

Catalysts

connect

Feb-March-April'19 Volume 32

Why PATENT & What to PATENT

Enzymes—Essence of Life

Microbiological Treatment of Food Waste

Rich Dad Poor Dad

Dare To Be All That You Can Be

Control of Dissolved Oxygen (DO) During Beer Processing

COMPLETE ENZYME & ADDITIVES SOLUTION FOR BREWING INDUSTRY

CHANNEL PARTNERS

CENTRAL INDIA



MECON CHEMICALS MATRIX CORPORATION

NEPAL



Industrial Marketing Pte. Ltd.



ENZYMES & ADDITIVES IN BREWING

- Enzymes and Additives in Mashing
- Enzymes and Additives in Fermentation
- Enzymes and Additives in Filtration
- Enzymes and Additives in Maturation

FEATURES

- Customized Solutions
- Trademark Products
- On Demand Analytical Support
- Well Equipped & State-of-Art Labs
- Leaders in Enzyme Solutions for Sugar & Ethanol Industry
- Certified Manufacturing Units
- More than a decade of Excellence
- Qualified Customer Support Teams

ABOUT THE GROUP

The Catalysts Group is among the top 5 Indian biotechnology companies, active in industrial enzymes business segment.

Our 15+ years experience of enzyme application in sugar as well as alcohol industries have given us a distinctive edge in creating customized products. Application of our products not only increases process efficiency, but also results in higher ethanol recovery.



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MESSAGE FROM THE **MANAGING DIRECTOR**

Dear Friends

Welcome to our first addition of Catalysts Connect in new financial year.

I am extremely happy to share that we completed our last financial year with more than 28% growth in our revenues. All our Industry verticals viz Sugar & Molasses, Grain as well as Malt & Brewing clocked double-digits growth. This is really phenomenal! We have continued making things happen...

All members of Catalysts family have worked very hard to achieve this. Their efforts are truly appreciable.

This would not have been possible without support of our clients. Special thanks to all our clients for having continuous trust on our products and services.

I would also like to thank our Principals especially Novozymes and LEAF for their continuous support as well as guidance to our teams.

All the growth drivers active during last financial year are still in place and we are confident to continue our growth Journey.

We have started two new verticals viz. Animal nutrition and Agriculture. We have already completed successful trials of products in both these verticals and are all geared up to launch them very soon.

All the best for 2019-20.

Cheers

Munish Madaan



MESSAGE FROM THE DIRECTOR

Dear Friends

This new financial year 2019-20 Catalysts is getting into a new phase of opportunities & challenges. Fuel ethanol policy has given a new hope for business growth considering not only distilleries running to their full capacities but also plant expansions & new projects. On the other side raw material prices & water crisis is the challenge.

Fighting against all odds and conquering the opportunities has been in the DNA of Catalysts. Like every year this year too we are committed to give 30% growth.

New verticals like Animal nutrition & Agriculture will contribute to the Catalysts quiver this year. Industries like Malt Spirit & Brewery will be under special focus in 2019-20. Our International footprint is increasing month after month making Catalysts flag spread round the globe.

We thank all our clients, associates, vendors and team for the wonderful 2018-19 and assure for more exciting year ahead giving all of us reasons to celebrate success.

Thank you

A handwritten signature in black ink, appearing to read 'Aditya Malhotra'.

Aditya Malhotra

Why Patent & What to Patent

Dr. Archana Prakash, R&D Deptt.



What is a Patent?

An application for a patent is a deal between the inventor(s) and the country in which it is filed. In exchange for full disclosure, the inventors can protect their invention for up to 20 years. In theory, by revealing their invention publicly, others can benefit by using it as a springboard for further developments. Without a patent, inventors are almost powerless to stop someone else exploiting their invention.

Rights in a Patent

Patent registrations confers on the rightful owner a right capable of protection under the Act i.e. the right to exclude others from using the invention for a limited period of time. The monopoly over patented right can be exercised by the owner for a period of 20 years after which it is open to exploitation by others. Patent confers the right to manufacture, use, offer for sale, sell or import the invention for the prescribed period.

What are the requirements for Grant of Patent?

1. The application for Patent shall be made at the Indian Patent Office.
2. Any person i.e. Indian or a Foreigner, individual, company or the Government can file a Patent Application.
3. The patent application can also be made jointly.
4. The patent application shall primarily disclose the best method of performing the invention known to the applicant for which he is entitled to claim protection.
5. The applicant shall also define the scope of invention.
6. The invention desired to be patented shall be new, should involve an inventive step and must be capable of industrial application.
7. A patent application can be made for a single invention only.
8. An international application made under the PCT (Patent Co-operation Treaty) designating India shall

be deemed as an application made under the Patents Act with the priority date accruing from the date of the international filing date accorded under the PCT.

Invention under the Patent Act

The Act under Section 2(1)(j) defines “invention” as a new product or process involving an inventive step capable of industrial application.

The term “industrial application” refers to capable of industrial application in relation to an invention means that the invention is capable of being made or used in an industry. One of the pre-requisite of invention is that it should be new i.e. the invention proposed to be patented has not been in the public domain or that it does not form part of the state of the art.

Under the Patent Act, both processes and products are entitled to qualify as inventions if they are new, involve an inventive step and are capable of industrial application.

Requirements to Qualify as Invention

- The Invention must be new;
- Invention must involve an inventive step;
- The invention must be capable of industrial application or utility;
- The invention shouldn't come under the inventions which are not patentable under Section 3 and 4 of the Patent Act, 1970;

What Inventions are not Patentable?

Non-patentable inventions are enumerated under Section 3 and 4 of the Patent Act. Such inventions are delineated below:

- Any Invention which is frivolous or which claims anything obviously contrary to well established natural laws is not patentable.
- Inventions which are contrary to public order or morality is not patentable.
- An idea or discovery cannot be a subject matter of a patent application.
- Inventions pertaining to known substances and known processes are not patentable i.e. mere discovery of a new form of a known substance which

does not enhance the known efficacy of that substance is not patentable.

- An invention obtained through a mere admixture or arrangement is not patentable.
- A method of agriculture or horticulture cannot be subject matter of patent.
- A process involving medical treatment of human and animals or to increase their economic value cannot be subject matter of a patent.
- Plants and animals in whole or in part are not patentable.
- A mathematical or business method or a computer program *per se* or algorithms is excluded from patent protection.
- Matters that are subject matter of copyright protection like literary, dramatic, musical or artistic work is not patentable.
- Any scheme or rule.
- Presentation of information
- Topography of integrated circuits.
- Traditional knowledge.
- Inventions relating to atomic energy.

When to apply for a patent...and When not to

There's a common misconception that, to be granted a patent, you have to invent something ground-breaking, but this is not true. A useful question to ask is: have you discovered something which is beneficial enough for someone to want to copy it? This could be a simple product improvement, but nonetheless it may be patentable. A patent is granted for inventions which are useful, and new and inventive over everything else that has gone before. A patent is a 'negative right' in that it doesn't enable you to start making or using an invention, but it does allow you to stop others from doing so.

Dos and Don'ts

Do:

- Keep the invention confidential before filing an application.
- Research – not just Google, use Espacenet and, if you can afford it, request a professional patentability search.
- Get advice.
- File as early as possible – the earlier you file, the

fewer prior publications can be cited against your application and the earlier protection can begin.

- Check your freedom-to-operate so you won't infringe someone else's patent rights.

Don't:

- Publically disclose the invention.
- Talk to anyone about your invention pre-filing – if you absolutely have to, get a signed NDA first.
- Think that copyright will protect your invention.

Infringement of Patent

Infringement of Patent primarily refers to intrusion or violation of the rights of a Patentee against which the Patentee has statutory rights under the Act.

The factors that are essential in determining infringement of a Patent are as under:

1. While determining infringement it has to be assessed whether the infringing activity fell within the scope of the invention. Thus, the infringement has to be determined with regard to what has been claimed as invention under the Patent Act by applying the principles or standards of construction.
2. To determine whether the infringing activity violated any statutory rights conferred to the Patentee under the Act. In this respect reference can be made to Section 48 of the Act which enumerates the rights of the Patentee with respect to a product patent and process patent.
3. To determine the infringer i.e. the person liable for the infringement.
4. To determine whether the infringing act fell within the acts which do not amount to infringement under the Patents Act i.e. excluded acts of Government use, use of patented product or process for experiment or research, import of medicine or drug by Government and patents in foreign vessels and aircrafts.

Patent Filing Process

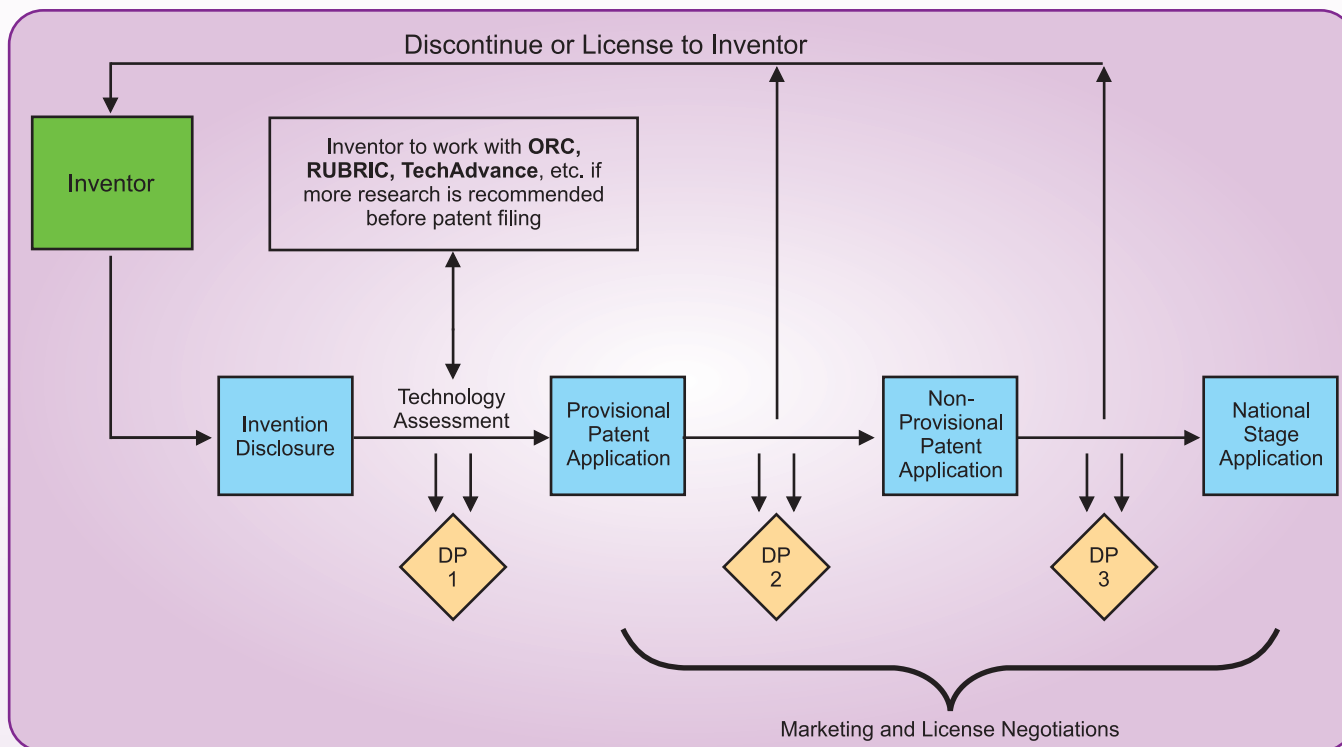
Patents can be secured by following the below-mentioned steps:

The procedure for the grant of the patent begins with the

Step 1: Filing a Patent Application

Ideation:

Here, you need to clearly pen down the idea or concept, clearly mentioning the key details about the invention and the desired patent.



Step 1: Filing a patent application:

Visualisation:

Visualise your idea and elements like diagrams that explain more about the invention.

Verification:

Verify whether your invention is patentable as defined in the Indian Patent Act. Some inventions may not be patentable, and it is necessary they meet the patentability requirements such as:

- Novelty
- Non-obviousness
- Usefulness
- Patentable subject matter

Drafting a patent application is an art in itself. Seeking the help of a patent professional or patent attorneys will be a wise choice here. Authorized patent professionals or trained for many years to be able to draft good applications which not only maximize protection for inventions, but also minimize the risk of others circumventing the patent. They can also guide your application through to grant of the patent and help you file applications abroad.

An application draft comprising a description of and the claims covering the new invention must be submitted. The description is similar to a scientific publication in that the background, methods and results are described. The claims are statements which set out the boundaries of the protection you want. It is possible to make applications in individual countries, collectively in Europe or to make an international application. If you

are in the initial stages of research and development process, then it is best to file an optional preliminary application called provisional patent application.

Why provisional patent application is a good idea before filing the patent application

- A provisional patent application secures your date and work. This means that none of your competitors can file for a similar invention once a provisional patent application is filed.
- As India follows the first-to-file system, this ensures that the holder of the provisional patent would also be granted the permanent patent.
- There is a buffer time of 12 months to further develop your invention and to specify its complete details. The application gets abandoned upon expiry of 12 months of the application.
- The cost and resource involved for provisional patent application are less when compared to the permanent patent.
- The provisional specification helps you assess the market potential of your invention before taking the final plunge and filing a complete specification.
- Once you are ready with your R&D and your invention's detailed specifications, you can go in for a complete patent application.

Step 2: Preparation of patentability report:

Authorized patent professionals or patent attorneys will then do an extensive research and prepare the patentability report, which includes analyses based on the above-mentioned criteria.

Step 3: Publication of patent application:

The application is then published after 18 months. A request to early filing of application can be made along with a prescribed fee.

Step 4: Patent Examination & Grant

A. Patent Examination:

would be a formal submission of request for patent examination that must be filed **within 48 months** from first filing the patent (provisional patent or complete patent). If failed to file within the time frame, per the Patent Act the application will be treated as withdrawn by the patent office. The examiner then conducts a comprehensive investigation and releases the first examination report called patent prosecution.

B. Patent objections:

It is common that patent applicants receive objections, like “inconsistent or unclear claims”, “invention lacking novelty”, etc. Hence, it is mandatory to analyze the patent examination report and draft a proper response to the objections

C. Grant of patent: Once all the patentability requirements are met, the patent grant notification will be published in the Patent Journal

How to make money from Patenting your invention?

Any patent holder looks for ways to monetize the patents and wants to enjoy the fruits of his hard work and research. The two ways to earn from it are:

Licensing a patent:

A patent owner can license his idea to another and give rights to the licensee to sell or make the patented invention. The patent holder can control these rights. A license agreement must include upfront payment and royalty percentage. Royalty is the percentage of the revenue earned from the licensed product over a period of time.

Selling of patent:

A patent can be sold to anyone within the country where the invention is patented. By selling patents, inventors can usually demand a lump-sum payment and is best in the long run. He can be free from maintenance fees for the patent office, litigation fees and most importantly free from worrying about future economic recession.

Conclusion and the future

Even in a world where developments are seemingly occurring at a faster and faster rate, the importance of patent protection in attracting potential investors is still vital, and no other system exists which can provide fair protection for inventors whilst fueling innovation by providing public disclosure of inventions. Awareness of patents needs to be raised so that opportunities to patent inventions and to generate income from them are not missed.

Source: The basics of patent Law in India/Jan 2019/Vakilno1.com

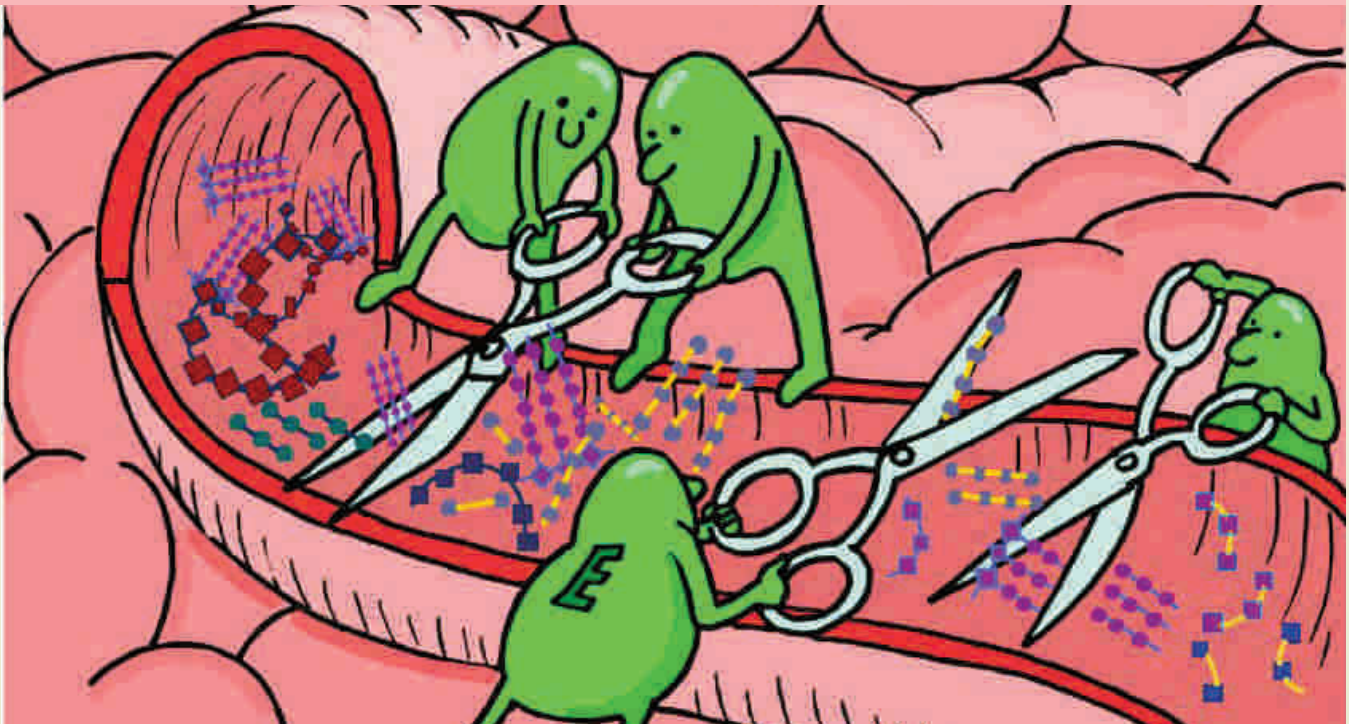
Enzymes-Essence of Life

Namrata Tyagi – R&D Deptt.

“Enzymes are substances that make life possible. They are needed for every chemical reaction that takes place in the human body. No mineral, vitamin, or hormone can do any work without enzymes. Our bodies, all of our organs, tissues, and cells, are run by metabolic enzymes. They are the manual workers that build our body from proteins, carbohydrates, and fats, just as construction workers build our homes. You may have all the raw materials with which to build, but without the workers (enzymes) you cannot even begin.”

Enzyme Nutrition – The Food Enzyme Concept by Dr. Edward Howell, M.D., Avery Publishing 1985.

How do digestive enzymes help the process of digestion:



digestive enzymes are the chemicals that break large insoluble food molecules into smaller soluble molecules

The enzymes in the body perform very important tasks. These include building muscle, destroying toxins, and breaking down food particles during digestion. An enzyme's shape is tied to its function. Heat, disease, or harsh chemical conditions can damage enzymes and change their shape. When this happens, an enzyme doesn't work anymore. This affects the body processes.

Enzymes are produced naturally in the body. They're mostly produced in the pancreas, stomach, and small intestine. But even salivary glands produce digestive enzymes to start breaking down food molecules while you're still chewing. You can also take enzymes in pill form if you're having certain digestive problems.

Primary Function of Digestive Enzymes

Amylase: breaks down carbohydrates, starches and sugars found in grains, rice, potatoes, fruits, vegetables, beans, herbs, snack foods.

Alpha Galactosidase: breaks down the polysaccharides and oligosaccharides (complex sugars) in foods such as legumes (beans and peanuts) and cruciferous vegetables (cauliflower, broccoli, cabbage, brussel sprouts, among others).

Beta-glucanase: Helps in the breakdown of plant cell walls (cellulose) beta-linked glucose polymers often associated with fibers, grains and cereals, such as in barley, oats, and wheat and other products such as soybean meal and locust bean gum.

Bromelain: A protein-digesting (proteolytic) enzyme complex found in the fruit and, in higher concentrations, in the stem of the pineapple; able to hydrolyze or break down a wide variety of protein types in a range of both acid and alkaline environments.

Catalase: an antioxidant enzyme helps the body to convert hydrogen peroxide into water and oxygen.

Cellulase: breaks down food fibre (cellulose) found in fruits and vegetables.

Glucoamylase: breaks down off long chain carbohydrates or starches (corn, potatoes, wheat and rice) into sugar that will afterwards be used as fuel by the body.

Hemicellulase: breaks down hemicellulose, which is a type of cellulose and a key component of the cell wall in all plants; has the ability to take non-cellulose polysaccharides (long chains of sugars) and convert them into usable constituents.

Invertase: breaks down white and simple sugar (fructose and fruit sugar).

Lactase: breaks down lactose, a simple sugar, found in milk sugars (milk products).

Lipase: breaks down fats found in butter, cheese, meat, dietary fats and oils, vitamins A, D, E, and K.

Papain: derived from the fruit of the papaya plant, that catalyzes the breakdown of proteins by hydrolysis (addition of a water molecule).

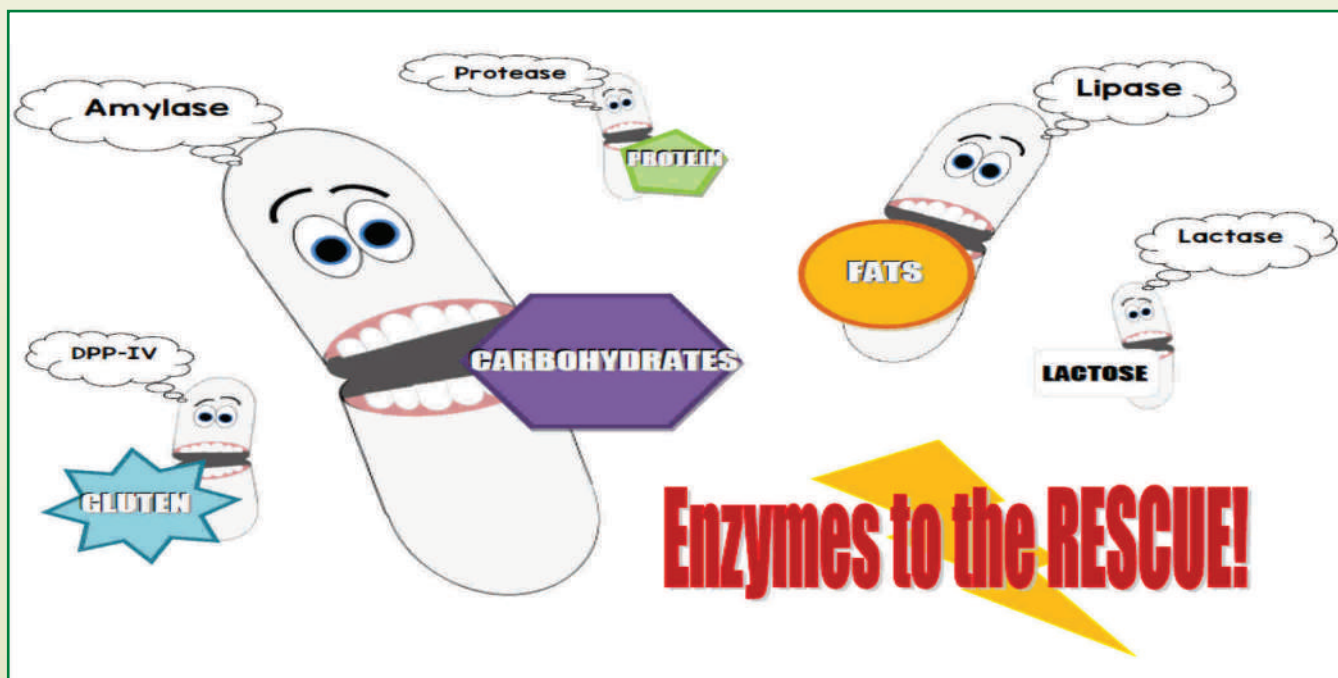
Pectinase: breaks down pectin, a polysaccharide found in plant cell walls. Found in many fruits and vegetables.

Peptidase: breaks down proteins into amino acids.

Phytase: breaks down carbohydrates; helpful in the breakdown of phytic acids in the leaves of plants, grains, seeds.

Protease : breaks down protein found in meats, fish, poultry, grains, nuts, gluten, milk proteins (caseins).

Xylanase: breaks down plant nutrients from vegetables with a high fiber content (fibrous veggies, grains, and legumes).



When are enzyme supplements needed?

Problems with pancreas, such as pancreatitis, [cystic fibrosis](#), or [pancreatic cancer](#), can reduce the number of important enzymes that body produces. As a result, you may not get enough enzymes to thoroughly digest the food and obtain all the nutritional value from what you eat.

If you have these conditions — or others in which your enzyme levels are below a normal or healthy range — talk with your doctor about treatment options.

Dietary enzymes are available in pill form as supplements. If your doctor recommends trying these supplements, make sure you get pancreaticenzyme products (PEPs) that are approved by the U.S. Food and Drug Administration (FDA).

You may also need enzyme supplementation if you're exposed to various chemicals or pesticides, or if your foods are always cooked at high temperatures. Heating foods can knock off any naturally occurring enzymes in the foods.

Some people may have stomach irritation with enzyme supplements. Be sure to talk with your doctor about any potential risks or complications with dietary enzymes.

The takeaway

Enzymes are crucial for good health. Your body produces them. You can also get them in fruits, vegetables, and other foods. They're also available in supplements.

But if you're in good health, follow a healthy plant-based diet, and your doctor says your enzyme levels are healthy, don't start taking enzyme supplements simply hoping to get even healthier. They can affect your metabolism in negative ways.

Taking dietary enzymes can make a positive impact on your health, but only if you really need them.

References: healthyalternativesinc.com, www.healthline.com, www.betternutrition.com

CONTROL OF DISSOLVED OXYGEN (DO) DURING BEER PROCESSING

Sh. Bijay Bahadur, Yuksom Breweries Limited (Sikkim)

Oxygen is everywhere. We need oxygen to live and it is also a necessary component for brewing beer. Insufficient oxygen is even worse, because yeast will die without oxygen, and then, there is no fermentation of wort to produce beer at all. At different stages of the brewing, except the beginning of fermentation, the contact between beer and oxygen should be limited in order to prevent oxidation of compounds that impart positive flavour attributes and / or the formation of compounds that cause negative attributes.

During fermentation, it may be necessary to increase oxygen levels in wort to support yeast activity. Oxygen levels during fermentation still need to be low enough to avoid oxidation of flavour compounds and therefore should be monitored and controlled continuously.

Oxidation before fermentation is often referred to as *Hot Side Aeration* (HSA) while oxidation during and after fermentation is referred to as *Cold Side Aeration* (CSA). A distinction is made between hot-side aeration (HSA) and cold-side aeration (CSA). The hot side includes procedures from mashing through wort cooling. When the wort is cool, oxygen is added to the wort before the yeast is pitched. At this point in the process, oxygen serves as an invaluable yeast nutrient. However, once the fermentation has started, oxygen returns to being a negative element, and what is referred to as the cold side starts at this point and continues until the beer is consumed.

Presence of oxygen (air) in beer results in oxidation, a major contributor to degrading beer flavour, quality and colour problems in beer. Oxidation also negatively impacts the beer's shelf life.

The goal of the Brewer is to identify the critical areas in the brewing process where oxidation is likely to occur and hence care is needed to prevent oxidation to ensure dissolved oxygen (DO) level in finished beer is kept extremely low.

Dissolved oxygen (DO) is the enemy of the bottled beer and the Brewers should take great care to make sure that DO level from packaging is kept as low as possible. However, the overall exposure to DO during process is more significant than bottle DO alone. Lower DO increases shelf life and flavour stability. Decreased DO levels in finished beer along with reduced energy and CO₂ usage is much better for the organization's bottom line as well as reducing carbon footprint.

Oxygen Levels Throughout The Brewing Process:

Brewing Process	Oxygen Level
In wort	6 – 14+ ppm
Fermentation	< 0.03 ppm
Filtration	0.001 – 0.2 ppm
Bright beer after filtration	0.001 – 0.2 ppm
Beer at the filter	0.001 – 0.2 ppm
Package dissolved oxygen (bottle)	0.03 – 0.25 ppm
Total package oxygen	0.05 – 0.45 ppm

THE MOST IMPORTANT SOURCES OF AIR (OXYGEN) PICKUP IN THE BEER PROCESSING ARE:

1. Transfer between tanks:

There is high initial pickup which is due to turbulent entry to the tank and gets smaller as transfer proceeds and tends to rise again towards the end of transfer. The final rise in DO may be partly due to presence of surface beer which has been in contact with air or to vortexing at the end of transfer.

2. Carbonation:

Increase in oxygen pickup can be traced during carbonation. Carbonation of beer by one volume of CO₂ gas containing 0.05% air can theoretically contribute 0.2 ppm of oxygen (if all oxygen becomes dissolved in beer).

3. Filtration:

Always DO content increases greatly in the first beer passing a newly started filter and decreases as filtration proceeds and the overall increase due to filtration can be kept down usually with carefully working.

4. Addition of stabilizers:

A ready source of DO is the addition of stabilizing or foaming additions when additives are prepared in water suspension.

It has been found that if insufficient ascorbic acid (antioxidant) is added to the beer, the dehydroascorbic molecule may act as an oxygen carrier and catalyse oxidation of beer, making things worse instead of better.

5. Addition of recovered beer:

Recovered (residual) beer commonly contains high DO content, some derived from first and last filter runnings and some picked-up by exposure of tank bottoms etc. to air in beer tanks or in sedimentation tank.

6. At bottling:

Aeration of beer during filling and in the filled bottle occurs in two different ways - absorption which takes place as the beer is filled and absorption from air lift in the head space, and the amount of oxygen picked-up from each of these sources is almost equal.

GOOD PRACTICES TO AVOID OXYGEN PICKUP:

- Beer should be stored as cold as possible, ideally at 0°C.
- Minimize cold side transfers, and purge both the lines and the target vessel while transferring.
- When transferring, and if possible, do it by pushing with CO₂ from one vessel to another, not by pumping or by gravity. Keep the pressure above ambient just a bit.
- All joints and unions in the transfer lines must be tight, and the line itself must be designed in such way that excessive beer flow velocities and turbulence are avoided.
- CO₂ should be used in place of air for top and back pressure.
- A light carbonation (0.1 – 0.2 % v/v) may be given during transfer and excess CO₂ blown off from the tank, carrying air with it before it has time to react. However, too much carbonation should be avoided as it may lead to loss of desirable volatiles.
- Beer should enter the receiving tank at low velocity so that turbulence is prevented.
- Transfer lines should be filled with water before commencing any transfer and this water may be pressed out by CO₂ before beer enters the line.
- High purity of CO₂ gas for carbonation of beer and the pressure of CO₂ gas during carbonation must be higher than the pressure of the total dissolved gases in the beer to prevent bubble formation.
- Precoating of kieselguhr filters with beer (use of beer can lead to foaming) rather than water or by using de-aerated water or the water used to sterilize the filter.
- Additives should be prepared in deaerated water.
- Extensive washing of recovered (residual) beer by CO₂ gas prior to reprocessing.
- Addition of correct dose of antioxidant such as ascorbic acid in order to compensate for processing faults and to take the place of careful process control.
- Uniform foaming up the bottles by beer fobbing device (a high pressure and temperature water jet down through the surface of the beer in the neck of the bottles).
- Filler should not be run at higher speeds than its designed speed otherwise this will give great turbulence leading to higher pick-up even when CO₂ is used for counter pressure in filler.
- Regular inspection and cleaning of the filling valves is essential especially when these incorporate mesh screens which can retain sharp particles of beer stone, glass chips, anything that can obstruct the smooth flow of beer in the filler or damage the valve surface may lead to turbulence which will entrap headspace air that cannot be removed by beer fobbing device (over foaming) after filling.
- The filling operation should be carried out as uniformly as possible in respect of filling rate, filling level and counter pressure conditions since variation in any of these caused stop-and-start operation usually lead to higher air content.
- There must be adequate accumulations of bottles both before and after the filler, and the bottle lifts and the conveyor between filler and crowner for smooth operation in order to avoid jerks and knocks.

MANAGING DISSOLVED OXYGEN LEVELS IN BEER:

Here are few simple ways to troubleshoot oxygen in the process and packaging workflow to ensure that whatever beer we serve that tastes the way we intend it to.

Following are some of the critical practices related initiatives to be roll out in order to maintain low levels of DO in packaged beer.

- **Incoming DO:** it's important to measure DO value in the bright beer tank. The lower the value, the better will be the quality. The more DO in the beer before packaging, the more DO in the beer overall.
- **Leaks:** Pinhole leaks or residual air in the hoses coming out of the bright beer tank can add oxygen to the beer. Leak from gland retainers/packings, O- rings, butterfly valves, and clamp gaskets can cause DO pickup. If beer is leaking out, oxygen is coming in.
- **Temperature:** Ideally, beer should be kept cold enough to pour well and still generate foam (1°C).

- **Rinsing/sanitizing the package:** Oxygenated sanitizer or even residual rinse water that has not been de-gassed could increase DO.
- **CO₂:** Control over the pre-CO₂ purge, especially in open-fill systems, is essential. CO₂ is heavier than air, so gently filling the package from the bottom and stopping before the top in a pressure-controlled environment is key initiatives.
- **Exposure to air:** When beer is exposed to air between cycles, it can pick up DO; therefore, control over the time from fill to closure is important. Even changes to outside air from air conditioners or open windows can increase the risk of picking up DO. Residual product on fill heads and foam scrapers is exposed to air between cycles. When beer remains on the filler as it is retracted, it can pick up extra oxygen and re-introduce it into the next bottle.
- **Foam:** A foam cap is by far the most important factor for reducing DO. Fill speed, foam, and fill volume are the biggest contributors to unwanted DO in packaging. Filling quickly with no foam makes the machine run faster, but DO values can be higher as well. Ideally, control over all aspects of the fill cycle will enable the operator to generate a proper foam cap.
Some manage that risk with underlid gassing, but it's not a cure-all. It can help keep DO at a minimum, but pressures that are too high will eliminate foam and introduce air through turbulence, and pressures that are too low won't achieve reduced oxygen levels.
- **Capping/Crowning:** Time to closure and control to closure are also important. It's crucial to make sure that the final crowing happens as quickly as possible with little agitation to the product to keep

oxygen from being introduced into the beer.

Packaging systems, similar to beer recipes, need to be learned, adjusted, and optimized over time to get the optimum results. Today's packaging systems can help minimize the amount of DO added during the packaging process.

No matter how we package, with best practices, high-quality monitoring equipment, consistent measuring methods, and troubleshooting, packaging beer correctly can reduce the amount of DO and preserve the integrity of the beer. It's important to factor in DO levels throughout the entire life cycle of the product.

How beer is made, packaged, and delivered can affect the flavour and quality of the final product. But with the right training, experienced operators, a good packaging system, and trial and error, we can manage DO levels and focus on what we do best—making great-tasting beer.

CONCLUSIONS:

Control of oxygen (air) is important at different stages of brewing. It affects yeast health and productivity as well as the oxidative formation and degradation of flavour compounds, affects colour and shelf life of the beer. Careful monitoring of oxygen levels as well as taking measures to control oxygen levels are essential to quality control during beer production.

It is recommended the best of all antioxidants – namely Brewer's Yeast. The role of yeast as an antioxidant and stabilizing agent during an active/vigorous secondary fermentation or conditioning of beer in storage tank, they are much less liable to oxidation and are more stable.

One fact is clear that Brewers can exercise a great deal of control over flavour stability, quality and colour by observing proper brewing techniques.

Microbiological Treatment of Food Waste

Dr. Archana Prakash – R&D Dept.

Microbiology, Research & Development Food waste (FW) is organic materials discharged from food processing plants, kitchens, cafeterias and restaurants.

1. Generally, FW waste includes fruits and vegetable peelings and residues, fish and poultry residues and bones, food fats, sauces, condiments, soup pulp, herbal medicinal pulp, cereals of all types such as rice, noodles, oats, plate scrapings and leftover of cooked food, barbecue raw or cooked leftovers, and pet foods.
2. FW which is discarded globally without any further use almost account to one third of the worldwide food produced for the human consumption.
3. The discarded FW have caused serious environmental problems such as water pollution, pathogen breeding and odor diffusing. Actually, FW is a renewable resource which is considered as a reservoir of carbohydrate polymers, lipids, proteins, and nutraceuticals and can form the raw materials for commercially important metabolites.
4. Traditional technologies to treat FW such as landfill and incineration have become less desirable due to current legislation or causing secondary pollution.
5. As an alternative method, microbiological treatment of FW has become a hot topic for processing FW in recent years. Using microorganism, FW can be transformed to liquid biofuels including biodiesel, bioethanol, butanol, gaseous biofuels such as biogas and hydrogen, bioplastics including polyhydroxyalkanoate (PHA) and poly-3-hydroxybutyrate (PHB), industrial enzymes, electricity and microbe organic fertilizers.

Therefore, the contents of FW microbiological treatment field are as follows:

1. Biotransformation of FW to biofuels using microorganism.
2. Producing environmentally benign and green bioplastics by microbes.
3. The production of industrial enzymes via microbiological processing.
4. Bioconversion of FW to electricity by microorganism.
5. Producing microbe organic fertilizers via composting.

FW can be converted to biofuels including biodiesel, bioethanol, butanol, biogas and hydrogen. It can be used as raw material for fatty acids and biodiesel production by the transesterification of microbial oils produced by various oleaginous microorganisms. The microbial enzymes have also been used for biodiesel production. FW is regarded as alternative substrates for ethanol production via fed-batch and simultaneous saccharification and fermentation methods.

Various strategies have been used to improve ethanol yield such as use of ethanol-tolerant strains, immobilized cell and recombination strains.

The hydrogen production potential of carbohydrate in FW is high and various fermentation systems including batch, semi-continuous, continuous, one or multiple stages, photo-fermentation or combined dark- and photo-fermentation system have been successfully applied in hydrogen production.

The production of biogas, particularly methane has been achieved via single stage anaerobic digestion, two-stage anaerobic digestion, packed bed reactors or fixed bed systems.

Polyhydroxyalkanoate (PHA) and poly-3-hydroxybutyrate (PHB) are perfect replacements for petroleum-derived plastics. FW has been used to produce PHA and PHB using various micro organisms. FW is considered as an ideal candidate for enzyme production via fermentation in bioreactor which can replicate the natural condition. Electricity generation was obtained via microbial fuel cell with FW as substrates.

Composting is regarded as a suitable method for disposing solid FW.

The process control strategies such as proportional control, integral control, and different control techniques have been used to improve the efficiency of composting.

As an attractive technology, microbiological treatment has potential for conversion FW to energy, enzyme, bio fertilizer and biomaterials. The future study on this field will focus on the improvement of output efficiency and decrease of cost for these products via screening new strains and exploring new process.

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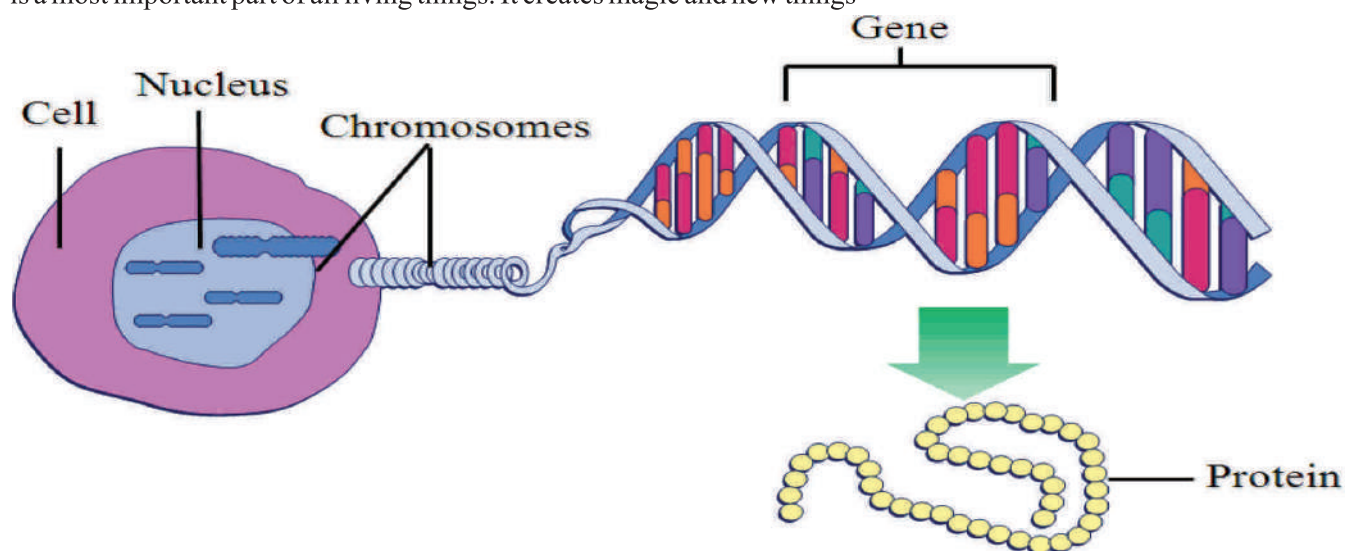
GENE EDITING WITH CRISPR

Deepika, R&D Dept.

GENE: - What is gene?

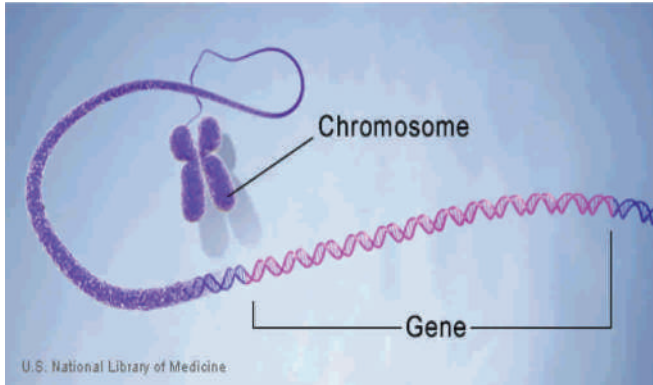
In biological terms, a gene is a sequence of nucleotides in DNA or RNA that codes for molecules having a function, during gene expression. The DNA is first copied into RNA.

The RNA can be directly functional or be the intermediate template for a protein that performs a function. Gene editing is a most important part of all living things. It creates magic and new things



CRISPR-Cas9 is a genome editing tool that is creating a buzz in the science world. It is faster, cheaper and more accurate than previous techniques of editing DNA and has a wide range of potential applications. **FENG ZHANG'S** and **GEORGE CHURCH'S** groups simultaneously described genome editing in human cell cultures using **CRISPR-cas9** for the first time.

CRISPR-Cas9 (clustered regularly interspaced short palindromic repeats) is a unique technology that enables geneticists and medical researchers to edit parts of the genome by removing, adding or altering sections of the DNA sequence.



The development of efficient and reliable ways to make precise, targeted changes to the genome of living cells is a long-standing goal for biomedical researchers. Recently, a new tool based on a bacterial CRISPR-associated protein-9 nuclease (Cas9) from *Streptococcus pyogenes* has generated considerable excitement

(1, 2) This follows several attempts over the years to manipulate gene function, including homologous recombination and RNA interference (RNAi)

(3) RNAi, in particular, became a laboratory staple enabling inexpensive and high-throughput interrogation of gene function

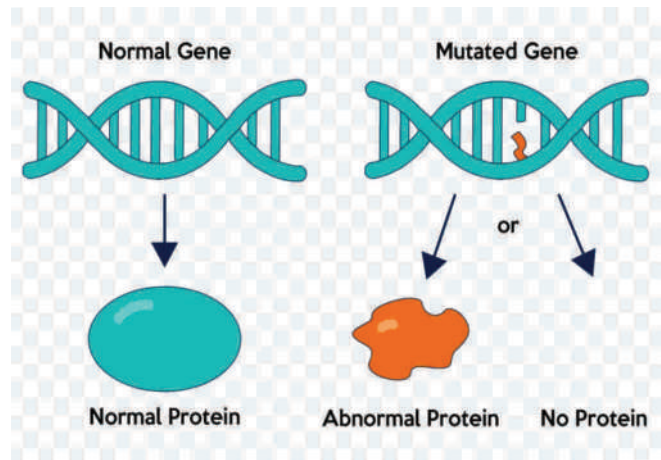
(4) But it is hampered by providing only temporary inhibition of gene function and unpredictable off-target effects

(5,6) Other recent approaches to targeted genome modification – zinc-finger nucleases [ZFNs] and transcription-activator like effector nucleases [TALENs].

(7) Enable researchers to generate permanent mutations by introducing double stranded breaks to activate repair pathways. These approaches are costly and time-consuming to engineer, limiting their widespread use, particularly for large scale, high-throughput studies.

How does it work?

The CRISPR-Cas9 system consists of two key molecules that introduce a change (mutation) into the



DNA. These are:

- **An enzyme Called Cas9.** This acts as a pair of 'molecular scissors' that can cut the two strands of DNA at a specific location in the genome so that bits of DNA can then be added or removed.
- **A piece of RNA Called guide RNA (gRNA).** This consists of a small piece of pre-designed RNA sequence (about 20 bases long) located within a longer RNA scaffold. The scaffold part binds to DNA and the pre-designed sequence 'guides' Cas9 to the right part of the genome. This makes sure that the Cas9 enzyme cuts at the right point in the genome.
- The guide RNA is designed to find and bind to a specific sequence in the DNA. The guide RNA has RNA bases that are complementary to those of the target DNA sequence in the genome. This means that, at least in theory, the guide RNA will only bind to the target sequence and no other regions of the genome.
- The Cas9 follows the guide RNA to the same location in the DNA sequence and makes a cut across both strands of the DNA.
- At this stage the cell recognises that the DNA is damaged and tries to repair it.
- Scientists can use the DNA repair machinery to introduce changes to one or more genes in the genome of a cell of interest.

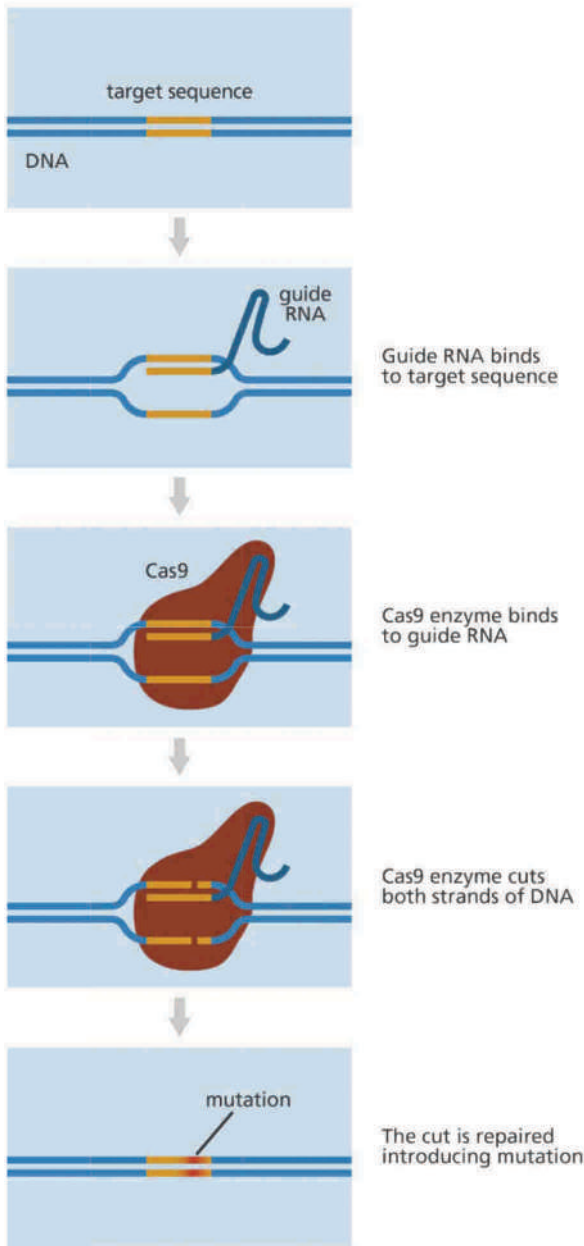


Diagram showing how the CRISPR-Cas9 editing tool works.
Image credit: Genome Research Limited.

How was it developed?

- Some bacteria have a similar, built-in, gene editing system to the CRISPR-Cas9 system that they use to respond to invading pathogens like viruses much like an immune system.
- Using CRISPR the bacteria snip out parts of the virus DNA and keep a bit of it behind to help them recognise and defend against the virus next time it attacks.
- Scientists adapted this system so that it could be used in other cells from animals, including mice and humans.

What other techniques are there for altering genes?

- Over the years scientists have learned about genetics and gene function by studying the effects of changes in DNA.
- If you can create a change in a gene, either in a cell line or a whole organism, it is possible to then study the effect of that change to understand what the function of that gene is.
- For a long time geneticists used chemicals or radiation to cause mutations. However, they had no way of controlling where in the genome the mutation would occur.
- For several years scientists have been using 'gene targeting' to introduce changes in specific places in the genome, by removing or adding either whole genes or single bases.
- Traditional gene targeting has been very valuable for studying genes and genetics however it takes a long time to create a mutation and is fairly expensive.
- Several 'gene editing' technologies have recently been developed to improve gene targeting methods, including CRISPR-Cas systems, transcription activator-like effector nucleases (TALENs) and zinc-finger nucleases (ZFNs).
- The CRISPR-Cas9 system currently stands out as the fastest, cheapest and most reliable system for 'editing' genes.

Applications and implications

- CRISPR-Cas9 has a lot of potential as a tool for treating a range of medical conditions that have a genetic component, including cancer, hepatitis B or even high cholesterol.
- Many of the proposed applications involve editing the genomes of somatic (non-reproductive) cells but there has been a lot of interest in and debate about the potential to edit germline (reproductive) cells.
- Because any changes made in germline cells will be passed on from generation to generation it has important ethical implications.
- Carrying out gene editing in germline cells is currently illegal in the UK and most other countries.
- By contrast, the use of CRISPR-Cas9 and other gene editing technologies in somatic cells is uncontroversial. Indeed they have already been used to treat human disease on a small number of exceptional and/or life-threatening cases.

Reference: -www.yourgenome.org, international.neb.com

The Three Different Fishes

Three fishes lived together in a lake. Although the three were together, all of them were very unique. They had contrasting characters and argue over small things. Still, they were happy. The three were grown up into a bigger fish.

The first fish always dwell in past and very lazy. The fish doesn't believe in preparing for the future. If you can find something that is quite opposite to the phrase, 'Prevention is better than cure' it could be the first fish. The second fish lives for the present. It is a little bit wise and tends to make some good decisions in the last minute. The third fish is an intelligent one. It usually thinks a lot, make the decision wisely and always carry smart and interesting ideas, suggestions and plans to live happily and safely.

One day, as the three were playing in the lake, the third fish heard two fishermen talking about fishing. The fish called the other two fishes to hear what they speak. The first man told, 'I heard about this take. It has some big fishes, why can't we enjoy our time here?' The second man replied, 'Yeah that's a good idea. I love to cook and eat the fresh fish. We'll make it tomorrow noon here!' And they left.

The third fish told the other two fishes, 'see they are planning to catch out us. We should go to some other place to live safely. I already found a route that will take us to the nearby canal and we may then reach a new lake'. The second fish told, 'Yeah I too heard them. But they may not return or may end up fishing at a distant place. We can think about it tomorrow when we see them.' The first fish, 'Oh let's just ignore it. Let us have some rest now!'

The third fish, the intelligent one, moved to the nearby lake through the secret way alone as the other two fishes denied accompanying. Next day, the two fishermen arrived. The second fish saw them at fishing and planned for an escape. As it was caught in the fishing net, it acted dead. The fishermen threw it back into the lake and the second one was escaped. The first fish, the lazy one had no idea about the presence of the fishermen. Very soon it was caught and before it could think about how to escape, he was put into the basket and lost the life in a few minutes.

Planning ahead makes lives easier



RICH DAD POOR DAD

(Author – Robert T Kiyosaki)

Harish Pattath, Animal Nutrition

Reading is something that we know is essential to enrich our lives, but is often forgotten or given less importance as we move to jump the hurdles life throws at us.

If we invest time in books, we may be able to mitigate such hurdles better by perspectives and ideas we gain from them. One such book that inspired me and changed the way I approached finance was Rich Dad Poor Dad, by Robert T Kiyosaki.

Finance is a tricky subject, whose discussions are limited in a typical middle class household. The so called middle class mindset, where we seem to revere finances but fail to take time and understand how it works is oftentimes the cause for incorrect or improper financial decisions one makes. It is therefore essential to understand how money works and this book offers a new perspective on redefining our approach to finance. One of the first things that caught my attention was how the author determined the difference in views related to a middle class mindset and the mindset of someone with a rich mindset.

We have been always taught that “Money is the root of all evil”, in everything we see around us and the entertainment we subscribe to reinforces that belief. This according to the author is something what he attributes to the middle class mindset. He instead says “Lack of money is the root of all evil”, and explains how greed is different from need and why the change in perspective is essential in order to better understand money.

Another key difference he points out is the self limiting approach the middle class mindset has. He adds that from our childhood we are often taught that if something we desire is beyond our current financial means we are taught that it is not meant for us. This translates to us limiting our wants based on our financial situation. The author says this is the wrong approach and if we come across something that is beyond our grasp, instead of throwing in the towel and saying “I can't get it”, if we instead change our mindset to “How can I get it?”, we are not limited but become more creative in our approach.

He adds when we say “I can't get it” it is equivalent to shutting doors to our potential and accepting defeat without even trying.

He adds, by using the question “How can I get it?”; when we come across difficult situation, we are accepting that the situation we face is temporary and it can be overcome and we must use our resources or improve the ones we have in order to get it.

These differences in approach, surely had me going back to my childhood and how money was often a taboo subject at home, and it was something that was never discussed with us kids. We grew up with that ignorance and kept making the same mistakes and avoided taking risks due to this.

An interesting point that the author makes throughout the book, is on how we perceive assets and liabilities. We consider a house, a piece of land or a brand new vehicle as an asset. Unfortunately, he says it isn't so. An asset according to him is something that generates money for us, and a liability is something for which we have to keep spending money. We, the majority middle class assume that we are investing in assets, while the harsh truth is that we are investing in liabilities.

This is further reinforced by the notion that the middle class is more comfortable accumulating debt rather than taking calculated risks to accumulate wealth and it is majorly due to such lack of clarity on finances which we have failed to take time and understand.

This book offers these along with a plethora of other insights on how we must view wealth and why it is essential to escape the middleclass mindset if we are to take decisions that impact our financial futures.

It is evident that we as a society do not focus on financial education from a young age and the repercussions of this are experienced throughout our lives. A good place to start, to better understand how money works and more importantly how it can work for us; is encapsulated in the book. The author, a successful entrepreneur who has had his share of failures talks of his experiences and valuable life lessons he gained with the help of two major influences in his life, his rich dad and his poor dad.

DARE TO BE ALL THAT YOU CAN BE

Florencia Joseph, HR Dept.

Hope lies in dreams, imagination & the courage of those who dare to make dreams into reality. Dare, Don't Be Afraid to Make Mistakes. Only people who dare, try, and persevere, complete tasks and achieve success. It is so comfortable to be passive, make no effort, and stick to the familiar. However, by doing so, we allow external influences shape your life.

Why Daring Is Intimidating?

- You are afraid you might make mistakes.
- You are afraid to look ridiculous.
- You want to avoid criticism.
- There is a lack of self-esteem & self-confidence.

If you wish to let the above list intimidate you, and therefore, be unhappy, complain, and stay where you are, this is your choice. However, if you want to live a greater life, you should consider taking a step beyond your fears and start daring. It is not so difficult to do. It is a matter of attitude. It is a matter of changing your mindset.

As the saying goes, **'it is all in the mind'**.

Where Can You Dare?

This depends on you. It is advisable to start with minor matters, and as you gain confidence, do bigger things. Here are a few suggestions:

- Start learning a foreign language.
- Go meet new people and friends.
- Redecorate your home.
- Start going to the gym.
- Ask your boss to give you something completely new & different to do.

After gaining some experience you will feel more confident to dare handle bigger projects, go back to college or start studying at the University.....Make the

move you always wanted, to a new neighborhood, a new city, or a different country...Turn a hobby into a business.....

If you make mistakes, it's all right. Everyone makes mistakes. Learn from them and go on. It's quite simple, though not so easy to dare, and be afraid to make mistakes. This has nothing to do with finance, physical strength or education. It is all a state of mind. It is something inside you. You need to find the strength and courage within you. You should learn to be courageous and daring, and do things, without the need to be pushed and motivated from the outside.

You have this strength within you, you only need to be conscious of it, and strengthen it.

Affirmations, Visualization, and Inner Strength Development are the tools to do this.

Learn to be a doer, by taking the initiative and acting now, without procrastinating or hesitation. Start with simple little things to gain experience and confidence.

- Can you learn to speak fluently a foreign language, without making some mistakes at first?
- Can you become a great cook, without learning, cooking and experimenting, and making some mistakes along the way?
- Can you become an expert in any field, before you had enough experience?

Don't worry if you make mistakes on the way. By making mistakes, you learn to improve and do better.

You just have to act. It's not as difficult as it seems.

Far better is it to dare mighty things, to win glorious triumphs, even though checkered by failure... than to rank with those poor spirits who neither enjoy nor suffer much, because they live in a gray twilight that knows neither victory nor defeat.

-Theodore Roosevelt

Annual Party April '19

Making Things Happen





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Catalysts was established in 2003. Having its corporate office in Delhi, R&D center in the largest state of Uttar Pradesh in India and Manufacturing units in the Hill state of Uttarakhand. It is a leading research and quality certified Biotech company. We are engaged in delivering enzyme based eco-friendly solutions to many industry verticals. We are a multilevel quality certified company having certification of ISO 9001:2015, FSSC 22000, HALAL, KOSHER, NABL & DSIR.

Our Process expertise based enzyme formulation are a key competitive advantage for Catalysts and thus for our customers. We have a modern fully-equipped technology centre, where application research is done extensively using substrates received from client side.

Our technical team provides real time process and troubleshooting support to various industries like Molasses Ethanol, Grain Ethanol, Carbohydrates processing, Malt extraction, Brewing process Sugarcane juice processing, Animal Nutrition and Agriculture.

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