


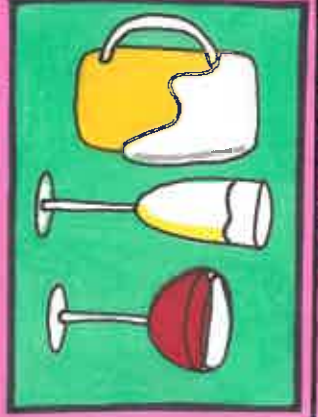


FUNGI - THE WAY FORWARD?

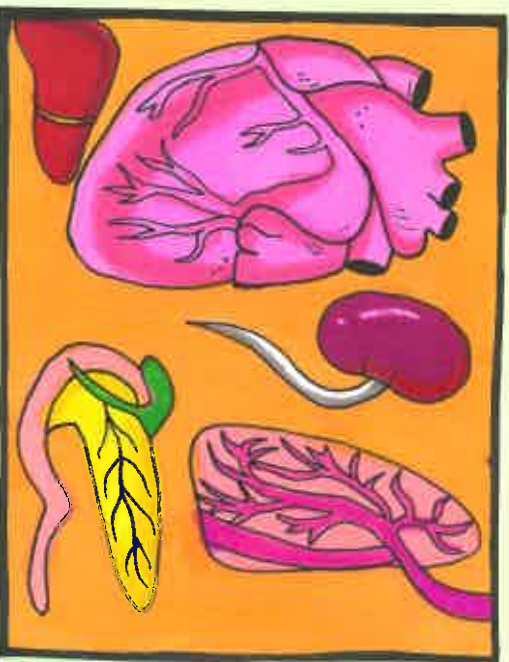
CONTENTS	CHEESE PRODUCTION	SODA AND SOFT DRINKS	BIOTECHNOLOGY	FERMENTATION
<ul style="list-style-type: none"> Cheese production Soft drinks Biotechnology Fermentation Immune suppressants Glossary Resources Meet the team 	<p>Fungi play a role in the cheese production process in 2 ways: they help with the ripening on the outside of the cheese, and they can spread the flavours from inside the cheese.</p> <p>An array of cheeses are inoculated with <i>Penicillium roquefortis</i> to give the cheeses a strong and pungent flavour. Some examples of these cheeses are Roquefort, gorgonzola, Stilton Blue and Danish Blue. The white crust on the outside of the cheeses called Brie and Camembert is the mycelium of <i>Penicillium camemberti</i>. True strong flavours of the cheeses are due to the fungus producing methyl ketones.</p> 	<p><i>Aspergillus</i> is utilised in industry in many ways. The majority of sodas and soft drinks contain citric acid as the main ingredient. Citric acid is not used in soft drinks but also in other drinks, many candies, canned goods and baked goods. Due to the fact that it is expensive to isolate the citric acid from the citrus fruit, it is produced in large scale fermentation vats, utilising <i>Aspergillus niger</i>. A high yield of citric acid can be made when you control the conditions, for example the sugar type, the concentration, metal content, pH levels and salt levels.</p> 	<p>Fungi are widely used in biotechnology since they are important experimental organisms that are easily cultured (grown), occupy little space, multiply rapidly and have a short life cycle. The most common use of fungi in biotechnology is antibiotics; there are about 1,600 types being produced right now. Their uses from this multitude don't end there. They include antibiotics, scents, the antibiotic penicillin (from the fungus <i>Penicillium notatum</i>) and the immunosuppressant cyclosporine.</p> 	<p>Yeast (<i>Saccharomyces cerevisiae</i>) is commonly used to make alcohol and carbon dioxide so break down sugars used in the fermentation process. By using this technique, up to 50% of sugar can be converted into alcohol. But, it usually doesn't pass 15% because fungi are sensitive so large concentrations of alcohol. Products such as beer use fermentation of cereal grains to produce their final beverage, while wine is composed of fermented grapes. The fungus <i>Aspergillus oryzae</i> ferments rice to produce sake and then fermented again, using bacteria and yeasts.</p> 

IMMUNOSUPPRESSANTS

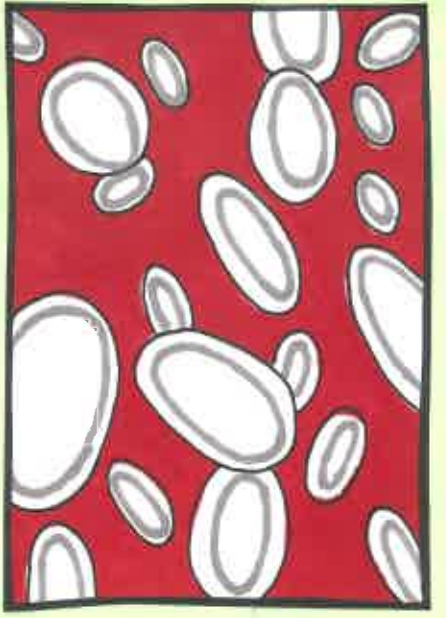
Cyclosporin A is a primary metabolite (substance used for metabolism) of several fungi including *Cylindrocarpum lucidum* and has been proven to be a powerful immunosuppressant in mammals. Cyclosporin A is predominantly used during and after bone marrow and organ transplants in humans where the immune system has the chance to reject the foreign substance.

Cyclosporin A's ability to suppress lymphocytes was first discovered in the 1970s and since then has been used universally all around the world.

The fungi works as an enzyme's inhibitor by blocking off or changing the enzyme's active site that is involved in the production of T cells (white blood cells). It basically stops the



body from attacking the foreign transplants by stopping the white blood cells from reproducing. However, cyclosporin A and all its classes may increase the risk of developing serious infections, cancer or transplant failure. The greater risks include kidney failure which can be life threatening.



GLOSSARY

LYMPHOCYTE - A form of small white blood cell with a single round nucleus, occurring especially in the lymphatic system.

MYCELIUM - The vegetative part of a fungus, consisting of a network of fine white filaments.

METHYL KETONE - An organic compound with a variety of carbon-containing substituents.

IMMUNOSUPPRESSANTS - Suppression of the immune system and its ability to fight infection.

FERMENTATION VATS - A sealed, cylindrical vessel for the culturing of microorganisms in a nutrient medium under sterile conditions, intensive mixing, continuous aeration with sterile air and constant temperature.

