

A LITTLE BIT of POISON

"Nobody loves me, everybody hates me,

Think I'll go and eat worms.

Big fat juicy ones,

Eensie weensy squeensy ones,

See how they wiggle and squirm.

Chomp off their heads

Squeeze out the juice

And throw their tails away

Nobody knows how I survive

On worms three times a day."



Whenever my children had a hard day at school and came home with the weight of modern expectations squarely on their shoulders, we broke the tension by chanting this popular children's rhyme while play-acting the depth of their misery. It became our mantra with which to banish the stresses of everyday suburban life at the kitchen table, and to give our immune systems a fair chance to recover from the knocks and needs so typical of life in an affluent Western society.

Recently, when I read the research about the effect of excessive hygiene on our immune systems and the use of 'worm egg capsules' as treatment, I couldn't help smiling. The irony in this clinical use of worm parasites as a so-called breakthrough in the treatment of allergies and auto-immune diseases is quite amusing. It seems that in the end we are going to "...go eat worms..." again to survive our modern life style.



I'll go and eat worms...

For the first three or four years of their life, my children played around my makeshift country surgery where I saw up to fifty patients a day in one of South-Africa's so-called 'black homelands'. Although as toddlers they were in contact with every possible kind of 'worm and bug' you can think of, they were seldom 'unwell'. Now and then, they were severely ill with specific infective diseases and suffered from high fevers and serious diarrhoea, but they recovered

soon to their normal healthy selves.

When we moved to a suburban environment, however, their immune systems protested with the same sensitivities and allergies that I observed in most of my city dwelling patients. They no longer played outside in the cold rain, or ate food prepared by their older playmates in the midst of sand, soil, ants and flies, and their immune systems were no longer prompted into action by worms and germs. Here in the city, hygiene, physical comforts, pre-planned arrangements, constant anticipation, 'soft' pollution and never-ending mechanical noise unhinged their bodies and created a constant low-grade state of confused alarm. Although seldom desperately ill, they now suffered from chronic sore throats, upset tummies, headaches and tiredness. It was clear that something about their new safe and clean environment did not suit their immune systems.

This could not be a case of ordinary bodily stress. Our life in the homeland was packed with daily stress responses based upon riots, petrol bombing, unsafe roads, snakes and dangerous diseases. It had to be something else. During the following years of seeing hundreds of patients with severe immune and nervous system malfunctioning I couldn't help suspecting that it had something to do with our desperate struggle to ensure all-embracing comfort and health, which is so characteristic of modern societies.

Take a moment to think about what **bodily comfort (inner world)** means to you:

A full stomach and warm bed, whatever the environment?

Living and working in an environment where the light, air and temperature are always the same; set to a level where they cause no conscious sensory stimulus to your body and can give you the opportunity to work and relax without bodily intrusion?

An awareness of natural fresh air, the cold wind, dogs barking; having a high sense of being part of the natural world you live in?

To be with friends in a lively bar, mellowed with alcohol, with a sense of being far removed from the worries of everyday life and bodily discomforts?

And what is **social comfort (outer world)** to you:

To be part of a loving family, as rowdy and unpredictable as they may be?

To be left alone to do what you want and others around you come and go without expecting much from you?

To know exactly what is expected of you and where you and others around you follow well-defined rules and respect the greater social systems?

In most affluent settings the dominant aim is create a safe physical environment. No poison, dirt, or unexpected injuries are allowed. We protect our bodies to the point of complete distrust in the world we live in. Don't get me wrong. I am aware of the fact that our high life expectancy in so-called developed

countries is the outcome of the incredible chemical evolution in hygiene and medicine, and our ability to stop most bugs in their track, so to speak. The price we pay, however, is a constant low level of 'not-so-wellness' because of a very edgy immune system, reacting to the constant distrust and over protection. In fact, recent research points towards the possibility that we may even increase this 'un-wellness' and shorten our lives with the eager supplementing and 'healthy lifestyles' we embark on to hold off old age and disease.

We are not made to live in a neutral, safe, abundant and stable environment all the time. Drug abuse, suicide, dangerous hobbies, risky financial Wall Street ventures and pointless misbehaviour in the streets remind us that many people can no longer tolerate our cushy modern life style. We somehow want to confirm the fact that every dimension of our system's organisation needs a certain amount of threat, unpredictability or unknown to function optimally. Even for those of us who live sensibly, the snug security that follows is not exactly what the doctor ordered. In spite of, or rather because of, our lack of real 'body-felt' challenge, our system experiences anxiety overload from the smallest discomfort, be it temperature changes or mental conflict. We develop posttraumatic stress after experiences which did not really threaten our life, and become severely depressed when we cannot immediately obtain what we want, irrespective of our intrinsic needs for survival.

Could it be that we do not '...eat enough worms...'?



see how they wiggle and squirm....

Since the beginning of human consciousness, we have intuitively been aware that we need a 'little bit of poison', a spoon-full of danger to keep the mind alert and the blood flowing. Today we speak about this ancient common sense as if it is a new discovery. Pretentiously we now call it ***hormesis*** from the Greek *hormæin* indicating an 'eager response'; to excite and stimulate. In modern medicine, the term hormesis describes the health-beneficial effects due to the low-dose presence of agents that are toxic at higher concentrations. In bio-analysis we see it as part of our natural adaptive response.

Our inner organisation, be it mind or immune cells, needs constant reminders that we are never in control of the outer environment and that fast and enthusiastic responses to adapt to the outer world are the only way to stay alert and alive. Natural *outer* hormesis substances influence *inner* chemicals and their feedback cycles. These inner chemicals such as nitric oxide, glutamate, and carbon monoxide, then also act according to the hormesis principle to keep particular feedback cycles going.

The 'eager response' to what could be poisonous is an inherent part of human (and all of nature's) biodynamic feedback cycles. It is a valid response to the unknown and the only way to survive in an 'outer world' that is always potentially toxic and since the beginning of time traditional healers used it in the form of low doses of poison to improve their own healing abilities and to treat many conditions. It is no wonder that hormesis has become an inherent part of our mythological and symbolic imaging to remind us that the taking of poison could not only save us but also take us to a new level of health and consciousness.



How do they "...wiggle and squirm..." us into action?

big fat juicy ones...

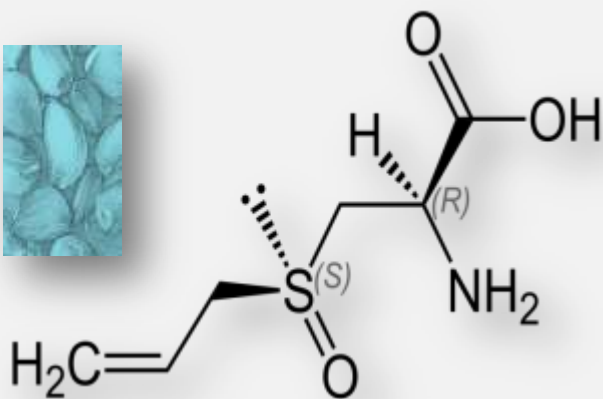
The image of the 'universal worm' is deeply rooted in our personal and collective unconscious and many myths from all over the world tell the story. These images of the association between poison and the preservation of life should never be negated as mere fantasy. Even in a highly rational modern world, many religious rituals, food taboos, alternative healing methods and aspects of drug abuse are based upon the symbolic interpretation of this interplay between creation and death, healing and poison.

The *serpent* was directly linked to the creation of life in most ancient cultures. We have, for example, Eurynome, the goddess in Greek mythology, whose name broadly means wide wanderer or wide distributor, indicating her all-affecting quality. She brought life to the original chaos by coupling with the Ophion, the universal serpent, to produce Eros, who was the 'firstborn of being' and future god of love. To the East, the sage Durvasa cursed Indra and the gods, causing them to lose their vigour and longevity. To reverse this, the 'milk ocean' had to be churned to create the 'elixir of immortality' and renew the vitality of the universe. During the churning the 'great serpent' vomited poison, some of which Shiva drank to save the world. The goddess Parvati hurried over to hold Shiva's neck so that the poison could not spread throughout his whole body. It takes little imagination to recognise the link between poison and immortality in this symbolic depiction of the essential human condition.

The serpent therefore also became a universal symbol of healing, an intuitive link to the delicate balance between early death and longevity, poison and remedy. The snake and its ability to shed its skin and be reborn but also cause death by poison has become part of our inherent understanding that medicine and poison are two sides of the same coin. The Sumerian god Ningizzida is the oldest known depiction of this god of healing as a serpent curling around a rod, and the depiction of the 'tree of life' entwined by a poisonous serpent is still used worldwide to represent medicine. In Greek mythology, we also meet Asclepius the god of healing whose staff or karykeion has two snakes curling upwards. Its analogy is the caduceus of Hermes with only one snake, well known in the depiction of medicinal science in the Western world and seen in the logo of the World Health Organisation (WHO). There also was Ikarios, sent by Dionysos with his gift of wine and who was killed by shepherds when they mistook the wine as poison.

Then of course, Pharmakeia whose name gave us the terms pharmacy and pharmaceutical, was the nymph of a well that had poisonous powers.

In Norse mythology, the sun god Baldur was invincible because his mother obtained a promise from fire, earth, water, all animals and all plants never to hurt her son. She, however, disregarded the insignificant mistletoe, and subsequently Baldur was killed by mistletoe. But, mistletoe has also been used as an antidote to poison. All over the world fables and fairy tales are full of examples of an 'eager transformation' after having been poisoned. Usually the hero or heroine gained greater fortune and consciousness after they took poison. Even Severus Snape in the Harry Potter series knew the principles of hormesis and the use of a poison's beneficial opposite. These archetypal or universal representations of hormetic principles carry potent energy and still have strong organisational and motivational effects within our system.



How do these '...big fat juicy ones...' protect us?

eensy weensy squeensy ones...

Hormesis acknowledges that exposure to low levels of something could have a strikingly different effect than a high dosage of the same thing. It is an idea from a different perspective than that of uncomplicated linear logic, where more of something has an equivalent but greater effect than less of the same something.

In a biological system like ours, hormesis practically means that when we are exposed to a low quantity of anything that threatens our survival, our system will use this exposure to improve its survival mechanisms. This could involve indirect and different feedback systems. In other words, low dosages of toxins and biological stressors could actually be beneficial although higher dosages will damage and kill. In fact, challenge with the right dose may not only restore damaging effects of a particular toxin or stressor, but could initiate feedback cycles, which are able to repair other unrelated defects.

Our experience and gut-feeling will agree with what we just said, and we can all name many examples – two glasses of wine a day may restore some of the consequences of metabolic syndrome while two bottles a day may damage the heart and liver. Or, just the right amount of enthusiasm may stimulate creativity while obsessive needs could well destroy any inventiveness. In fact, the effect of most medicines used today would qualify for certain aspects of hormesis. However, for a very long time scientists had little tolerance for the essential model of Paracelsus: "*Poison is in everything, and no thing is*

Many concepts in the different biomedical fields contain the essential nonlinear quality of hormesis, for example dual response, heteroprotection, overcompensation stimulation, adaptive response, preconditioning, nonmonotonic dose-response, bitonic or bimodal response, functional antagonism, Arndt-Schulz Law and Yerkes-Dodson Law. Thus, all of them could be seen as part of the process of hormesis.

without poison. The dosage makes it either a poison or a remedy." It is not always what we take, but how much we take.



So, how do we handle the '...eensy, weensy squeensy ones...'

squeeze out the juice...

Today hormetic phytochemicals (plant substances) are in the front line of alternative medical practice. Their effect is based upon this concept that natural chemical substances challenge our adaptation feedback cycles to increase our natural stress resistance. In other words, exposing our cells to the recurring mild chemical stress caused by certain plant nutrients and herbs could actually protect our cells.

Most of the chemicals in plants are produced to protect the plant from being eaten. They are thus all natural poisons. Early in our history, humans adjusted to these poisons in a way that ensured

their use of the plants as food, but without destroying the entire plant and depleting nature as a whole. We even learned how to use these plant poisons inside our body, to keep our own feedback cycles complex and adaptable. In this way, we could live in harmony with our food source and still develop as a species. (Read [Of Wood and Worm](#) in our hormesis series).

We can say that hormesis explains why many supplements, which were shown to be beneficial under controlled laboratory or theoretical circumstances, cause serious problems in people who take them regularly in high doses.

Furthermore, humans have learned to use animal proteins and fats, which our immune system would initially not have accepted, to increase our chance of survival, particularly in harsh climates, such as the ice ages in the Northern hemisphere. Again it is the principle of hormesis that explains that although a large amount of animal food carries the 'toxic' danger of heart disease, some human groups may genetically need animal protein for optimal functioning.

Presently, supplements, herbal remedies and nutrition have become the backbone of the health and pharmaceutical industry. Every edible berry or fruit takes centre stage at one time or another as the best supplier of anti-oxidants or the next answer to cancer. Mostly it is a question as to which fruit or berry becomes the particular focus of some scientist who has access to sponsored funding and finds good media attention. However, we have to be constantly alert to the fact that too much of any wonder cure could be deadly to our system. Whether vitamin C, glutamate or omega-6 fatty acids: too low an intake or taking excessive amounts could be equally detrimental. Our entire metabolism, immune system and neurological

communication system run on the basis that too little as well as too much causes damage. It is always a case of the right amount for the right situation.

In other words, whatever research on food and plants tells us, our inner chemicals do not adhere to linear rules and whether we are considering body or mind, we have to concentrate on how our personal system measures the value of outer chemicals.

How then should we '...squeeze out the juice...'?

throw the tails away...

If our inner chemicals have such a complex interaction with outer influences, why is the medical world so slow to wake up to a principle that is crucial to the understanding of this complexity?

Hormesis could explain why many substances, which were shown to be beneficial under controlled laboratory or theoretical circumstances, may cause serious problems in people who take them regularly in high doses. Millions of people are on preventative treatment for mood changes, allergies and metabolic syndrome. But, thousands also die every year from the side effects of anti-depressants, blood pressure medication, cortisone and treatment for overweight.

Artificially produced chemicals have also become part of our every daily food intake. Even when we obsessively examine and debate the safety of pharmaceutical substances, we often forget that it is especially the 'hidden' chemical substances that cause the most prominent hormetic effects. Think about artificial sweeteners, and substitutes for salt and fat in food, and those chemicals that have become part of our daily pastimes such as alcohol and sport supplements. In fact, popular media reports seldom consider hormesis when they inform us about research results in relation to safe amounts of alcohol, fatty acids or radiation.

Medical and industrial research thus has to face our inner hormesis all the time. We cannot predict the effect of a low dose from simple high dose experiments, and there are many circumstances where low doses could be detrimental while high dosages are beneficial and vice versa. All immunisation is based upon a trust that low dosages of an infectious agent will protect us while larger amounts of the same viruses or bacteria could kill us. However, modern DNA and gene studies show intricate relationships between virus material and our own cells, relationships which may explain seemingly unrelated side-effects to immunisation. Antibiotics, which kill bacteria in high enough doses, may only stimulate their growth in low doses because bacteria are extremely clever in using hormesis to increase their survival in the presence of antibiotics. Some antidepressants need to be taken in high doses to bring true healing in

the brain, while low doses could actually make symptoms worse. Even some hormonal treatments in low doses may have a detrimental effect while in high doses they can reverse a problem.

Most recently, possible detrimental effects of nano particles used in everyday production of sophisticated materials necessary for technology, industry and medicine appears in many research papers. Radiation also, which is the most subtle hormetic substance in our interaction with our environment, can cause cancer in lower dosages, but higher dosages cure cancer. Nevertheless, radiation and nanotechnology and its use in medicine and green ecology are vital in the world of our new millennium. We can only hope that hormesis will no longer be sidelined as belonging to shamans or homeopathy, but that our green conscience or just ordinary human common sense will prioritise it in forthcoming research studies.



So, what else if 'we throw the tails away...'?

worms three times a day...

Hormesis reminds us that we can actually never be sure how much of a substance of outer influence we need or can cope with, that too much of a good thing is often toxic and that having nothing is very different from not having enough.

Even more important is the fact that everything that we take in from outside the body can influence the natural hormetic processes that are inherent to our own inner chemicals and their functioning inside our cells. This often counters the argument that something that has no effect or is safe under strictly controlled research conditions would necessarily be safe to the inner world of our body and mind. It is especially in our nervous system that inner hormesis processes are active. For example, low levels of the neurotransmitter glutamate improve the survival and adaptive abilities of brain cells, but in high levels glutamate causes excessive stimulation of receptors which cause 'excitotoxicity' and death to overactive brain cells.

Because our nervous system encounters the full effect of the outer world before any other part of our system, its organisation has to design faultless, but flexible adaptation processes. Some researchers have even coined the term neurohormesis for the brain's typical hormetic responses. For example, in our modern world, the rallying cry '*more of more*' is nowhere more pertinent than when it comes to cognitive stimulation. The principle of hormesis however will always make cognitive stimulation poisonous to our system when overdone. Yet in optimum amounts, it could enhance longevity and well-being. The same is true for adrenaline rushes and artificially induced trances.

Other disabling conditions of our time are immune sensitivities, auto-immune diseases and metabolic abnormalities. All of them indicate some form of mistaken over-reaction; a toxic alert from inside our bodies which wake up natural defensive feedback cycles. Modern medicine's answer to this over-reaction is

maximum avoidance and suppression. This merely increases our response to the unexpected and unknown and prevents optimum defences when needed.

One of the best examples is the observation that children who grow up on farms among animals are less prone to asthma and allergies. Recent research in Germany showed that cow dung or forage crops contain a sugar molecule arabinogalactan, which protects children if inhaled in the right amount during early years of life. The sugar molecule changes the immune system's response to invader substances when present in excessive amounts, while in too low amounts the same outer substances may cause allergy. Research, led by the University of Bristol's School of Veterinary Sciences, has also found that spending early childhood in a complex farm environment increases the number of regulatory T-lymphocytes, the cells that damp down the immune system to decrease overly sensitive immune responses.

What we need is to allow for enough sensitivity in our system to protect itself from harm. For example, we need some level of auto-immunity to protect us from cancer. We need some infections to switch on certain genes necessary for optimal immune responses. In fact, many inner and outer toxins function as critical switch devices. It is of no use to have the gene to resist a specific germ if it is not properly switched on. Even during psychotherapy, superficial analysis may only enhance narcissistic or neurotic self-involvement whereas cutting to the bone, as with proper psycho-analysis, could restructure identity incongruities.

Although more and more scientists now focus on understanding alterations in patterns of gene expression after exposure to modern day 'poisons' instead of concentrating on the chemical composition of these outer substances, we still know little about the individual variation in our inner responses. Until we know a lot more, we will never be sure when these curious variations enhance metabolic and immune competence and when they harm our feedback systems. The best we can do is to anticipate that natural hormesis

responses will always provide unexpected discrepancies in our interaction with the outer world.

As long as we take our '...worms three times a day...'

nobody knows how I survive...



In most mythologies the shedding of a snake's skin represents the insight that change has to be accepted without resistance and that inner responses to outer 'poisons' is guided by an inherent natural arrangement. Mythological images such as the moon and the serpent will always personify trust in the inherent adaptability of nature and therefore also of our natural biological system.

Taking note of the mythic rendering of our insight into hormesis and analysing our personal responses to it the form of bodily symptoms, personal metaphors and dreams may safeguard us while medical science is still incapable of explaining it in terms of medical physiology.

In other words, for now, we just have to trust in the intuitive wisdom of collective mythology, respect the serpent and eat our worms.

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- Avatar of Vishnu, holding up mount Mandara, during Samudra manthan, with snake Vasuki wrapped around. ca 1870. . [https://commons.wikimedia.org/wiki/File:Flickr - archer10 \(Dennis\) - China-6219.jpg](https://commons.wikimedia.org/wiki/File:Flickr_-_archer10_(Dennis)_-_China-6219.jpg)
- Paracelsus surrounded by various philosophical symbols, including his famous sword. From Paracelsus: Etliche Tractaten, zum ander Mal in Truck ausgangen. Vom Podagra und seinem Speciebus (Coln, 1567). National Library of Medicine
- Garlic - Alliin_Structural_Formula https://commons.wikimedia.org/wiki/File:Alliin_Structural_Formula_V.1.svg
- <https://upload.wikimedia.org/wikipedia/commons/8/8b/DNA-liqand-by-Abalone.png>
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