ENZIM
Dalam Makanan

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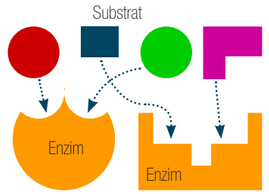
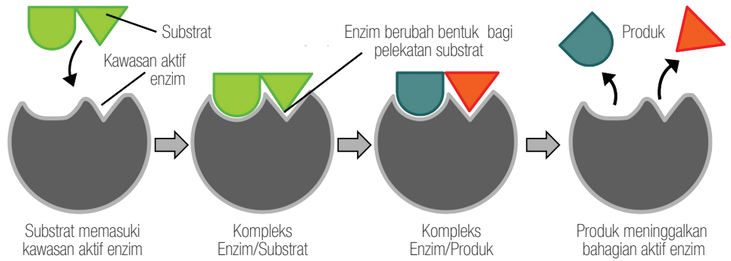
ENZIM DALAM MAKANAN

Enzim merupakan molekul-molekul biologi (protein) yang membantu mempercepatkan atau pemangkin untuk tindak balas kimia. Hampir semua proses metabolik di dalam sel memerlukan enzim untuk membantu meningkatkan kadar tindakbalas bagi mengekalkan kelangsungan hidup. Enzim adalah pemangkin yang sangat spesifik dan biasanya bertindak untuk suatu tindakbalas tertentu sahaja.



Enzim adalah pemangkin yang amat khusus dan hanya berfungsi dengan substrat tertentu sahaja.

BAGAIMANA ENZIM BERFUNGSI?



KEGUNAAN DALAM INDUSTRI

Enzim digunakan di dalam pelbagai industri. Ianya digunakan secara meluas di dalam Industri Makanan. Membolehkan sesetengah proses industri dijalankan pada suhu dan tekanan yang normal. Ianya juga membantu mengurangkan penggunaan tenaga dan peralatan yang mahal.

INDUSTRI MAKANAN DAN TENUSU:
Amylase, Protease, Rennin, Lipase, Lactase

INDUSTRI BRU:
Amylase, Glucanease, Protease

INDUSTRI KERTAS:
Amylase, Cellulase, Ligninase

INDUSTRI BIOFUEL:
Cellulase, Ligninase

INDUSTRI TEKSTIL:
Cellulase, Lipase

FUNGSI ENZIM

Protease: Digunakan untuk proses pra-pencernaan protein dalam pengeluaran makanan bayi.

Lipase: Digunakan bersama protease dalam campuran detergen untuk memecahkan dan mencernakan bahan kotoran kepada bahan lebih kecil dan larut air.

Carbohydrase: Digunakan untuk menukar sirap kanji yang agak murah kepada sirap gula yang lebih berharga. Contoh - sebagai bahan dalam minuman sukan.

Isomerase: Digunakan untuk menukar sirap glukosa kepada sirap fruktosa - fruktosa lebih manis daripada glukosa - oleh itu, ia digunakan dalam kuantiti yang lebih kecil di dalam produk untuk menguruskan badan.

REFERENCES:
1. Muhammad M. Chaudry & Mian N. Riaz, Halal Food Production, 2004
2. Matthewson, P.R, 1998. Major biological source of of enzymes (Appendix C), in Enzymes, Eagan Press, St. Paul, MN, pp 93-95.

KEGUNAAN ENZIM KEPADA MANUSIA

SEKTOR	APLIKASI	FAEDAH
Detergen	Agen membasuh & mencuci	Membasuh pakaian & membersihkan gigi
Tekstil	Pembasuh pakaian tebal, Pengilat sutera, Pelembut kulit	Mencuci jean, Membuatkan kain kapas kelihatan seperti sutera, Melembutkan barangan kulit
Pemprosesan Makanan	Bakeri, Bru, pemprosesan jus buah	Menjernihkan jus & bir, roti menjadi lebih berkualiti, Menukarkan kanji kepada gula
Pulpa dan Kertas	Penukaran kanji, Peluntur, Kawalan kejelikitan dan lendir	Mengurangkan kos pengeluaran dan meningkatkan kualiti

ISU HALAL DALAM PENGGUNAAN ENZIM

Sumber Asal: tisu haiwan (babi, lembu atau biri-biri), bahan tumbuhan, mikro-organisma dan proses penapaian.

Bahan-Mentah bagi pertumbuhan media: contohnya: pepton daripada babi atau lembu tidak disembelih.

Kultur Asal: hendaklah daripada sumber halal

SUMBER ENZIM

	ENZIM	SUMBER
Haiwan	Catalase Lipase Protease	Hati Pankreas Pankreas
Bakteria	a-amylase Protease	Bacillus Bacillus
Tumbuhan	Protease	Betik

KEGUNAAN UTAMA ENZIM

SUMBER	JENIS	AKTIVITI	KEGUNAAN
Bakteria	Bacillus	Protease	Daging, minuman
Bakteria	Streptomyces	Isomerase	Minuman, kanji
Kulat	Aspergillus	Protease	Keju
Kulat	Kulapok	Lipase	Keju, Lemak
Yis	Saccharomyces	Invertase	Koko
Yis	Kluyveromyces	Chymosin /rennin	Keju
Tumbuhan	Barli / Malt	Amylase	Bakeri, gula
Tumbuhan	Betik	Papain /protease	Bakeri, minuman
Haiwan	Hati lembu	Catalase	Minuman, tenusu
Haiwan	Ruminan	Rennin /protease	Keju
Haiwan	Perut Babi / lembu	Pepsin /protease	Keju, Bijirin

ENZYME
In Food

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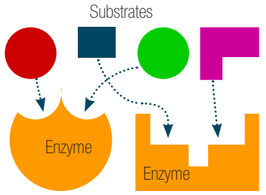
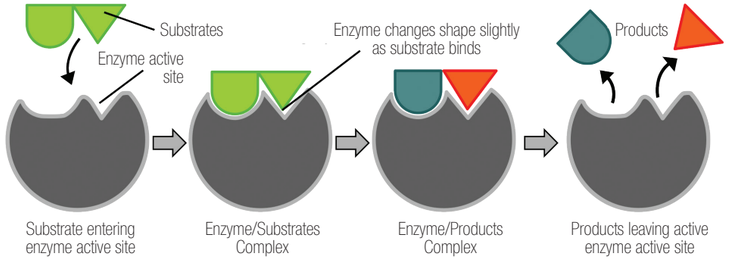
ENZYMES IN FOOD

Enzymes are biological molecules (proteins) that accelerate, or catalyze chemical reactions. Almost all metabolic processes in the cell need enzymes in order to occur at rates fast enough to sustain life. Enzymes are very specific catalysts and usually work to complete one task.



Enzymes are very specific and only work with certain substrates

HOW ENZYMES WORK?



INDUSTRIAL APLICATIONS

Enzymes are used in Chemical Industry and other industrial application. It is widely used in Food Industry. It allowed certain industrial processes to be carried out at normal temperatures and pressures. It also help reducing the amount of energy and expensive equipment needed.

FOOD AND DAIRY INDUSTRY:
Amylase, Protease, Rennin, Lipase, Lactase

BREW INDUSTRY:
Amylase, Glucanease, Protease

PAPER INDUSTRY:
Amylase, Cellulase, Ligninase

BIOFUEL INDUSTRY:
Cellulase, Ligninase

TEXTILE INDUSTRY:
Cellulose, Lipase

ENZYMES FUNCTION

Protease: Used for protein pre - digestion process in baby foods manufacturing.

Lipase: Used together with protease in biological detergents to break down - digest - the substances in stains into smaller, water soluble substances.

Carbohydrase: Used to convert starch syrup, which is relatively cheap, into is more valuable. Example - as an ingredient in sports drinks.

Isomerase: Used to convert glucose syrup into fructose syrup - fructose is sweeter than glucose, so it is used in smaller amounts in slimming foods manufacturing.

REFERENCES:
1. Muhammad M. Chaudry & Mian N. Riaz, Halal Food Production, 2004
2. Matthewson, P.R, 1998. Major biological source of of enzymes (Appendix C), in Enzymes, Eagan Press, St. Paul, MN, pp 93-95.

WHAT DO ENZYMES DO FOR YOU?

SECTOR	APPLICATION AREA	BENEFITS
Detergents	Household washing and cleaning agents	Washing clothes in cold water and brushing your teeth
Textiles	Heavy fabric washing, Silk Polisihing, Leather goods softening	Stonewash denim, make cotton look and feel like silk, make your leather softer.
Food Processing	Baking, Brewing, Fruit juice processing	Clarify your juices and beer, make bread better, turn corn starch into sugar syrup
Pulp and Paper	Starch conversion, Pitch control bleach-boosting, Deinking, Stickies and slime control	Reduce production costs and improve product quality

HALAL ISSUES OF ENZYMES

Source of origin: animal tissues (porcine, bovine or ovine), plant materials, microbial and fermentation process.

Raw materials of growth media: e.g: peptone from porcine or un-slaughtered bovine.

Origin of cultures: should be from halal sources.

SOURCE OF ENZYMES

	ENZYMES	SOURCES
Animal	Catalase Lipase Protease	Liver Pancreas Pancreas
Bacterial	a-amylase Protease	Bacillus Bacillus
Plant	Protease	Carica Papaya

ENZYMES MAIN USES

SOURCE	TYPE	ACTIVITY	USES
Bacteria	Bacillus	Protease	Meat, beverages
Bacteria	Streptomyces	Isomerase	Baverages, starch
Fungi	Aspergillus	Protease	Cheese
Fungi	Muccor	Lipase	Cheese, fat
Yeast	Saccharomyces	Invertase	Cocoa
Yeast	Kluyveromyces	Chymosin /rennin	Cheese
Plant	Barley / Malt	Amylase	Bakery, sugar
Plant	Papaya	Papain /protease	Bakery, beverages
Animal	Bovine liver	Catalase	Beverages, dairy
Animal	Ruminants	Rennin /protease	Cheese
Animal	Pig/cattle stomach	Pepsin /protease	Cheese, cereals

ALKOHOL

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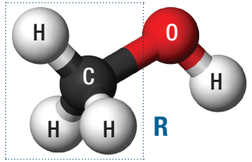
APA ITU ALKOHOL?

Bahasa: perkataan Arab iaitu al kuhul yang bermaksud intipati (*essence*).

Kimia: satu siri sebatian organik yang terdiri daripada jujukan karbon (C), hidrogen (H) dan oksigen (O). Rumusan am bagi alkohol ialah R-OH, yang mana R adalah sebatian hidrokarbon atau kumpulan alkil (CnH2n+1) dan kumpulan berfungsi hidroksil (OH) terikat pada atom karbon.

Alkohol yang sering digunakan dalam produk ialah: etanol, propylene glycol (1,2-propanediol), isopropanol (2 propanol), xylitol, sorbitol, gliserol,isomalt, dan sebagainya.

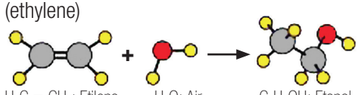


Dalam pelabelan makanan, alkohol secara umumnya dirujuk kepada **etanol** kerana ia merupakan sebatian yang memberi kesan kemabukan kepada peminum. Etanol adalah komponen utama yang terhasil daripada proses fermentasi.

PROSES PENGHASILAN ALKOHOL

ALKOHOL SINTETIK:

Sintesis dari hasil sampingan kimia petroleum (ethylene)



ALKOHOL BIJIRIN:

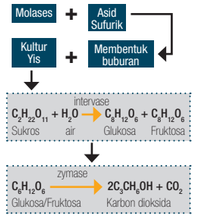
Fermentasi daripada sumber karbohidrat
i. Fermentasi gula
ii. Fermentasi kanji

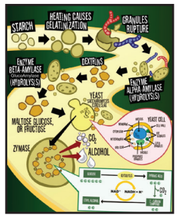
Fermentasi Gula

Sumber bahan yang tinggi kandungan gula seperti buah-buahan (anggur, kurma), *molasses* (tebu), ubi bit *(beet root)*. Contoh produk yang terhasil daripada fermentasi gula adalah seperti Khamr (Arak): *Red wine, white wine, rum, brandy,* todi.

Fermentasi Kanji

Sumber bahan karbohidrat berkanji seperti bijirin malt, barli, gandum, jagung. Contoh produk yang terhasil daripada fermentasi kanji adalah seperti Khamr (Arak), Bir malt, Wiski, Sake dan Tuak.





ALKOHOL INDUSTRI (ETANOL)

Alkohol industri merupakan alkohol yang dihasilkan khusus untuk kegunaan industri dan terdapat dalam dua gred iaitu:

1. Gred makanan (*potable alcohol*)

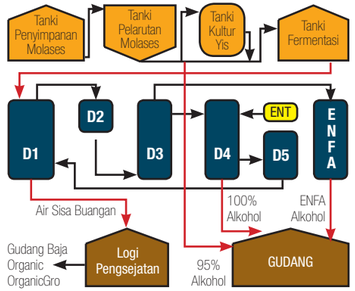
Terhasil daripada proses fermentasi (gula atau kanji) tetapi mempunyai proses lanjutan - penyulingan - sehingga kepekatan etanol mencapai 95-99%.

2. Gred bukan makanan

Denatured alcohol: Proses fermentasi yang sama seperti alkohol gred makanan, tetapi pada peringkat akhir akan ditambah bahan kimia nyah-asli (*denaturant*) seperti bitrix, gasolin, denatonium bagi menjadikannya beracun dan tidak sesuai diminum.

Alkohol Sintetik: Alkohol yang terhasil dari sumber petroleum ini tidak sesuai digunakan dalam produk makanan dan tidak boleh diminum. lanya sesuai untuk penggunaan luaran seperti bahan bakar, bahan pelarut atau kimia untuk ujikaji makmal (*analytical grade*).

PROSES PENGHASILAN ALKOHOL INDUSTRI



APLIKASI ALKOHOL DALAM INDUSTRI

INDUSTRI MAKANAN

- Alkohol industri gred makanan
- Bahan pelarut terbaik
- Bahan nyah-kuman bagi peralatan pemprosesan makanan.

Penggunaan KHAMR (arak) dalam industri penyediaan makanan

- Makanan yang dimasak dengan khamr (arak) dapat memberikan atau meningkatkan rasa tertentu.
- Mengawet dengan merendahkan nilai pH dan memberikan warna dan perisa.
- Bir mengandungi yis yang boleh membantu menaikkan doh roti.
- Melembut dengan meleraikan serat otot daging semasa diperap.

INDUSTRI FARMASEUTIKAL

- Alkohol industri gred makanan.
- Produk pembersih mulut & ubat batuk.
- Menyah-kuman/ bacteria, melarutkan sebatian dalam sesuatu formulasi ubat, mengekstrak bahan aktif, dan pengawet.

INDUSTRI KOSMETIK DAN WANGIAN

- Alkohol industri gred bukan makanan (*denatured alcohol* atau alkohol sintetik)
- Medium untuk penyerapan bahan ramuan produk kepada kulit wajah
- Memudahkan minyak wangi dilarutkan, nilai estetik-mudah meruap, mengeluarkan bau kuat setelah disapu pada kulit.

Fatwa Kebangsaan 'Alkohol Dalam Makanan, Minuman, Pewangi & Ubat-ubatan' oleh Muzakarah Khas Jawatankuasa Fatwa Majlis Kebangsaan bagi Hal Ehwal Ugama Islam Malaysia (14-16 Julai 2011).

Semua minuman arak mengandungi alkohol, akan tetapi bukan semua alkohol adalah arak. **Alkohol yang diperolehi dari proses pembuatan arak, hukumnya adalah haram dan najis.**

Manakala alkohol yang diperolehi **bukan melalui proses pembuatan arak, hukumnya tidak najis tetapi haram diminum** dalam bentuk aslinya kerana **ia adalah racun** dan **boleh membunuh.**

Minuman yang diproses/dibuat bukan dengan tujuan untuk menghasilkan arak dan mempunyai **alkohol dibawah aras 1%v/v adalah harus (boleh) diminum.**

Manakala **minuman ringan** yang **dibuat dengan niat** dan **cara yang sama seperti proses membuat arak,** sama ada mengandungi **banyak, sedikit alkohol atau alkoholnya disuling adalah haram.**

Makanan atau minuman yang mengandungi alkohol secara semulajadi seperti perahan buah-buahan, kekacang dan bijran atau alkohol yang terkandung itu **terjadi secara sampingan semasa proses pembuatan** makanan atau minuman adalah **tidak najis dan harus (boleh) dimakan/minum.**

Makanan/minuman yang mengandungi **bahan perisa/pewarna yang mengandungi alkohol** bagi tujuan penstabilan **adalah harus (boleh)** digunakan **sekiranya alkohol itu bukan dihasilkan dari proses pembuatan arak dan kuantiti/kadar alkohol dalam produk akhir tidak melebihi 0.5% dan tidak memabukkan.**

Ubat-ubatan & pewangi yang mengandungi **alkohol sebagai bahan pelarut adalah tidak najis dan diharuskan** sekiranya alkohol tersebut **bukan diambil melalui proses pembuatan arak.**

ALCOHOL

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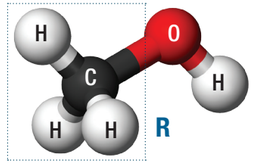
WHAT IS ALCOHOL?

In **Arabic word:** Al-Kuhul which means essence.

In **Chemistry:** organic compound derived from carbon chain, hydrogen and oxygen. General formula for alcohol is R-OH, where R is hydrocarbon compound or alkyl group (CnH2n+1) and the functional group hydroxyl (OH) binds carbon atom.

The Common used of alcohol is: ethanol, propylene glycol (1, 2-propanediol), isopropanol (2 propanol), xylitol, sorbitol, gliserol, isomalt and etc.

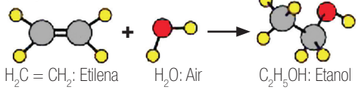
In food labeling alcohol is generally refers to Ethanol, as it is a compound that gives intoxicant to the drinker. Ethanol is also the main component derived from fermentation process.



ALCOHOL PRODUCTION PROCESS

SYNTHETIC ALCOHOL:

Synthesis by product of petroleum chemistry (ethylene)



$H_2C = CH_2$: Etilena + H_2O: Air → C_2H_5OH: Etanol

GRAIN ALCOHOL

Fermentation from carbohydrate source

i. Sugar fermentation

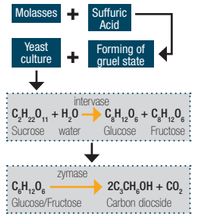
ii. Starch fermentation

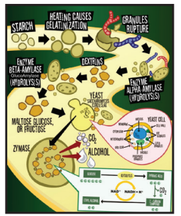
Sugar Fermentation

Made from high sugar content source such as fruits (grapes and dates), molasses (sugar cane) and beet root. Example of product from sugar fermentation: Khamr (Alcoholic beverages): Red wine, white wine, rum, brandy, toddy.

Starch fermentation

Made from carbohydrate source such as cereal, malt, barley, wheat, corn. Example of product from starch fermentation: Khamr (Alcoholic beverages): Beer, Malt, Whisky, Sake, Tuak.





INDUSTRIAL ALCOHOL (ETHANOL)

Industrial alcohol is alcohol that is produced specifically for industrial use. It is available in two grades:

1. Food grade (potable alcohol)

Produced from fermentation process (sugar or starch), and advanced to distillation process until the ethanol concentration reached up to 95-99%.

2. Non-Food grade

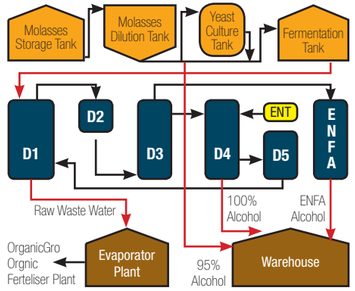
Denatured Alcohol

Basically, the fermentation process are similar to food grade alcohol, but at the final process, denaturant chemical such as bitrix, gasoline and denatonium will be added, for making it toxic and not potable.

Synthetic Alcohol

Alcohol derived from petroleum source is not suitable to be use in food product and not potable. It is suitable for external use such as fuel, solvent or chemicals for laboratory analysis (analytical grade).

INDUSTRIAL ALCOHOL PRODUCTION PROCESS



ALCOHOL APPLICATION IN INDUSTRY

FOOD INDUSTRY

- Food grade alcohol industry
- Best solvent
- Disinfectant for food manufacturing utensils and equipment

Use of alcohol beverage in food preparation

- Food cook with wine will provide and enhance specific taste.
- As preservative by lowering the pH value and gives colour and flavours
- Beer contains yeast which may help in raising the dough.
- Tendering meat fiber during marinating.

PHARMACEUTICAL INDUSTRY

- Food grade alcohol industry
- Mouthwash and cough syrup
- Disinfection of bacteria, extraction of active ingredients, dissolving compounds in drug formulation and as preservatives.

COSMETIC AND FRAGRANCE INDUSTRY

- Non food alcohol grade (denatured alcohol or synthetic alcohol)
- As a medium for absorption of ingredients to skin care product.
- Facilitate in dissolving of fragrances, esthetical value – volatile, removing stringent smell after applying to skin.

National Council of Alcohol in Food, Beverage, Fragrance and Medicine' by Fatwa Committee of the National Fatwa Council for Islamic Religious Affairs Malaysia (14-16 July 2011)

Every wine contains alcohol. However not all alcohol are wine. **Alcohol that is extracted from the wine making process is ruled as prohibited (haram) and impure.**

However, **alcohol that is not produced through the wine making process is not ruled as impure,** but **is still prohibited (haram) from being consumed** in its original form as **it is a poison and can kill.**

Soft beverages processed/made not for the purpose of producing wine and **containing alcohol below the level of 1% v/v are permissible to be consumed.**

Whereas for **soft beverages made with the same intention and method of producing wine, regardless of whether their alcohol content is high or low or whether their alcohol content is distilled, their consumption is prohibited.**

Food or beverages **containing natural alcohol** such as fruits, nuts, grains or their juices, **or alcohol that incidentally forms during the production process** of certain food or beverages **is not considered impure and is permissible to be consumed.**

Food and beverages with **flavouring or colouring that contains alcohol for stabilisation purposed are permissible to be consumed provided that the alcohol is not produces from the wine making process.** The **quantity of such alcohol in the final product is not intoxicating and the alcohol level does not exceed 0.5%.**

Medicines and perfumes containing alcohol as a solvent agent are not impure and are permissible provided such **alcohol is not extracted from wine making process.**