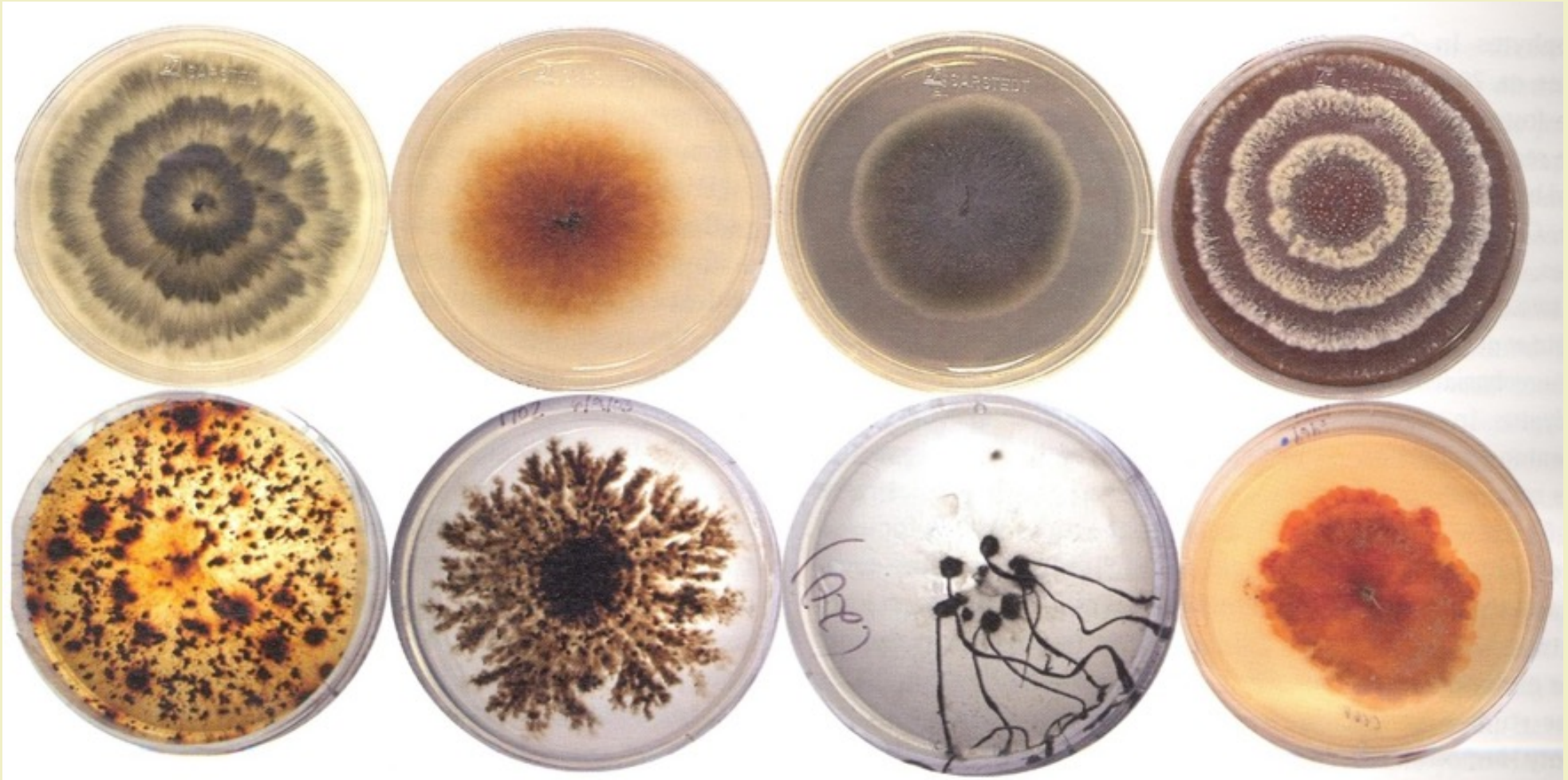


GOOD GUYS-BAD GUYS: EMERGING DISEASES

GARETH JONES



WHAT WAS THE FIRST THING THAT APPEARED AFTER THE ATOMIC BOOMB ON HIROSHIMA?



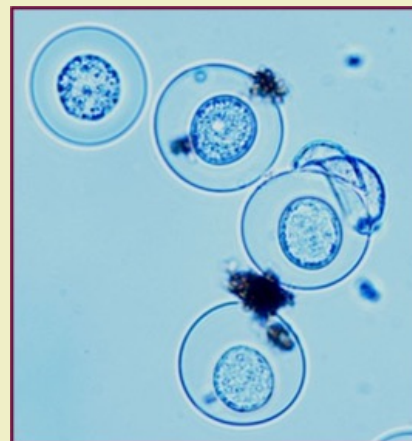
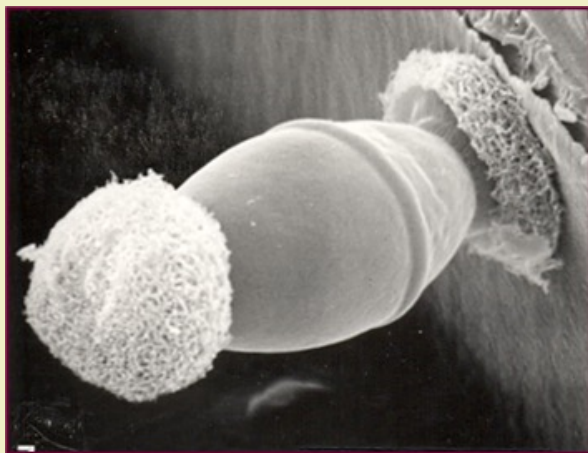
**Tricholoma matsutake, an edible and much prized mycorrhizal mushroom
THE GOOD AND THE BAD**

TOP BAD GUYS

1. ANIMAL PATHOGENS: CHYTRIDS ON FROGS
2. HUMAN PATHOGENS: *Aspergillus fumigatus*
3. WOOD DECAY FUNGI: *SERPULA LACRYMANS*
4. MYCOTOXINS: *ASPERGILLUS FLAVUS*
5. IN DOOR AIR: *STACHYBOTRYS CHARTARUM*
6. POISNOUS MUSHROOMS: *AMANITA PHALLOIDES*
7. PLANT PATHOGENS: *AUSTOPUCCINIA PSIDII*
8. COMPOST: *ASPERGILLUS*
9. EMERGING DISEASES: MANY
10. FUNGAL RESISTANCE A BIG ISSUE



THE GOOD GUYS: EVERYTHING ELSE!

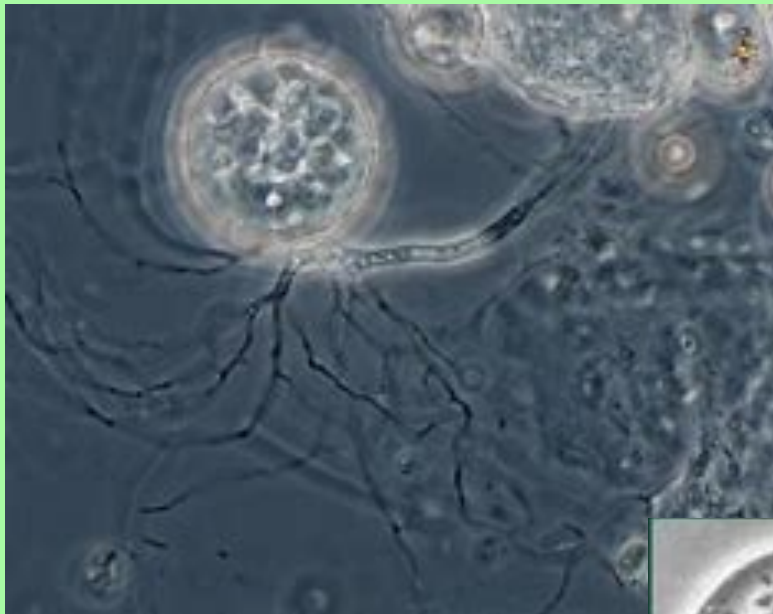


CHYTRIDS ON FROGS: **chytridiomycosis** *Batrachochytrium dendrobatidis*



Basic facts

6.5% of known frog species now extinction
90 species are confirmed or presumed extinct in the wild
Other species have declined by more than 90%



Zoospore is motile with a single flagellum
This is the infective stage



Signs of disease:

Brown to red discoloration of the skin, excessive shedding and mucus production, muscle incoordination, and acute death.

Fungus attacks keratinocytes in the skin of adult animals and mouth parts of tadpole epidermis

Good news

Treatment possible:

1. Topical administration of itraconazole (a 0.01% bath for 5 min/day for 10–11 days).
2. Keeping animals well within their normal thermal range may be effective.
3. The use of terbinafine (0.01% bath, buffered using bicarbonate to a pH of 7.2–7.4, for 5 min/day for 5 days)
4. Spraying animals daily with voriconazole at 125 mg/L for 7 days may be effective

Systemic antifungal drugs seem to be ineffective in treating this infection

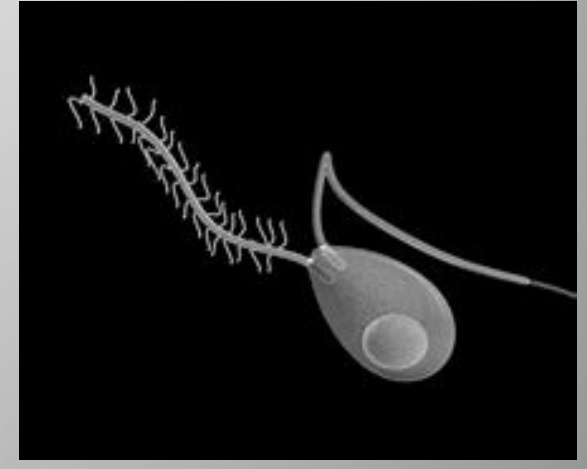
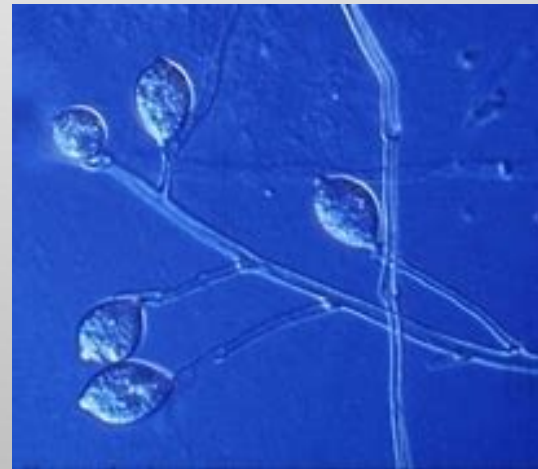
BAD GUYS

HUMAN AND ANIMAL PATHOGENS

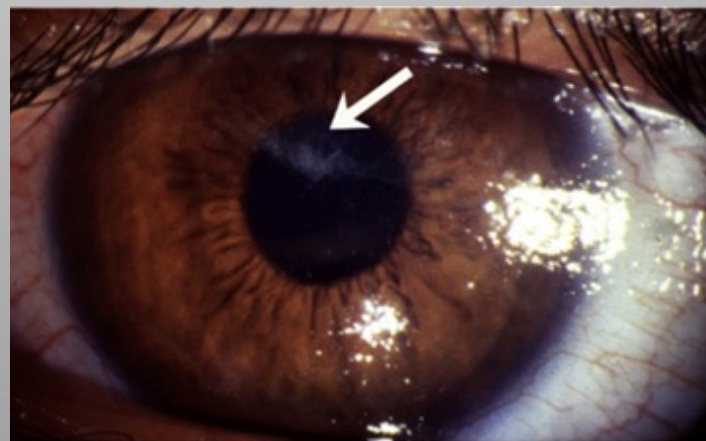
PATIENT SUFFERING FROM PYTHIOSIS: A WATER BORNE DISEASE
FOUND IN RICE FARMS IN THAILAND

THERE IS NO CURE JUST AMPUTATION OF AFFECTED PARTS

Causative agent is the oomycete fungus *Pythium insidiosum*



Saprolegnia on fish common disease



Encephalitozoon
hellem
Keratoconjunctivitis.
corneal damage
Microsporidia of
concern
as emergent
diseases

EMERGING DISEASES

WHO Critical Priority Group fungal pathogens:

Cryptococcus neoformans, *Candida auris* and *Aspergillus fumigatus*

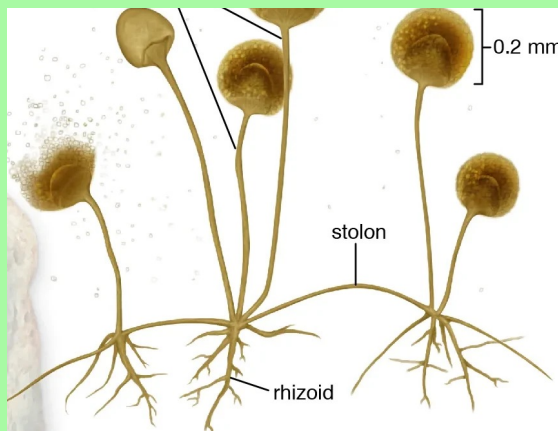
Fungi leading causes of infectious disease mortality, resulting in more than 1.5 million deaths every year

Aspergillus fumigatus is an environmental fungus that kills in the region of 1 million people each year

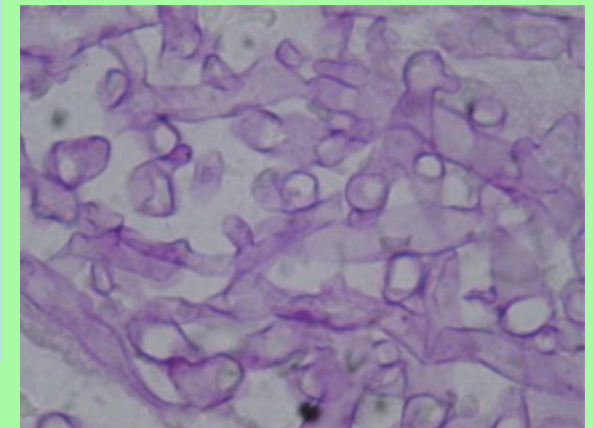
OTHER FUNGI EMERGING AS POTENTIAL DISEASES IN HUMANS

Candida glabrata

Talaromyces marneffeii first found in Bamboo rat in 1956, third most common infection in HIV patients, after tuberculosis and cryptococcosis.

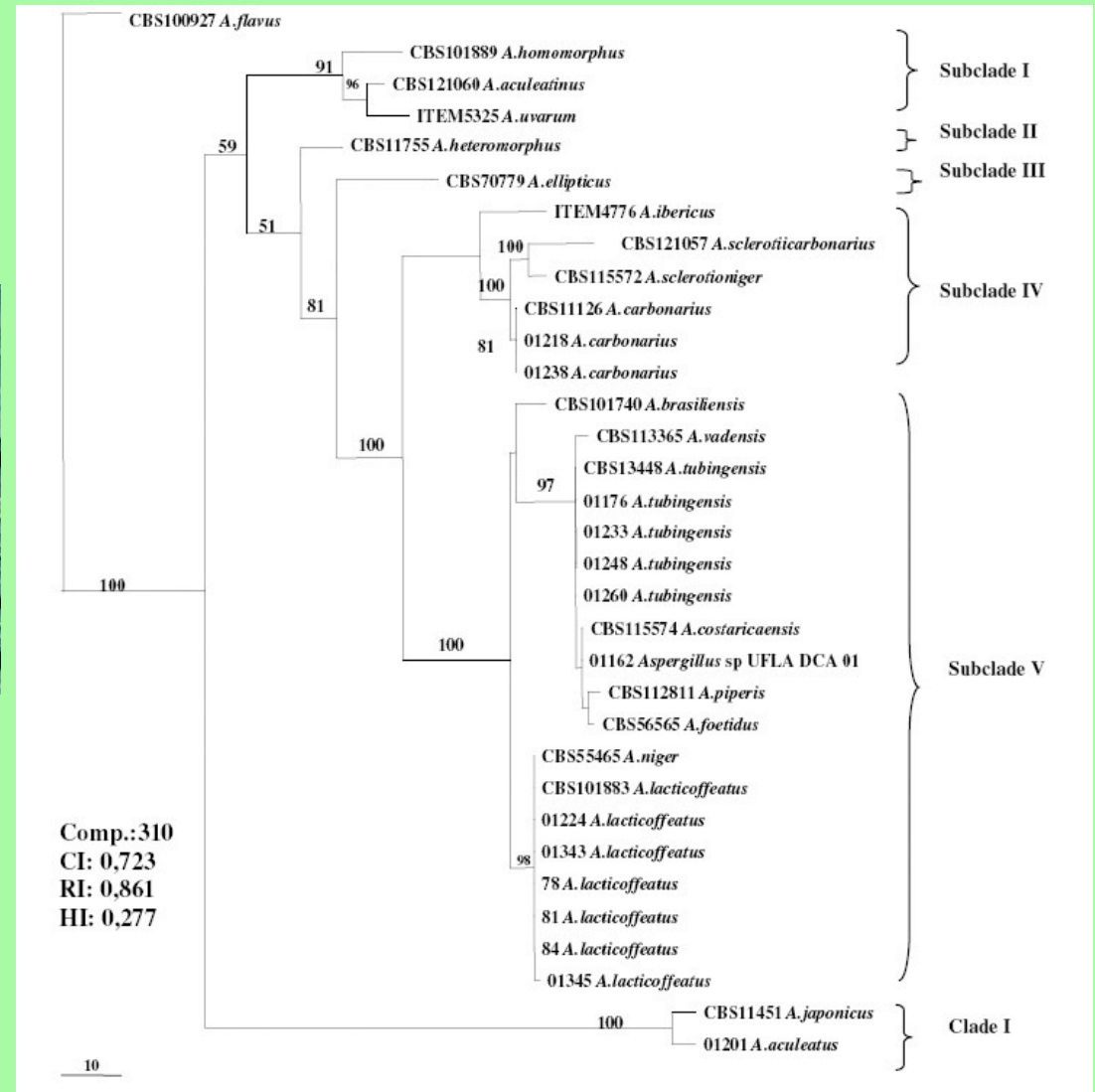
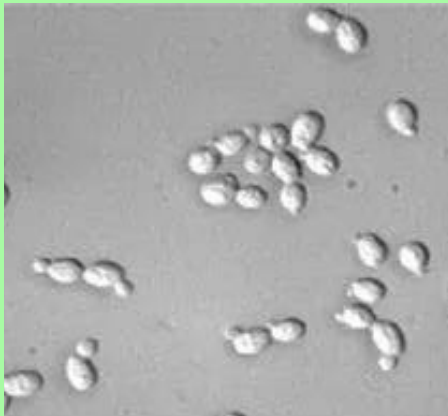
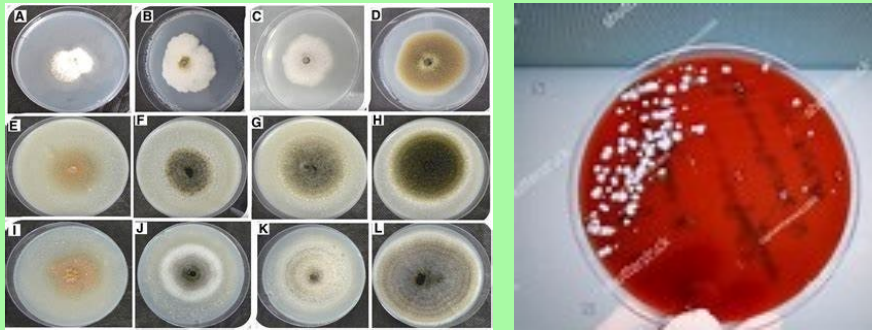


Various Rhizopus species:
R. microspores, *Rhizopus stolonifer*
cause Mucormycosis
an emerging disease
Now renamed *Neorhizopus* and
Thermorhizopus



WHY ARE THERE SO MANY FUNGAL INFECTIONS REPORTED?

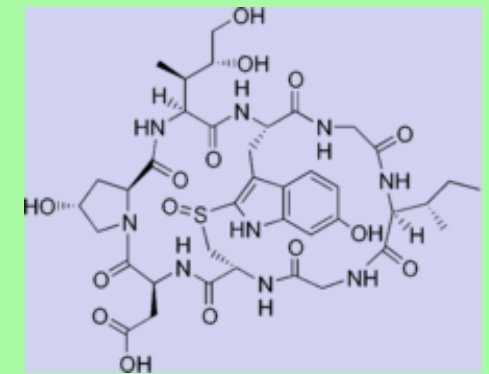
1. BETTER IDENTIFICATION OF FUNGI
2. FUNGAL RESISTANCE TO DRUGS
3. GREATER CONTACT WITH ANIMALS



POISNOUS MUSHROOMS: AMANITA PHALLOIDES (DEATH CAP)



Toxins:
amatoxins,
phallotoxins,
virotoxins,
especially α -
amanitin,



Cortinarius sp.



Galerina marginata



HUMAN POISONING: NUMBERS AND SPECIES

SPECIES

Amanita patherina	76
Amanita muscaria	72
Amanita verna	33
Amanita phalloides	29
Morchella esculenta	52



TOXINS

Cyclopeptide
Muscarine
Ibotenic acid
Psilocybin



SYMPTOMS

Palpitation
Chest pain
Headache
Nausea
Vertigo



CURE

Atropine
Avoid alcohol





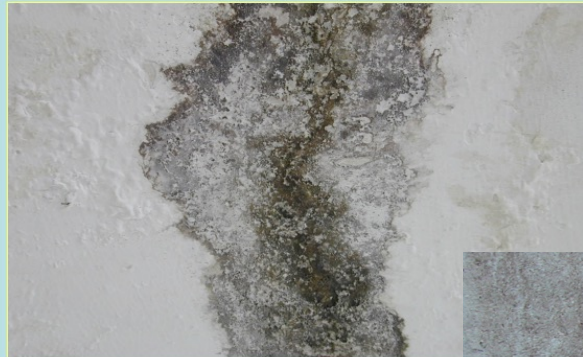
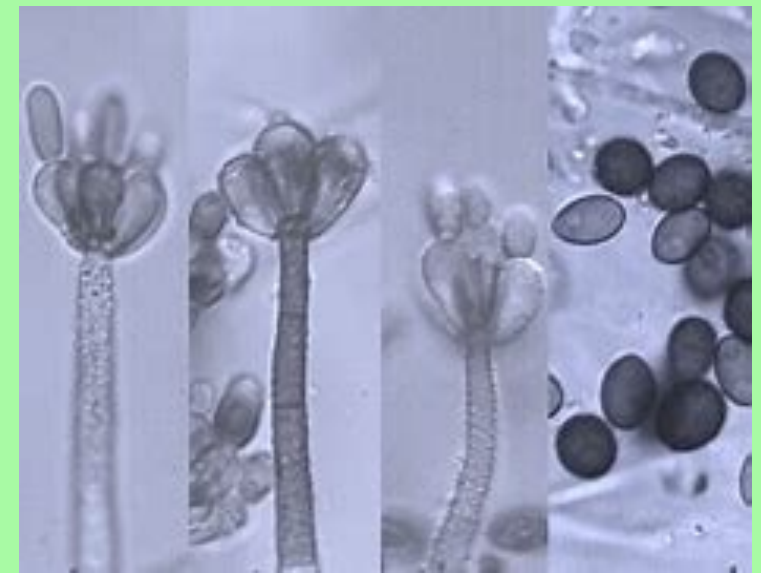
**BUT ROT OF LIVING TREES
WHERE CENTRAL PART OF
STEM ROTTEN AWAY**



**GOOD OR BAD GUYS?
WOOD DECOMPOSING FUNGI
THEY POSSESS POWERFUL ENZYMES THAT BREAKDOWN THE CELL WALLS
OF WOOD**



PAINT SURFACES: MICROBIAL FOULING



CAUSE OF INDOOR MOLD GROWTH

Stachybotrys chartarum

Aspergillus fumigatus

Plus over 27 other species

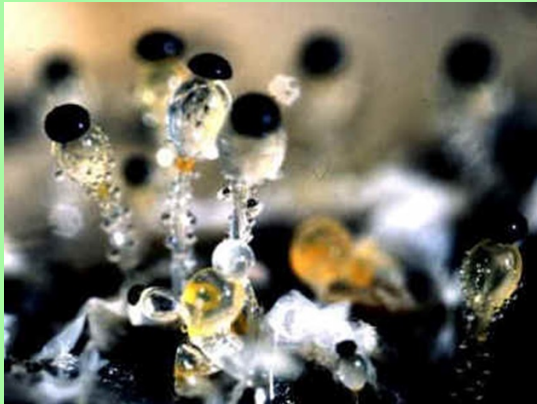
PRODUCES MYCOTOXINS THAT

AFFECT OUR HEALTH



GOOD GUYS

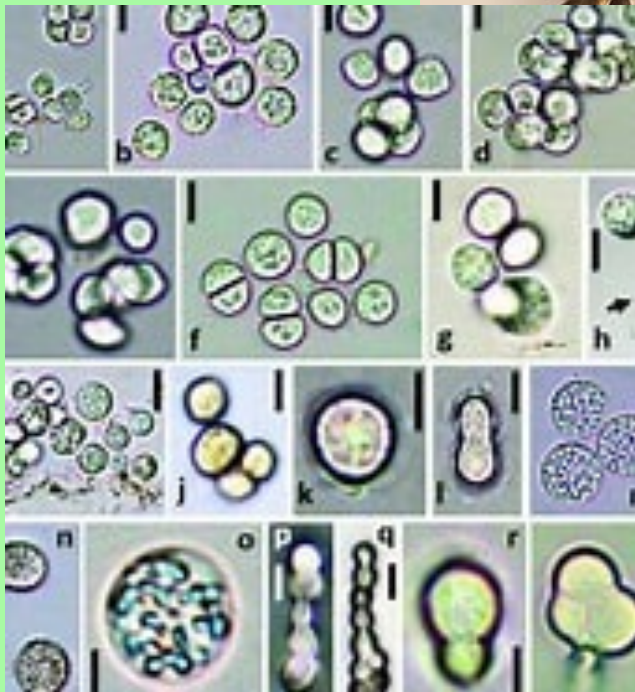
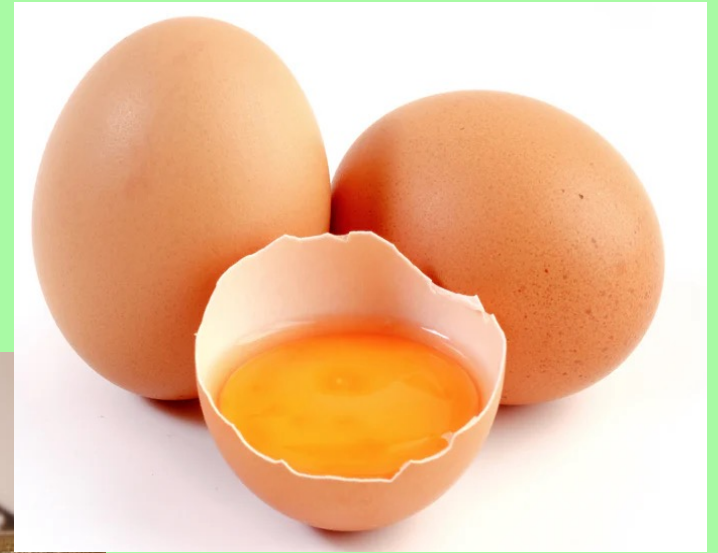
IF THERE WERE NO FUNGI: THE WORLD WOULD BE UP TO IT'S NECK IN SHXXT
A WIDE RANGE OF FUNGI ACTIVE IN THE DECOMPOSITION OF THESE PATS



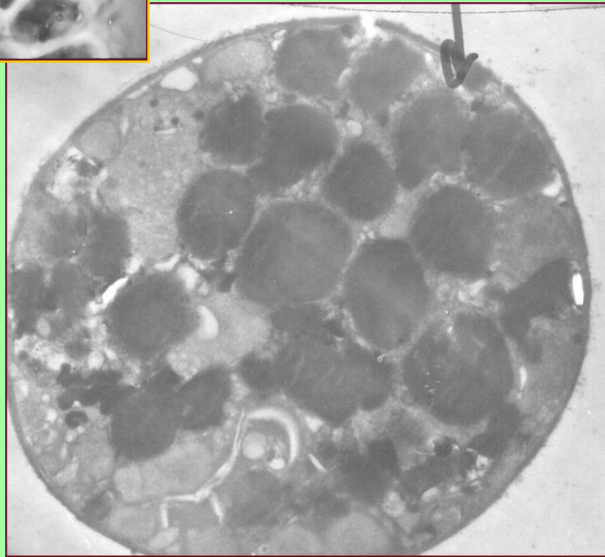
ANY IDEAS AS TO WHO ARE THE GOOD GUYS?



**WHAT DO
THESE
HAVE IN
COMMON?**



OMEGA-3-LONG CHAIN FATTY ACIDS (EPA and DHA) ARE VITAL FOR GOOD HEALTH

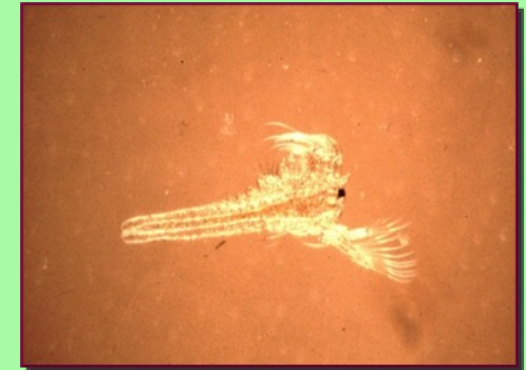


Facts

Omega-3 long-chain fatty acids (EPA and DHA) are essential for the optimum development and function of vital body systems.

But, the human body can not produce Omega-3.

Therefore, a daily dietary intake of 0.6 to 1 gram of Omega-3 is recommended.



QUEEN'S AWARD
4 TIMES WINNER

VITABIOTICS

ultra™
Omega-3

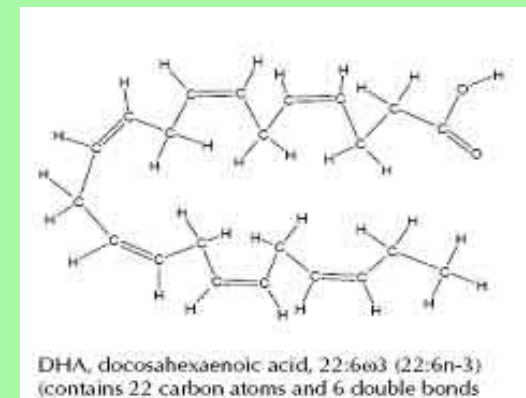
High Purity Fish Oil

SUPER STRENGTH
60% Omega-3

DHA helps to maintain normal function of
BRAIN[†] & VISION[†]
EPA & DHA support normal
HEART[†] FUNCTION

VITABIOTICS
SCIENCE OF HEALTHY LIVING

FROM SUSTAINABLE FISHERIES



HAITAI

EDO Pack®

DHA Onion Thin Cracker

オニオンクラッカー

維他命D₃ 添加

DHAと天然カルシウム(鈣質)添加
ADD DHA & NATURAL CALCIUM

素食亦宜

Enjoy a delicious taste of onion thin cracker.

12枚入り X 6パック NET WT.: 160g

Quorn : FUNGAL OR MYCO- PROTEIN

IN 1960'S GREAT INTEREST IN SINGLE-CELL PROTEIN FOR ANIMAL AND HUMAN FOOD

THE FILAMENTOUS FUNGUS FUSARIUM VENENATUM FROM A SOIL SAMPLE IN 1967 WAS TARGETED.

Quorn was launched in 1985 by Marlow Foods, a joint venture between Rank Hovis McDougall (RHM) and Imperial Chemical Industries (ICI).
Subsequently Zeneca group, later AstraZeneca.

GREAT FOOD FOR VEGETARIANS
SO ANOTHER EXAMPLE OF THE BENEFITS OF FUNGI

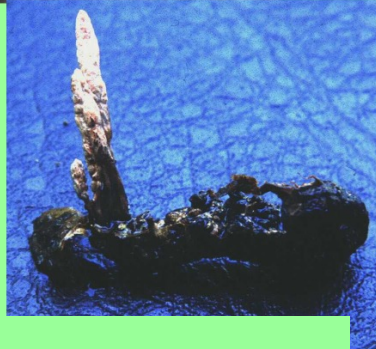


EDIBLE MUSHROOMS

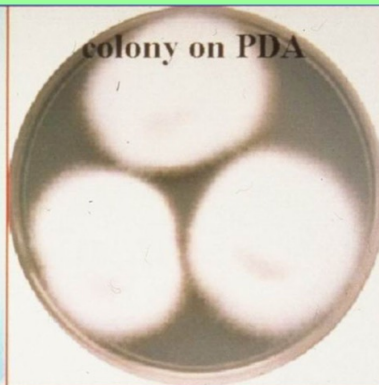
WIDE RANGE GROWN COMMERCIALY
ON WOOD SHAVINGS IN PLASTIC BAGS



FUNGAL ANTI-MICROBIALS: GOOD GUYS



stroma on lepidoptera larva

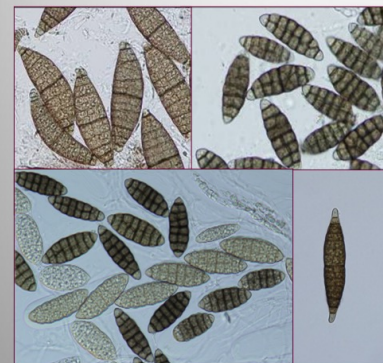


colony on PDA

Cordyceps pseudomilitaris BCC 1620

Source of isolation : Lepidoptera larva, Thailand
Isolated and identified by : Nigel L. Hywel-Jones

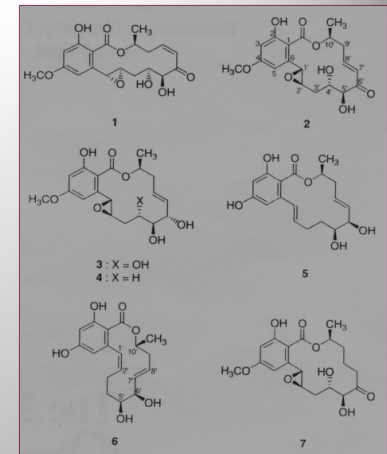
NEW COMPOUNDS FROM MARINE FUNGI



Aigialomycins A and hypothemycin showed Antimalarial activity

Aigialus parvus

Isaka et al., 2002, J.Org. Chem. 67:1561-1566.



2-7 Aigialomycins A-E

14-membered resorcylic macrolides

1 Hypothemycin

FUNGAL ANTI-MICROBIALS: GOOD GUYS

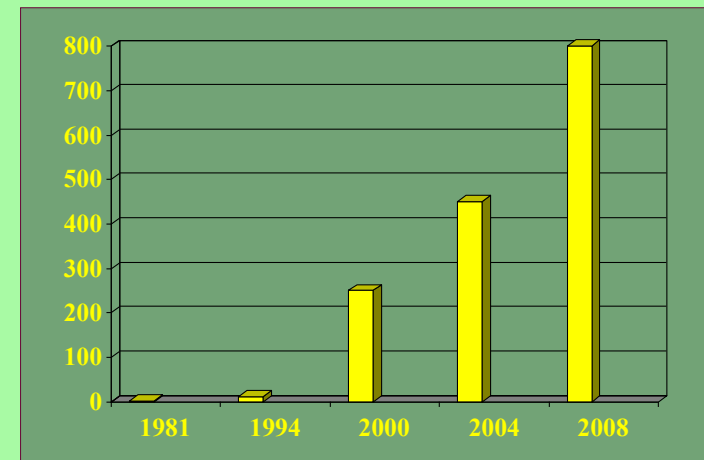
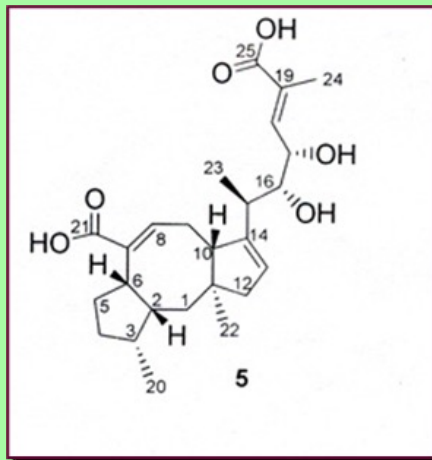
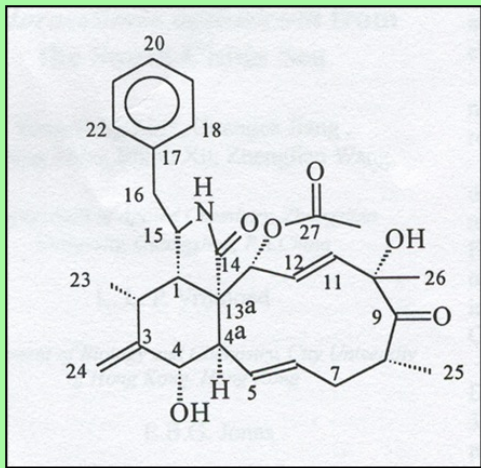
WE CONTINUE TO SEARCH FOR NEW ANTI-MICROBIALS
ESSENTIAL AS DRUG RESISTANCE IS AN ONGOING ISSUE

WE NEED A NEW CHEMICAL STRUCTURE SO AS TO AVOID DRUG
RESISTANCE

MANY THOUSANDS OF FUNGI HAVE BEEN SCREENED IN OUR SEARCH FOR
NEW CHEMICAL STRUCTURES
THOSE FROM SOIL, INSECTS, FRESHWATER AND MARINE, DEEP SEA
SEDIMENTS, ARTIC WATERS

FUNGAL RESISTANCE

Fungicides and antifungal drugs costs circa **\$16 billion in 2023.**



**LINGZHI MEDICINAL MUSHROOM GANODERMA LUCIDUM
PRODUCER OF SO MANY FASINATING COMPOUNDS**



**Produces over 36 Triterpenoids:
Lanostane triterpenoids possessing
significant anti-tuberculosis (anti-TB)
activity**

**Ganoderiol F potent activity against
Mycobacterium tuberculosis**

STOP PRESS

**ALZHEIMER'S IS A TERRIBEL CONDITION WHERE NEURONS IN THE BRAIN
SENESECE**

**GANODRERMA EXTRACTS HAVE BEEN SHOWN TO REGENERATE NEUROL
COMMUNICATION NETWORKS**

KINASES IN THESE EXTRACTS STIMULATE NEURITOGENESIS IN THE BRAIN



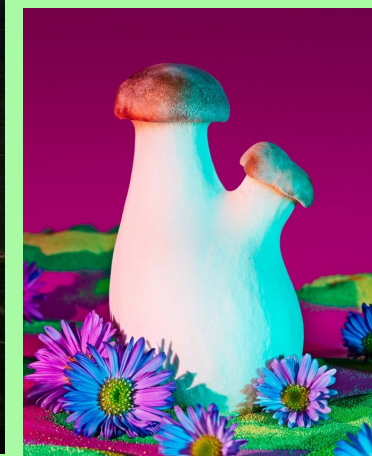
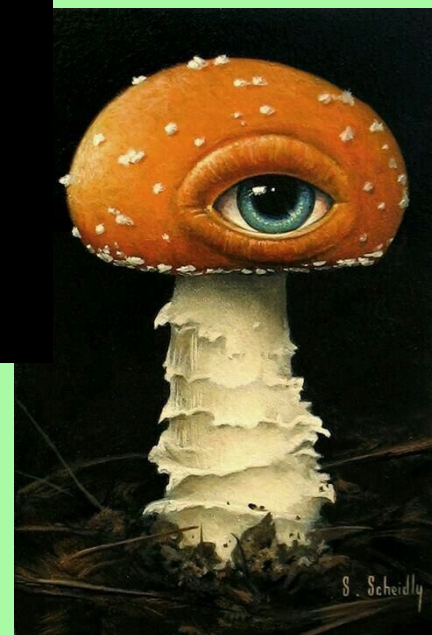
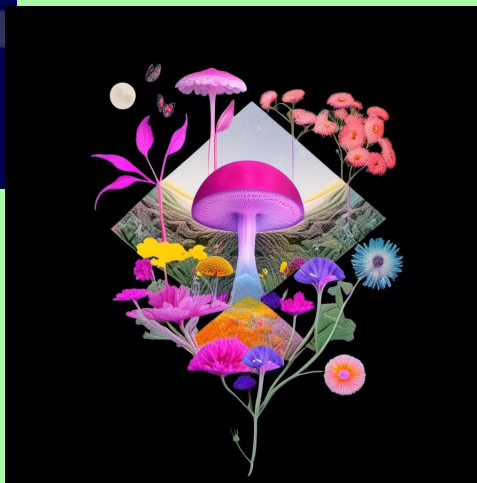
**WHY HAVE I INCLUDED THESE MARSUPIALS
HERE?
THESE SPECIES FEED EXCLUSIVELY ON
MUSHROOMS**



Southern Brown Bandicoot, Royal Botanic Gardens, Cranbourne ©2004 rnr.id.au



FUNGAL MERCHANDISING





**THANK YOU AND HOPE
YOU LOVE MUSHROOMS**



**David Attenborough BBC
Mycena subcyanocephal
smallest mushroom, 1mm tall
Tropical Taiwan**





EMERGING DISEASES

WHO Critical Priority Group fungal pathogens:

Cryptococcus neoformans, *Candida auris* and *Aspergillus fumigatus*

Fungi leading causes of infectious disease mortality, resulting in more than 1.5 million deaths every year

Aspergillus fumigatus is an environmental fungus that kills in the region of 1 million people each year

OTHER FUNGI EMERGING AS POTENTIAL DISEASES IN HUMANS

Candida glabrata

FUNGAL RESISTANCE

Fungicides and antifungal drugs costs projected to exceed \$16 billion by 2023.

1. Tuberculosis (TB) the world's deadliest communicable diseases: approximately 10.6 million people fell ill with TB in 2021.
2. An estimated 1.4 million TB deaths among HIV-negative people in 2021
3. Problem is increased multidrugresistant TB (MDR-TB), a form of TB caused by bacteria that do not respond to isoniazid and rifampicin.

FUNGAL RESISTANCE

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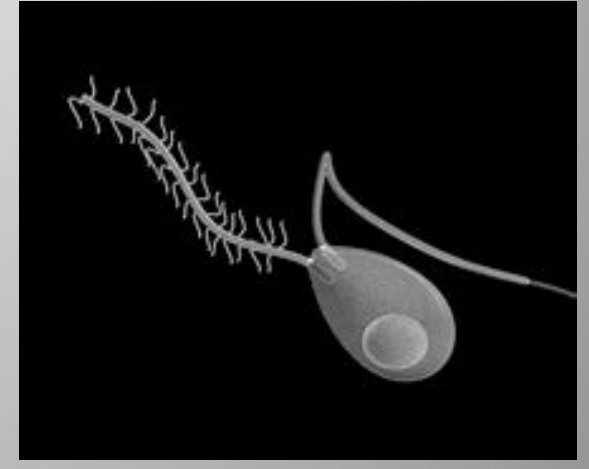
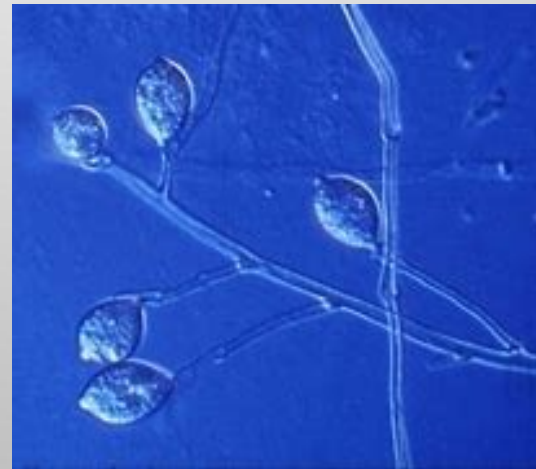
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- 2. An estimated 1.4 million TB deaths among HIV-negative people in 2021**
- 3. Problem is increased multi drug resistant TB (MDR-TB), a form of TB caused by bacteria that do not respond to isoniazid and rifampicin.**

BAD GUYS

HUMAN AND ANIMAL PATHOGENS

PATIENT SUFFERING FROM PYTHIOSIS: A WATER BORNE DISEASE
FOUND IN RICE FARMS IN THAILAND

THERE IS NO CURE JUST AMPUTATION OF AFFECTED PARTS
Causative agent is the oomycete fungus *Pythium insidiosum*



FUNGI CALLED SAPROLEGNIA
ALSO CAUSE MORTALITY OF
FISH



ALSO MICROSPORIDIA
WHICH ARE
BASAL FUNGI
WITH SMALL
GENOMES