput screening. This is due to the fact that CRISPR technology is improving in accuracy, minimizing off-target impacts, and utilizing more effective delivery methods. An all-encompassing strategy may give millions of Alzheimer's patients fresh hope and greatly improve our capacity to cope with, treat, and potentially even cure the crippling illness.

ANTIOBESITY DRUGS- THE CURRENT SCENARIO

MRS.DISHARI DUTTA
DEPARTMENT OF PHARMACEUTICS,
BENGAL SCHOOL OF TECHNOLOGY

Obesity is a significant public health concern, with alarmingly high rates in recent decades. The Pacific Islands states have the highest prevalence, with over 50% of the population affected. In the United States, obesity affects nearly one-third of adults, with prevalence ranging between 23% and 38%. The COVID-19 pandemic has worsened the situation.

The guidelines for obesity treatment suggest a multidisciplinary approach, including lifestyle modifications, behavioural therapy, pharmacotherapy, and/or bariatric surgery, with anti-obesity medications recommended for individuals with a BMI ≥ 30 kg/m² or 27 kg/m² with co-morbidities.

The FDA and EMA have revised their approval criteria for Anti obesity medication (AOM), emphasizing the importance of cardiovascular and central nervous system safety. In the past decade, two drugs for syndromic obesity, one for leptin deficiency in generalized lipodystrophy, and six drugs for long-term non-syndromic obesity have been approved. One drug, Lorcaserin, was withdrawn in 2021 due to an increased risk of cancer, possibly related to excess weight and increased cancer screening in this population.

FDA approved medications for monogenic syndromes of obesity

1. Setmelanotide is a FDA-approved subcutaneous injectable formulation for chronic weight management in patients aged 6 and older with obesity due to proopiomelanocortin, PCSK1, or leptin receptor deficiency. This medication re-establishes the MC4 receptor pathway, reducing hunger and promoting weight loss by lowering caloric intake and increasing energy expenditure in animal models. This treatment is particularly beneficial for those with severe childhood-onset obesity.

2. Metreleptin, an adipokine, has been studied for its metabolic effects, immune, neuroendocrine, and neurocognitive functions. FDA approved in 2014, it is a subcutaneous injection used as a replacement therapy for leptin deficiency in patients with congenital or acquired lipodystrophy and associated co-morbidities. The dose depends on the patient's weight, starting at 0.06 mg/kg/day for those with baseline weight ≤ 40 kg and 2.5 mg/kg/day for males or 5 mg/kg/day for females. In a prospective non-randomized crossover study of 17 patients with generalized or partial lipodystrophy and low leptin levels, Metreleptin showed a significant improvement in metabolic parameters at 6 months compared to baseline.

This included a decrease in total cholesterol, triglycerides, fasting glucose, urinary glucose excretion, and insulin sensitivity. Metreleptin also decreased 24-hour energy expenditure by 5.0% and 7.9% at 2 weeks and 6 months, respectively, and reduced lean body mass by 2 kg at 6 months.

FDA approved long-term non-syndromic obesity drugs

1. Orlistat (tetrahydrolipstatin) is an anti-obesity medication approved by the US Food and Drug Administration (FDA). This medication is a saturated derivative derived from the endogenous lipstatin found in *Streptomyces toxytricini*.

2. Phentermine is a sympathomimetic amine anorectic. It has a similar mechanism of action as amphetamine in that it is an agonist at the trace amine-associated (TAAR1) receptor site, stimulating the release of norepinephrine and epinephrine. It is a central nervous system stimulant.

3. Topiramate is an anticonvulsant lowering the seizure threshold stabilizing membrane by acting on high-voltage-activated calcium channels and voltage-gated sodium channels and its augmenting effect on GABA-A receptors. Topiramate is also a weak carbonic anhydrase inhibitor, and it also antagonizes glutamate receptors. Topiramate augments appetite suppression and satiety enhancement based on the combination of the mechanisms of Phentermine.

4. Naltrexone is Opioid receptor antagonist and Bupropion is Dopamine antagonist (DA) and Norepinephrine (NE) reuptake inhibitor used in combination. The Contrave Obesity Trials (COR) program involved three main RCTs examining the effect of naltrexone and bupropion on total body weight loss in patients with obesity. The trials administered a combined oral sustained-release formulation of naltrexone and bupropion (NB32) or a placebo twice daily, along with lifestyle modification, over a 56-week period. The COR-I trials included a third arm with a lower total dose of 16 mg/day naltrexone with 360 mg/day bupropion (NB16). The COR-II trial had co-primary efficacy outcomes at 28 weeks, and participants achieving $< 5\%$ total body weight loss were re-randomized to NB32 or placebo. The study population consisted of men and women with overweight/obesity and controlled co-morbidities, such as hypertension and/or dyslipidemia. The mean age of participants ranged from 43.7 to 45.9 years, with a mean baseline BMI of 36.1 to 37.0 kg/m².

5. The Semaglutide Treatment Effect in People with Obesity (STEP) trials assessed the effectiveness and safety of Semaglutide 2.4 mg weekly compared to a placebo for 68 weeks. The study included men and women with overweight/obesity and weight-related comorbidities. The mean BMI ranged from 37.8 to 38.4 kg/m².

Recent evidence suggests that novel pharmacotherapies for obesity will revolutionize the treatment of obesity and its complications, including diabetes, cardiometabolic and

liver comorbidities, by improving body weight and addressing cardio-renal and metabolic issues.

REFERENCE-

Chakhtoura, Marlene, et al. "Pharmacotherapy of obesity: an update on the available medications and drugs under investigation." *EClinicalMedicine* 58 (2023).

NEXT-GENERATION SEQUENCING (NGS) AND BIO- IT INDUSTRY: A NEW AND UPCOMING PARADIGM SHIFT IN BIOLOGY RESEARCH

MRS.SUBHABRATA BANERJEE
DEPARTMENT OF PHARMACEUTICAL CHEMISTRY,
BENGAL SCHOOL OF TECHNOLOGY

Bio-IT Industry term mainly includes, but is not limited to Bioinformatics. Other areas are experiencing a meteoric rise like BIG Data Analytics in Biology, AI-ML models in Biological/Clinical Data Interpretation. These other fields often require bedrock of Bioinformatics as data simplifier. Bioinformatics is an interdisciplinary field that merges biology, computer science, mathematics, and statistics to analyze and interpret biological data. Professionals in this field handle a variety of tasks, including developing computational tools, analyzing complex biological datasets, and applying these tools to solve biological and biomedical problems. The job roles in bioinformatics vary widely, most of whom are listed below-

A Bioinformatics Scientist develops and implements computational algorithms and tools for analyzing biological data. They work with various datasets, such as genomic data and protein sequences, to understand biological processes. Collaboration with biologists and other scientists is essential for designing and interpreting experiments. This role requires strong programming skills in languages like Python, R, and Perl, along with a solid understanding of molecular biology, genetics, statistical analysis, and data visualization.

The role of a Bioinformatics Analyst involves analyzing biological data using existing tools and methods, managing large datasets, and providing insights based on the analysis. Analysts often work on projects related to genomics, transcriptomics, proteomics, and other omics data. Proficiency in bioinformatics software, statistical analysis, data mining, and a good understanding of biological concepts are crucial for this position.

A Computational Biologist uses mathematical and computational models to understand biological systems. They develop and apply models to predict biological behavior, simulate processes, and analyze data. This role requires a strong background in mathematics and statistics, proficiency in programming languages, and a deep understanding of biological systems and computational modeling.

Genomics Data Scientists specialize in analyzing and interpreting high-throughput genomics data, such as DNA and RNA sequencing. They work on projects related to personalized medicine, disease research, and genomics. Expertise in next-generation sequencing (NGS) technologies, data analysis, visualization, and programming are key skills for this role.

Bioinformatics Engineers focus on developing and maintaining software tools and pipelines for bioinformatics analysis. They work on database development, data integration, and software engineering projects, often collaborating with scientists to design bioinformatics solutions. Strong software development skills, knowledge of bioinformatics tools and databases, experience in data management, and familiarity with cloud computing and high-performance computing are essential for this position.

A Clinical Bioinformatician analyzes clinical and genomic data to support diagnostic and therapeutic decision-making. They work on clinical genomics, personalized medicine, and biomarker discovery projects, communicating findings to clinicians and other healthcare professionals. This role requires an understanding of clinical and medical concepts, experience with clinical data and bioinformatics tools, and strong analytical and communication skills.

Research Scientists in Bioinformatics conduct research, develop new computational methods and tools, and publish their findings in scientific journals. They present their work at conferences and collaborate with researchers from other disciplines. Expertise in bioinformatics and computational biology, strong research and analytical skills, proficiency in programming and statistical analysis, and good communication and writing skills are crucial for this role.

Bioinformatics Consultants provide expertise and guidance on bioinformatics projects, helping clients with data analysis and interpretation. They assist in developing bioinformatics strategies and work with various clients, including research institutions, biotech companies, and healthcare organizations. A broad knowledge of bioinformatics and related fields, strong problem-solving skills, the ability to communicate complex concepts to non-experts, and project management skills are essential.

Bioinformatics professionals commonly use tools and technologies such as programming languages (Python, R, Perl, Java, C++), bioinformatics tools (BLAST, Bowtie, SAMtools, GATK, Bioconductor), databases

(GenBank, Ensembl, UCSC Genome Browser, PDB), statistical and visualization tools (R, MATLAB, GraphPad Prism, ggplot2), Linux/Unix, version control systems (Git), and cloud computing platforms (AWS, Google Cloud).

To pursue a career in bioinformatics, a background in biology (B.Pharm graduates after Masters in Biotech/Bioinformatics etc.), bioinformatics, computer science, or a related field is typically required, often at the master's or Ph.D. level. Experience with computational methods and bioinformatics tools is highly valued, and some positions may require specific expertise in areas like genomics, proteomics, or clinical bioinformatics.

The career prospects in bioinformatics are strong, with opportunities in academia, biotechnology, pharmaceuticals, healthcare, and government research institutions. The field offers a wide range of roles, from research and development to clinical applications and data analysis.

WHY Bioinfo?

Basic Bioinformatics job pays around 3.5-15 lakh per annum. People in the NGS data analysis field are said to have been on the higher end of the salary spectrum. Further upskilling your skillsets with using AI-ML tools give opportunity to work in an advisory role or analytics development role having a salary spectrum of 13-21 lakh per annum in India on an entry level.

Genomatics, Genedata, illumina, DNAnexus are big giants providing bioinformatics solutions. Companies like Strand life sciences, have products like GeneSpring (having patient related data stored across different healthcare facilities). Xcode Life is a company analyzing data ranging from a few genes to whole genome to generate healthcare reports regarding Genes which are thought to have been causing Allergies/Dermatological degradation, Hereditary diseases, specific traits and personality of that person, DNA methylation changes in cancer etc. Clevergene is a company carrying out a genetic diagnosis for precision medicine, it performs and collects DNA sequencing data and using AI driven data analysis it creates models for data interpretation related to Epigenomic effect, Metagenomic data etc.

BD BioSciences provides diagnostic and research tools to Clinical/Life Science laboratory professionals who are involved in drug discovery, biopharmaceutical production, disease management. Brainpan Innovations Private Limited carries out an interdisciplinary research using a team of Computational Scientists, Designers, Engineers, Mathematicians, Medical Professionals to combat healthcare challenges in developing economies. GenomicsCentral is a company providing complete solutions from Non-NGS/NGS data to (Big) Data Analytics, Personalized medicine.

Next-Generation Sequencing (NGS): In a NutShell

The term NGS includes steps of DNA fragmentation (to break the targeted DNA into many short segments, usually 100–300 bp in length) using mechanical methods, enzymatic digestion, or other methods. Library preparation is a process by which DNA segments are modified so that each DNA sample can have a sample-specific index like sample identification which helps to identify the patient from whom DNA sequencing was performed. This process also allows the sequencing adaptors to be added to the DNA segments. Sequencing-Massive parallel sequencing is performed using an NGS sequencer. The library is uploaded onto a sequencing matrix in a certain sequencer. Different sequencers have different sequencing matrices. For example, Illumina NGS sequencer uses flow cells and Ion Torrent NGS sequencer uses sequencing chips. Bioinformatics analysis and data interpretation-Bioinformatics analysis is a process involving base calling, read alignment, variant identification, and variant annotation. During this process, the sequence information is compared to a human genome reference sequence to identify whether there are any variants/mutations in the targeted sequences.

Next-Generation Sequencing (NGS) Analysis Tools

Next-Generation Sequencing (NGS) has transformed genomic research by providing high-throughput sequencing technologies that generate vast amounts of data. To process, align, assemble, and interpret these sequences, specialized tools and software are required. Some commonly used NGS analysis tools include FASTQC for quality control of sequencing reads, BWA and Bowtie for aligning short sequences to reference genomes, and SAMtools for interacting with sequencing data. GATK is a comprehensive toolkit for variant discovery, while HISAT2 and STAR are used for mapping RNA-seq reads. TopHat and Cufflinks focus on identifying splice junctions and transcriptome assembly, respectively. Tools like DESeq2 and EdgeR are essential for differential gene expression analysis. Additionally, BCFtools, Picard, SnpEff, and IGV provide functionalities for variant calling, data manipulation, genetic variant annotation, and visualization.

FASTQC: A high-throughput sequence data quality control tool. To evaluate the quality of raw sequencing reads, it offers a variety of quality measures and visualizations.

A tool for aligning short sequences to a reference genome is the Burrows-Wheeler Aligner (BWA). Mapping NGS reads to a reference genome is a common use case, especially for genotyping and variation detection.

Bowtie: A memory-efficient, incredibly quick method for matching small DNA sequences to big genomes. For RNA-seq and other NGS data formats, it is frequently utilized.

SAMtools: An application suite designed to work with high-throughput sequencing data. It has tools for calling variants and inspecting, filtering, and sorting alignments.

A potent toolset for variant detection in high-throughput sequencing data is GATK

(Genome Analysis toolset). It has pre-processing, variant calling, and post-processing capabilities, all of which are frequently utilized in genomics research. **HISAT2:** A quick and accurate alignment tool to map readings from RNA-seq to a genome. It is renowned for handling spliced alignments with ease and quickness. **Spliced Transcripts Alignment to a Reference, or STAR,** is an RNA-seq data aligner renowned for its exceptional accuracy in spliced read mapping. **TopHat:** An RNA-seq read splice junction mapper. To locate splice junctions in RNA-seq data, it is utilized in combination with Bowtie.

Cufflinks: A software package for RNA-seq data differential expression analysis and transcriptome construction. Transcript abundances are estimated, and differential expression and regulation are examined. A tool for analyzing differential gene expression based on count data from RNA-seq experiments is called DESeq2. To find genes that are expressed differently, a statistical model is employed. Another tool for RNAseq count data differential expression analysis is EdgeR, which offers reliable statistical techniques for identifying genes with differential expression. **BCFtools:** A collection of tools for working with VCF (Variant Call Format) and BCF (Binary Call Format) files, including variant calling. It is an add-on for variant analysis with SAMtools.

Picard: A collection of Java command-line tools for working with BAM and SAM files as well as high-throughput sequencing data types.

The high-performing, userfriendly Integrative Genomics Viewer (IGV) is a tool for interactively exploring huge genomic datasets, including NGS data.

NGS Job Roles

Professionals specializing in NGS data analysis work in various settings, including research institutions, biotechnology companies, clinical laboratories, and pharmaceutical companies. Here are some common job roles:

The duties of an NGS bioinformatics scientist include creating and implementing computational techniques for NGS data analysis. Work on tasks like genome assembly, RNA-seq analysis, and variant calling. Work together to plan experiments and analyze data with scientists that conduct wet lab research.

Strong Python, R, and Perl programming abilities, familiarity with NGS tools and pipelines, familiarity with genomic data, and comprehension of molecular biology are among the capabilities. Another role is the **NGS Data Analyst**, who processes and analyzes NGS data using established pipelines.

They handle quality control, alignment, variant calling, and data interpretation, and communicate findings through reports. This position demands proficiency in NGS analysis tools, data visualization, and statistical analysis.

The **NGS Pipeline Developer** is responsible for developing and maintaining automated pipelines for NGS data processing and analysis. They optimize workflows and integrate new tools and algorithms. Strong software development skills, experience with workflow management systems, and knowledge of NGS technologies are critical for this role.

Clinical Genomic Scientists analyze clinical NGS data for diagnostic purposes, interpret genetic variants, and provide clinical reports. They must stay current with clinical guidelines and best practices in genomic medicine. Expertise in clinical genomics, experience with clinical-grade NGS pipelines, and the ability to communicate genetic information to healthcare providers are essential.

The **NGS Research Scientist** conducts research involving NGS technologies, developing new methods and applications. They publish findings, present at conferences, and work in multidisciplinary teams. This role requires strong research and analytical skills, proficiency in NGS data analysis, and good communication and writing skills.

NGS Project Managers oversee NGS projects from planning through execution and delivery. They coordinate teams, manage timelines and budgets, and ensure project goals are met. Project management skills, understanding of NGS technologies, and experience in team leadership are important for this position.

Finally, the **Bioinformatics Consultant (NGS Specialist)** offers expertise and consulting services on NGS projects, assisting clients with experimental design, data analysis, and interpretation. They may also provide training and support for NGS technologies. This role requires in-depth knowledge of NGS platforms and analysis methods, strong problem-solving skills, and excellent communication abilities.

Education and Experience

Most NGS-related roles require a background in bioinformatics, genomics, computational biology, or a related field, typically at the master's or Ph.D. level. Practical experience with NGS data, computational tools, and programming languages is highly valued. Depending on the role, knowledge of clinical genomics, regulatory standards, and laboratory practices may also be necessary.

Bioinformatics Industrial Certificate Program (BICP)- Programme Summary

The BICP program is a 12-month/6-month training that includes Bioinformatics, Programming, Project Work, Live Company Project, and Job Assistance. In the first month, modules on Advance Bioinformatics, Microarray Data

Analysis, and Next Generation Sequencing (NGS) data analysis will be covered. The second month will focus on Programming with Python and R, Bio-Python application, and developing NGS Pipeline using Python. For the next 4 to 6 months, there will be Project Work on NGS data analysis with an additional application of your choice. This will be followed by 4 months of Company Live Project Exposure where you will work on real client projects, gaining experience in handling large data and fast deliverables.

These kinds of trainings are also available for students of Biological/Clinical domain (both General stream and technical courses) having interest in BIO-IT industry as a carrier opportunity. Some companies carrying out these Trainings include RASA LifeSciences, Arraygen Technologies, Biotechnika etc. Some Indian Colleges/Universities also provide opportunities to students for internships imparting related necessary skills.

A SHORT REVIEW ON GENETICALLY ENGINEERED HYBRID ANTIBIOTICS AND GENETICALLY ENGINEERED BACTERIUM AS NEW APPROACH TO TREAT INFECTIONS

DR. ANGSHUMAN LAHIRI
DEPARTMENT OF PHARMACEUTICAL CHEMISTRY,
BENGAL SCHOOL OF TECHNOLOGY

From a common man's viewpoint, whenever we get fever, and / or we visit a doctor, we get a piece of paper, what technically is coined as "prescription", we usually have some common items. A painkiller (technically, NSAID), an antacid (technically, acid-blocker, may be an H₂-receptor antagonist or a proton pump inhibitor) and the last but not the least to mention is an ANTIBIOTIC. In fact, these are the medicaments which plays a crucial part in the curing of some infections, cough and cold and whatever diseases we are suffering from.

Penicillin is the best example of "discovery by serendipity", which has been a common term in drug discovery nowadays. Today the global antibiotics market is estimated approximately at USD 50.91 billion and is expected to grow at a compound annual growth rate (CAGR) of 4.2% from 2024 to 2030.

Apart from the benefits of an antibiotic, there are certain issues which provides pharmaceutical scientists and technologists enormous challenges like antibiotic resistance and other issues to develop new drugs and to explore new sources to develop newer antibiotics. In this context two different aspects will be discussed in this article.

Genetically engineered hybrid antibiotics is one such approach. Development of molecular cloning systems in *Streptomyces* have made possible the isolation of biosynthetic genes for some of the many antibiotics

produced by members of this important genus of bacteria. D A Hopwood and coworkers reported the production of novel compounds by gene transfer between strains producing the isochromanquinone antibiotics Actinorhodin, Granaticin and Medermycin. These experiments were made possible by the recent cloning of the whole set of genes for the biosynthetic pathway of actinorhodin from *Streptomyces coelicolor* A-3.

Wei Li Thong et al., recently published an article that suggest gene editing enables rapid engineering of complex antibiotic assembly lines. Re-engineering biosynthetic assembly lines, including non-ribosomal peptide synthetases (NRPs) and related megasynthase enzymes, is a powerful route to new antibiotics that are too complex for chemical synthesis. CRISPR-Cas9 gene editing can be exploited to rapidly engineer one of the most complex megasynthase assembly lines in nature, that deliver the lipopeptide antibiotic Enduracidin. Gene editing was used to exchange subdomains within the NRPs, altering substrate selectivity, leading to ten new lipopeptide variants in good yields.

Another aspect is the development of genetically engineered bacterium. Advances in synthetic biology and the clinical application of bacteriotherapy enable the use of genetically engineered bacteria (GEB) to combat various diseases. GEB act as a small 'machine factory' in the intestine or other tissues to continuously produce heterologous proteins or molecular compounds and, thus, diagnose or cure disease or work as an adjuvant reagent for disease treatment by regulating the immune system. Although the achievements of GEBs in the treatment or adjuvant therapy of diseases are promising, the practical implementation of this new therapeutic modality remains a grand challenge, especially at the initial stage. Yiting Liu and coworkers, reviewed the development of GEBs and their advantages in disease management, summarized the latest research advances in microbial genetic techniques, and discussed their administration routes, performance indicators and the limitations of GEBs used as platforms for disease management. There are several examples of GEB applications in the treatment of cancers and metabolic diseases and their great potential for clinical application in the near future.

Biotechnology is one of the sunrise sectors globally and there has been numerous approaches which are being considered by scientists in the relevant field for a healthy, infection-free world. In the coming days, these two approaches are likely to play a key role in management of infectious diseases.

SOME OF THE LATEST ARTICLES RELATED
TO HUMAN HEALTH:

DR. DEBASISH BHATTACHARJEE
DEPARTMENT OF PHARMACEUTICAL CHEMISTRY,
BENGAL SCHOOL OF TECHNOLOGY

1. ***Long COVID***: A new study has highlighted the scale and impact of long COVID, analyzing numerous previous studies to understand the number of people affected, the underlying disease mechanisms, and the variety of symptoms patients experience. This comprehensive analysis aims to provide a clearer picture of the long-term effects of COVID-19 and inform future treatments [oai_citation:1,Health & Medicine News -- ScienceDaily] (https://www.sciencedaily.com/news/health_medicine/).

2. ***Flu and Coronavirus Treatment***: Researchers have created a new treatment and vaccine that targets the flu and various coronaviruses, including COVID-19. This development could significantly enhance our ability to manage and prevent these viral infections in the future [oai_citation:2,Health & Medicine News -- ScienceDaily] (https://www.sciencedaily.com/news/health_medicine/).

3. ***Cartilage Regeneration***: Scientists at Northwestern University have developed a new bioactive material that successfully regenerates damaged cartilage in knee joints. This breakthrough could lead to treatments that prevent the need for knee replacement surgeries and address conditions like osteoarthritis and sports injuries [oai_citation:3,New biomaterial regrows damaged cartilage in joints - Northwestern Now] (<https://news.northwestern.edu/stories/2024/august/new-biomaterial-regrows-damaged-cartilage-in-joints/>).

4. ***Mental Health Innovations***: The National Institute of Mental Health (NIMH) has highlighted several advances, including a digital autism screening tool that enhances early identification and noninvasive brain stimulation techniques to treat depression. These innovations aim to improve the early detection and treatment of mental health conditions [oai_citation:4,Science News from 2024 - National Institute of Mental Health (NIMH)] (<https://www.nimh.nih.gov/news/science-news/2024>).

5. ***Cancer Metastasis***: Researchers are working on new treatments to stop cancer metastasis, the process by which cancer spreads from one part of the body to another. By improving our understanding and ability to halt metastasis, these efforts could lead to more effective cancer treatments.

These articles reflect the ongoing advancements in understanding and treating various health conditions, promising to improve patient outcomes and overall public health. For more detailed information, you can visit the original sources from ScienceDaily, the National Institutes of Health, and Northwestern University.

GREEN CHEM HERB; THE NATURAL
PHYTOPHORE EXTRACTION BY GREEN
CHEMISTRY

MR. GOURANGA SUNDAR ROY, DR. RAJA MAJUMDER
DEPARTMENT OF PHARMACOGNOSY,
DEPARTMENT OF PHARMACEUTICS,
BENGAL SCHOOL OF TECHNOLOGY

ABSTRACT:

Traditional extraction techniques are still used to extract natural phytophores, although modern methods are increasingly favored. Green chemistry is essential to the greater effort to protect the environment and industrial sustainability while maintaining the effectiveness and efficiency of chemical processes. Green chemistry uses biodegradable materials—solids, liquids, etc.—while consuming the least amount of energy and producing the least amount of pollutants. The result is a human remedy—a treatment plan that is safe, compassionate, and effective for humans. The analysis of previous approaches is needed to expand the likelihood of future routes leading to human benefits, which is the research need in this study.

KEY WORDS: Green Chemistry, Phytophore, Xenobiotics, Ethyl Lactate, Biodegradable.

INTRODUCTION:

With its advent in 1990s, Green Chemistry is a blessing for sustainable energy and relieves the atmosphere with the deletion of wastes and consequences of the deleterious by-products. Hazardous and Toxic chemicals are omitted. Energy is saved by the little use of it and renewable use. In addition to the protection of the environment, green-synthesis also enhances the caliber of human life. Green chemistry is essential to the greater effort to protect the environment and economic sustainability while maintaining the effectiveness and efficiency of pharmaceutical processes.

MODERN GREEN EXTRACTION TECHNIQUES OF PHYTOPHORES:

Subsequently and consequently, after the traditional methods of extractions, such as Maceration, Percolation, Infusion, Decoction, Soxhlation, and etc; the Modern Methods of extractions are on the table; like, Micro-Wave-Assisted Extraction, Ultrasonic-Bombardment-Assisted Extraction, and Supercritical-Fluid-Extraction. The Hyphenated Methods of Analytical Program accelerates the identification and quantification of the structurally analogue Herbal Phytophore components, subsequent to the modern extraction methods. Finding applications for the residuals or byproducts produced during extraction, such as making agricultural fertilizer or utilizing plant wastes for the generation of biofuels.

PLANT BASED PHYTOPHORES for Green Extraction of Alkaloids, Glycosides, Tannins, Saponins, Volatile Oils and other phyto molecules. In 2020, Jeniffer et al tried with alkaloidal and polyphenol moieties, with natural eutectic solvents. They proved that the methanolic extract of the plant, which were analysed by HPLC hyphenated with QTOF (Quadrupole Time-of-Flight) and subsequently MS/MS study brought the molecules of green chemistry. The molecules were from Chilean plant having a group of characteristic medicinal properties. Laurolicine, Isoboldine, Isocorydine, Boldine, Coclaurine, Isomethyl-coclaurine; and a total of eleven major alkaloidal outcomes; out of a multiple of closely related structural alkaloidal phytophore. They also isolated 22 polyphenols. Along with them, Oligomers having trimer structural compounds and tetramer structural components, about 20 in total were isolated. The tri- and tetra- glycosides isolated were multiples of Quercetin, Kaempferol etc. Choline-Chloride, Levulinic Acid, Citric Acid, Oxalic Acid, Proline, Lactic Acid, Glycerol, etc. were used as an identity standard for the Green-Chem-Analysis of the closely related diversified structural components of the Chilean Medicinal Plant.

USE OF ETHYL LACTATE AS GREEN SOLVENT:

ETHYL LACTATE:

As a unique-solvent it has the capability to Liquefy equally polar as well as non-polar components present in Phytophore, Food, Cosmetics, Agro-Chemicals, Nutraceuticals; during production, quality control, quality analysis, stability studies; and further research. Along with Ethyl Lactate; Choline-Chloride, Levulinic Acid, Citric Acid, Oxalic Acid, Proline, Lactic Acid, Glycerol, etc. were used who can be named as a green-components for the determination of the constituents of Green-Extraction.

CONTRIBUTION OF GREEN CHEMISTRY IN PHARMA, FOOD & BEAUTIFICATION:

Sustainable Green Chemistry open up the doors for the mentioned dealing entrepreneurs. This is to switch over to the sustainable and less harmful products with least waste materials as by products. Use of Super Critical carbon dioxide, ethyl-lactate, and other modes of Renewable-Eco-Friends are being experimented

HOW LESS ENERGY INPUT:

Using least number of synthetic steps, least green house emission of gaseous materials leads to greater efficient energy coin utilized. Creating systems that utilize wind, solar, or other renewable energy sources.

HOW ENVIRONMENT FRIENDLY:

Using essential amino acids, essential carbohydrates, biohealthy oligomers, using Bio-Catalyst minimizes the terminal-wastes; with environment-friendly herbophores.

FLOW CHART of GREEN EXTRACTION:

- Ethnicity 1: NWP = No Waste Principle
- Ethnicity 2: MMU = Maximum Molecular Utilization
- Ethnicity 3: EDE = Energy Design Efficiency
- Ethnicity 4: MDF = Minimum Derivative Formation
- Ethnicity 5: UCBC = Uses of Catalysts &/or Bio-Catalysts

WHY XENOBIOTIC PRODUCTION is MINIMUM:

The ultimate fate of Xenobiotics (formed as the penultimate products of green chemistry) is hydroxylated by Cytochrome P 450 in the Liver; and also enzymatically conjugated for naturally excretion through micturation by the fundus; by glycerin other polyol smaller molecules. Here, economy is cycled through recyclization.

FUTURE PROSPECT:

Clinical findings and the Clinical Trials, with referred herbal drugs, utilizing ethyl lactate, in Green Environment must be performed so as to incarnate this modern method towards safety, efficacy and dosage regimen determination and dosage spectrum approval towards a better future; which is a probable updated remedy.

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AN OVERVIEW OF PRESENT TRENDS OF
HERBAL MEDICATION IN INDIA

MR. SIDDHESWAR MAITI
DEPARTMENT OF PHARMACOGNOSY
BENGAL SCHOOL OF TECHNOLOGY

Herbal drugs formulation constitutes a major share of all the officially recognised systems of health in India. Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy, except Allopathy. More than 70% of India's 1.1 billion population still use these non-allopathic systems of medicine. Currently, there is no separate category of herbal drugs or dietary supplements, as per the Indian Drugs Act. However, there is a vast experiential-evidence base for many of the natural drugs. This offers immense opportunities for Observational Therapeutics and Reverse Pharmacology.

Authors	Title	Journal	Date of Publication
Utpal Misra	Risk management plan for adverse drug reactions.	World journal of pharmaceutical and life sciences.	02/01/2024
Anandamoy Rudra, Raktimava Das Sarkar, Aryama Bose	Exploration of the synergistic effects of phytoconstituents of ashwagandha, amla and ginger as a potent immunity-boosting agent for covid-19 affected individuals	Current functional foods	2024
Gouranga Sundar Roy	RUNDOWN OF THE PHARMACEUTICAL AND THERAPEUTIC EFFECT OF INDIAN CASSIA (Iaurus nobilis L) FOR THE MANAGEMENT OF METABOLIC DISORDER	World journal of pharmacy and pharmaceutical sciences. 2023	23-12-06
Gouranga Sundar Roy	'BONE-SETTER' – the Cissus quadrangularis	World journal of pharmacy and pharmaceutical sciences. 2023	2023-12-02
Gouranga Sundar Roy	Optimised herbal transdermal patch of ethnobotanical plant Costus igneus N. E. br. Developed through response surface methodology	OPEN ACCESS RESEARCH JOURNAL OF BIOLOGY AND PHARMACY	2023-09-02
Suchandra Goswami, Koushik Brahmachari, Mousam Ghosh, Sanchita Maji, Susanta Koley, Santanu Shaw, Diptendu Goswami	Gastroprotective potential of Indian Medicinal Plants-A Comprehensive Review	Mathews Journal of Gastroenterology and Hepatology	03/06/2024

Herbal drugs formulation constitutes a major share of all the officially recognised systems of health in India. Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy, except Allopathy. More than 70% of India's 1.1 billion population still use these non-allopathic systems of medicine. Currently, there is no separate category of herbal drugs or dietary supplements, as per the Indian Drugs Act. However, there is a vast experiential-evidence base for many of the natural drugs. This offers immense opportunities for Observational Therapeutics and Reverse Pharmacology. Evidence-based herbals are widely used in the diverse systems and manufactured, as per the pharmacopeial guidelines, by a well-organised industry. Significant basic and clinical research has been carried out on the medicinal plants and their formulations, with the state-of-the-art methods in a number of Institutes/Universities. Indian medicinal plants also provide a rich source for antioxidants that are known to prevent/delay different diseased states. The antioxidant protection is observed at different levels. The medicinal plants also contain other beneficial compounds like ingredients for functional foods. Hence, the global knowledge about Ayurveda and Indian herbals will hopefully be enhanced by information on the evidence-base of these plants. This will yield rich dividends in the coming years.

Keywords: Ayurveda, Indian medicinal plants, reverse pharmacology, observational therapeutics, antioxidant.

RECENT PHD AWARDS OF OUR FACULTY MEMBERS

We are pleased to announce that two of our esteemed faculty members have recently been awarded their Doctor of Philosophy (PhD) degrees.

Dr. Saumya Das, Associate Professor,
Department of Pharmaceutics
From **Jawaharal Nehru University, Hyderabad**

Dr. Atanu Chatterjee, Associate Professor,
Department of Pharmaceutical Chemistry
From **Maulana Abul Kalam Azad University of Technology, West Bengal**

RECENT PATENT OF BST (2024)

Dr. Dharmajit Pattanayak Associate Professor,
Department of Pharmaceutics
ROTATING CYLINDER TYPE DISSOLUTION TESTING APPARATUS FOR GASTRO RETENTIVE DRUG
Serial No. : 169079 on The Patent Office,
Government of India Date: 10/05/2024