

An after-dinner fungus: *Penicillium roqueforti*

When you're eating your cheese and biscuits after dinner, did you know that a fungus may be responsible for the taste of the cheese?! So-called 'blue cheeses' like Stilton and Roquefort get their blue veins from a helpful fungus called *penicillium roqueforti*.



What is the fungus? *Penicillium roqueforti* is a type of 'saprophytic' fungus which lives in the soil. Saprophytic fungi are the largest group of fungi. The enzymes of the fungi convert dead or decaying matter like dead leaves, fallen trees or dead insects into organic acids, carbon dioxide and fungal biomass.

What effect does the fungus have on cheese? When a blue cheese like Stilton or Roquefort is made, mould spores of *Penicillium Roqueforti* are added to fresh milk. Once curds have formed and the cheese has been moulded, air is allowed into the cheese to activate the *Penicillium Roqueforti* and after several weeks, the blue/green veins form that give the cheese its distinctive flavour, taste and texture.



Where does it get its name? The fungus is named after the French town called Roquefort where there are caves with *Penicillium* mould spores occurring naturally. The cheesemakers in the town discovered the effect of the fungus on their cheese.

So, the next time you're enjoying Stilton or Roquefort, remember that it is a fungus that gives the cheese the great taste!

Useful information sources:

http://en.wikipedia.org/wiki/Penicillium_roqueforti

<http://www.facebook.com/pages/Penicillium-roqueforti/112911785424331>

http://cheese.about.com/od/howcheeseismade/a/make_bluecheese.htm

Trametes versicolor

What is it?

Trametes versicolor is a species of mushroom found in temperate to subtropical forests throughout the world. Its common name is Turkey Tail for its brightly coloured patterns which resemble that of a Wild Turkey. Typically, it grows in rows or shelves which overlap each other on logs or stumps of hardwood and they are usually found from fall to spring. Turkey Tail has been found to have great medicinal value and is commonly used in traditional Chinese medicine under the name "Yun Zhi".



What does it look like?

Possessing a leathery texture, the flesh of these fungi is about 2 mm thick and can grow up to 10cm in diameter. Older specimens may have algae growing on them giving the fungi a greenish appearance. However, they exist in a variety of attractive colours. The underside of the fungus appears creamy white but the upper surface can have a variety of colours such as black, red, blue, green, yellow and brown, which is why they were once used for decorating hats. The color of the fungus is dependent on the amount of sunlight that it receives. The surface of the fungus is densely packed with pores where there are about 2-5 pores per millimeter of surface.



What does it feed on and what feeds on it?

The Turkey Tail fungus serves as a primary decomposer of wood and as such feeds on two substances from the wood that it rots, lignin and cellulose. Both of these substances are derived from the cell walls of the plant cells. On the other end of the food chain, the turkey tail fungus is vulnerable to being eaten by the larvae of the Fungus Moth (*Nemaxera betulinella*) and the maggots of the Platypodid fly (*Polyporivora picta*) which exist in the same ecosystem.

How does it help us?

The Turkey Tail fungus contains a substance called PSK (Polysaccharide-K) which is used to manufacture a drug called Krestin. PSK is a protein bound polysaccharide which boosts the immune system in cancer therapy. It is now used in several countries such as Japan as an official adjuvant against cancer. It has been successfully used in treating several cancers such as leukaemia, breast cancer, lung cancer, gastric cancer and colon-rectal cancer. Adding to this, it has been found to effectively reduce the size of tumours in lab animals. It is now becoming increasingly evident that this fungus will continue to improve our lives.

Bibliography

<https://fungalgenomics.concordia.ca/fungi/Tver.php>
http://botit.botany.wisc.edu/toms_fungi/aug97.html
http://en.wikipedia.org/wiki/Trametes_versicolor

Chernobyl Fungi, Harmful, Helpful

.....or both!

Funnily enough fungi can be a pretty useful thing in our day to day lives, in ways that most don't even know, from making beer to decomposition and even washing our clothes but although they are in a whole different kingdom to us, some fungi share the same type of pigment that we all have in our skin, melanin. - Melanin is a pigment which colors our skin and also helps us to absorb UV rays from the sun in order to help stop ourselves from getting burnt.

Chernobyl Fungus?

In 1999 a robot was sent out to the nuclear plant in Chernobyl where, since the disaster in 1886, a black fungus named "Cladosporium sphaerospermum" was found growing on its walls, on further analysis scientists discovered that the fungus they found there contained high levels of melanin.

The major nuclear reaction that occurred at the plant was so **big** it means that no one can go anywhere near it. - This is because the ionizing radiation it gives off is very penetrating and harmful to living cells, causing mutations in genes which can lead to cancer, but however, the fungus appeared to be thriving there.

What's happening?

Scientists took three types of fungi containing melanin, including the fungus abundant in Chernobyl, and exposed them to ionizing radiation and found that the ones that contained melanin grew up to 2.5 times faster as a result. This proves a link exists between the radiation and the melanin enabling the fungi to grow faster.

So... is this useful?

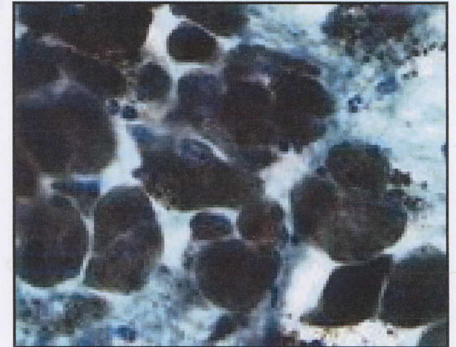
This is still a very new area of research but the discovery alone means whole new implications for the fungus such as:

- Use in space - where there is lots of ionizing radiation
- In protective clothing in nuclear plants
- Genetically engineering its genes into crops to make them grow faster.

Another aspect of the discovery is its relevance to us and *how our body uses melanin* because if melanin can utilize ionizing radiation than perhaps it can also use the longer wavelengths of the electromagnetic spectrum which aren't quite so dangerous such as visible light and UV. This would mean that we could also be taking in radiation and using it as a source of energy.

So where many other organisms are weak and are killed off by radiation, fungi such as *Cladosporium sphaerospermum* can not only endure it but use it to flourish.

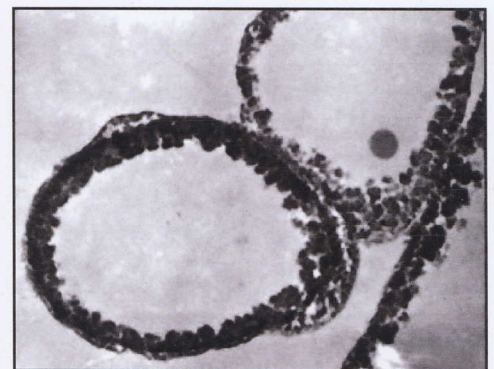
By Isabelle Ellis



Melanin



Chernobyl Nuclear Plant 1986



Cladosporium sphaerospermum found in abundance in Chernobyl

Helpful Fungi,

Astraeus Hygrometricus

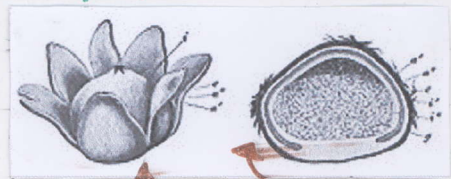
(barometer earthstar, false earthstar,
or hygroscopic earthstar.)

- Grows with a broad range of tree species and in stony or sandy soils. It is found near trees because it helps the trees get nutrients from the earth.
- It also often found in open fields either in groups or scattered around the area and is likely to be found in tropical and temperate area of the world.
- The earthstar starts as an immature bud in the ground and once mature, opens and comes to the surface as a star like mushroom.
- The star like feature is to help the fungus open its spore case so it can get moisture from the air (high humidity) and closes to stop evaporation, (low humidity). It can vary in colour (light grey-tan) and is 4-10 cm when fully open. The spore case has a pore on top and feels scuffy and 1-3cm broad.
- Can be eaten but rather tough and described by local people in South Bengal as "delicious food" but is NOT poisonous.
- Used, traditional medicine in China and Indian ethical medicine. Chinese use it on wounds to stop bleeding, (spore dust) and to reduce chilblains while Indians blend spore mass with mustard seed oil for burns, and it is also used in scientific research on growth of tumor and bone marrow cells.



earthstar in Britain

earthstar from Japan



mature

immature

* For more information visit www.wikipedia.org/wiki/Astraeus_hygrometricus, also for more references.

CORDYCEPS SUBSESSILIS



British Mycological
Society

Fungi	Kingdom
Ascomycota	Phylum
sordariomycetes	Class
hypocreales	Order
clavicipitaceae	Family
cordyceps	Genus
Cordyceps subseussilis	Species
Tolypocladium inflatum	Asexual form



A Scarab Beetle infected by the Cordyceps. The beetle's body tissue is completely replaced by the fungus's mycelium, sometimes over several weeks. The spores are then released from the shoots on the beetle's back.

- **Cordyceps Subseussilis** is a rare parasitic ascomycete fungus, that only attacks and consumes Scarab Beetles. This fungus has been discovered in the USA but wider distribution is not yet known due to its rarity.
- It's asexual form (where there is only one parent in reproduction) is **Tolypocladium inflatum**, which is more common and is used in medicine
- Cyclosporin is derived from the asexual form. It is isolated by the use of enzymes, and is a very widely used immuno-suppressant.
- Cyclosporin is used to prevent organ transplants from being rejected by the body; the immune system of the host body does not always accept donor organs.

Sources: <http://www.danielwinkler.com/id176.htm>,
http://botit.botany.wisc.edu/toms_fungi/jun2006.html
http://en.wikipedia.org/wiki/cordyceps_subseussilis