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Dilemmas of Practice

A TCM Perspective on Mushroom Nutrition: *Hericium erinaceus* and *Trametes versicolor* (synn. *Coriolus versicolor*) as a synergistic combination for nourishment of both brains

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ABSTRACT

Mental abilities and cognitive functions are generally associated with the brain in our skull. But there exists yet another system of neurons: governing the function of the gastro-intestinal (GI) tract recently gaining the name of a 'second brain'. Evolutionarily and historically, behind the formation and function of our organs was always the food we ate. Food chosen with respect to its innate characteristics is ready to serve as the most natural protective and corrective factor even today. Wholesome food can be distinguished through different approaches of modern research, traditional use and personal preferences. The more criteria taken into account, the more vivid the solutions. Multilateral approaches to individualised nutrition can provide elegant and long-term supportive strategies to the dynamic of health. With respect to mental abilities and cognitive functions, promising added value can be brought to the diet through the mushrooms lion's mane (*Hericium erinaceus*) and turkey tail (*Trametes/Coriolus versicolor*).

Keywords: mental abilities, cognitive functions, neuroprotection, nootropics, cognitive enhancers, herbal medicine, natural products, edible mushrooms, mushroom nutrition, mushroom biomass, mycelium, primordia, lion's mane mushroom, hedgehog mushroom, pom pom mushroom, pom pom blanc, *Hericium erinaceus*, *hou tou gu*, turkey tail mushroom, *Trametes versicolor*, *Coriolus versicolor*, *yun zhi*, integrative medicine, traditional Chinese medicine, TCM, CAM, oriental medicine.

INTRODUCTION TO MUSHROOM NUTRITION

Decline in both mental and cognitive function is a compound issue. It does not happen overnight. That is great, as there is plenty of time to do something. But at the same time, changes are so subtle and so distributed in time, that early recognition of warning signals is often missed. We also understand, that mental and cognitive functions are intertwined with the rest of our system.

From the integrative care point of view, it is important to stress and understand the utmost difference between the *modus operandi* of modern science, as represented by exposition to pharmaceutically produced specific drugs (molecules), contrary to

that of the *modus operandi* of holistic approaches, as represented by non-specific intervention through food, but also lifestyle, mental hygiene and rest.

Drug development is derived from a scientific process that looks for the silver bullet of one active principle (often just one molecule) to produce a desired action in a carefully specified area. In other words, you need a target; if you have it, results can be tremendous. But without a target, as well as with too many targets at once, this whole approach becomes literally aimless.

From a single bullet one would also not expect the capacity to bring peace and harmony to myriads of interactions. This is the domain of non-specific interventions. In short, our immune system has both specific and non-specific immune mechanisms. (Zemskov et al., 2019) Aside from surgery, our Western healthcare system is built around specific immune responses: prescription drugs and vaccines being paramount. It is hard to find within the public healthcare system an adequate counterbalance praising the non-specific immunity, such as balneology, psychotherapy, lifestyle counselling, and last but not least informed choices in what we eat several times a day which can become a major tool full to promote our health (or at least not encumber it too much).

Diet in the general population is heavily based on the Plantae and Animalia kingdoms¹. Should we accept the thesis that a varied diet can provide appropriate quantities of nutrients as postulated in the EU legislation (Council regulation, 2006/1924/EC), there still remains unanswered the biggest question, what a varied diet means by itself and in relation to an individual.

Without any further advice to draw from EU legislation, citizens are left to their own conclusions, responsibilities and beliefs, including cultural, faith based and worldview considerations. Living organisms are taxonomically grouped together based on their similarities. To achieve a desired higher variety in our nourishment, i.e. with as broad a range of active principles as possible, simply means including in the diet the widest possible scope of edibles. Now is the time to put into our mouths a whole new kingdom² – the kingdom of mushrooms/fungi.

Direct neuroprotective effect is attributed by sound modern clinical research to *Hericium erinaceus* and *Trametes/Coriolus versicolor*, two mushrooms with evidence of traditional use from China and in Chinese medicine. The aim of this article is to provide key attributes both from a modern and traditional perspective and to outline synergistic benefits when combined.

Mushroom nutrition and microbiome

Microbiome-modulated metabolites, derived from nutrition- and environmental-related sources, are endogenously produced and modulated by the host and its microbiota are at the interface of the immunity. (Blacher et al., 2017)

It is obvious, that we should pay bigger attention to food, how it interacts with our microbiome, especially gut microbiota, as its composition and activity are under the influence of numerous factors and is found to be affected in a vast number of pathological situations. The influence of the gut microbiota extends to the brain, through the 'gut-brain axis'³. (Cani et al., 2017) Gut dysbiosis can lead to altered brain functions and mental illnesses. (Rogers et al., 2016)

To our 'integrative eyes', it seems, that when the microbiome studies move from biologists to more health-oriented research, scientists cannot resist applying very outdated reductionism. Only really complex methods of scientific research should be applied, because without a doubt, we are not dealing with single or multiple targets, we are dealing with a complex 'community'.

On the other hand, once we acquire a tool to deal with the microbiome in its complexity, complex results can be obtained. For example, when addressing metabolic syndrome, a practitioner can never have a simple solution from a 'silver bullet' or single molecule intervention.

The more complex the signals we get in metabolic syndrome, the more complex the solution which must be taken. However, complex solution does not need to be complicated. We need to better understand the full potential of food and how to supplement to get a healthy outcome. The elegance is that food is already complex, especially when as natural as possible.

For example, do we understand, that preservatives in food are continuing to do their preservation in the microbiota with no beneficial effect? (Chassaing et al., 2015) Are prescribing doctors aware, that not only are 78 per cent of antibacterial drugs inhibiting one or more human gut bacteria species, but also that at least a quarter of non-antibiotic medications do the same? (Maier, 2018) In sum, institutions responsible for food safety could better inform the average citizen of the combined effect of long-term everyday exposure to pesticides residues, preservatives and medicinal drugs on their microbiome.

Being more informed on food health attributes and food safety is beneficial not only for individuals but also for the whole of society

as well as providing cost reduction within the healthcare system. More attention should be paid to what nature has to offer, what the possibilities of intervention are through edibles. Mushroom nutrition is worth researching, as it can provide a promising impact on microbiota and has a potential for preventative healthcare. (Ferrão et al., 2017)

Mushroom nutrition as a material

Mushrooms spend more than 90 per cent of their life cycle in the mycelium. They spread by growing the mycelium and can multiply when the mycelium is divided. What we commonly perceive as mushrooms, is another way of reproduction: fruiting bodies with spores. Mushrooms cannot produce energy through photosynthesis, so the mycelium is able to actively acquire or produce extracellular compounds and metabolites that promote the longevity and vitality of the living mushroom.

It is likely that the potent enzymatic and reactive oxygen species (ROS) detoxifying properties of mushrooms are due to the harsh environments colonised by mushroom mycelia with high concentrations of free radicals that the mushrooms have to protect themselves against. (Karmali, 2004)

In this context it is worth noting that many of these enzymes are found almost exclusively in the mushroom mycelia and hence preparations derived from the fruiting bodies of mushrooms are likely to be missing some enzymes or have far lower levels of enzymatic activity than those derived from mushroom mycelia. (Karmali, 2013)

When mushroom nutrition is processed carefully, enzyme activity can stay preserved. As enzymes are proteins, they are sensitive to heat (>40°C).

Role of some enzymes present in mushrooms: (Karmali, 2013)

- I) Enzymes that prevent oxidative stress: Laccase, Superoxide dismutase (SOD)
- II) Enzymes that inhibit cellular growth: Protease activity, Pyronase activity/Glucose 2 oxidase, Glucoamylase/Beta-glucanase activity
- III) Enzymes that promote detoxification: Peroxidase activity, Cytochrome P-450 activity

Oral administration of these enzymes contributes to the reduction of chronic toxic overload in the organism and to the optimisation of the following:

- balance of pH levels: blood and extracellular matrix
- removal of toxic substances
- recovery of intestinal bacterial balance (biota balance)
- enhancement and balance of the immune system
- improvement in cell metabolism

To broaden the spectrum of active ingredients, it is possible to obtain simultaneously from one crop both mycelium (spawn) and primordia (young fruiting bodies), which further broadens the spectrum of active ingredients. This is called mushroom biomass.

There is ongoing debate, between those believing in mushroom extraction and further concentration of active principles, or even modifying mushrooms artificially, who argue that this is better than a mushroom biomass. 'The more, the better' paradigm, where attention is focused exclusively on one biomarker, such as mushrooms' beta glucans. As naturopaths we give value to natural context of ingredients, natural ratios of different substances, and perceive that when we concentrate something, something else is lost.⁴

As supporters of holistic medicine, we seek balance, equilibrium. We need to understand the nature of the substance. Such 'understanding' is impossible with extracts: which meridians do they enter according to TCM, what are their taste and thermal properties, there is also no honest answer to suitability of any extracted beta-glucan to a particular condition, for example Damp-Heat.

We believe that present-day complex multicomponent and composite diseases, particularly lifestyle diseases, cannot be successfully treated by 'some kind of' (one or more) isolate(s). The power of natural medicines really lies in understanding the use of complex natural ingredients (whole parts of plants or mushrooms) whose specific health-promoting properties have been investigated and verified by many generations. Mushroom biomass can serve as a source of enzymes in the natural context of other ingredients. Edible fungi are super verified, as they have been with us since the dawn of history (unlike many foods we deem well-established). It is always amazing, how much can be done, when one returns to the roots.

Mushrooms – modern research

In our view as authors and lecturers, we have utmost respect for modern science as it deepens our understanding of the substances. But as clinicians, we can see every day that extrapolation from the shards of knowledge provided by modern science to the individual person seeking our advice is very often almost impossible without concurrent use of some holistic approach.⁵

a. Research on mushrooms in general

The group of mushrooms, for which terms like nutritional mushrooms, mushroom nutrition or even medicinal mushrooms are widely used, is huge with lot of interesting candidates. Their availability can be limited in those EU countries that choose to apply Novel Food legislation (Council regulation, 258/97, 2015/2283/EU) beyond original legislators' aim. Globally, about 10-25 different species are well established in use and production. (Valverde, 2015)

The majority of nutritional mushrooms contains all eight essential amino acids and have fascinating content of macro, micro and trace elements. Great interest is attracted by their high content of polysaccharides that support immunity and are mostly used preventively or as adjuvants, and also curatively as immunomodulators in different treatments. Laboratory research and clinical studies affirm traditional usage of mushrooms and even new fields of application have been published. (Lindequist et al., 2005)

Predominantly important is the high content of polysaccharides (Wasser, 2002), big and branched molecules, which are created out of smaller saccharide units. Polysaccharides have been studied since the 1950s. Results of these studies are showing that these molecule structures have strong anticancer and immunostimulant effects. (Waldron et al., 1993) These giant molecules are similar to molecules in the cell membrane of bacteria. Heteropolysaccharides stimulate the immune system by initiating reactions, e.g. increasing cytotoxicity of macrophages against cancer cells and enhancing production of interleukin-1 among others. Antitumour polysaccharides intensify cytotoxicity of natural killer cells (NK cells) as well as of T-lymphocytes.

Besides polysaccharides, mushrooms are rich in enzymes. Several mushrooms have been shown to contain substances which mimic SOD activity and the 'P450' cytochrome enzyme system has also been found in some higher basidiomycete fungi. Other enzymes present in clinically used mushrooms include laccase, glucose oxidase and peroxidase. (Karmali A, 2004)

Summarised, mushrooms are viewed as antimutagenic adaptogens and are used mainly for specific polysaccharide and enzyme content.

b. Research on *Hericium erinaceus* with regard to cognitive functions

- Nerve growth, regeneration, protection
 - activation of peripheral nerve regeneration (Wong et al., 2016)
 - protective effect against oxidative stress and apoptosis induced by di(2-ethylhexyl)phthalate (DEHP), a plasticizer known to cause neurotoxicity (Amara et al., 2020)
 - neuroprotective effect after pilocarpine-induced status epilepticus (Jang et al., 2019)
 - protective effect against ischaemia-injury-induced neuronal cell death (Lee et al., 2014)
- Brain functions: Recognition & memory
 - there is emerging evidence, that active principles from *Hericium erinaceus* could pass through the blood-brain barrier (Ryu et al., 2018)
 - recognition memory improvement and inducing hippocampal and cerebellar neurogenesis during ageing (Ratto et al., 2019)
 - prevention of the impairment of spatial short-term and visual recognition memory in an Alzheimer model (Brandalise et al., 2017)
 - increase in general locomotor activity (Rossi et al., 2018)
 - improvement in mild cognitive impairment (Mori et al, 2009)
- Mood: Depression from chronic stress and inflammation
 - potential benefits for depressive disorder (Chong et al., 2020)
 - reduction of depression and anxiety (Nagano et al., 2010)
 - improvement of mood and sleep in overweight or obese patients (Vigna et al., 2019)
- Gastroprotection
 - gastroprotective effects against ethanol-induced ulcers (Wong et al., 2013)

Not surprisingly, scientific papers can be grouped according to two different approaches, which illustrate the huge difference in the nature of active principles supplied by food in contrast to those by nutraceutical concentrates and extracts bordering with or already representing drugs. With food, everything is so complex and in such tiny amounts, that you need to observe and examine the whole system, great if a living one and at best a human: even here extrapolation of the results to an individual is quite challenging. On the other hand, a much bigger challenge in terms of both efficacy and safety, comes with drugs or nutraceutical bordering with drugs as defined by the production method⁶: these are much harder to extrapolate to an individual, as from the clinical point of view, grasping very detailed science about too small pieces of information (such as single constituents) is almost impossible.

For integrative care, the open access review article (Chong et al., 2020) is quite interesting, as it describes highly desired activities of *Hericium erinaceus* in chronic stress and inflammation, which corresponds well with the holistic Chinese medicine view of reducing inflammation (*xiao yan*) and the context of visceral agitation (*zang zao*) – see further in Traditional section.

c. Research on *Trametes/Coriolus versicolor* with regard to cognitive functions

- neuroprotective properties
 - redox modulation of cellular stress response and lipoxin A4 expression with the relevance to possible Alzheimer's pathogenesis (Trovato et al., 2016)
 - increased neurogenic reserve as the brain ability to manage different challenges and to be resilient to neuropathology (Ferreiro et al., 2018)
 - improves Meniere's biomarkers and symptom scores (Scuto et al., 2019)
- broad antiviral properties (Brandt et al., 2000), (Linnakoski et al., 2018)
 - HSV: herpes simplex virus (Krupodorovat et al., 2014)
 - HPV: human papilloma virus (Couto, 2006)
 - EBV: Epstein-Barr virus (Martinez, 2002)
- immunomodulation
 - chronic fatigue syndrome (Monro, 2004)
 - Cytokine Th1/Th2 shift (Monro, 2005)
 - review of health benefits of edible mushroom *Coriolus* (Cruz et al., 2016)
- microbiome – prebiotic activity
 - prebiotic activity (Cruz et al., 2017)

d. Research on the combined effect of *Hericium erinaceus* and *Trametes/Coriolus versicolor* with regard to cognitive functions

Everyone should pay increased attention to their own lifestyle during so called middle age, as the metabolic syndrome (obesity, hypertension, hyperlipidemia) are important contributors

to later dementia. Dementia can be caused by:

- 1) Cerebrovascular diseases (silent stroke, micro-infarcts, arteriosclerosis)
- 2) Traumatic brain injury (TBI)
- 3) Hypertension
- 4) Alzheimer's disease (AD) – most common cause of dementia

Further risk factors for dementia development are unhealthy diet, alcohol abuse, smoking and diabetes. Among protective factors are diet, education, physical activity, cognitive and social activity. Supplementation with both mushrooms may inhibit oxidative and cellular stress responses which are linked to the onset of dementia. (Calabrese et al., 2017; D'Amico et al., 2021)

In our clinical understanding of modern research, we are identifying the following modes of action:

- 1) antiviral and antibacterial activity
- 2) enzyme and secondary metabolite activity
- 3) prebiotic activity (brain-gut axis)
- 4) balancing effects on different areas (incl. Th1/Th2 shift)
- 5) maintaining homeostasis (dynamic state of health equilibrium)

Given the nature of the mushroom as unaltered natural food, consumers can benefit, as their immune system has the freedom to use anything from the plethora of offered and even overlapping modes of action. From this point of view, *Hericium erinaceus* and *Trametes/Coriolus versicolor* separately or even better in combination, can be used almost unreservedly as part of the nutrition, serving as nootropics (cognitive enhancers).

Concurrently, again due to the complex nature of unprocessed food (or processed as little as possible), many observed, either concurrent or pre-staged conditions, might be addressed by the combined effect as well: a broad spectrum of conditions with diminished levels of energy (ATP) ranging from depression to chronic fatigue syndrome, metabolic syndrome, low neurogenic reserve, inadequate sleep or low-quality sleep, internal and external stress, etc.⁷

MUSHROOMS – CHARACTERISTICS AND TRADITIONAL USE IN CHINESE MEDICINE (TCM)

Immunity is a complex thing from both a Western medicine and TCM point of view. The essential difference between them lays in how they approach a health assessment. To understand something, Western science needs to decompose to the tiniest bits. Contrary to TCM, which seeks corresponding parent framework for any single sign. This way is not unique to TCM, similar views can be found in other holistic approaches, but TCM excels in the length of written history, by which is also meant centuries of continuous expert evaluation.

a. TCM on mushrooms in general

Their tastes are mainly sweet (can supplement, can harmonise, can slow) or bland (can percolate, can benefit), i.e. despite being able to create effects in many parts of the body, the Earth element is always

addressed to some extent. (Simonovsky, 2012) So, the overall effect of general mushroom nutrition with regard to mental functions can be summarised by classical statements: in prosperity of Spleen-qi the Heart is coming up to nourishment (*pi qi chong ze xin de yang*) and Heart governs Spirit-Mind (*xin zhu shen zhi*).

b. TCM treatise on *hou tou gu* (*Hericium erinaceus*)

Culinary, yet rare and protected, well known to mushroom hunters under names: pom pom mushroom⁸, lion's mane mushroom, bearded tooth mushroom; in Chinese: monkey's head mushroom (*hou tou gu* 猴头菇, or *hou tou jun* 猴头菌), in Japanese: *yamabushitake* (ヤマブシタケ, 山伏茸). Chinese written history dates its culinary use back to 3rd century AD (Lu, D., 2013)

Tastes and nature: sweet, bland and balanced

Effects: benefits the five *zang* (*li wu zang*), aids digestion (*zhu xiao hua*), supplements the Spleen and fortifies the Stomach (*bu pi jian wei*), disperse inflammation (*xiao yan*), calms the Spirit (*an shen*)

Application:

- harmonisation of the middle with special attention to the Stomach, along with mild clearing of the Liver, especially in situations, when standard harmonising formulas might be still too harsh⁹:
- disharmonious Stomach (*wei bu he*); here *Hericium* works according to the classical statement, that *fu* organs are supplemented by freeing (*fu yi tong wei bu*), yet again in a very mild and balancing manner
- Liver-qi invading the Stomach (*gan qi fan wei*)
- Spleen vacuity being exploited by Wood (*pi xu mu cheng*)
- strong Stomach and weak Spleen (*wei qiang pi ruo*)
- Stomach Heat (*wei re*)
- Spleen-qi deficiency (*pi qi xu*), namely without Dampness
- digestion disturbances, lack of appetite
- fatigue
- calming the Spirit (*an shen*)
- especially suitable when emotional disturbances (anger, sadness, anxiety, worry) are combined with digestive problems
- support of sleep disturbed by disharmonious Stomach, as illustrated by the classical statement from *Neijing*: disharmonious Stomach is followed by restless sleep (*wei bu he ze wo bu an*)

Hou tou gu (*Hericium erinaceus*) - clinical pictures

#1: Male, 34 y. o.

Main complaint: bad breath

Other information: mild digestive problems for two months, relatively elevated appetite, burning stomach, thirsty with desire for cold water, moved from Italy five months ago, changed his long-time eating habits from Mediterranean cuisine to more continental one (more sweet, fat and spicy food, less vegetables), feelings of dissatisfaction at work, also a bit nervous; tongue: red, with less and dry coating

Diagnosis: Stomach Heat (*wei re*), Liver-qi invading the Stomach (*gan qi fan wei*)

Therapeutic principle: clear the Stomach (*qing wei*), harmonise the Liver and Stomach (*tiao he gan wei*)

Prescription:

1. *qing wei san* (Clear the Stomach Powder, *Coptis* and *Rehmannia* Formula): for two weeks (to clear the Stomach Heat)
2. *hou tou gu*: as a follow-up treatment at 2 g a day (to harmonise the digestion, to harmonise Stomach and Liver function, to reduce Heat and inflammation, to supplement the Spleen, to calm the Spirit)

Notes: Acupuncturists may use the following points of choice, either instead or along with the initial herbal prescription:

- Ren 12 *zhong wan*, P 6 *nei guan*: correcting the flow of Stomach-qi
- Bl 21 *wei shu*
- St 44 *nei ting* (LI 11 *qu chi*): clearing Heat
- Sp 4 *gong sun*: Spleen luo point, stomach cramps, diarrhoea, vomiting.
- Liv 3 *tai chong* (Liv 2 *xing jia*), Liv 14 *qi men*, GB 34 *yang ling quan*: 'Liver invading the Stomach'
- LI 4 *he gu*, Bl 17 *ge shu*.

#2: Boy, 12 y. o.

Main complaint: digestive problems, nausea, regurgitation of food, sometimes vomiting

Other information: loss of appetite, stomach-ache, distension in his abdomen, bitter taste in the mouth, nervous, tired, symptoms getting worse with stress (from school pressure and from bad relationships with schoolmates), tongue red, especially on the sides; in Western medicine diagnosed with psychosomatic problems

Diagnosis: Liver-qi stagnation (*gan yu*), Liver-qi invading the Stomach (*gan qi fan wei*)

Therapeutic principle: harmonise the Stomach (*he wei*), supplement the Spleen and fortify the Stomach (*bu pi jian wei*), calm the Spirit (*an shen*)

Prescription: *hou tou gu* at 1.5 g a day (long-term use)

Notes: family realised, that it would be good to change the school, but it was not possible earlier than in next school year. Supplementation by *hou tou gu* improved digestion disorders and improved stress resistance

#3: Boy, 6 y. o.

Main complaint: epileptic seizures

Other information: about twice a day he stared ahead without response to verbal or even painful stimuli, i.e. absence (petit mal), EEG showing positive epileptic changes, low ability to concentrate, unrest (nervousness), insomnia. This situation was already treated by Western medicine for three months with some improvement in seizures, which were at the time of the first visit about three times a week, concurrently he was unfocused and with tendencies to anger. So, his mother started to look for additional help from non-conventional therapies (homeopathy, TCM).

Diagnosis: *yin* deficiency (*yin xu*), Liver-qi stagnation (*gan yu*), ascendant Liver-*yang* (*gan yang shang kang*)

Therapeutic principle: supplement Kidney-*yin* and Liver-*yin* (*bu gan shen yin*), normalise *qi* flow (*shun qi*), expel hidden pathogenic factor (*qu fu xie*)

Prescription:

1. *liu wei di huang wan* (*Rehmannia Six Formula*) + homeopathy: for two months (to supplement Kidney-*yin*, Liver-*yin* and constitution); with result of some improvement as seizures occurred only rarely, but yet full recovery was not achieved, so change in the treatment was done...

2. *hou tou gu*: as a follow-up and long-term treatment at 1 g a day (to support Mind and Brain, to calm the Spirit, to tonify 5 *zang*, to harmonise Liver); after another month (i.e. three months incl. the previous intervention) he was only restless, but with no seizures; after two years no need for Western treatment as EEG was not showing epileptic changes. Currently, he is doing fine at school, tendencies to anger are mild and is without drug medication.

Notes: *Hericium erinaceus* was given for nerve function support, as it was the main complaint. In this given context (*yin xu, fu xie*) it also could be combined with *yun zhi* (*Trametes/Coriolus versicolor*).

The treatment was done without any acupuncture or acupressure. But according to the condition, we would consider the following protocol:

- in condition defined as internal, vacuity and Heat (*li, xu, re*) as seen in Liver-*yin* vacuity (*gan shen yin xu*)
 - tonify (*bu*)
- on *shu* points: Bl 18 *gan shu*, Bl 23 *shen shu*
- on central point Bl 17 *ge shu*, Ren 4 *guan yuan*
 - even method (*ping bu ping xie*)
- on distant points: Liv 3 *tai chong*, Sp 6 *san yin jiao*
- in condition defined as internal, full and Heat (*li, shi, re*) as seen in Liver-*qi* depression (*gan qi yu*) and ascendant Liver-*yang* (*gan yang shang kang*)
 - dispersion (*xie*)
- on distant points: Liv 3 *tai chong*, TH 6 *zhi gou* or GB 34 *yang ling quan*
 - even method (*ping bu ping xie*)
- on central point: Bl 17 *ge shu*
- on *shu* point: Bl 18 *gan shu*

Similar case, yet far less serious, is a boy, 7 y. o., third day after vaccination by MMR vaccine (measles, mumps, rubella) were observed during the evening meningitis like symptoms: sensitivity to light, mental confusion and signs of inflammation of the brain or peripheral nerves like temporary loss of the will to execute bodily movements accompanied by blank look¹⁰. *Hou tou gu* (*Herichium erinaceus*) was immediately administered at 2 g, with obvious relief in severity of the symptoms within one hour, which was followed by another 2 g after two hours from the previous dosage. By bedtime and with continuous good prognosis being observed, within one hour after the second dose the child went to sleep (without any meal during the afternoon due to no appetite). Following morning all the symptoms were gone completely. Both these cases should be viewed in context of the article of Jang et al., 2019.

We are now further investigating the hypothesis, that *hou tou gu* can address internal Wind (*nei feng*) when used in the right context.

c. TCM treatise on *yun zhi* (*Trametes/Coriolus versicolor*)

Edible, yet not culinary, mushroom growing worldwide. Due to its strong lignin-degrading enzymes represents a nightmare to many wooden house owners. Its fruiting bodies resemble the turkey tail, hence the name. To the Chinese, they resemble clouds (cloud mushroom, *yun zhi* 云芝), in Japanese it is called *kawaratake* (カワラタケ, 瓦茸). Despite its vast distribution, it has not a clear and direct entry in *Shen nong ben cao jing*, but recently (Lu, 2011) it is attributed to the green '*zhi* 芝', one out of total six different coloured '*zhi*' described there.

Tastes and nature: sweet, bland, sour and balanced¹¹

Effects: supplements Liver-*qi* and Lung-*qi*, calms the Spirit

Application:

- supplementing the Liver-*qi*, namely its function of smoothing the flow of *qi*¹², especially in the context of the relationship of Liver with other organs and functions¹³:
 - Lung governing *qi* and Liver governing Blood
 - descending of Lung-*qi* and ascending of Liver-*qi*
 - smooth flow of Liver-*qi* helping Spleen-*qi* to transform, separate, transport and move upward
 - Liver and Kidneys have a common origin
- supplementing the Lung-*qi*, Kidney-*qi*, very suitable for terrain of *yin xu* (but directly does not supplement *yin*)
- different contexts of *qi* depression (*qi yu*) alone, or combined with turbid (*zhuo*) or Phlegm (*tan*), incl. binding depression of Phlegm and *qi* (*tan qi yu jie*) (but directly does not have the effect of transforming the Dampness or Phlegm)
- calming the Spirit
 - especially suitable when *qi* depression is on the terrain of *yin xu* and/or *xue xu*
 - support of sleep, making it sounder and deeper, again best on the terrain of *qi yu, yin xu, xue xu*; also suitable for combination with appropriate herbal formulas

***Yun zhi* (*Trametes/Coriolus versicolor*) — clinical pictures**

#1: Boy, 8 y. o.

Main complaint: frequently ill

Other information: sore throat or cough every month, sensitive and palpable lymph-nodes, low-grade fever in the afternoon, high antibody levels against EBV (IgG), red tongue red, yellowish coating

Diagnosis: insecurity of defensive *qi* (*wei qi bu gu*), lingering pathogens (*fu xie*)

Therapeutic principle: expel *fu xie*, transform Phlegm, secure defensive *qi*

Prescription:

1. *yun zhi* + probiotics + homeopathic drops for three weeks

2. *yun zhi* (1 g every day) for two months to promote Lung-qi functions (frequent infections, cough), to transform Phlegm (strengthening of the Spleen to get rid of the Phlegm and qi binding together (*tan qi yu jie*), incl. lingering/hidden Phlegm), also for slight clearing of deficiency Heat.

Taken into account were also actions according to modern research: hepatoprotective and antiviral.

Results were decrease in lymph nodes size and he stopped being sick repeatedly.

Notes: Acupuncturists may use some points addressing lingering pathogens, for example:

- St 40 *feng long*: eliminating Phlegm
- LI 11 *qu chi*, Liv 2 *xing jia*: expelling Heat
- TH 5 *wai guan*, Liv 3 *tai chong*, Sp 10 *xue hai*: correcting the flow of qi and Blood
- TH 10 *tian jing*, TH 17 *yi feng*, St 21 *liang men*: swollen lymph nodes

#2: Young woman, 18 y. o.

Main complaint: chronic fatigue syndrome

Other information: frequent infections of upper respiratory tract, enlarged lymph nodes, low-grade fever (subfebris), joint pain, mild afternoon temperature, night sweats, fatigue, loss of appetite, weak voice, fear of the cold, inability to remember, dizziness, pale tongue. Western medicine diagnosed EBvirus antibodies and herpes simplex.

Diagnosis: lingering pathogenic factor (*fu xie*), qi yin xue deficiency, empty Cold

Therapeutic principle: Expel *fu xie*, supplement the middle, supplement yin

Prescription: *yun zhi* as a long-term basis combined further with herbal prescriptions supplementing the middle and/or supplementing yin

Notes: Acupuncturists may use some points addressing

- qi-xue vacuity defined as internal, vacuity and Cold (*li, xu, han*)
- tonify (*bu*)
- on local points of Spleen and Stomach: Liv 13 *zhang men*, Bl 20 *pi shu*, Ren 12 *zhong wan*, Bl 21 *wei shu*
- on central point Bl 17 *ge shu*
- yin vacuity defined as internal, vacuity and Heat (*li, xu, re*)
- tonify (*bu*)
- on local points: Bl 23 *shen shu*
- on central point Du 4 *ming men*
- even method (*ping bu ping xie*)
- on distant Kidney point: Sp 6 *san yin jiao*

d. TCM treatise on *hou tou gu* and *yun zhi* combination

Nei jing says, that brain houses the original Spirit (*nao cang yuan shen*). *Ben cao gang mu*, that brain is the seat of original Spirit (*nao wei yuan shen zhi fu*). Both are referring to what is received from Heaven (*tian shou*). Brain is the sea of marrow (*nao wei sui zhi hai*), but it is a place where marrow is piling up, not where it is engendered. As explained in *Ling shu*, chapter 36: 'bodily fluids (*jin ye*) made of food¹⁴ conjugate, become a greasy jelly seeping into the bones supplementing and boosting the brain marrow (*nao sui*)'.

Now we fully understand, that supplementing of the brain cannot be done without food, i.e. Spleen and Stomach.

Supplementing can eliminate weakness (*bu ke qu ruo*). Both mushrooms are very mild in supplementing, they rather promote said organ functions (= organ qi) than boost. Simultaneously, they are also appropriately addressing some full conditions, but preferably of very mild manifestation, such as organ agitation (Liver, Stomach), inflammation (esp. *yin xu* type), restlessness (*hun, shen*), Phlegm (*tan*) and qi depression (*qi yu*). They represent a very mild and gentle combination of supplementing (*bu*) and harmonising (*he*) suitable for both short- and long-term use.

Out of the five *zang*, Heart, Liver and Kidneys have the closest link with brain. Heart houses the *shen*, which together with *yuan shen* housed in brain, are part of the process of how thinking is created. Liver significantly contributes to the mental life through its function of controlling the smooth flow of qi; it also interferes with the regulation of the overall state of Mind. In addition, together with the brain, they also affect the condition of eyesight.

Kidneys store the essence (*jing*) from which the marrow (*sui*) is created. To brain, marrow is the building material. Brain is created in the skull from accumulation of marrow and throughout the life is supported by Kidneys' essence (*shen jing*).

Brain functions, regardless of whether they concern consciousness, intellect or even the control of sensory organs, are dependent on the factual state of operation of the *zang* organs. (Ando, 1995)

Hou tou gu and *yun zhi* – combined clinical picture #1

Due to the combined general effect addressing a really big part of organ interactions and because we are not working with herbs but mushrooms, we can somewhat resign on a clear identification of the very root of the cognitive functions decline. Of course, to better grasp the situation, we should understand, whether it is deriving from overuse (lifestyle or not enough rest, as is common in the 20-50 age group) or due to premature ageing (60+).

Main complaint: mental exhaustion due to excessive mental activity

Other information and proper diagnosis: would be necessary, should we want to add some other herbal prescriptions or combine with acupuncture etc.

Therapeutic principle: harmonise five *zang* (*tiao he wu zang*) so marrow can flourish

Notes: Typical groups of recipients would include: students, presenters, managers, scientists, people doing too much of any type of mental imaging, like system gamers, designers or chess players¹⁵ and elderly people. Subjective improvement is often communicated as: a feeling of head working better, being able to expand thoughts, more clear thinking, thinking stopped hurting, renewed satisfaction with own mental performance often along with improvement in physical performance, etc.

The first 60 years of our lives should be about balancing organ functions.

The second 60-year cycle, ie from age 60 onwards, should be about greater attention to Blood stasis (*xue yu*), Phlegm (*tan*) and internal Wind (*nei feng*)¹⁶. A combination of both mushrooms well addresses the first 60-year period in terms of balancing organs, while during the second period other possible additions should be considered according to the person (*yin ren er yi*).

Dosage:

Single dose: adults up to 2 g, children up to 1 g;

Daily dose: adults usually 2-3 g (up to 6 g), children usually 1 g (up to 2 g).¹⁷

Daily distribution: if one dose a day only, preferably to be taken at bedtime; if more doses, the other one or two can be taken during the day, e.g. according to the organ clock, or free windows in between other supplementation.

Long-term use: it is genuinely food, just with well understood functions, therefore suitable for long-term use; over time, different changes in the supplementation schedule can be done (mushrooms alone, in combination with herbs, with changes in herbal prescriptions while mushrooms remain).

Combinations: very possible, goes well with herbs and minerals¹⁸ From the point of view of traditional Chinese herbal medicine (TCHM), both mushrooms can be combined with any supplementing formula.

Better effects are obtained, if the combined formula respects *yin* and *yang* phases of the day, resp. four seasons extrapolated to a day, i.e. during the morning it is best to use formulas lifting the *qi* (direction of movement: *sheng* 升 and *fu* 浮) and in the afternoon and bedtime formulas down-bearing the *qi* (direction of the movement: *jiang* 降 and *chen* 沉).

Best results: would be obtained when supplemented with respect for the reconstruction phase¹⁹ of the day, while taking into consideration individual constitution and actual health status. Tremendous results, with marked difference when compared to the use of given formulas only, can be obtained through bedtime supplementation along with:

- *yin* supplementing formulas, such as:

- *suan zao ren tang* (Zizyphus Combination),

- *liu wei di huang wan* (Rehmannia Six Pill)

- *zhi bai di huang wan* (Anemarrhena, Phellodendron & Rehmannia Pill), etc.

- *yin* and Blood supplementing formulas, such as:

- *yi guan jian* (Linking Decoction)

- *tian wang bu xin dan* (Ginseng & Zizyphus formula) etc.

- Heat clearing formulas, such as:

- *dao chi san* (Guide Out the Red Powder)

- *zhi bai di huang wan* (Anemarrhena, Phellodendron & Rehmannia Pill)

- harmonising formulas, such as:

- *yi gan san* (Bupleurum formula)

- digestive formulas, such as:

- *bao he wan* (Citrus and Crataegus Formula)

- Phlegm addressing formulas, such as:

- *wen dan tang* (Bamboo and Hoelen Combination)

- *qi* and Blood stagnation addressing formulas, such as:

- *xue fu zhu yu tang* (Persica and Achyranthis Combination)

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ENDNOTES

1. Living organisms on Earth are taxonomically split into three domains: Archea, Bacteria and Eukarya. Eukarya is further divided into five kingdoms: Plantae, Protista (incl. a.o. algae), Animalia, Chromista and Fungi. (Viruses and prions are currently not placed in any domain.)

2. It is important to mention, that those avoiding in their nutrition food of animal origin, are losing one whole kingdom in their diet. Mushrooms (fungi) are not plants, not animals, therefore so full of potential.

3. It is interesting, how the 1904's physiology/medicine Nobel Prize winner I. P. Pavlov's gut-brain axis is being revamped into a novel scientific approach aiming at better understanding of complex interactions between GI system, including microbiota, and CNS. Unfortunately, the very nature of compound systems is to be complex and taxing not only in terms of development, but also maintenance and repair.

4. Part of the issue is also about the safety of any novel substance. Even the debate on efficacy (and bioavailability) is not easy: identifying the correct active principle, finding a way to extract it, how to preserve it (after it has lost its innate context and protection). We should understand that natural edibles are not a library of separate active principles, we cannot take one as a book out of the shelf without causing disruption, as there is always something damaged, corrupted and lost. We should trust our microbiome to do the extraction for us.

5. As always, there are exemptions: especially in cases where the research results are well fitting the constitution, pathomechanisms or some features of the condition.

6. How the actual substance is obtained, e.g. by extraction of selected active principles.

7. From this point of view, modern science has yet to evolve, as it currently, at least in our humble opinion, must wait until it can make a clinical use of artificial intelligence (AI) to combine thousands of pieces of fragmented scientific information with varied data from the patient. Until then, other approaches are necessary to be used to the benefit of the citizens. Authors of this paper are relying on the holistic approach using TCM and believe that TCM, due to its effectiveness and added value theoretical concepts, will be covered by the AI algorithms in the future as well. The very first necessary step has already been done by World Health Organization (WHO) in their latest International Classification of Diseases, ICD-11, Chapter 26.

8. Anglicised from original French sounding 'pom pom blanc'. This mushroom was first commercially cultivated in the US by mycologist Malcolm Clark. After he presented the mushroom back in the 80s to chef Jacques Rober in San Francisco's gourmet Ernie's Restaurant to develop new dishes, it was obvious, that none of the guests would order a meal with something sounding like being formerly a part of lion, hedgehog or monkey. The French name, meaning 'white bobble' was a literal description of the cultivated mushroom shape and colour: With such a melodious name, it won the place on the menu and later the hearts (or stomachs) of the guests. More details and more recipes in the book Clark et al, 2013.

9. For Chinese medicine herbalists it always takes some effort to understand the difference between mushrooms and herbal formulas, because mushrooms despite being mild in their *qi*, i.e. effects, have very broad spectrum of application, which is often not very easy to squeeze into syndrome terminology. Acupuncturists and *tui na* practitioners often find this feature quite relaxing.

10. All given symptoms are listed in the vaccine insert, under the section of consumer information, within the list of reported post marketing side effects.
11. Some sources are giving mild cooling, others mild warming nature; from our experience it lays somewhere between mild cooling and balanced, definitely not warming.
12. Yet again, something to highlight for herbalists, supplementing of Liver-qi should be differentiated from actions one would associate with spreading Liver-qi, like with *chai hu* (Bupleuri radix), *xiang fu* (Cyperus rhizoma) etc., so please keep in mind, that *yun zhi* (Trametes/Coriolus versicolor) can be taken at night to promote sleep, it is not a qi lifting substance and also can be used in the context of yin deficiency.
13. For more details please refer to Maciocia, 2015.
14. The term 'five [types of] grain (*wu gu*)', one per each element, stands for food, and should be translated as such. It is interesting that some producers utilise different grain crop as a substrate to grow the mushroom biomass on.
15. For example, we achieved very encouraging subjective results in some members of the Czech National Senior Chess Player Team. The combination

of *hou tou gu* and *yun zhi* was delivered to them as nutritional nootropics (cognitive enhancers) based only on vague confirmation of generally weakened condition.

16. Just a note on the obvious: general potential life expectancy according to TCM is 120 years. Of course, every person has their own heavenly number (life expectancy). Moreover, different turns on the road of life might induce that the individual potential is not reached.

17. The actual dosage depends on individual clinical response. Theoretically, it is based on the hormetic dose-response mechanisms (Wang, 2017): to regulate the immune system a low dose is used, in contrast to a higher dose with a stronger effect, but inevitably performed at the expense of the ability to balance.

18. Because plants are another kingdom to fungi, combinations with any suitable herbs and herbal formulas can be very synergistic. To minerals, basic elements of lifeless nature, mushrooms could bring the connection to life, moreover it is very natural for mushrooms to work with elements.

19. This is just a mere link to many big topics: not only yin and yang, but also Western knowledge of Th1/Th2 shift, activity of the brain during sleep, different metabolism during sleep etc.

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