Infinita
Biotech Private Limited

BIOVOICE

KNOW, SHARE & GROW

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Our Mission

To continue to set the bar high as an industry leader in creating unique, eco-friendly enzymes formulations for industrial applications. We are committed to providing high-quality products with international standards to our esteemed clients and prioritising environmental concerns while carrying out our business and manufacturing activities.

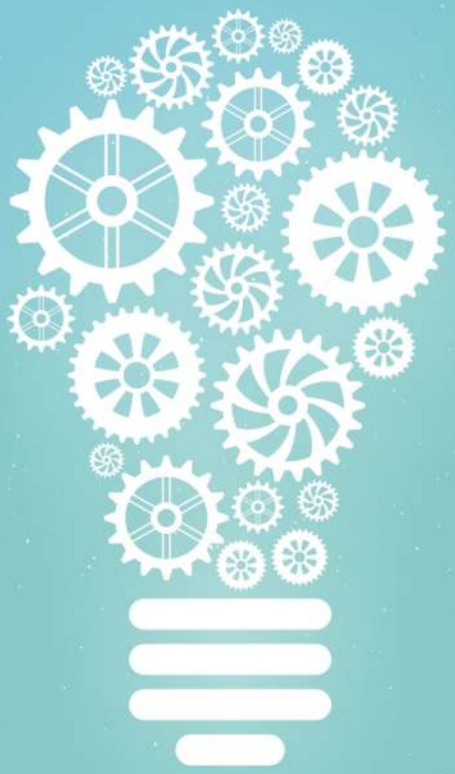
Our Vision

To be the leading biotechnology company in the world in the field of eco-friendly enzymes formulations for industrial applications.

Our Values

These are the guiding force behind every action we take.

I INNOVATION
N NATURE
F FOCUS
I INTEGRITY
N NOVEL
I INCLUSION
T TEAMWORK
A AGILITY



Corporate Profile

Infinita Biotech Pvt. Ltd., founded in 2015, is a leading Indian multidivisional biotechnology company engaged in manufacturing eco-friendly enzymatic solutions for a variety of industrial applications in India as well as overseas.

Our company comes with technical experience professionals of over 30 years in the field of industrial enzymes. Our leadership and extensive expertise in the domain of biotechnology has enabled us to grow with continued success. This can be attributed to our policy of providing innovative, effective and high-quality products and solutions to meet specific customer needs with continuous research and development. The desire for cutting-edge innovation is defined by our best-in-class research laboratories and state-of-the-art manufacturing facilities. Our production mechanisms are handled by well-qualified and highly motivated personnel and follow stringent control protocols and in-process quality assurance procedures. Our distinctive delivery processes are backed by a strong marketing and distribution network, which is strengthened by the relationship we share with our suppliers and dealers.

We strive to continuously improve our practices and as a part of this process we have acquired certifications and licenses like ISO 9001:2015 through TUV India, FSSAI central license, ISO 22000:2018, HALAL, Kosher and our Research and Development Centre has been recognized by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India.

Our concern for the environment is at the centre of everything we do. As a result, our products provide multiple benefits that cannot be obtained through traditional chemicals and processes such as superior quality, lower production cost, less wastage and reduced energy consumption.

As of today, our clients belong to a wide range of sectors like

Message From The Managing Director

Adarsh Desai

Trust all of you find this 3rd edition of our annual Magazine - BIOVOICE - in good health and cheer. We all have come a long way and it is finally so good to live normally like before.
Quite a few things have transpired over this last one year. A lot of new innovative products have been developed while new geographies have been explored.

It is finally good to be participating in exhibitions and meeting our esteemed clients in person. While we all move forward to digitalisation and work in a tech driven world, there is always the personal element which makes a difference.

We have participated in various exhibitions domestically as well as internationally this year. One of the key exhibitions we participated in was the Oil Spill India Conference 2022, wherein we had put up a stall to demonstrate our specialised Enzymatic Product for Crude Oil Spill Remediation.

Further, a lot of trips have enabled us to reconnect with our associates and customers in person. Also, our team has expanded in this one year, wherein a lot of key recruitments have been done.

On the business front, this has been a strong year and we expect a growth of at least 30% from the previous financial year. We have invested a lot this year in expansion of our R&D centre and procurement of high tech equipment to further strengthen our R&D and QC.

We have also expanded our space, wherein we have developed an independent area for setting up a pilot plant for the R&D and manufacturing of a few specialised Enzymes.

From industries point of view, Detergent has been a key area for us in this year. It has been the highest revenue earner for us as well. In a very short span of time, we have proudly become one of the largest Detergent Enzymes Exporters in India, selling across all major continents.

In this year, we have also been able to register our products in different countries such as Australia, US, Egypt, etc. for sensitive applications. A lot of focus has been given on strengthening our QA team this year, to be able to provide all the required documentation for highly regulated industries and geographies for our Enzymes.

Our plan for next year would be to accelerate our specialised Enzymes development part and continue spreading our footprint across the globe.

We have been very active on Social Media and we hope to stay connected with all of you on the same. Also, since a long time, we have been writing blogs every month on various subjects related to Enzymes. We believe in sharing as much information and awareness as we possibly can, for everyone to know how Enzymes are playing and can play a great role in our lives. Right from the food we eat to the clothes we wear to the fuel we put in our vehicles, Enzymes have a big role to play in it.

We genuinely wish all the very best to our competitors as well. For, at the end, we want this whole green industry to grow for a better tomorrow for all of us. Everyone has to play an important role in increasing the usage of Enzymes for the benefit of all.

I would like to thank all our readers, well-wishers, esteemed customers, suppliers, associates and last but not the least, my Infinita Biotech team, for being a part of this beautiful journey which we have just begun! A lot to do more, a lot of difference to be made!

BIOSCOPE

Articles

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Articles

Enzyme Immobilization - the future

Enzyme Immobilization - the future

Contributed by:
Milind Kulkarni
Chief Technical Officer

The successful establishment and expansion of Infinita Biotech Private Limited (IBPL) in India and world-wide markets can be ascribed to innovation and technical expertise in the field. We have developed solutions to the challenges faced by our customers and feedback from our marketing team. Application of experience and knowledge in various fields and its amalgamation has led to development of novel products based on Biotechnology.

IBPL is a recognized Biotech research lab by Dept of Biotechnology, GOI. IBPL invests heavily in research and development to develop environment friendly and green solutions to replace toxic chemicals. We have successfully developed novel products for Agriculture to replace toxic insecticides. In fact, we have developed bio based products to revive soil fertility by nullifying effects of chemical based toxic herbicides used for decades.

Our growing portfolio of products for soil and water remediation are developed with Govt Research Organisations, such as DBT-ICT, to solve the challenges. One of the successful examples is to completely degrade crude oil spill biologically with help of enzymes and selected microbes. This catastrophic spill happens all over the globe during crude oil extraction and transport, which directly kills flora and fauna in water bodies in large numbers. Till date, there is no successful biological solution for this problem. IBPL has developed Pilot Plant to study novel enzyme-based product development from plants and herbs.

Apart from this, Co-Factors, also known as "helper molecules" for various enzymes, have been identified for better enzyme efficiency, which leads to better enzyme formulation output.

Enzymes, as biocatalysts are engaged in a diverse range of bio-chemical transformations, to increase their efficiency "enzyme immobilization" has been used for further improvements. Primary objective is to attain increased activity, stereo selectivity and stability, so that the specific enzyme used can be recovered at the end of bio transformation and reused. This has an immense effect on cost reduction of the final product.

Let us discuss this topic in detail as it is a useful tool industrially for easier product isolation or higher product quality to be achieved in fewer processing steps.

Enzyme Immobilization - the future

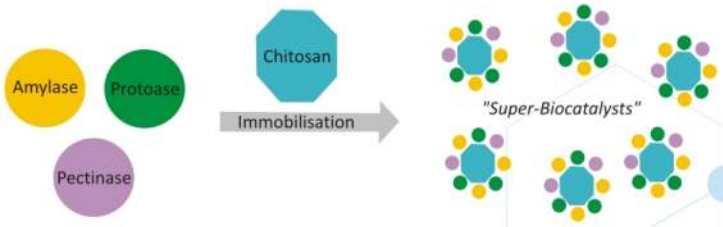
Introduction

Enzyme immobilization has drawn attention in various sectors, i.e. pharmaceuticals, chemicals, bio fuels, food, flavours, fragrances and cosmetics. Enzyme immobilization has been discussed by many authors. It still has two main concerns that are identified. The first is the development of novel supports and second is the integration of enzyme immobilization with new state-of-the-art technologies.

Novel Support Systems: Polysaccharides

Due to low cost and wide availability , use of polysaccharides for enzyme immobilization has been reviewed. The most prominent are agarose, guar gum, agar, alginates, chitosan, cellulose, carrageenan, gelatin, dextran, xanthan and pectins. The types of monomers and their bonding characteristics are helpful for immobilization possibilities.

New concept of multi enzyme immobilization on a single polysaccharide support is selected where glutaraldehyde-activated chitosan can be used to immobilize an α-amylase, protease and pectinase. This can be applied to debitter, de-haze and reduce protein levels of a beverage liquid in a single operation. The concept of "super - Biocatralysts" is shown below in the picture.

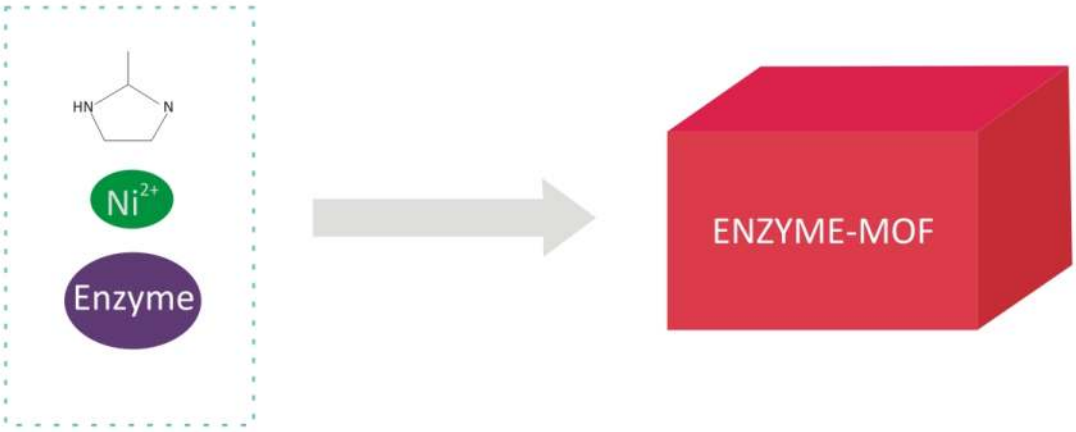


Novel Support Systems : Metal–Organic Frameworks

Metal–organic frameworks (MOFs) are composed of metal ions or clusters linked by organic ligands which are crystalline porous materials having large surface area which has good thermal stability. MOFs have unique strength to adjust the pore size, making them critical use in industrial and commercial applications.

The technology for MOF enzyme production is still at a very early stage, and the typical method of preparation is by simply mixing the enzymes, metal ions and organic ligands under ambient conditions in bulk solution; for example, glucose oxidase, zinc nitrate and 2-methylimidazole, as shown in the picture . A marked increase in activity can be achieved by using microfluidic methods. The use of a three-way mixing scheme inside a microfluidic laminar flow system allows precisely controlled diffusive mixing conditions where one component can be added to the system with precise timing.

Whilst still embryonic, this approach for immobilizing enzymes holds much potential not only for biocatalysis but also in biosensing and nanomedicine.



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Novel Support Systems :Renewable Materials

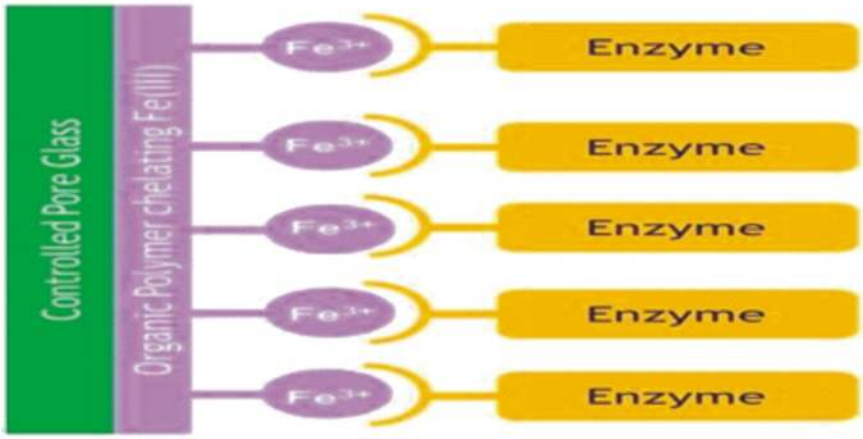
Renewable materials such as agricultural and food wastes have several characteristics that make them of potential interest in enzyme immobilization technology. Aside from being widely available and low in cost, they may possess high porosity with high surface area and the presence of different chemical groups (amino, hydroxyl, carboxyl, thiol and phosphate groups). Typical examples include coconut fiber, corn cobs, corn stover, rice husk and spent coffee grounds. These are generally lignocellulosic with varying composition containing lignin, cellulose and hemicellulose, imparting differing physical properties to each.

Lignocellulosic waste has been used to immobilize trypsin. Pre-treated support was activated with glyoxyl groups, glutaraldehyde and IDA-glyoxyl. The immobilization resulted in the retention of catalytic activity and resulted in a thermally stable enzyme at 65 °C, a value that was 1090-fold higher than that obtained with the free enzyme.

Novel Support Systems : Controlled Pore Glass

Controlled pore glass has been widely reported as a support for enzyme immobilization. One such material is based on controlled pore glass, which is coated with an organic polymer and chelated with Fe(III) for well-established His-tag binding (via an oligomeric his6-homopeptide).

Due to efficient mass transfer through interconnecting pores and selective and non-destructive binding through His-tags, a high enzyme mass loading can be reached without the loss of activity caused by a high degree of diffusion limitation and deactivation. Picture below shows the structure.



Novel Support Systems : Chitosan

Chitosan is a biopolymer, either derived from waste crustacean shells or mushrooms and other fungi. It shows unique physicochemical properties. Due to its low-cost, large-scale availability, biodegradability, non-toxicity and bio-adhesive properties, it is one the favourable support material. It entraps bioactive biomolecules such as protein and nucleic acid through various mechanisms such as chemical cross-linking, ionic cross-linking and ionic complexation.

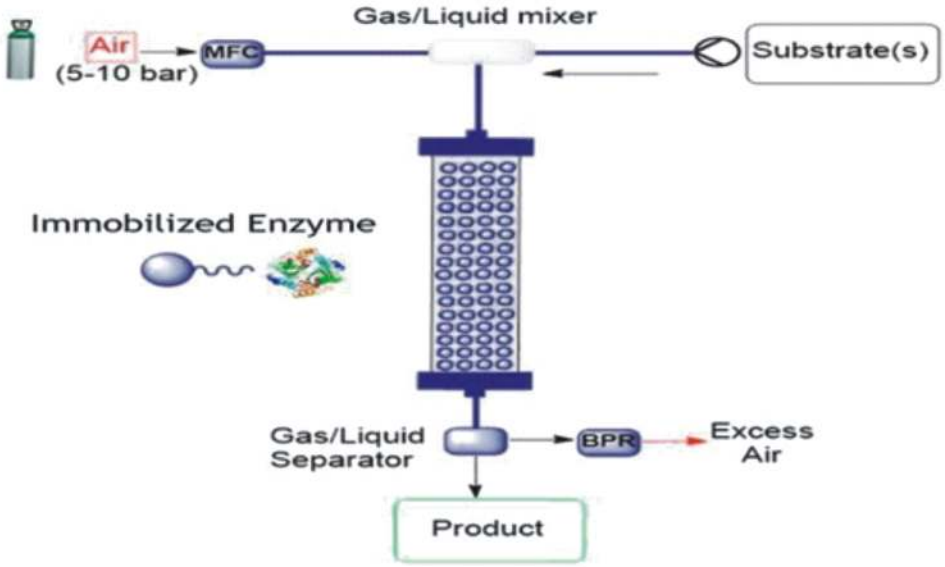
Integrating Immobilization into Developing Biocatalytic Technology

Biocatalytic technology is developing rapidly in numerous directions that go well beyond the simple concept of a batch reactor biotransformation comprising an immobilized enzyme and substrate.

Flow Biocatalysis Technology

The use of immobilized enzymes in a packed column, where a substrate flows through the biocatalyst, is well established. Attention is now turning to the extension of this concept into general chemical flow processes and continuous synthesis, including microreactors, which may have multiple steps and where a spatial arrangement of multiple enzymes may be desirable. Oxidative O2-dependent biotransformations find many valuable potential applications for chemical synthesis, two enzymes glucose oxidase and D-amino acid oxidase for the conversion of glucose to D-glucono-δ-lactone and D-methionine to the α-ketoacid, respectively. These two biotransformations were demonstrated with a packed-bed reactor containing oxidase and catalase co-immobilized on porous beads to demonstrate catalyst recyclability and operational stability during continuous high-pressure conversion. Excellent results obtained at low residence times (1–4 min), with up to 360 reactor cycles at constant product release, as shown in picture.

Flow biocatalysis with immobilized enzymes shows much potential in effecting synthetic transformations, and we may anticipate more examples and processes reaching commercial reality in the near future.



Conclusions

A review of recent literature in the field of enzyme immobilization shows a continuing and strong interest in this specialist area of biocatalysis. New types of supports and ways to immobilize enzymes are evident; for example, exploiting the use of sustainable low-cost waste as immobilization matrices. The primary motivation for enzyme immobilization is to reduce biocatalyst cost contribution, and is expected to remain as the main driver, but as areas such as continuous manufacturing increase in prominence, then so too will the interest in integrating immobilization technology into such processes increase. Enzyme catalysis is gaining great traction as success breeds success across many segments in chemical processing. Increased pressure on environmental control, cost reduction and higher quality requirements will see Immobilization of these enzymes stay in focus and, eventually, become a prerequisite.

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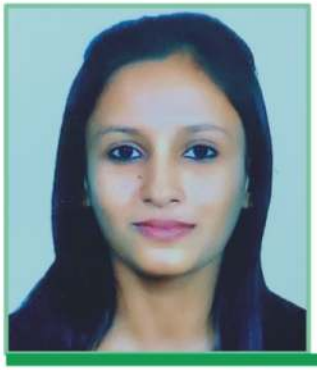
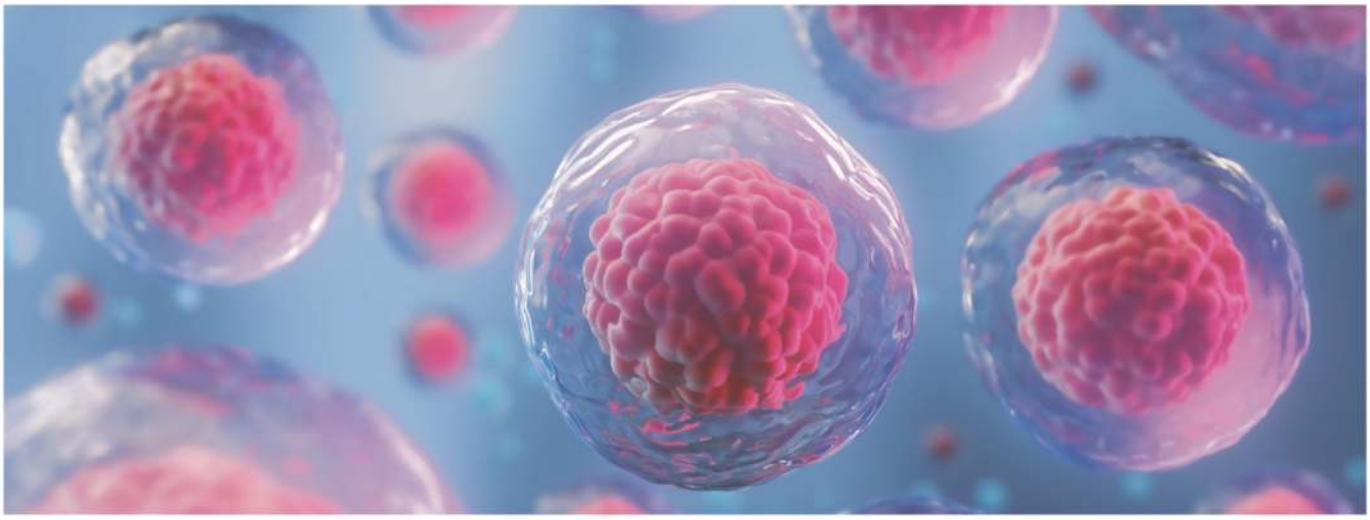
Longevity Promoting Enzymes



Longevity Promoting Enzymes

Contributed By -
Nidhi Shah,
QA Executive

"Anti-aging" is a very powerful word that drives the attention of the world to the point of an abstract idea of "LIVING FOREVER". We live in the present. And the present day does not demand an idea of living forever, but to set a fountain of Youth to an extended period of time. Anti- Aging is a desire to take self control on ageing concerns and age related diseases. Research has been promoting Anti-aging ENZYMES , a better alternative to cosmetic surgeries and dermatologists. A multiple of enzymes have contributed to the race bar and have shown future potentials.



1) HTC (Hydride Transfer Complex)

Diabetes, neurovascular disorder, dementia and different age-related diseases and conditions are the direct outcome of cellular senescence. Mobile Senility is unavoidable but tumours are able to deviate this defence and proliferate bypassing the growing older mechanism. Cell senility edges the capability of the cells to divide and acts as a barrier in opposition to the formation of tumours. The study with the tumour cells is the pathway to understand cellular ageing.

Senescent cells produce inflammatory cytokines, immune modulators, growth elements, chemokines and proteases (SASP-Senescence-associated secretory phenotype) and play a role in ageing. Those inflammatory factors accumulate with age leading to Homeostasis. Homeostasis is a state where the quantity of oxygen needed isn't always enough on the tissue stage. This ends in the cell dying. If this SASP can be averted, it may help to delay age-related diseases as well as slow down ageing activity. This prevention movement has been observed in premalignant tumour cells. Tumour cells are a senescence suppressor and vice versa. With this kind of base, a hypothesis is created among scientists for an enzyme that acts on tumour cells and is able to protect the cells from hypoxia.

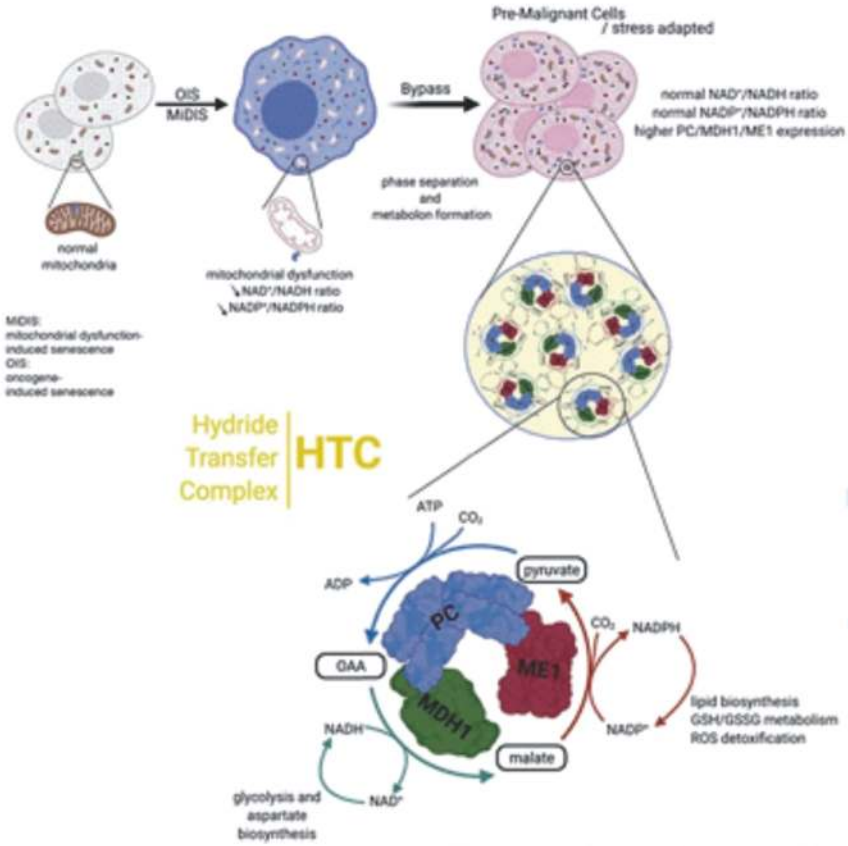
HTC (Hydride Transfer Complex) is naturally made up of 3 enzymes, namely malic enzyme 1, pyruvate carboxylase and malate dehydrogenase 1. HTC enzymes are extraordinarily expressed in prostate cancer, and their inactivation triggers senescence. Stimulating the enzyme expression exogenously is sufficient to pass senescence.

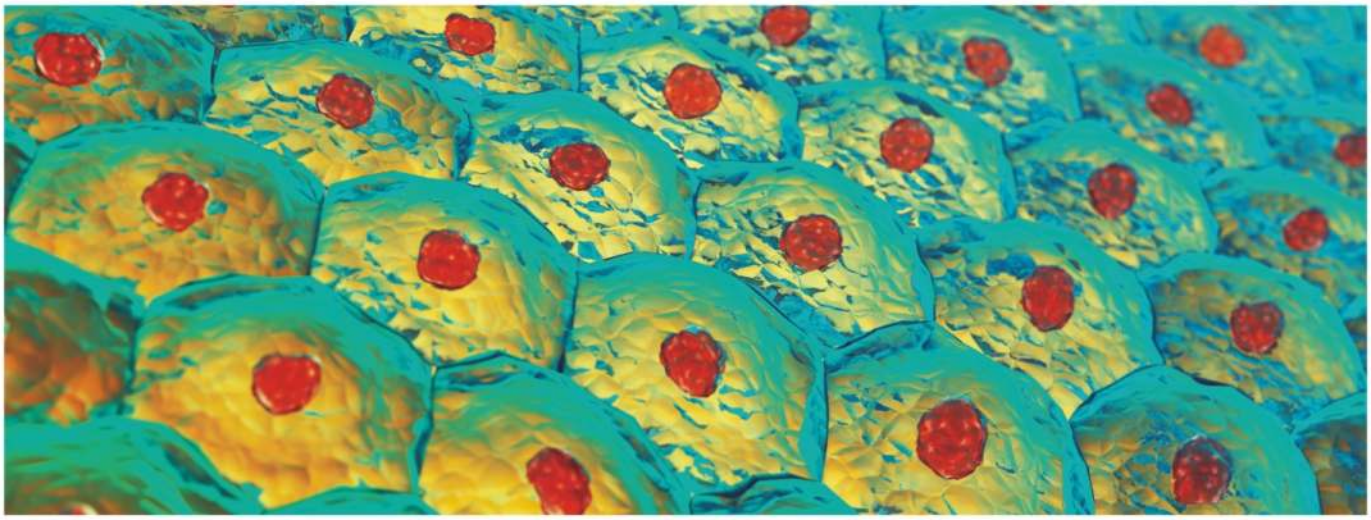
HTC mechanism

HTC complex reprograms NAD metabolism by transferring reducing equivalents from NADH to NADP+.

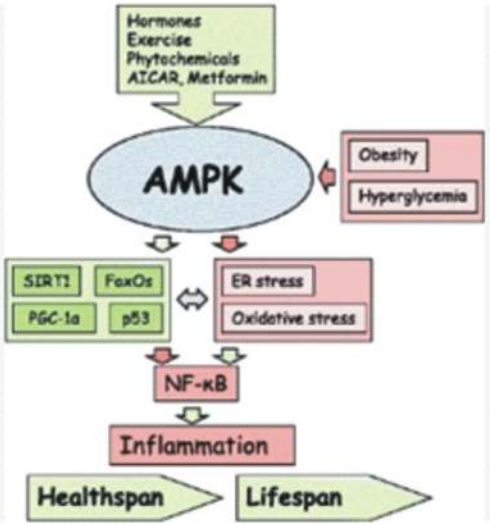
HTC is found in phase-separated bodies in the cytosol of hypoxic cells and can be assembled in vitro with bioengineering recombinant proteins. HTC is repressed in senescent cells but induced by p53 inactivation. HTC enzymes are highly expressed in mouse and human prostate cancer models, and their inactivation triggers senescence. Exogenous expression of HTC is sufficient to bypass senescence, rescue cells from complex I inhibitors, and cooperate with oncogenic RAS to transform primary cells. Altogether, we provide evidence for a new multi-enzymatic complex that reprograms metabolism and overcomes cellular Senescence.

Senescence is an extensively acting tumor suppressor mechanism in which cells bearing oncogenic mutations cannot amplify because of a chronic nation of mitochondrial dysfunction, oxidative pressure, DNA harm and activation of tumor suppressors(2) . Dysfunctional mitochondria are a hallmark of senescent cells in response to brief telomeres(3). Mitochondrial dysfunction-related senescence is characterised by decreased NAD+ (nicotinamide adenine dinucleotide)/NADH ratio, expanded reactive oxygen species (ROS), and decreased ATP as compared with non-senescent cells This entices increase in glycolysis to hold viability . Due to this fact inhibition of senescence frequently precedes transformation. It's far vital to recognize how most cancers cells triumph over the limitations to mobile proliferation that characterise senescence, consisting of mitochondrial disorder. The beginning of mitochondrial dysfunction in senescent cells isn't always well understood. In the course of oncogene-triggered senescence (OIS), numerous proteins are targeted for degradation affecting a ramification of techniques required for cell proliferation. Such a proteins is sign transducer and activator of transcription 3 (STAT3) (four) , which regulates transcription inside the nucleus, (five) and electron shipping and oxidative phosphorylation in mitochondria (6) 1713-1716. The mitochondrial functions of STAT3 are required for mobile transformation by means of oncogenic RAS protein . Deletion of STAT3 in hematopoietic stem cells ends in mitochondrial disorder, overproduction of ROS and untimely ageing of blood cells. Together, these research endorse that the mitochondrial features of STAT3 may be required to prevent senescence. To find out mobile pathways that compensate for mitochondrial disorder and allow tumour cells to avoid senescence, we used several models of cellular senescence. We determined that senescence caused by using STAT3 depletion required a lower within the NAD+/NADH ratio that changed into maintained by means of the actions of the p53 and retinoblastoma protein (RB) tumour suppressors. P53 and RB repress an enzyme complicated that catalyses a metabolic cycle that transfers the hydride anion (H) from NADH to NADP+, for this reason regenerating NAD+ and offering NADPH. This hydride switch complicated (HTC) can be assembled in vitro with purified proteins and is capable of catch up on mitochondrial disorder and sell tumorigenesis. Inhibition of HTC results in senescence in tumour cells, revealing the therapeutic ability of focused on this unrecognised enzyme metabolism.





2) PROTEIN KINASE



Adenosine Monophosphate activated Protein Kinase (AMPK), Also referred as "Magic Bullet '' has proved its potential in anti-ageing strategy. AMPK is the central to control cellular homeostasis and metabolism within the cell. It regulates cell growth, cell death as well as autophagy, and hence is the most critical factor for ageing and lifespan. It was observed that activating AMKP in animal models has led to a noticeable increase in the lifespan.

Korean advanced institute studied AMPK with another enzyme vaccinia-related kinase 1 (VRK 1) on model C. elegans to investigate the increase in lifespan. It was discovered that an enzyme VRK1, when collabrated with AMPK, it modulated cellular energy responses. When VRK-1 activity is boosted, it stimulated the activity of AMPK and thereby plays a role in extending the organism's lifespan. VRK 1 gene is widely expressed in human tissues and has increased expression in actively dividing cells. As VRK-1 to AMPK mechanism occurs in human cells also, it suggests a potential that the results can be replicated in human subjects also.(1)

Boosting AMPK activity will keep your tissues young and slow agein throughout your body. It is now clear that, when caloric intake remains much higher than needed to sustain energy expenditure, AMPK activation is markedly decreased. With reduced AMPK activity, cells decrease their energy-releasing ATP-generating activities, and instead shift to energy-storing processes that generate new fat deposits and glucose molecules leading to premature ageing and diseases.

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Image Courtesy

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Articles

ECOENZYME - CRUDE SPILL
A big success

Petroleum hydrocarbons are the most common environmental pollutants. Amongst them, oil spills pose a great hazard to terrestrial as well as marine ecosystems. Oil spills may happen either accidentally or operationally wherever oil is produced, stored, processed or used at sea or on land. The major pollutants of these toxic spillages are aliphatic and aromatic hydrocarbons. Even a relatively small amount of oil spills can cause major harm depending on location, atmospheric conditions, environment sensitivity and nature of soil.

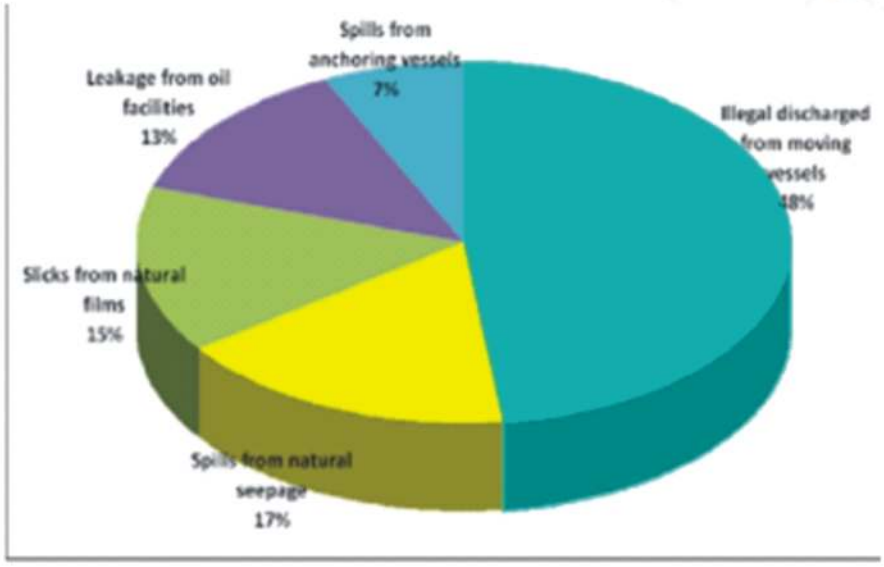
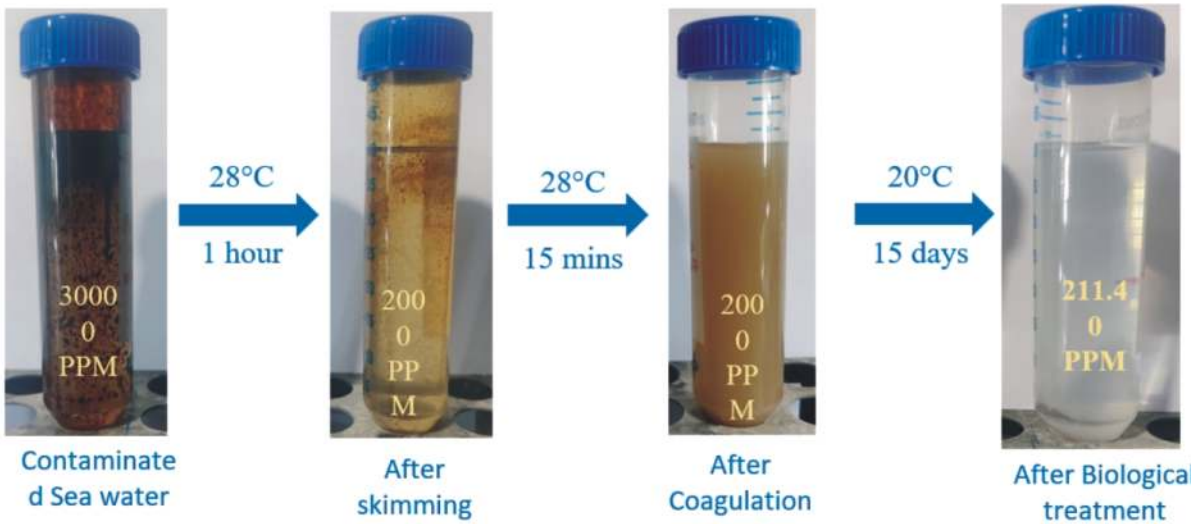


Figure 1: Various possible routes of oil spillage

How ECOENZYME - CRUDE SPILL works?

When ECOENZYME - CRUDE SPILL is applied to targeted areas, the enzymes and microorganisms of the product attach themselves to the hydrocarbon and initiate to attack their carbon structure. Eventually, the carbon chain of hydrocarbons metabolises and it will be utilised by microorganisms for energy and growth purposes.

Overall Process



Dosage :
Recommended Dosage: 5-10 Kg/Ton of oil,
to be optimized based on requirements.

Overall Removal of the oil from Contaminated Water – 99%

Figure 2: Overview of oil degradation using ECOENZYME - CRUDE SPILL

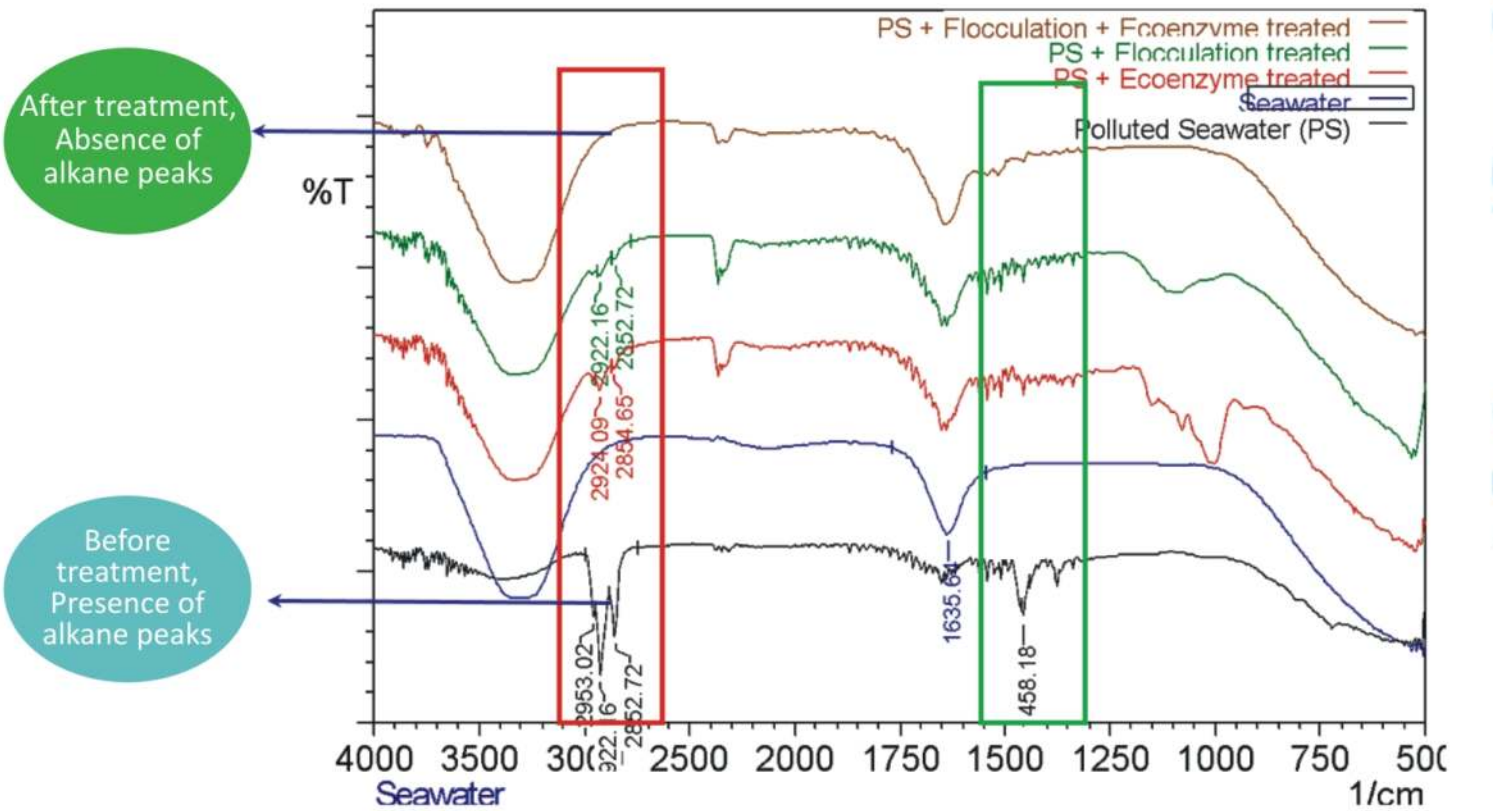
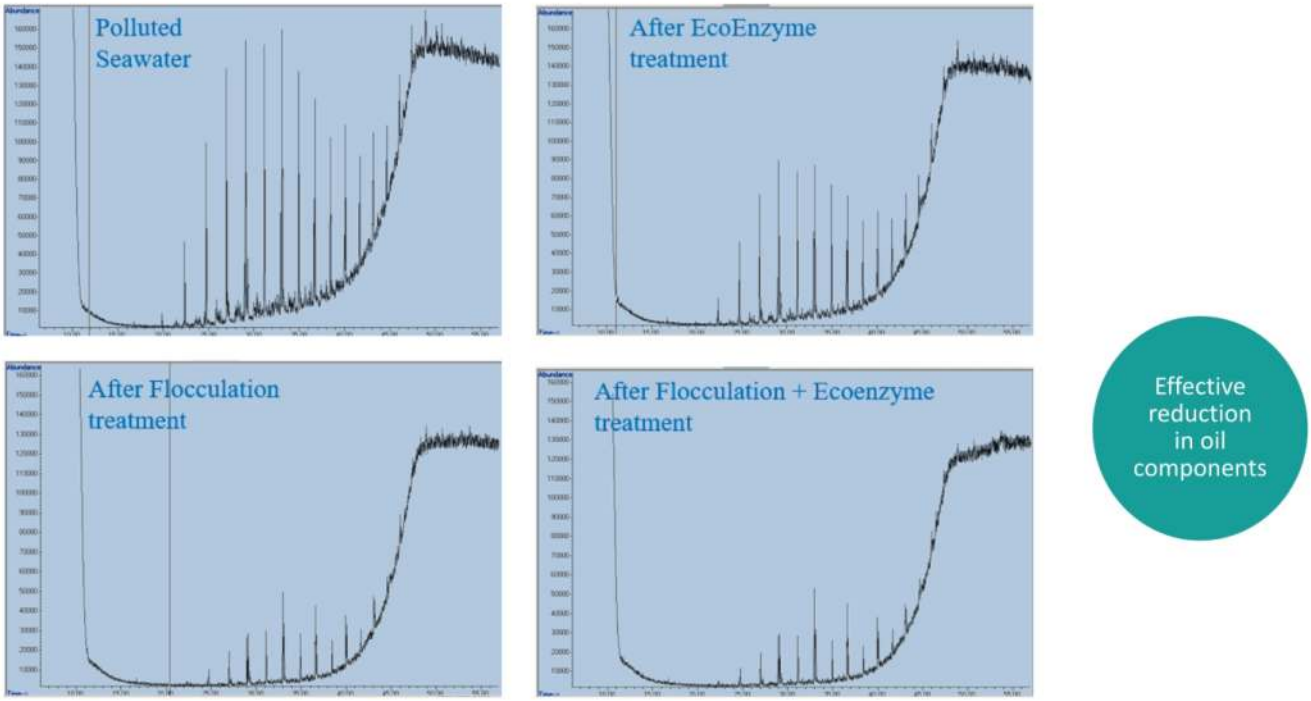


Figure 3: FTIR analysis shows degradation of alkanes using ECOENZYME - CRUDE SPILL



After treatment, reduction in the intensity of Oil peaks were observed

Figure 4: GC-MS analysis shows degradation of crude oil components using ECOENZYME - CRUDE SPILL

Why prefer ECOENZYME - CRUDE SPILL?

- ECOENZYME - CRUDE SPILL offers various advantages over conventional methods.
- ECOENZYME - CRUDE SPILL is concentrated formulation which can be diluted as per requirement and applied on targeted areas through various mechanism
- ECOENZYME - CRUDE SPILL can tremendously work with a wide range of environmental conditions such as aerobicor anaerobic conditions. The main advantage of our product is that it hydrolyses crude oil, which proves to becompletely safe and eco friendly.

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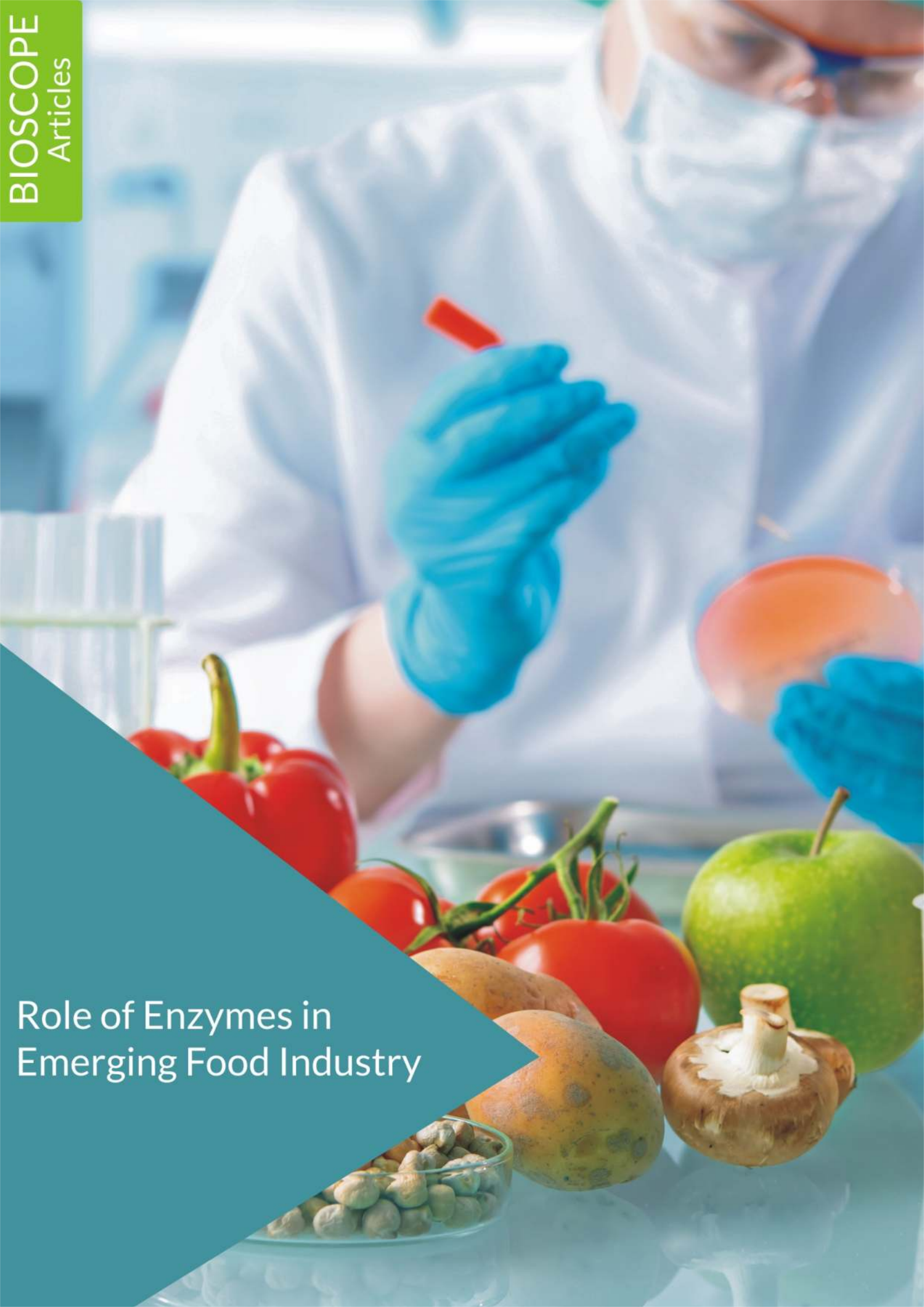
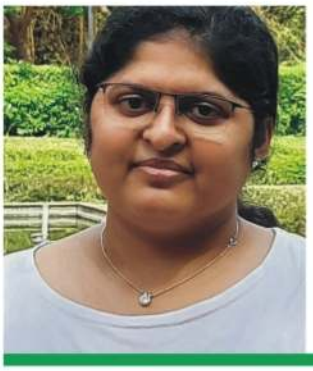


Role of Enzymes in Emerging Food Industry



Role of Enzymes in Emerging Food Industry

Contributed By -
Frinkal Patel,
QC Executive

Today, the global food system is responsible for over 30 percent of greenhouse gas emissions, with food loss and waste alone accounting for 8 to 10%. The global population is expected to increase to almost 10 billion by 2050. The World Resources Institute has predicted 50 percent more food will be required; also, 70 percent more animal-based protein is needed to feed the planet. This implies we must revolutionise global food production as well as manufacture and consumption practices. If we are not able to manage this, we would require land twice the size of India to be converted for agriculture in next three decades, leading to significant deforestation and biodiversity loss.

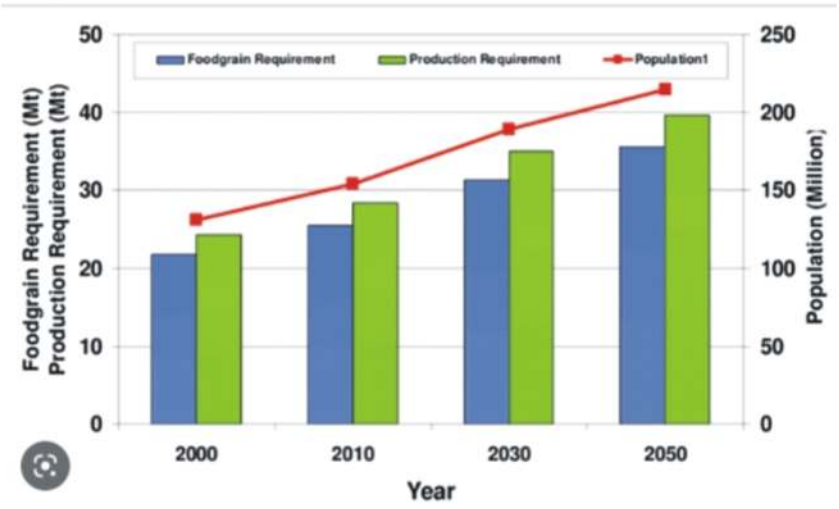


Fig 1: Estimated food grain requirement, production requirement and population trend over a 50 year period [https://www.researchgate.net/figure/Population-Growth-Vs-Food-grain-requirement-and-production-of-Bangladesh-Source-Hussain_fig1_228521756]

Enzyme engineering is a new technology combining enzymology and biochemical technology. It will be helpful to substitute many chemical processes in a variety of industries, and also holds a future for the practice of processes developed in the past. Previously, the enzyme used in food industry was mostly sourced from animal origin and plant extracts. Nowadays, enzymes used are from microbial fermentation. Enzymes have become an increasingly important component due to high efficiency, specificity and their ability to produce a more efficient food manufacturing and production system.

Fig2:Microbial enzyme in food industries
[https://www.scirp.org/journal/paperinformation.aspx?paperid=115826]

In the future, food production will rely on advances in microbiology, artificial intelligence and bioprocessing. Enzymes hold important role in the sustainable food system, thus making it healthy and at the same time add value to waste streams, e.g., production of whey protein from dairy waste.

Below are examples of some enzymes used in food industry:

Enzyme	Mode of Action	Application
Esterases	• Split esters into acid and alcohol. • Esterases hydrolyze short-chain rather than long-chain acylglycerols like lipase	• To produce fragrances and flavours by modification of oil and fat • Feruloyl esterases hydrolyse lignocellulosic biomass, they are inevitable for waste management
Lipoxygenases	• Dioxygenation of polyunsaturated fatty acids in lipids	• Aroma generation in food industry and bread making • Bleach the flour pigment carotenoid, by co-oxidation of the pigment with fatty acids • To improve tolerance to mixing and different handling properties of dough
Xylanases	• Breakdown xylans, a major constituent of hemicelluloses	• To improve texture, tastiness and palatability in biscuits. • Improve extraction, clarification and stabilization in juice industry • In combination with other enzymes, xylanases lead to better yield of juice and increased recovery of aromas, essential oils, vitamins, mineral salts, pigments, etc. • The dough becomes softer and crumb formation is delayed, allowing the dough to grow.
Pectinases	• Hydrolysis of glycosidic bonds in pectic polymers	• Removal of the haze in juice production. The use of biogenic enzymes such as pectinases in juices would act almost nine times better than mechanical maceration to get good results.
Glucose oxidase	• Convert glucose to gluconic acid	• Glucose oxidase improves the colour, texture, flavour and shelf life of food products and prevents rotting. • During food packaging glucose oxidase is used for increasing storage life by removing oxygen.

Enzyme	Mode of Action	Application
Laccase	• Oxidize phenolic and non-phenolic substances	• Modification of colour appearance of food and beverage industries • Oxygen removal in the beer production, which enhances storage life of beer. • Reduce organoleptic characteristics in wine • Removal of haze in brewing industry
Catalase	• Breakdown of hydrogen peroxide into oxygen and water	• Catalase is used with glucose oxidases for food preservation. • Catalase is applied in milk processing industry to eliminate peroxide from milk, to remove glucose from egg white in baking industry • In food wrappers to prevent oxidation and control perishability of food
α-Acetolactate Decarboxylase	• Removal of α-acetolactate and α-aceto-α-hydroxybutyrate	• Beer maturation- the maturation of beer without the use of enzymes takes 2 to 12 weeks • The use of α-acetolactate decarboxylase results in maturation within 24 hours
Asparaginase	• Conversion of asparagine to acrylamide	• An anticancer agent- Various food processing methods such as frying in oil and baking cause the conversion of asparagine to acrylamide, a known carcinogen. Depletion of asparagines by enzymatic treatment has been found effective in reducing the formation of acrylamides from asparagines by 97% .
Naringinase- Debittering Enzymes	• Breakdown of naringin, the principle bitter flavanone glycoside found in citrus fruits	• Debittering enzyme supplemented to fruit juices • Naringinase together with β-glucosidase and arabinosidase is to improve the aroma of wine • Various food additives such as biopolymers and sweeteners can be synthesized using naringinase

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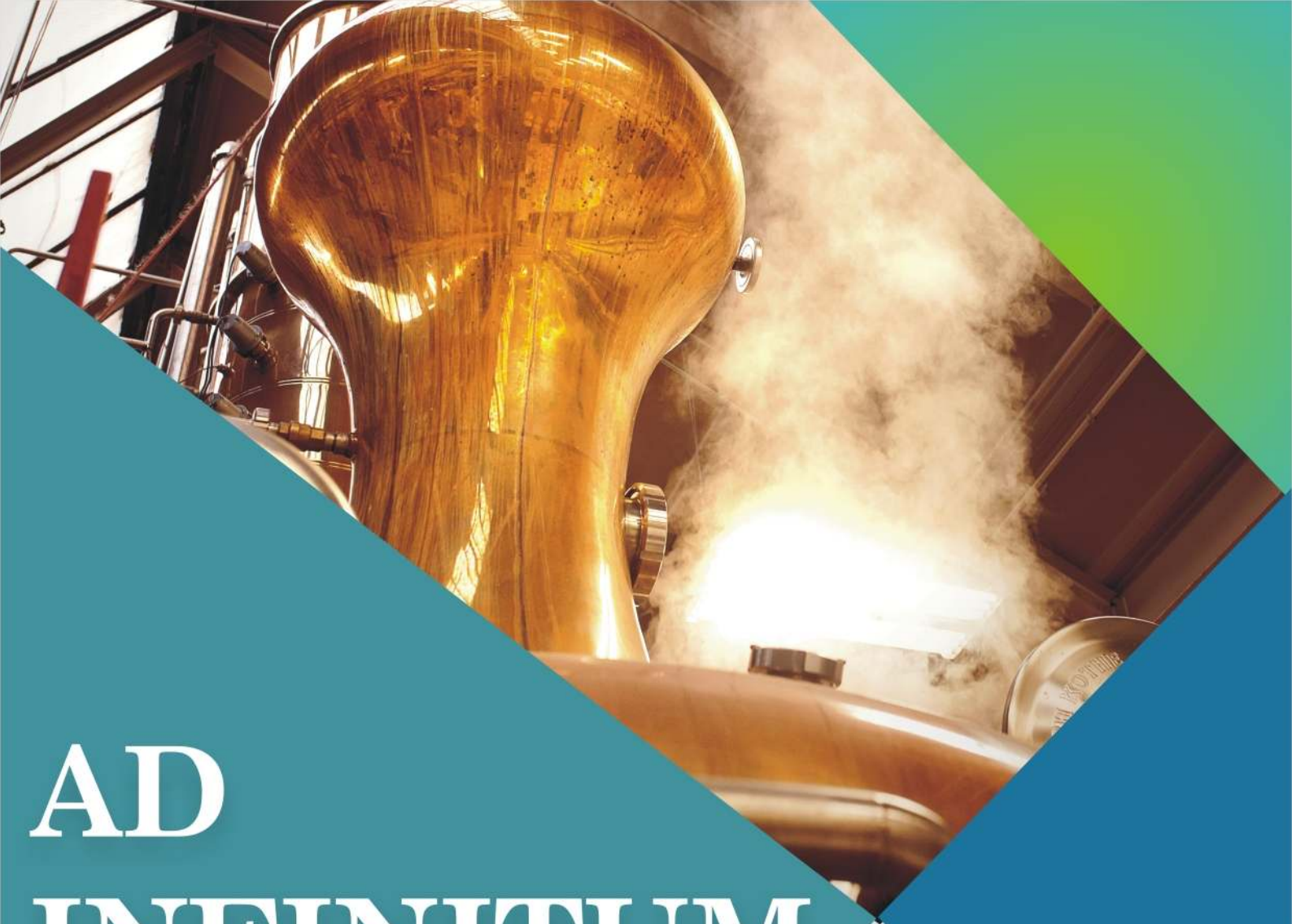

AD INFINITUM

Unique Enzymatic Solutions

ECOENZYME - NUTRIPLACE

Alcohol is considered a basic material for a number of industries like chemical, medicinal, cosmetics, beverage, food, and perfume industries, and the number of alcohol distilleries is increasing worldwide. Distillers have always appreciated the functional part that yeast plays - spirits couldn't live without it. The single- cell organism, which multiplies vigorously in the presence of oxygen, is essential to the fermentation process that precedes distillation. Even when all the available oxygen is used up, yeast will convert sugar into alcohol. Fermentation is simply the process by which yeast converts sugar into alcohol and carbon dioxide and other fermentable products in order to produce beer – and potentially spirits – with satisfactory quality, drinkability and stability.

Generally, distilleries use Urea, DAP or Liquor Ammonia as a cheap source of nitrogen for Yeast growth in Pre-fermenter and Fermenters to maintain healthy and viable yeast. Nutrition is a very important factor during the growth of yeast, for maintaining a good start during each stage. Apart from a good nitrogen source, yeast also needs micronutrients, vitamins, coenzymes and minerals.

Infinita Biotech offers a unique product ECOENZYME-NUTRIPLACE. It is a specially formulated blend of enzymes and micronutrients for replacing the use of urea in distilleries.

ECOENZYME - NUTRIPLACE is a rich source of essential micronutrients with vital enzymes needed for incentive growth. ECOENZYME - NUTRIPLACE is frequently used to fulfil the requirement of micronutrients needed for healthy yeast growth and budding. ECOENZYME - NUTRIPLACE meets these specific conditions of yeast and promotes growth.

Benefits of using ECOENZYME - NUTRIPLACE are:

- Eco-friendly product, with complete enzymes and micronutrients needed for yeast growth
- Replaces chemical grounded nutrients
- Enhances harmonious fermentation and yields
- Boosts in yeast cell growth and multiplication.

AD INFINITUM

ECOENZYME - ALGAE

ECOENZYME - ALGAE

Blue-green algae is a very common phenomenon that affects entire ecosystems.

Algal bloom is the rapid increase or accumulation of algal populations in freshwater or saltwater systems. It is often recognizable by the discoloration of the water due to algae pigments. The term algae encompasses many types of aquatic photosynthetic organisms, both macroscopic multicellular organisms such as algae and microscopic unicellular organisms such as cyanobacteria. Blue-green algae are the result of nutrients such as nitrogen and phosphorus entering water systems from various sources (such as fertilizer runoff and other forms of nutrient pollution) and causing excessive algal growth. Blue-green algae affect entire ecosystems.

Consequences range from benign feeding at higher nutrient levels to more detrimental effects such as blocking sunlight for other organisms, lowering oxygen levels in water, and excreting toxins into water for some organisms. Blooms that can harm animals and ecosystems, especially blooms in which toxins are secreted by algae, are commonly referred to as "harmful algae blooms" (HAB). These blooms can last from a few days to many months causing the fish to die.The process of nutrient oversupply that leads to algal growth and oxygen starvation is called eutrophication. Toxic algae blooms are a major environmental problem. Red tides and cyanobacteria are examples of harmful algal blooms that can have serious impacts on human health, aquatic ecosystems and economies.

Harmful algae blooms are the growth of algae in water. Some produce dangerous toxins in freshwater and saltwater, but even non-toxic flowers harm the environment and local economies, leading to heavy buds. Various chemical algicides are available in the market to help solve this serious problem, but they also pollute the water quality.

Infinita Biotech has come up with a specialised formulation effective in eliminating Algae. Our ECOENZYME - ALGAE is a novel product containing a mix of enzymes, a biological way to get rid of algal blooms. ECOENZYME - ALGAE works well at a temperature range of 15 - 50^{0}C in water bodies. The enzymes and chlorine-based derivatives in ECOENZYME - ALGAE is a quick and easy solution to remove algae. ECOENZYME - ALGAE works by interrupting the vital life processes of algae and disrupts the cell wall and in turn, inhibiting its growth.

Benefits of using ECOENZYME - ALGAE are:

- Eco-friendly solution to eliminate algae
- Safe and easy to use
- Replace the use of aggressive chemicals

AD INFINITUM

ECOENZYME - INVERT

ECOENZYME - INVERT

Invertase is an extensively used enzyme in the food industry. Invertase is also known by different names - saccharase, glucansucrase, invertin, beta- fructosidase. Invertase cleaves the terminal non-reducing beta- fructofuranoside residues releasing invert sugar. At Infinita Biotech, we provide invertase Enzyme in powder form as ECOENZYME – INVERT.

Druggists during the 1800s were studying the effect of yeast on sugar and realised that before the sugar began fermenting, it changed form. After much exploration, the druggists isolated the enzyme that caused this - invertase. By the time 1900, the process for inferring invertase from yeast was generally used. Over the course of the coming 20 plus times, druggists found numerous uses for invertase, most importantly in candy- making.

Invertase is isolated from S. cerevisiae and other microorganisms. Hydrolysis from sucrose to fructose and glucose is catalysed by this enzyme. Under acceptable functional conditions, invertase displays trans-fructosylation activity, which enables the synthesis of short- chain fructo- oligosaccharides (scFOS) from sucrose.

The production of inverted sugar is one of ECOENZYME – INVERT's multiple operations. Due to its sweetening effects, which are more than sucrose, ECOENZYME- INVERT has great industrial significance and has good prospects for its use in biotechnology. Invertase is more active at temperatures between 40 and 60 °C and pH ranging from 3 to 5.

It is basically used for the hydrolysis of sucrose to glucose and fructose(invert sugar syrup). Invert sugar syrup is used as a sweetener in baking, beverage, canning and dairy processes. The good humectant properties of the syrup also contribute to better shelf - life in confectionary products. Within the scope of the latter, ECOENZYME - INVERT is directly used to promote the formation of soft fondant centres. It's also used in the manufacturing of artificial honey and plasticizing agents which are used in cosmetics.

AD INFINITUM

ECOENZYME - PECT JUICE

ECOENZYME - PECT JUICE

Cell wall degrading enzymes such as cellulase, pectinases and proteases are greatly used by the beverage industry for the fruit softening and clarified fruit juices. The use of pectinase enzymes is wide. In the natural state, pectinase found in fruits speeds up the process of ripening. Pectinase enzyme is one of the best catalysts and has multiple uses in the food industry. The pectin in the middle lamina of plant tissues is enzymatically degraded by protopectinase, pectin methylesterase, pectin lyase, and polygalacturonase to fully hydrolyze the galacturonan polymer to its constituent galacturonic acid. This helps in improving the clarification and yield of fruit juices. The acidic pectinases are used extensively in fruit juices.

Pectinase isn't used as a single enzyme in the food industry. Rather, it is combined with amylase, like the alpha-amylase enzyme. The combination works as an amazing purifying agent. The food and wine industry use this combination for processing of various products. Pectinase helps in producing clearer juice. Infinita's new product ECOENZYME - PECT JUICE is a synergistic mix of pectinase and cellulase enzymes with various hemicellulosic side activities such as Xylanase and Arabinase. It breaks down the cell wall of fruits and vegetables. It thus provides excellent yields in food processing. It is especially designed for the extraction and clarification of fruit juices and vegetable purees.

ECOENZYME - PECT JUICE offers various benefits like:

- Rapid extraction of juice with decreased pressure build - up
- Increase in free- run juice and total yield
- Increase in extraction capacity due to faster filtration rate
- Fast viscosity reduction

When used in brewing, the function of ECOENZYME - PECT JUICE is twofold; first, it helps break down the plant (generally fruit) material and so helps the extraction of flavours from the mash. Secondly, pectinase is used to break down pectin, which causes the haze or cloudiness in wine. In turn, it produces a clear wine. Pectinase as a single enzyme is also used for oil extraction and degumming of plant fibres in pulp and paper industry; it is also involved in specialised food applications like extraction of bioactive compounds.

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ENZYMATIQUE

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Enzymes in Distillery Industry

Enzymes are frequently used in distilleries for numerous benefits, including increasing yield and efficiency by utilising dextrins and polymers that yeast cannot directly metabolise, streamlining the processes, and removing bacterial contaminants, which lower by-products and improve spirit quality. Based on the type of feedstock they use, which mostly consists of two types: sugar- and starch-based, distilleries can be differentiated from each other. The feedstocks for sugar-based distillery enzymes include processed cane juice, cane molasses, beet juice and beet molasses. On the other hand, grain and tuber distilleries, such as those using rice, wheat, corn, barley, millet and cassava roots, are further split into starch-based distilleries.

Grain alcohol, a refined version of ethanol, is made by distilling grains that have undergone fermentation. However, due to various climatic circumstances and various needs, it can also be generated by fermented grains. Typically, ethanol is manufactured at industrial scale from fermented molasses and sugar leftovers. Alcohol fermentation is accelerated by enzymes for grains including maize, starch, corn grain, millet, wheat, sweet sorghum, tapioca and sugar beet, depending on their availability and consumption patterns.

Before commercial enzymes hit the market, malt-sourced enzymes were typically used. Multiple enzymes are produced during the natural malting process in cereals, which fortunately for us may be employed to convert starch into sugars. The brewing and malt whisky industries still often use this technique today. Malt-sourced enzymes are tricky to use because they are sensitive to pH and temperature, making efficient malting expensive and time-consuming. Because of this, distillers' life was made easier when the enzymes, as we know them today, first entered on the market. They were also able to use a larger variety of feedstocks.

Compared to enzymes produced from malt, commercial enzymes allow for a more effective conversion of starch into fermentable sugars. Commercial enzymes are frequently added to the processes of some malt whisky manufacturers (located outside of Scotland) in order to boost productivity.

The function of enzymes is that of a biochemical catalyst, which means that they can accelerate chemical reactions. For example, the breakdown of peptides into amino acids or the breakdown of starch into dextrins. The fact that each enzyme can only react on a certain substrate and can only catalyse a single kind of reaction is also important to understand. In other words, it works as a lock-and-key method, matching an enzyme to a substrate and a key to a lock (Fig.1). This means that one particular enzyme must be used for each specific need.

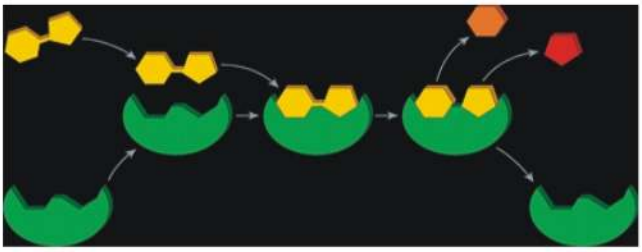

Fig 1. One enzyme- one substrate

The enzymes alpha-amylase (AA) and glucoamylase (GA) are required for the breakdown of starch into glucose, which can then be fermented by yeast, when making spirits from starch-based feedstocks (grains, potatoes, etc). (Fig.2).

Using enzymes for viscosity reduction, such as glucanase, is important because using grains, such as rye, barley, and oats among others, may cause problems with non-starch viscosity. Protease is the last enzyme, and it can provide yeast with nutrition if proteins are present in the feedstock.

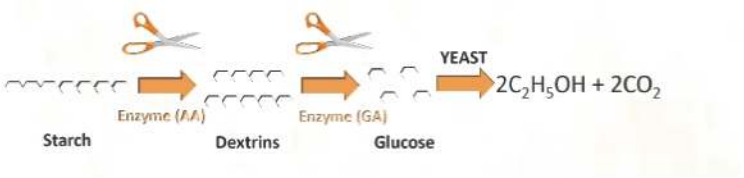

Fig 2. Starch conversion to Alcohol

The Global alcohol enzyme market was valued at $553.1 million in 2019, and is projected to reach $804.6 million by 2027, registering a CAGR of 4.9% from 2020 to 2027.

Generally speaking, malt was traditionally added to the feedstock to introduce enzymes into alcohol distillation. Today's advances in enzymatic research allow us to move past outdated methods and simply avoid all the dangerous chemicals previously used in the manufacturing of ethanol as we aggressively push an environmentally safe method for accelerating the process. Since enzymes, unlike malt, require a very modest ratio, large quantities of malt can be replaced by smaller quantities of enzymes in many nations and by well-known industrial participants. This lowers the cost of handling and warehousing while also saving 30% on raw material expenses.

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Enzymes in Agriculture Industry

From the beginning, when humans depended on agriculture to survive, to the present, when people still depend on agriculture, the produce has been constant. Because plants supply food, it's possible that agriculture's production is solely tied to human survival.

Without using chemical treatments, the farmers can now continue their traditional organic farming practices. The best products a farmer may get emerge from the soil, which is always natural. The farmer is satisfied with the increased output, both in terms of quality and quantity. All of this is steadily improving. There is no going back now for any agricultural stakeholder in any respect. Therefore, it would be fair to accept enzymes as beneficial for the development and production of agriculture.

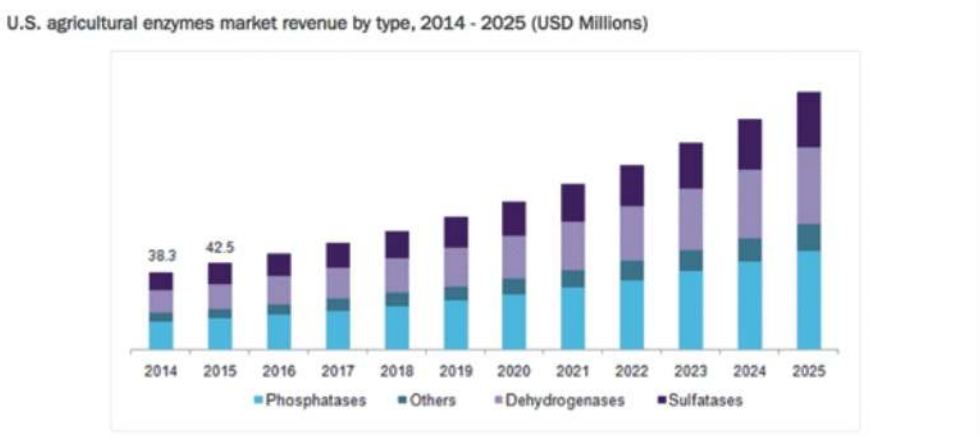
Agricultural enzymes are catalysts that speed up the chemical process that helps generate the nutrients in the soil so that plant roots can consume them. Without an agricultural enzyme, these nutrients would have remained immobilised in the soil, unavailable to the plants. Enzymes for agriculture are added to the feed to increase plant productivity and quality. Since its use increases crop output, enzymes are widely used in the agricultural sector. By about 20%, photosynthesis is increased when agricultural enzymes are used. The usage of pesticides is reduced and the environment is protected through the use of enzymes in agriculture.

Technology is improving rapidly, which makes it easier for farmers to nurture their crops properly. There are chemicals and fertilisers that can help in the growth of the plants. However, in terms of plant production or soil fertility, these are not sustainable. These chemicals have a potential to destroy the area of land, making it unproductive and infertile. Therefore, going back to organic farming practices is highly required.

Microorganisms like fungi and bacteria are the source of agricultural enzymes. With the help of nutrients like soy, corn, sugar and starch, these are produced in covered steel tanks. Presently, gene technology is also used in some situations to enhance enzymes and increase performance.

Phosphatases, dehydrogenases and urease are three of the most important enzymes involved in plant growth and soil fertility. Carbohydrase, proteases, phytase, sulfatases and amylases are additional enzymes used in agricultural applications. The most popular agricultural enzymes are phosphatases, and it is anticipated that they will continue to dominate the agricultural enzyme industry in the near future.

In 2016, the market for agricultural enzymes was estimated at USD 246.9 million globally. Growing consumer demand for organic food, along with high competition strategies employing the major industry players is expected to drive market expansion.



In many different ways, people have employed enzymes for thousands of years. This will undoubtedly continue to rise with the development of biotechnology and other advancements. Increased crop output and soil fertility can be achieved sustainably by using enzyme-microbe complexes.

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Enzymes in Wastewater Treatment

Wastewater treatment is important to secure both the environment and human health. Oil, grease, chemicals, pesticides and plastics are examples of resistant pollutants that are hard to decompose using ordinary activated sludge treatments. Due to their presence, toxicity, resistance to natural biodegradation and other negative effects, these pollutants pose a significant hazard to aquatic habitats and organisms. Enzymes are recommended for the treatment of these resistant pollutants as a high-efficiency biocatalyst.

The majority of wastewater treatment techniques used today use biological and physiochemical processes. For the treatment of wastewater, physiochemical approaches such as chemical oxidation, distillation, membrane-based separation technologies and adsorption have been used. These techniques are standard therapy, but they are quite expensive and it might lead to even more pollution and disease. Most contaminants in wastewater can be removed using biological methods, which are more environmentally friendly. These techniques used plants, microorganisms and enzymes to treat wastewater. Similarly, while enzymes could function quickly and selectively, plants and microbes are sensitive to some hazardous chemicals from wastewaters.

Table. 1 Major contaminants in wastewater

Contaminants	Reason for Importance
Suspended solids	Can lead to the formation of sludge deposits and anaerobic conditions when untreated when wastewater is discharged to the aquatic environment
Biodegradable organics	Are principally made up of proteins, carbohydrates and fats. They are commonly measured in terms of BOD and COD. If discharged into inland rivers, streams or lakes, their biological stabilization can deplete natural oxygen resources and cause septic conditions that are detrimental to aquatic species.
Pathogenic organisms	Found in wastewater can cause infectious diseases.
Priority pollutants	Including organic and inorganic compounds, may be highly toxic, carcinogenic, mutagenic or treatogenic.
Refactory organics	That tend to resit conventional wastewater treatment include surfactants, phenols and agricultural pesticides
Heavy metals	Usually added by commercial and industrial activities must be removed for reuse of the wastewater
Dissolved inorganic constituents	Such as calcium, sodium and sulphate are often initially added to domestic water supplies, and may have to be removed for wastewater reuse.

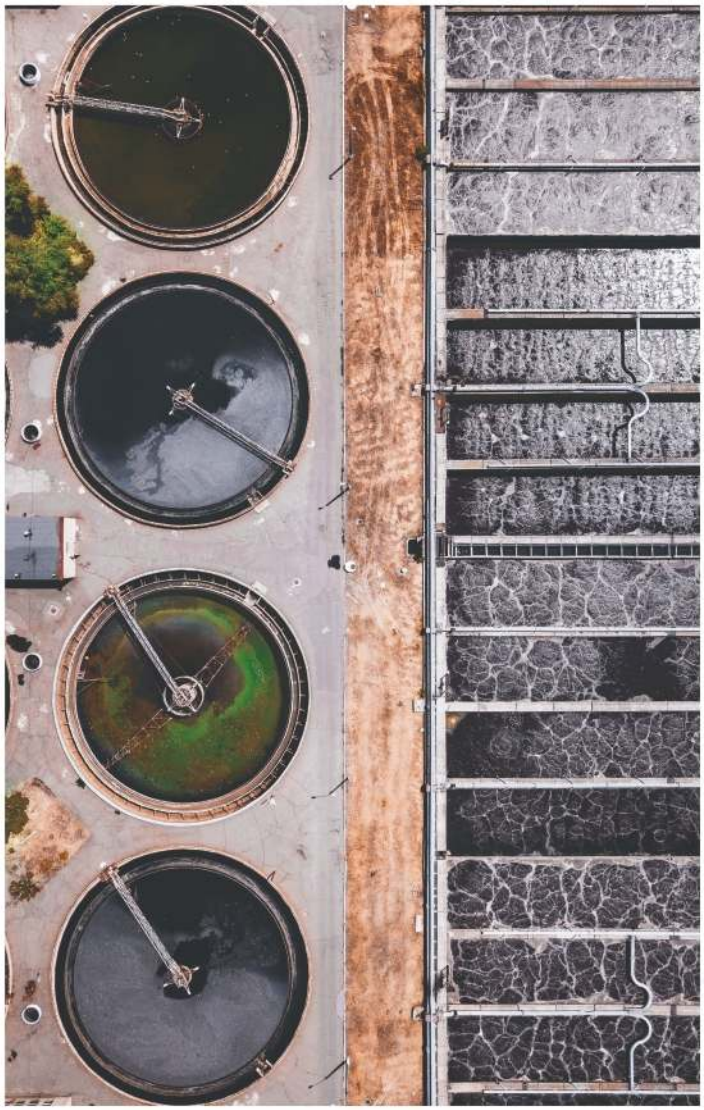
Approximately $5.5 billion worth of industrial enzymes were marketed in 2018, and by 2023, it is forecasted that this market will have grown to $7.0 billion, or 4.9% annually. Proteases, amylases and lipases are hydrolytic enzymes that represent the majority of the global market and are widely used in a wide range of industries, including the manufacturing of biodiesel and leather, thereby removing the need for toxic chemicals (e.g. sodium sulphide in leather tanning).

Enzymes have particular active sites which can bind with particular substrates and decrease the activation energy during enzymatic reactions. As a result, the response kinetics and specificity of these processes are very high. Enzymes could also speed up the process of carrying substrates into cells, increasing the efficiency of these procedures. The two most common enzyme types used in wastewater treatment are hydrolases and oxidoreductases. There are six different types of enzymes. Due to their diverse range of chemicals, these two enzymes can biocatalyst the majority of contaminants in wastewater. Currently, commercial applications exist for enzymes like peroxidase, laccase and lipase. Due to their broad substrate specificities, laccase and peroxidase are frequently used to remove certain organic micropollutants.

These wastewaters may initially have high levels of inorganic pollutants that are easily biodegradable but whose impact load on biological systems could be measured in the tens of thousands of mg/L for Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), or Chemical Oxygen Demand (COD). The biological treatment process appears to be a viable method for the treatment of wastewater. It additionally provides the advantages of cheaper treatment costs with no additional contamination, in contrast to other wastewater treatment methods. Most waste-treatment procedures are divided into one of two categories: physico-chemical processes or biological processes. Due to the fact that enzymatic treatment involves chemical procedures that rely on the action of biological catalysts, it lies between these two conventional classifications.

The applicability to biorefractory compounds, activity at high and low contaminant concentrations, activity over a wide range of pH, temperature, and salinity, absence of shock loading effects, absence of delays associated to the adaptation of biomass, decrease in sludge volume and ease and effortlessness of controlling the operation are among the anticipated advantages of enzymatic treatment as compared to traditional treatment.

Pollution harms the environment in all of its aspects. But the biggest problems facing our generation right now are air and water pollution. The aforementioned articles examine several methods for treating wastewater with enzymes because they are biological and more environmentally friendly than their chemical competitors. We genuinely hope that they are completely utilised and bring in a better, cleaner world soon.



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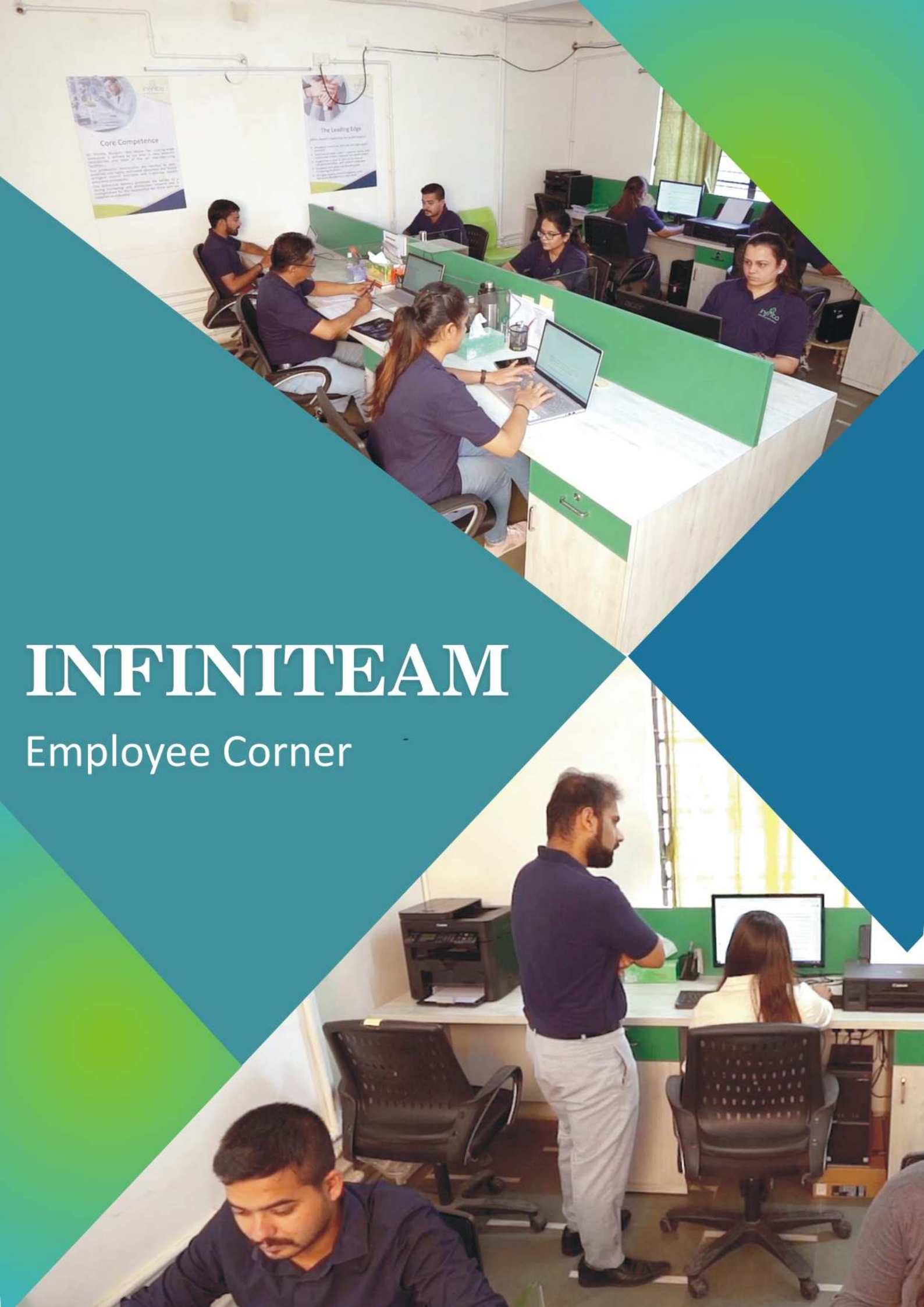

INFINITEAM

Employee Corner

The concept of Six Sigma is a great improvement manner and advantage is crucial every day. Six sigma plays a very critical function in the sector of Human assets. Human assets are the most critical part of any organization. The achievement and the failure of the business enterprise specifically relies upon the excellent of human resources the organisation have. On this most dynamic subject, HR faces many problems on ordinary foundation like employee issues, labour disputes, Attrition of the employees, locating the right talent and so on.

Hence to address all this components of HR infinita biotech we implement the concept of SIX Sigma for enhancing the quality of Human sources. At the same time as enforcing this idea beneath query, we kept in thoughts.

- What is the reason the HR characteristic or sub-characteristic?
- What are the expected deliverables (humans, competencies, offerings, cost, reviews, etc.)
- What improvement sports are done inside the HR function
- Worker involvement
- Concept and innovation for improvement
- HR effectiveness in pleasant its meant functions

Message from
Marketing Manager
Jimesh Patel

Is success at work important to you?

In the corporate world, there are people who watch things happen, there are people who wonder what happened and according to me, there are people who make things happen. It is important to be proactive and take initiative, in order to achieve success. This means setting goals and working towards them, being proactive in seeking out opportunities and taking action to bring your ideas and plans to fruition. It also means being resilient and persistent, and not being discouraged by setbacks or challenges. Making things happen requires focus, determination and a willingness to take risks and step out of your comfort zone. While it's important to be aware of what is happening around you and to learn from others, it's equally important to be proactive and take control of your own life and career.

As a marketing team of a company, we identify a potential market for a company in a new country and after successfully researching, finding a local distributor and potential customers. Establishing our footstep in the new market is a significant achievement for us. Opening a new country for export and capturing export share is an important accomplishment for any company. It demonstrates a strong ability to identify and seize new opportunities, as well as to adapt to new environments and cultures. It also shows that the company's products or services are in demand and are able to compete effectively in the market. It shows that we are proactive, resourceful and able to adapt to new environments and cultures. It also demonstrates our ability to identify and seize opportunities, as well as our ability to build relationships and navigate complex business environments.

Our success can be a valuable asset for our company, as it opens up new avenues for growth and revenue. It may also be a source of personal pride and satisfaction, as you have taken on a challenging task and achieved a significant goal.

Opportunities can come in many forms, such as new projects, promotions, networking events or learning opportunities. By being proactive and seeking out opportunities, you can take control of your career and work towards your goals. It's also important to be open to new experiences and challenges, as these can help you to grow and develop as a professional.

It's important to remember, however, that climbing the ladder of success is not always easy, and that there may be setbacks and challenges along the way. It's important to be resilient and persistent, and to keep working towards your goals even when things don't go as planned. With focus, determination and a willingness to take risks and step out of your comfort zone, you can overcome obstacles and achieve success.

It's important to continue building on this kind of success and finding ways to continue expanding our company's presence in the GLOBAL MARKET.

Employee Reviews - Learnings at Infinita Biotech

Sulagna Roy - QC Executive

IBPL has got me introduced to a wide array of enzymes and their unique applications. While quality management remains a prime focus of IBPL, it has also been engaged with process development for enzymes which has given me an opportunity to understand the finer details of enzyme production, extraction and stabilization.

Mansi Patel - QC Officer

Proud to work here as we are headed as a profitable and values-driven organization. Continuing the momentum of employee engagement around issues like sustainability, diversity, and inclusion, and making work meaningful excites me for the future.

Tejas Shah - Senior Accountant

I am working in Infinita Biotech Pvt Ltd as Accounts Executive from July - 2021. It was very difficult at the time of joining. After a few months, it started to ease. I have learned a lot of abilities to independently handle tasks. Thank you to Infinita Biotech for giving me the opportunity.

Ketan Patel - Production Manager

I am Working with Infinita Biotech since the beginning of the Company, you can say, I was the first person who joined Infinita as an employee, and I have witnessed the growth of the company. Infinita gave me exposure to my career in the production department by innovating and formulating different products by using technologies and research.

INFINITALK

Events and Happenings

WINNER

Rangoli Competition

Infinita
Biotech Private Limited

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