



HALAL CONTROL
Confidence through Integrity.

Production of Enzymes and Starter Cultures from a Halal Perspective

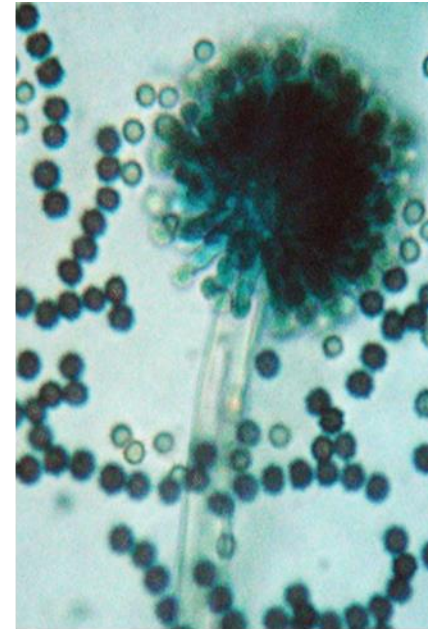
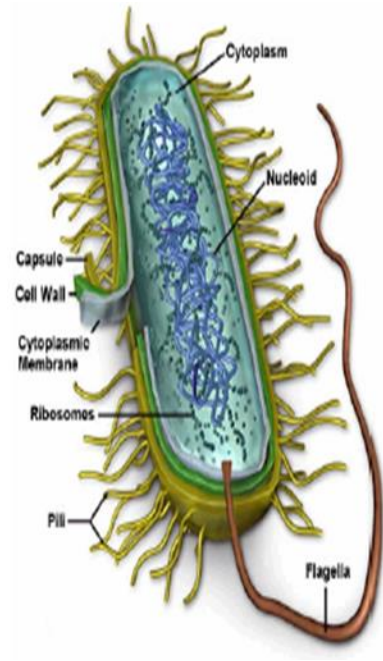
Dr. Ali Fanous



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- 6 What are enzymes?
- 7 Enzymes application
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AGENDA

Products which are produced by microorganisms (yeast, bacteria and mold) in a certain media/substrate and certain conditions.



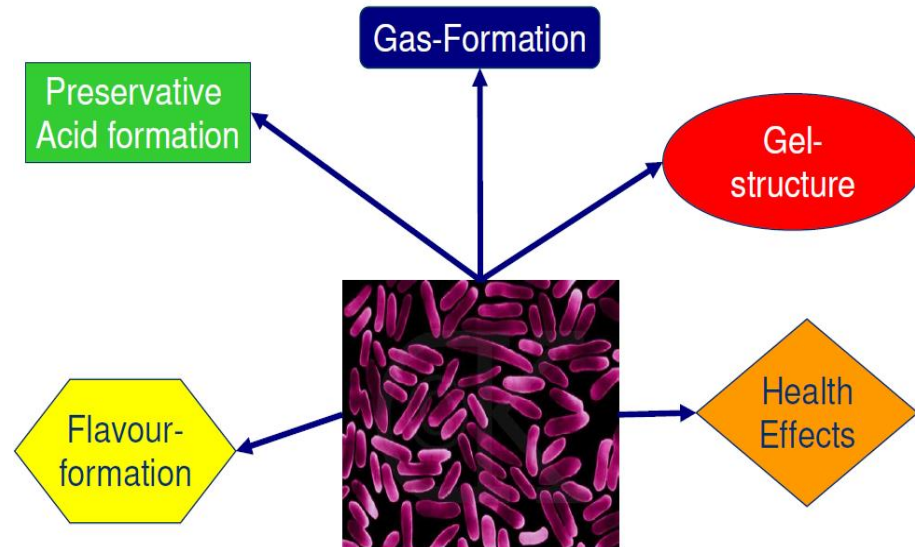
MICROBIAL PRODUCTS

Starter cultures are those microorganisms that are used in the production of cultured dairy products such as yogurt and cheese.

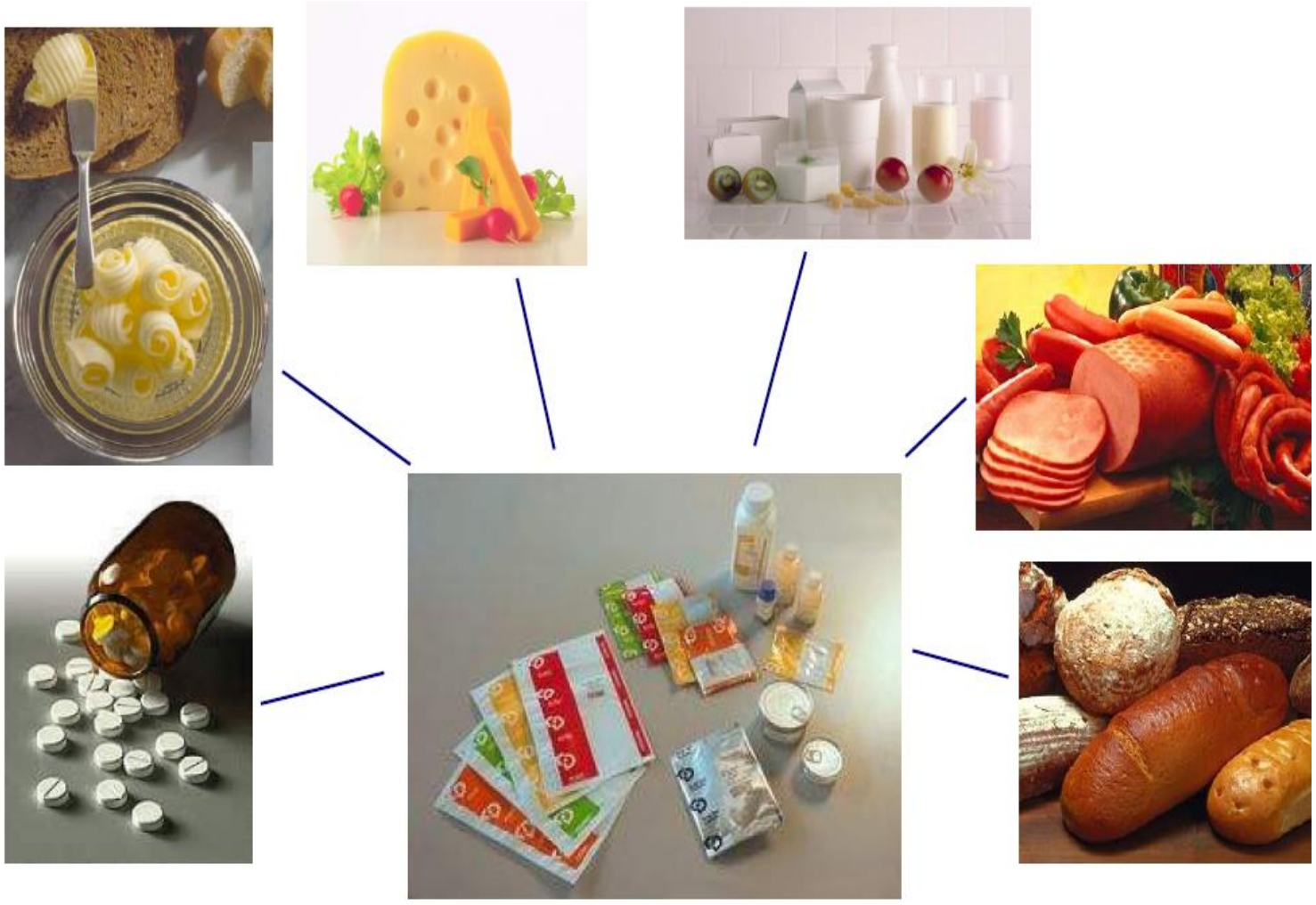
The primary function of lactic starters is the production of lactic acid from lactose.

Other functions of starter cultures may include the following:

- flavour, aroma production and improvement of the product's structure
- inhibition of undesirable organisms



WHAT ARE STARTER CULTURES ?



APPLICATION OF STARTER CULTURES IN FOOD

Preparation of growth media

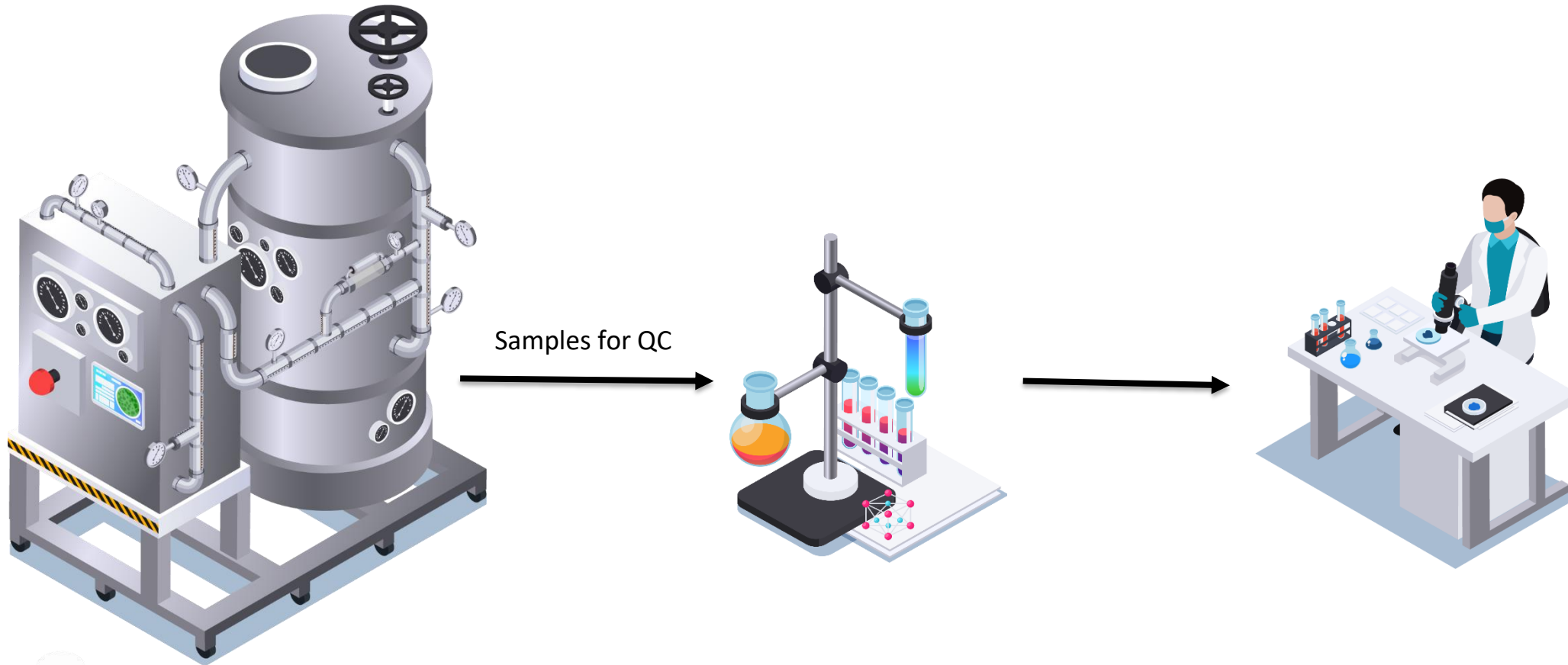


Media Mix of

- Carbohydrate (whey powder)
- Protein (skim milk, peptone, yeast extract)
- Trace elements (minerals, yeast extract)
- Buffering (Minerals)

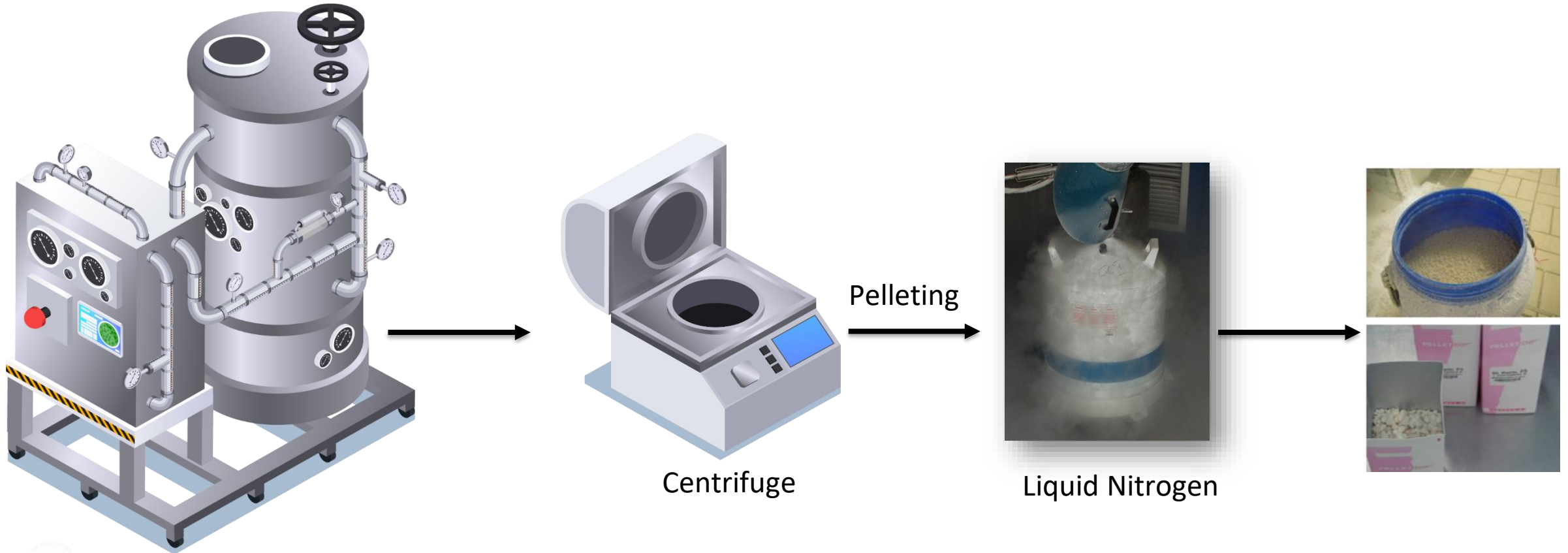
PRODUCTION OF STARTER CULTURES

Cultivation of bacteria (Fermentation)



PRODUCTION OF STARTER CULTURES

Concentration of bacteria and freezing the pellets

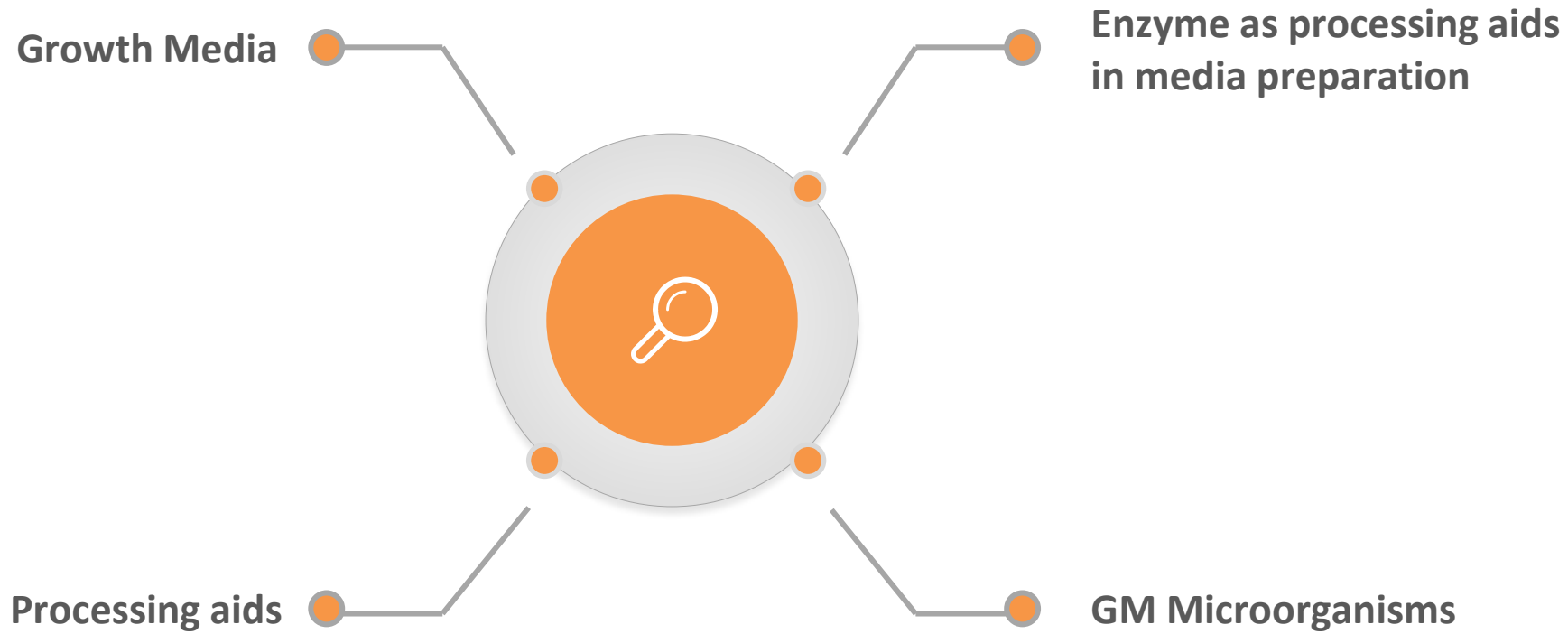


PRODUCTION OF STARTER CULTURES

Freeze-Drying



PRODUCTION OF STARTER CULTURES



HALAL CRITICAL POINTS



No	Material	Source
1	Beef extract	Extracted from beef
2	Peptone	Hydrolysis of protein from meat, casein, or gelatin using acid of enzymes
	a. Acid-hydrolyzed casein	Hydrolysed protein from casein using acid for hydrolysis example: casamino acids (Difco); Hy-case (Sheffield)
	b. Enzymatic digest of casein	Hydrolysed casein using enzymes for hydrolysis Example: Casitone (Difco); Tryptone; trypticase peptone
	c. Enzymatic digest of meat protein	Hydrolysed protein from meat using enzymes for hydrolysis. Bactopectone proteos peptone
	d. Enzymatic digest of plant (soy) protein	Hydrolysed protein from plant (soyben) using enzymes for hydrolysis. Example: Soyapeptone
3	Mixed hydrolysate	Biosate (yeast extract and casein digest); Tryptone (mixed-enzymatic source)
4	Blood	Animal source
5	Agar	Carbohydrate from seaweed
6	Gelatine	More than 65% of gelatine all over the world come from pork skin and bones, and about 30% come from bovine source.
7	Tryptone	The assortment of peptides formed by the digestion of casein by the protease trypsin which usually come from porcine source

FERMENTATION MEDIA

Meat extract provides nitrogen, amino acids, nucleotide fractions, organic acids, minerals and vitamins.



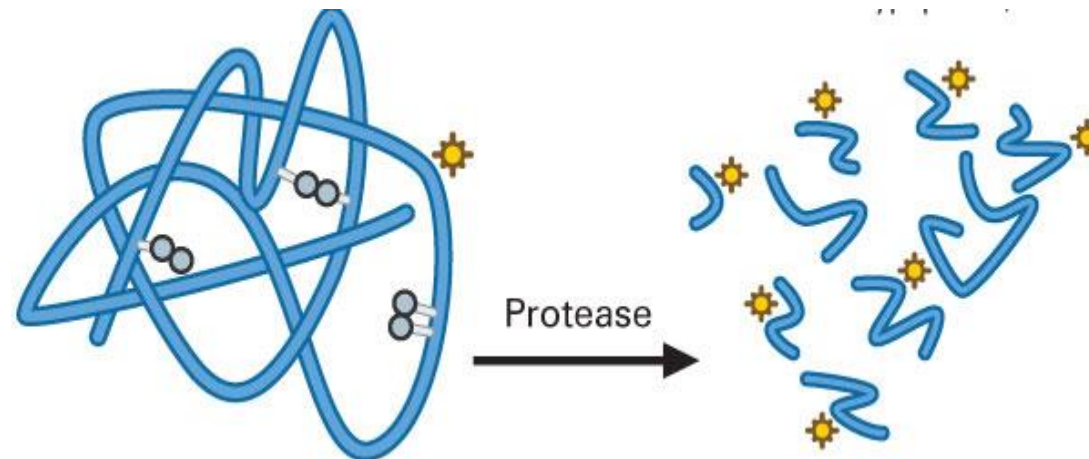
Gelatin supplies sufficient nutrients for the growth of nonfastidious bacterial species.



FERMENTATION MEDIA

Enzymatic digest of casein provides a complex nitrogen source in microbiological culture media. It is used to support the growth of fastidious microorganisms, and has a high tryptophan content.

Enzymatic digest of plant (soy) protein provides nitrogen source, vitamins and carbohydrates in culture media. It is guaranteed to be free of any animal origin ingredients.



FERMENTATION MEDIA

Elliker Medium

For the cultivation of streptococci and lactobacilli in dairy products.

Practical information

Applications	Categories
Selective enrichment	Lactobacilli
Selective enrichment	Streptococcus

Industry: Dairy products

Principles and uses

Elliker Medium, also known as Lactobacilli Broth, is a medium recommended for the general cultivation of streptococci and lactobacilli.

Testing dairy products for lactic acid bacteria facilitates the determination of acid levels, evaluation of lactic starter cultures and helps to control the quality of cured cheese, cultured milks and uncultured products. The medium is prepared according to the formula of Elliker, which has a slightly acidic pH and contains sufficient nutrients to support the growth of these gram-positive microorganisms.

Gelatin, tryptone and yeast extract provide the essential nutrients for growth. Lactose, sucrose and dextrose are the fermentable carbohydrates providing carbon and energy. Ascorbic acid provides adequate acid conditions. Sodium chloride supplies essential electrolytes for transport and osmotic balance and sodium acetate is the selective agent inhibiting gram-negative bacteria and also acts as a buffer system.

Formula in g/L

Dextrose	5	Ascorbic acid	0,5
Gelatin	2,5	Lactose	5
Sodium acetate	1,5	Sodium chloride	4
Sucrose	5	Tryptone	20
Yeast extract	5		

FERMENTATION MEDIA

MRS BROTH

Formula / Liter

Enzymatic Digest of Animal Tissue.....	10 g
Beef Extract.....	10 g
Yeast Extract.....	5 g
Dextrose.....	20 g
Sodium Acetate.....	5 g
Polysorbate 80.....	1 g
Potassium Phosphate.....	2 g
Ammonium Citrate.....	2 g
Magnesium Sulfate.....	0.1 g
Manganese Sulfate.....	0.05 g

Final pH: 6.5 ± 0.2 at 25°C

Formula may be adjusted and/or supplemented as required to meet performance specifications.

FERMENTATION MEDIA

The most commonly used processing aids are:

- Silicon
- Sulphonates
- Esters
- animal oil (lard)
- fatty acids from animal oil.

Example:

Polyoxyl (40) stearate:

An emulsifier and antifoaming agent (Doubtful)



Activated carbon is usually obtained from wood, coconut shell, or animal bone.

Example:

HA1 (Brimac) Carbon BONE CHAR 20x60 (fine granular bone charcoal) is produced from aged bones

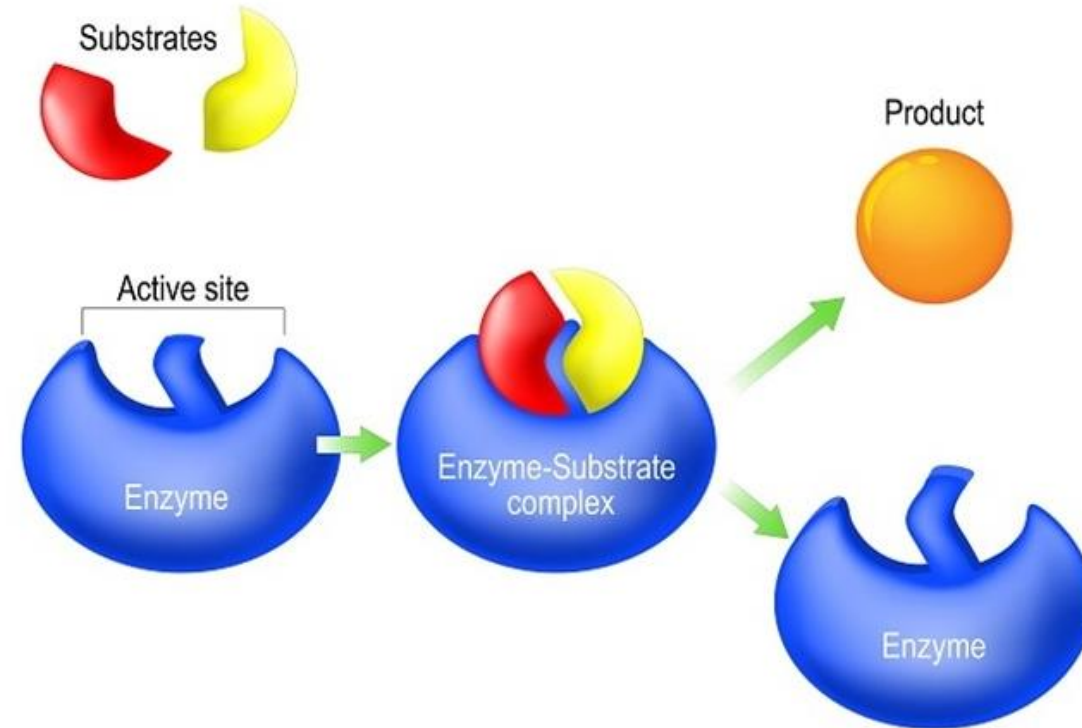
Harvesting aid for spore of fungi using Tween 80 surfactant (e.g. citric acid fermentation etc)



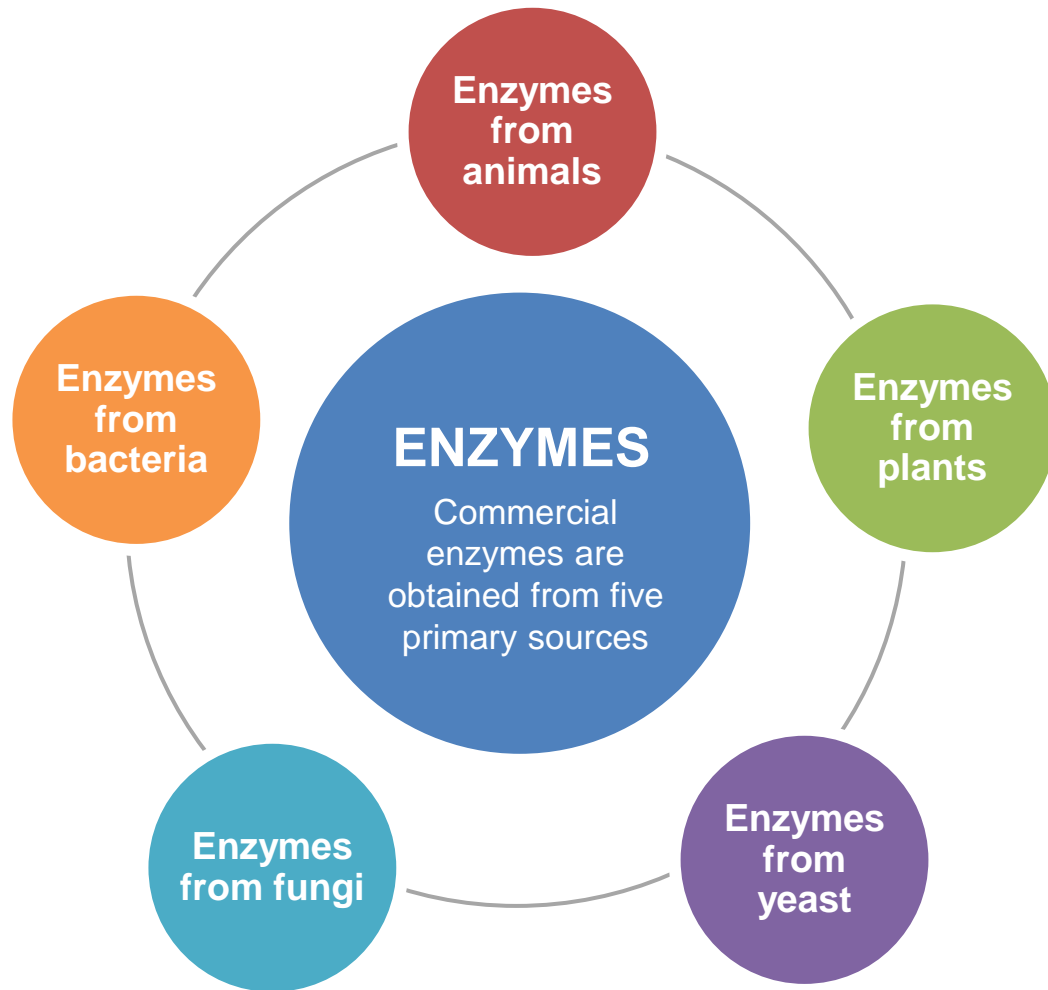
PROCESSING AIDS

Enzymes are proteins that act as biological catalysts by accelerating chemical reactions without themselves being altered in the process.

Both the enzyme and the substrate possess specific complementary geometric shapes that fit exactly into one another. This is referred to as "the lock and key" model. This model explains enzyme specificity.



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Enzymes from bacteria

α -amylase, β -amylase, glucose isomerase, protease, pullulanase



Enzymes from animals

Catalase, lipase, rennet



Enzymes from fungi

Amylase, catalase, dextranase, glucose oxidase, lactase, lipase, pectinase, protease, raffinase



Enzymes from plants

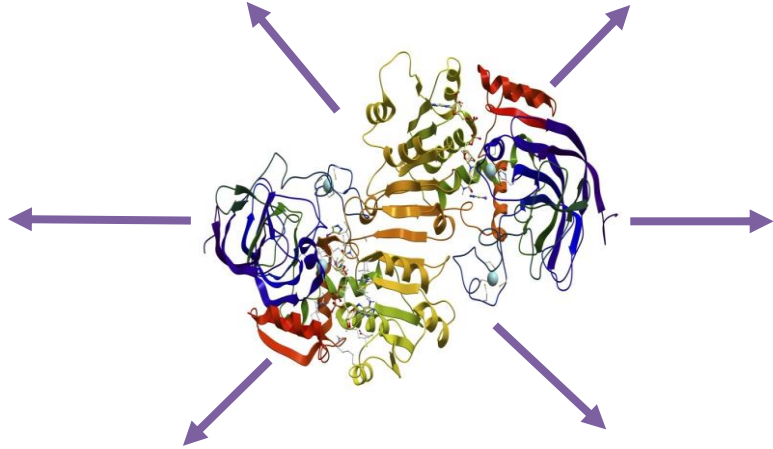
Actinidin, α -amylase, β -amylase, β -glucanase, ficin, lipoxygenase, papain



Enzymes from yeast

Invertase, lactase, lipase, raffinase

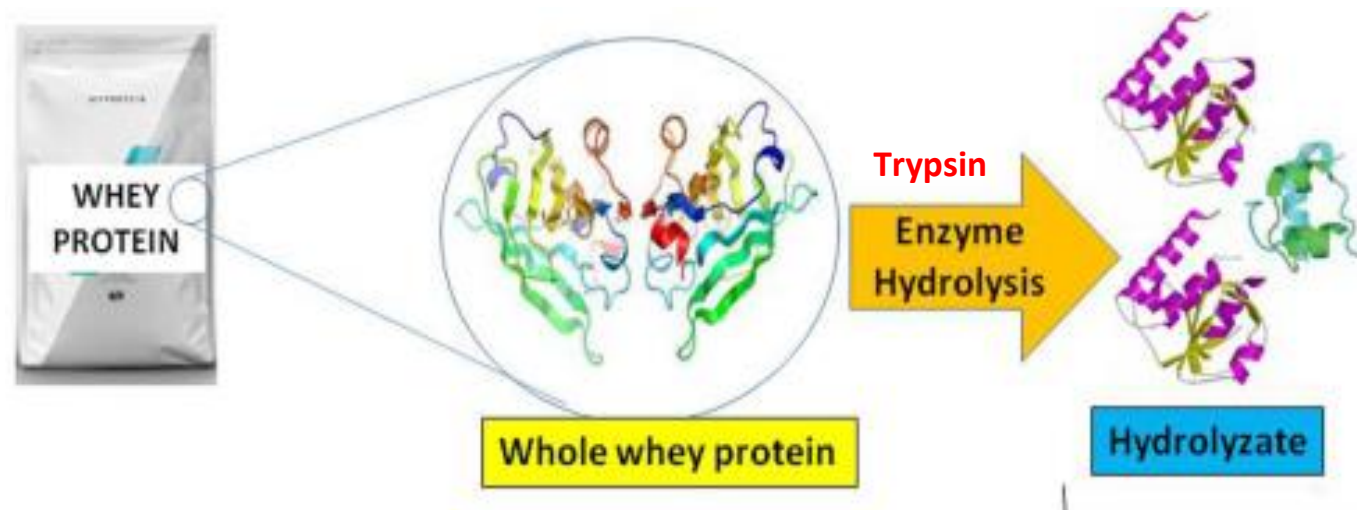
PROCESSING AIDS- ENZYMES



ENZYMES APPLICATION

Hydrolyzed Whey Protein provides an excellent source of low-molecular-weight bioactive peptides with important functional properties and bioactivities.

- Easier on Digestive System
- Faster Absorption
- Higher Bioavailability
- Hypoallergenic - Less likely to trigger allergic reactions



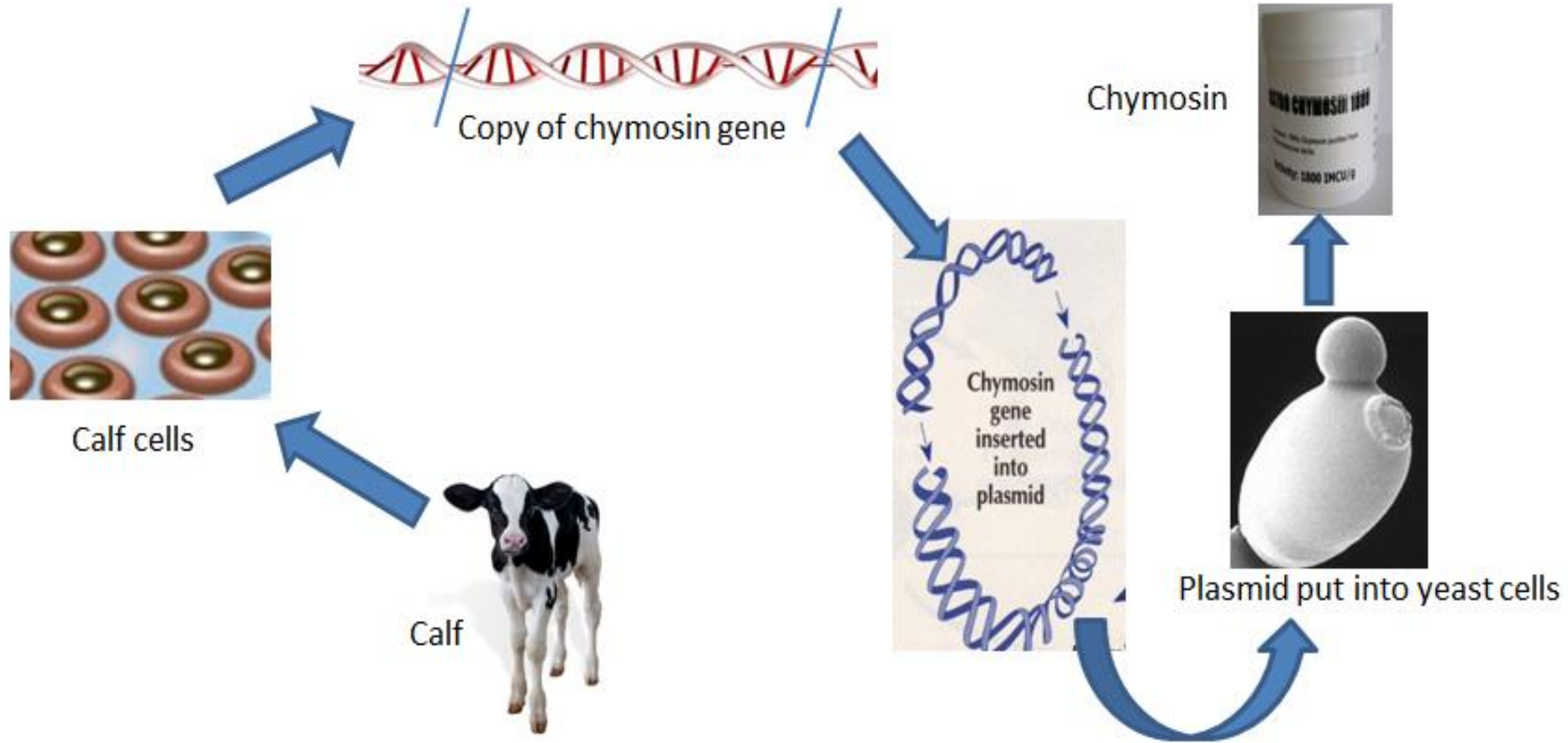
ENZYMES APPLICATION

Genetic modification can apply on microorganisms to enforce them to produce specific products. The source of the transferred gene can be from animal tissue.



GM MICROORGANISMS

Chymosin produced by recombinant *Saccharomyces cerevisiae* with the bovine gene.



GM MICROORGANISMS



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THANK YOU

