

# (Wild) Mushrooms

As a source of medicinals  
and food supplements

Leo van Griensven

# Perception: medicine or drug



African, 9000 yr BC



Hellenic, 1500-500 yr BC



Maya, 1500-500 yr BC



Aztec, 16th century



Netherlands, 20th century

# A few "medicinal" mushrooms



*Agaricus blazei*  
(= *brasiliensis*)



*Ganoderma*, Ling Zhi



*Coprinus*, Ink Cap  
Shaggy Mane



*Grifola frondosa*  
Maitake



*Cordyceps militaris*



Shiitake



*Trametes*, *Coriolus*  
Turkey Tail



*Phellinus linteus*



Chaga (*Inonotus obliquus*)

Sterile conk trunk rot of birch, *Inonotus obliquus*



The corpse of Ötzi, the snowman, was found in the mountains of South Tirol in 1991. He originates of the stone age (appr. 3000 BC) and was naturally mummified. He carried some tinder with him,.....or was it medicine ?



Ötzi's tinder

Chaga 2000 AC

## Antioxidant activity

## TE activity/100 grams

Ascorbate

442,000

Trolox

400,000

Vitamin E

201,000

Chaga alc. extr.

200,000

Blueberries

3,300

Raisins

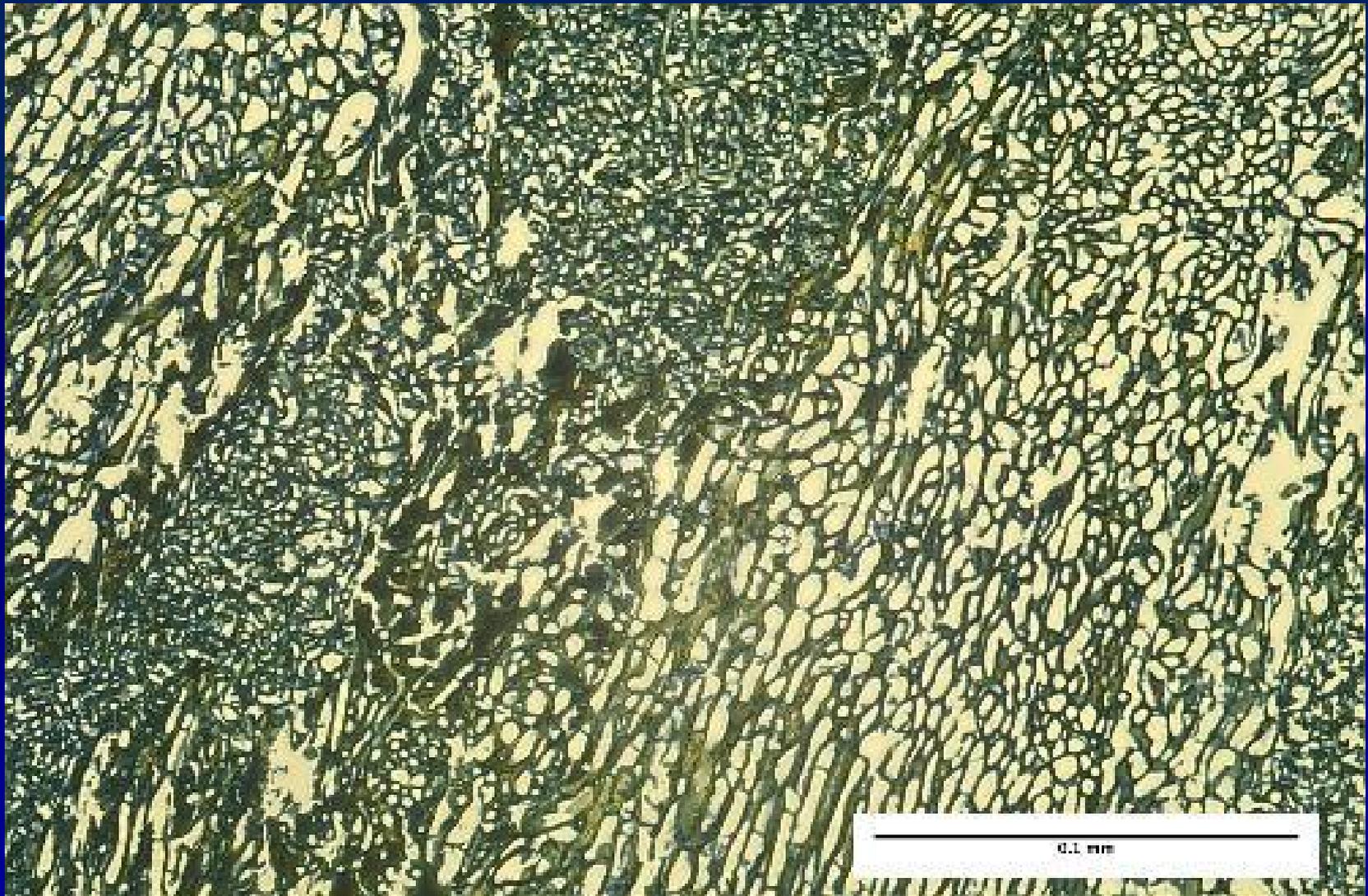
5,900

Red Beans

11,500

Red Cabbage

1,000



LM structure of Chaga conk



Kamo, T., M. Asanoma, H. Shibata & M. Hirota, 2003. "Anti-inflammatory lanostane-type triterpene acids from *Piptoporus betulinus*." *Journal of Natural Products* 66(8): 1104-1106.

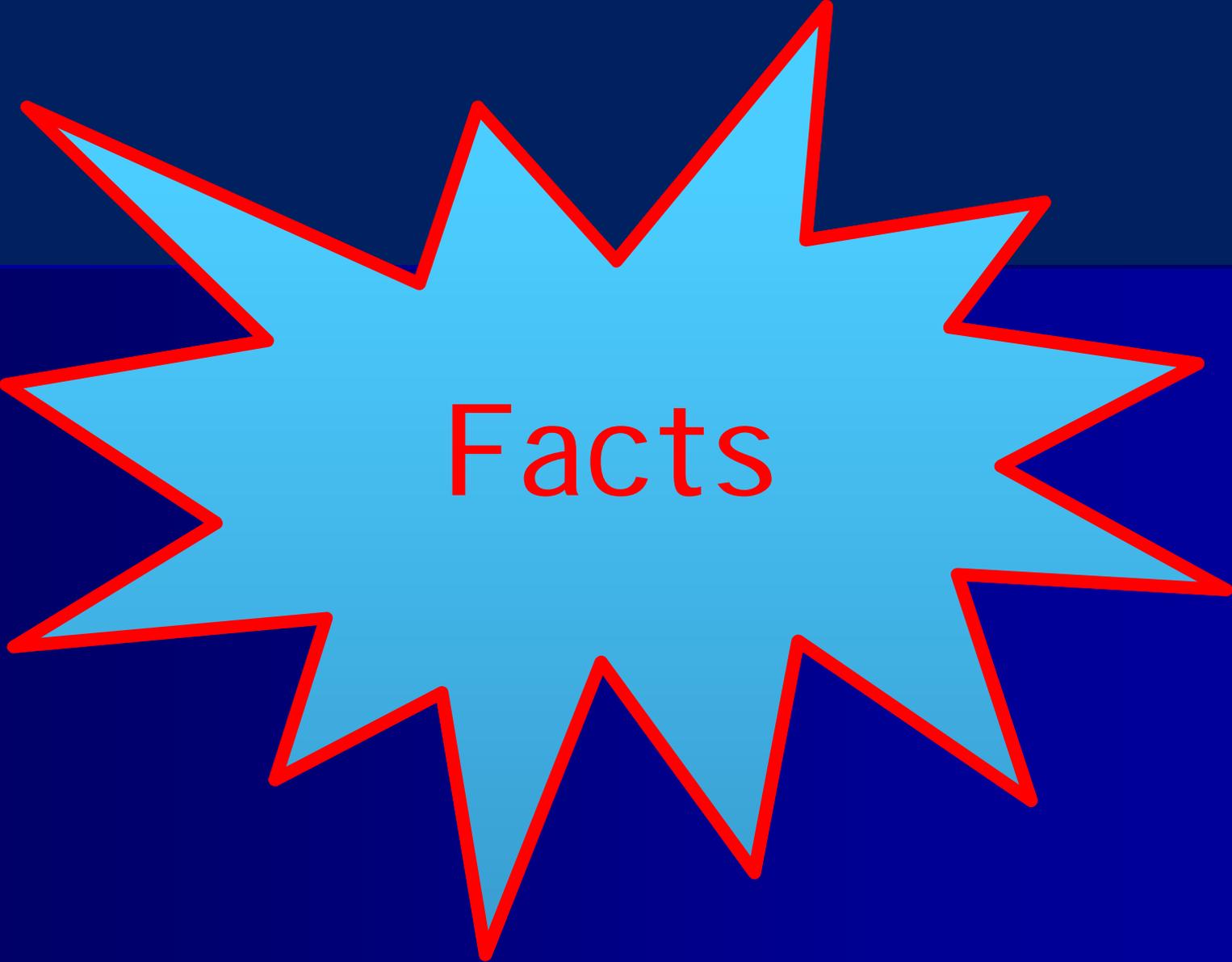
Schlegel, B., U. Luhmann, A. Hartl & U. Grafe, 2000. "Piptamine, a new antibiotic produced by *Piptoporus betulinus* Lu 9-1." *Journal of Antibiotics* Sep; 53(9):973-4.

Pisha, E., H. Chai, I.S. Lee, T.E. Chagwedera, N.R. Farnsworth, G.A. Cordell, C.W. Beecher, H.H. Fong, A.D. Kinghorn & D.M. Brown, 1995. "Discovery of betulinic acid as a selective inhibitor of human melanoma that functions by induction of apoptosis." *Nature Medicine* Oct;1(10):1046-51.

# Facts. Numbers prevail



Allopathy: evidence based medicine  
Evidence requires "numbers"



Facts

# In rats and mice it has been proven that

Mushroom polysaccharide extracts contain:

Carbohydrates, Polyphenols, Triterpenoids, Proteins, Peptides.....

that cause various activities *in vitro* and *in vivo*: prebiotics, antibiotics that regulate intestinal flora, immunomodulators that activate defense and balance inflammation processes, pro- and antioxidants, signaling compounds, transcription regulators.....

and of which detailed knowledge is only limited.....

# Animal studies

## ■ Cancer survival in mice

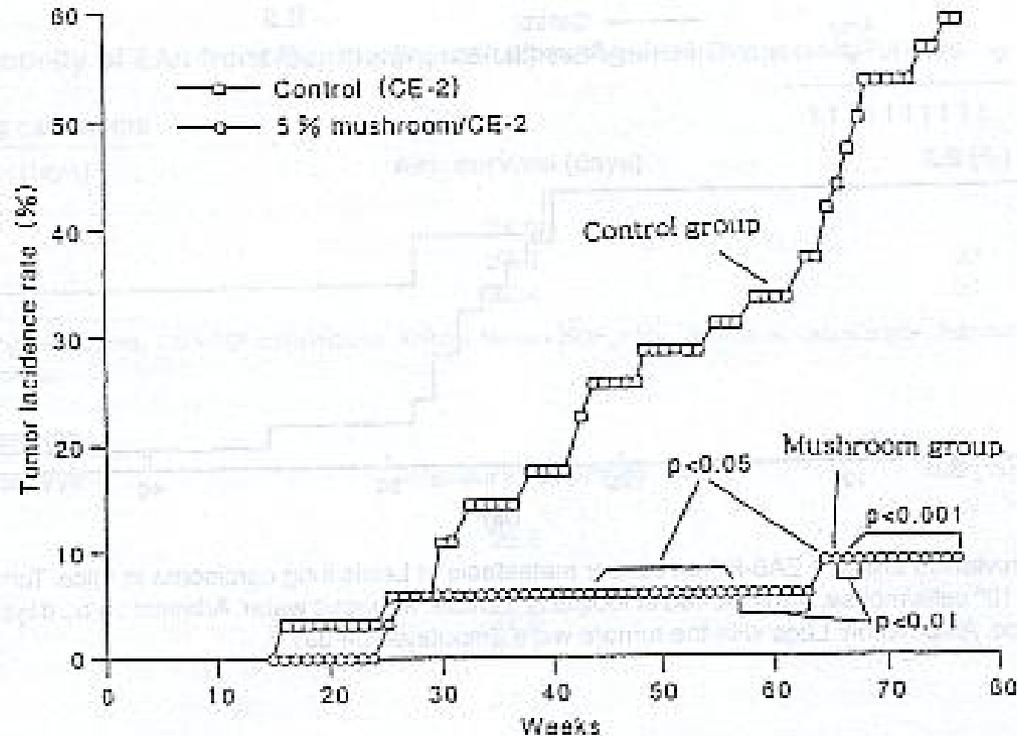


FIGURE 3. Cancer preventive effect of intake of an edible mushroom, *Hypsizygus marmoreus*. Animal: female DBA/2 mouse. Carcinogen: 20-methylchoranthrene, i.d. injection. Statistical analysis: Chi-square test of incidence.

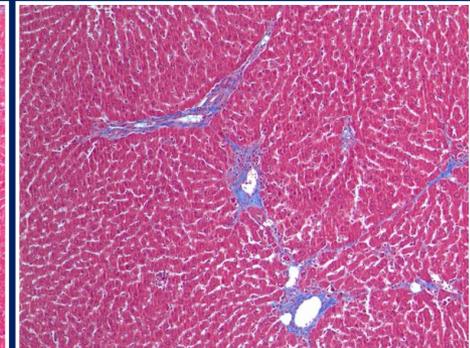
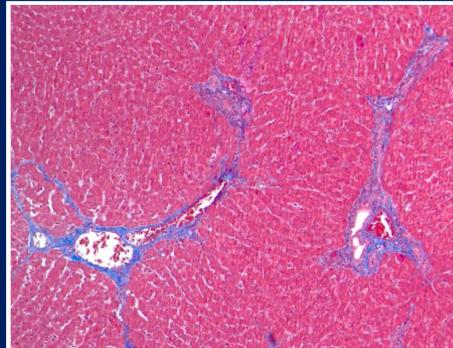
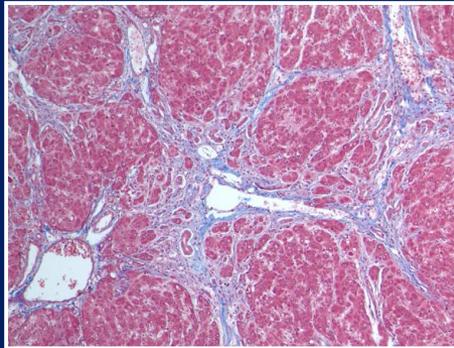
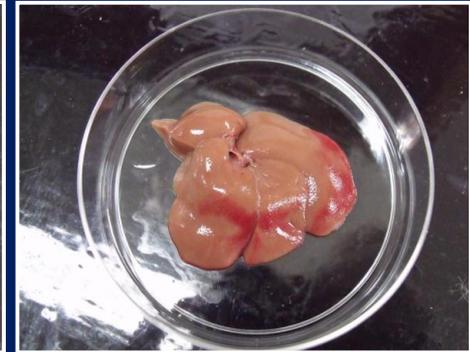
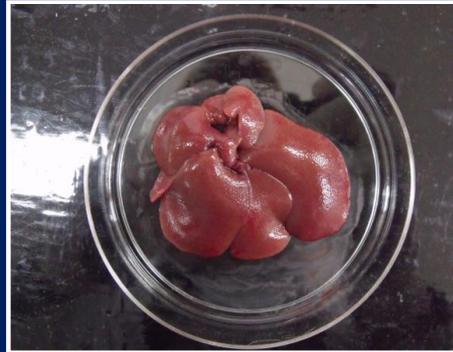
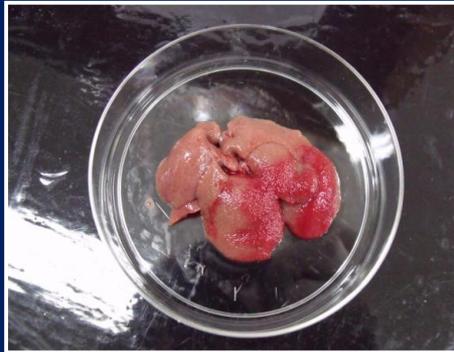
Ikekawa T et al. Chem Pharmac Bull 1992,  
40(7):1954-7.

# Liver fibrosis in rat

TAA control

TAA +  
polysaccharide

TAA + alc extr

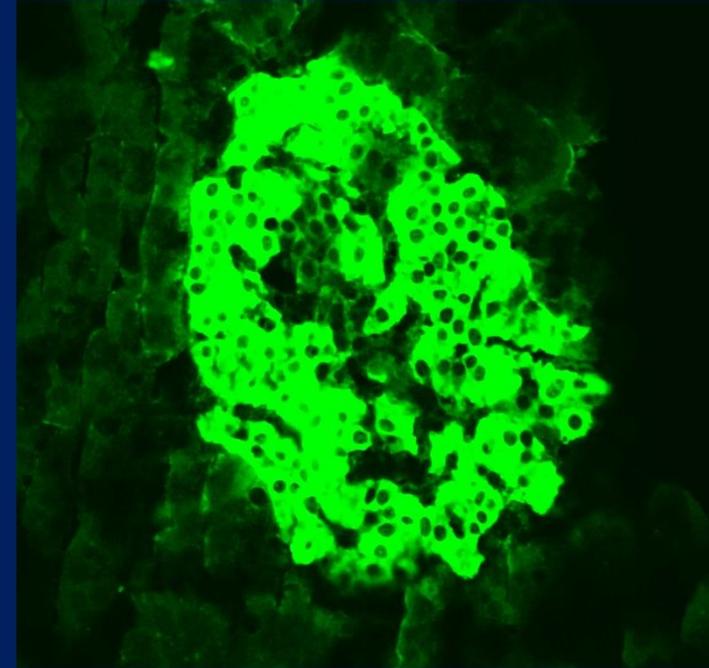
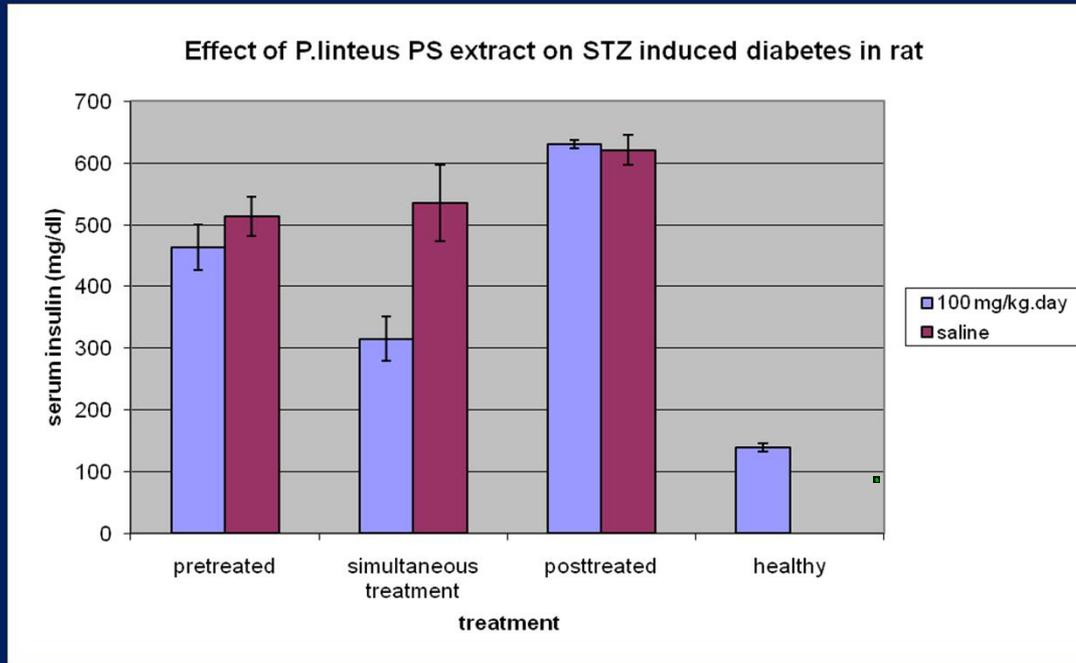


Induction of fibrosis: TAA 100 mg/kg ip, every 3 days, 8 times

Mushroom extracts: 50 mg/kg/day, po

PLP; *P. linteus* polysaccharide, PLT; *P. linteus* ethanol extract

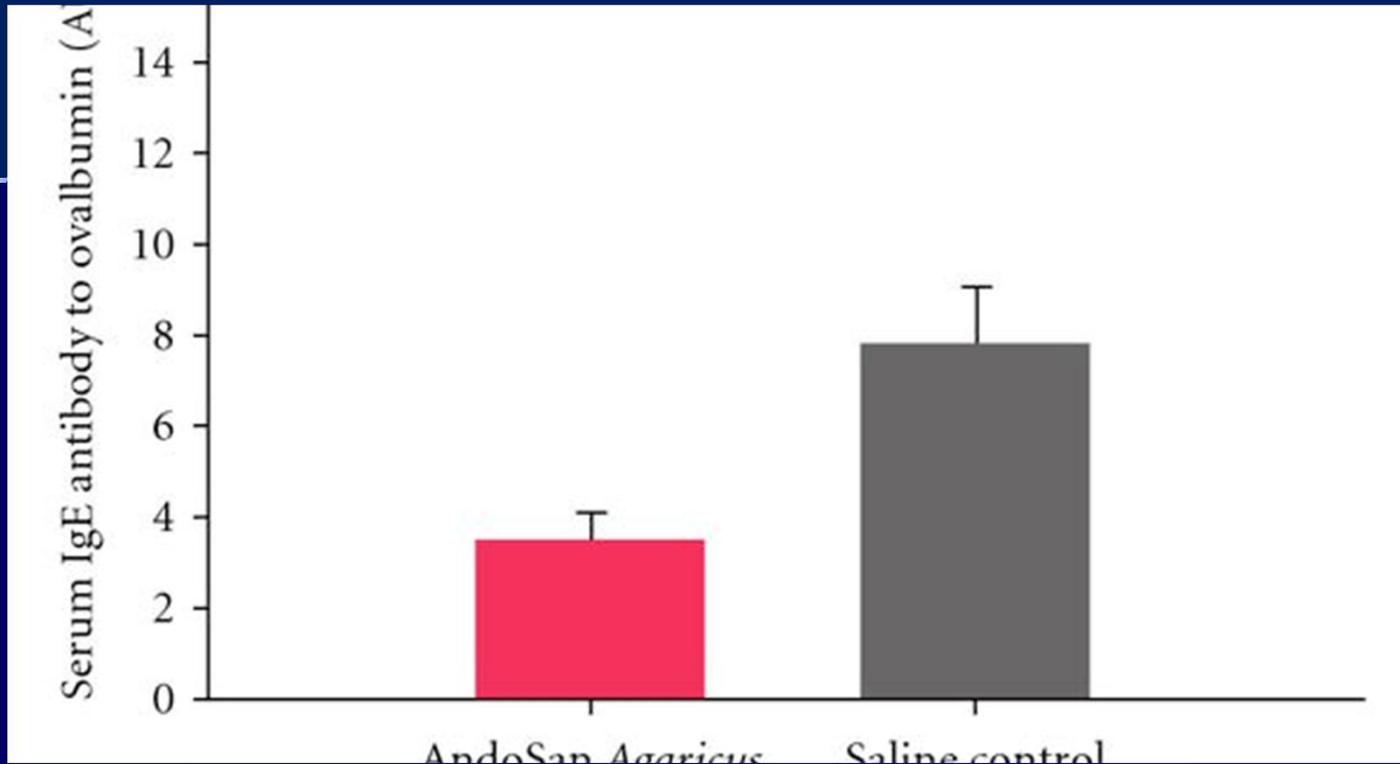
# Symptom suppression of STZ induced diabetes in rat



Insulin staining in Langerhans islets of rat pancreas

M.Yamac, G. Kanbak, M. Zeytinoglu, H. Senturk, G. Bayramoglu, L.J.L.D. van Griensven. Pancreas Protective Effect of Button Mushroom *Agaricus bisporus* (J.E. Lange) Imbach (Agaricomycetidae) Extract on Rats with Streptozotocin-Induced Diabetes Int J Med Mushr 20109, 12(4) 379-389.

# *A. blazei* extract is active against allergy



The mushroom extract protected against IgE-mediated allergy in a mouse model when given p.o. either before or after ovalbumin s.c. sensitization of the animals.

# And in humans ??

Turkey Tail (*Coriolus versicolor*)  
showed significant therapeutic  
effects in combination with surgery  
and chemo/irradiation

# A meta-analysis published in 1994

- Efficacy of immunochemotherapy as adjuvant treatment after curative resection of gastric cancer. Study Group of Immunochemotherapy with PSK for Gastric Cancer.
- Nakazato H, Koike A, Saji S, Ogawa N, Sakamoto J. Yokoyama Gastrointestinal Hospital, Japan Lancet. 1994 Jul 23;344(8917):274.
- **Abstract**
- In Japan the standard adjuvant treatment after resection of gastric cancer is intravenous mitomycin plus oral fluorouracil. We have assessed the efficacy of protein-bound polysaccharide (PSK) in addition to standard chemotherapy in patients who had undergone curative gastrectomy at 46 institutions in central Japan. 262 patients were randomly assigned standard treatment alone or with PSK. The minimum follow-up time was 5 years (range 5-7 years). **PSK improved both the 5-year disease-free rate (70.7 vs 59.4% in standard treatment group,  $p = 0.047$ ) and 5-year survival (73.0 vs 60.0%,  $p = 0.044$ ).** The two regimens had only slight toxic effects, consisting of nausea, leucopenia, and liver function impairment, and there were no significant differences between the groups. The treatments were clinically well tolerated and compliance was good. Addition of PSK to adjuvant chemotherapy with mitomycin and fluorouracil is beneficial as treatment after curative gastrectomy

*Agaricus blazei* Murill protects against  
allergy, colitis ulcerosa and Crohn's disease.

Patient studies as well as lab work that corresponds  
with our own results

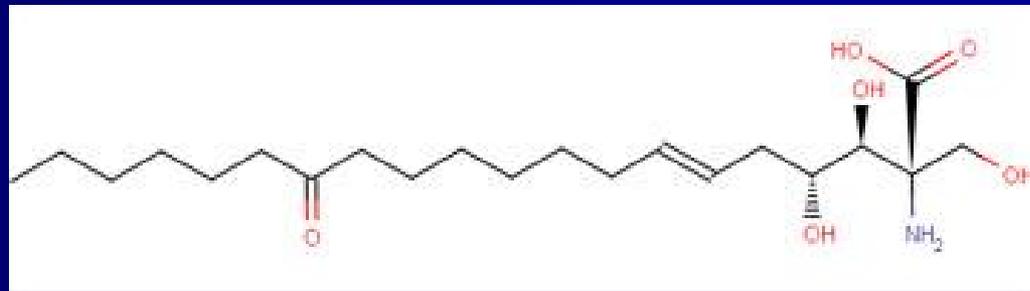
Still: very very little glucan + secret component  
Mesalazine use in patient group (anti-inflammation)

K. Ellertsen and G. Hetland, "An extract of the medicinal mushroom *Agaricus blazei* Murill can protect against allergy," *Clinical and Molecular Allergy*, vol. 7, article no. 6, 2009.

The present best therapy for MS is with fingolimod (miriocrin) which is from *Isaria a*



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10-100 X STRONGER THAN  
CYCLOSPORIN

# Case reports

# Psoriasis patient treated by high dose of *P. linteus* extract

" I interviewed him a week ago before we took the pictures. According to him: The symptom started 3 years ago. He never had this before. He think that stress is the factor. He tried every medication - Western, Chinese, etc. without any improvements whatsoever. It became so bad and it's so itchy that he cannot sleep at night. He even tried to tie his own hands before going to bed, but to no avail. Six months ago he stopped all medication and took only the Gold program, and achieved drastic results."



# Chances

- From Cash Crop to Superfood
- Health Food, Supplement and Medicine

# Nutritional Value per 100 g

## Mushrooms

## Meats

■ Energy	27 kcal	200-500 kcal
■ Carbohydrates	4.1 g	1 g
■ Fat	3.1 g (MUFA+PUFA: 85%)	6-40 g (MUFA+PUFA: 35%)
■ Protein	1 g	25 g

Strong antioxidants

High fiber content i.e. polysaccharides

Vitamins

Minerals + trace elements

# A major challenge: the market

## Market study: Mushrooms as health food

### Findings:

Customer has no knowledge nor interest. If told, positive attitude, but no commitment. "Health" is qualifier.

Supplements and health foods have negative image...artificial...

**Market is not ready**

### Advice:

**Use push strategy. Inform and advise the customer.** Preferably through learned intermediates. Teach the teachers. Tell facts.

A major challenge:

Can mushroom derived medicines or supplements be brought on the European market ?



What are the requirements ?

# EFSA

EFSA is considered the biggest hurdle in obtaining EU health claims today. EFSA routinely rejects health claim petitions, often citing a lack of scientific data—and immune-support health claims are no exception.

1. All foods and all food components need to be safe
2. All health claims need to be assessed by independent scientific support
  - Is the food defined ?
  - Is the claimed effect defined ?
  - What is the evidence ?
3. If conclusions positive EFSA advises the European Commission to authorize the claim



efsa

- 2010: - Lentinan is safe at 50ug/kg.day
- 2011: - Oat resp. barley glucan contribute to normal blood cholesterol
- Yeast glucan has no effect on immune response
  - Aspergillus cell wall chitin-glucan is safe
  - Glucan caused reduction of inflammation not proven
  - Glucan caused health effects not proven

Where are the chances ?  
What will the future bring ?



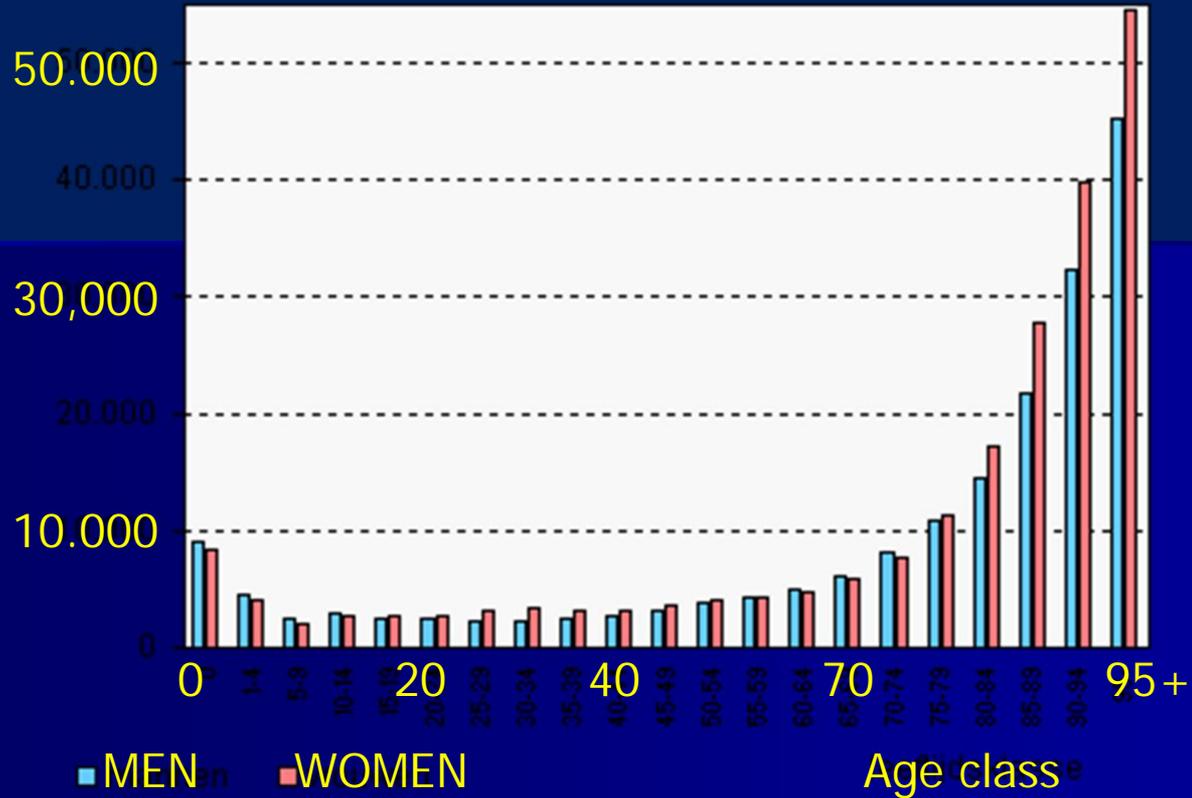
# Background

- Our life expectancy

	2010	2030
■ Women	82.7 y	90 y
■ Men	78.8 y	88 y
■ Costs of care	90 G€	>200 G€
■ GDP NL	13%	22 %
■ Cost coverage		
■ (% family income)	23.5	47

# Annual costs of health care p.p.

kosten per inwoner (euro)

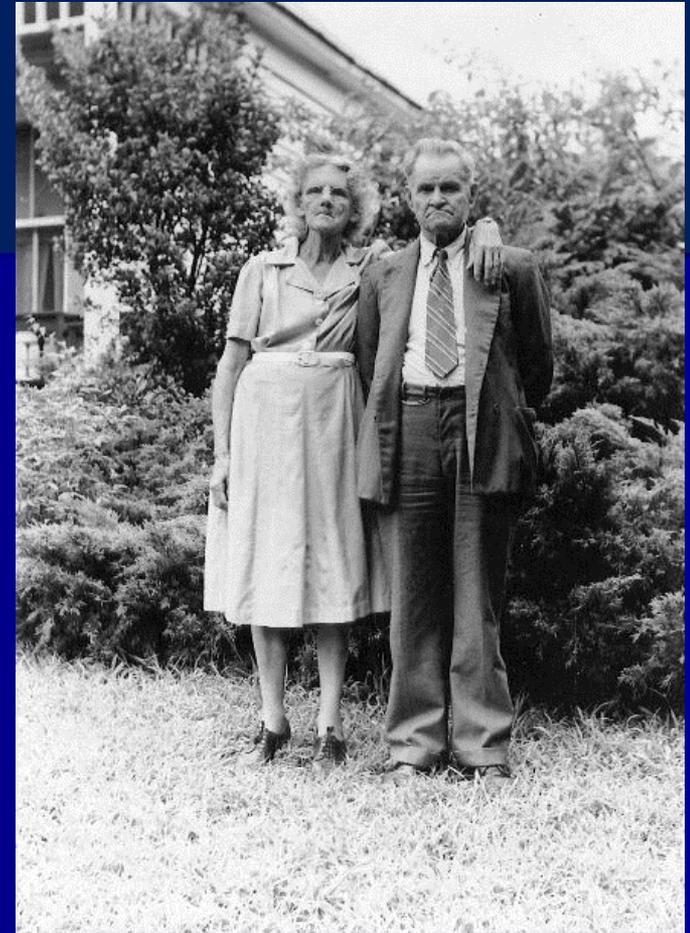


Solidarity may find its end

Either insure, save .....

or

live healthy



# We all know what does it

- Exercise
- Balanced diet
- **SUPERFOODs** combine nutritional value with health stimulating properties



A major chance but also major challenge

What makes the consumer to believe ?

Push: Teach & Repeat the message

Could science become a marketing tool ?

The best argument possible: facts !



# The message.....

Mushrooms are a superfood, they help to prevent disease and to remain healthy.

# The lesson of the red fruit

“There may be positive short term results from nutrition/health marketing (i.e. science facts ), but expectations must be tempered. The real value may be in **the long term** “

Dr. John L. Stanton  
Professor and Chair Dept. of Food Marketing  
St. Joseph's University Philadelphia



# What to do ?!

- Prove health effects *in vivo*, “super sales argument” for superfood. Joined research in translational medicine: from bench to bedside



Challenge:  
Push, create  
market

# Your chances ?

Health products straight from nature

- Blueberries, strawberries.....
- Bee products: honey, propolis.....
- Mushroom products: supplements.....
- Wood products: tannins, resins....

# Your challenge ?

Create demand and develop the  
market

Thank you much for your attention