# VADEMECUM NANO GOLD

## TE GEBRUIKEN VOOR:

- ✔ HELDERHEID EN FOCUS
- ✔ COGNITIEVE PRESTATIES
- ✔ GEZOND ZENUWSTELSEL
- ✔ POSITIEF HUMEUR EN VITALITEIT
- ✔ SOEPELE GEWRICHTEN
- ✔ HUIDREGENERATIE
- ✔ BEWUSTZIJN

## Nano goud is “Goud voor het lichaam”

De stabiliteit en schoonheid van goud maken dat wij dit prachtige edelmetaal een bijzondere waarde toekennen en gebruiken als sieraad, verfraaiing en statussymbool. Maar de bijzondere waarde van goud gaat verder dan uiterlijk vertoon. Citaten uit de bijbel, geschriften van de oudste beschavingen en de “goudkoorts” van de alchemisten onthullen de fysieke waarde van goud. Als minuscuul kleine ofwel nano deeltjes, bevat goud eigenschappen die ons fysieke en mentale welzijn ten goede komen. Volgens NASA’s astronoom Michelle Thaller, zouden wij zonder nano goud niet eens kunnen functioneren.

# Chapter 1: overview, indications, use and dosages

## Nano gold in short

Nano gold is a metal-mineral that everyone needs to a greater or lesser extent. We use it, among others, for proper brain function [14,36,54].
Nano gold works as an antioxidant, increases the effect of other antioxidants and nutrien ts[8,9,15,16,18,33,36,38], protects DNA [36] and counters the development and growth of cancer cells. It acts as an anti-inflammatory [9, 24,25,38,48], protects and helps to rebuild nerve tissue, stimulates the production of collagen and prevents wrinkles [18,21,24]. Nano gold stimulates neurotransmitters such as dopamine, increases the transmission within nerve cells both in brain and body [16,36,62,63]. Gold (therefore) increases our focus, clarity and awareness.

## Nano gold is:

- ✔ Anti-aging for body, skin and mind
- ✔ Cell and neuro protective, cell regenerating.
- ✔ An anti-oxidant and catalyst for other anti-oxidants
- ✔ Anti-inflammatory
- ✔ increasing focus and clarity
- ✔ Raising awareness
- ✔ Lifting mood
- ✔ Rejuvenating body and skin
- ✔ Improving neurotransmission
- ✔ Protection our cells, including RNA and DNA

## Indications for use:

- ✔ Alzheimer's disease
- ✔ Arthritis
- ✔ Aging
- ✔ Auto immune disorders
- ✔ Bursitis
- ✔ Cell damage
- ✔ Cancer
- ✔ Couperose and Rosacea
- ✔ Depression
- ✔ DNA damage
- ✔ Focus and concentration problems
- ✔ Inflammations (sterile)
- ✔ Joint pains
- ✔ Loss of focus and concentration
- ✔ Low immunity
- ✔ Neural disorders
- ✔ MS
- ✔ Ostheoartritis
- ✔ Rheumatism
- ✔ Tendinitis
- ✔ Sagging skin
- ✔ Wrinkles

## Nano Gold is available in:

- ✔ Pipette bottles of 100 ml
- ✔ Refillable bottles of 200 ml, 500 ml or 1 liter
- ✔ Spray bottle of 50 ml, enriched with nano platinum and nano zinc

## Composition:

Purified water, nano gold as mono-atomic, di-atomic and clusters (metallic gold), ions. 10 ppm

## Excipients: None

## Oral use:

Take before or in between meals. Preferably keep in the mouth for 1 minute before swallowing. This promotes direct and complete absorption through the mouth muco-sa. Do not put the bottle to your mouth, but use the measuring cup provided, your own cup or a spoon. This may also be a metal spoon.

## Dermal use:

Use the spray bottle ad spray 4/5 times, or dab a teaspoon of nano gold on the skin and allow to soak in. Repeat 2 to 3 times daily.

Best results can be expected with combined use of both oral and dermal use.

## Dosages:

### Adults:

**Initial dosage:** 5 ml (1 teaspoon) to 15 ml (1.5 tablespoons) daily. Build up to the stan-dard dosage in one to two weeks.
**Standard dosage:** 20 - 30 ml per day (2,3 tablespoons.)
**Maintenance dosage:** 10 to 15 ml per day. Or, for example, twice weekly 20-30 ml. After approximately 1 to 2 months, it is usually possible to switch to the maintenance dosage while preserving the results obtained.

During pregnancy, lactation or use of medication that affects the brain: Max 10-20 ml per day.

## Infants and children:

**Initial dosage:** 1 to 3 drops per week.

**Standard dosage:**

**0 - 2 years:** 1 to 2 drops per day
**2 - 6 years:** 3 drops to 5 ml (1 teaspoon) per day
**6 - 12 years:** 5 ml (1 teaspoon) to 10 ml / 1 tablespoon daily.
**Maintenance dosage:** a few drops to 5 ml per day or, for example, twice weekly 5 to max. 10 ml at the time.

**Note:** Individual needs can vary greatly. For some people, a few drops are already effective (especially for highly sensitive people), while others may need a higher dosage, long term, temporarily or occasionally. Higher dosages go up to about 60 ml (6 tablespoons) per day.

**Caution:**

Because gold works on the brain, "opening up" blocked systems, it can sometimes overstimulate, resulting in headaches, nausea or fatigue. Even though these symptoms are harmless, usually never last longer than a week and often provide faster and better results, they can be very unpleasant. Therefore, to prevent complaints, we work with an initial/starting dose.
Headaches due to gold intake, sometimes can be counteracted by taking nano magnesium with it.

## How quickly can results be expected?

Many people notice an effect of nano gold within half an hour to a few days. For example, more clarity and focus, pain relief, an uplifting mood, or improved sleep is noticed. Complaints such as Parkinson's disease, rheumatism and bursitis of course need more time before a clear effect is noticed, usually one to two months.
The current diet in most countries hardly contains gold anymore. The body cannot establish gold itself. Therefore, those who can keep ailments under control with gold or like to obtain and maintain optimal health, are dependent on long term supplementation. Luckily, long-term dosages are usually very low, for example 30 ml twice a week.
Nano gold, like other minerals such as magnesium or iron, can be taken according to need. For example, when inflammation flares up (rheumatism, periodontitis, PDS) or acute nerve pain or lethargy is playing up, one can go from the maintenance dose to the daily dose of 30 ml for however long is needed, before going back to maintenance again. The positive effect of gold can be reinforced by taking nano magnesium and / or nano platinum aside, depending on the indication.

## Interactions and synergistic effects

- Nano gold is a trace element, that still occurs in our foods, and can be safely taken in addition to food and supplements and along with almost all medications.
- Because nano gold increases the transmission of impulses, it can overstimulate. In case of sensitivity and certain medications an adjusted dosage might be desirable. See also "caution".
- Nano gold has a stimulating effect on neurotransmitters, such as dopamine. Medication and supplementation that affect neurotransmitters can be enhanced by gold. This can give a faster and better result, but due to double stimulation it can also cause overstimulation. Be cautious with dosages when using antidepressants, sleep aids and Parkinson's medications (dopamine related). Always start with a low dosage of a few drops to a teaspoon and if in doubt always consult an expert.
- Precious metals as medicine: Sometimes precious metals such as gold and platinum can completely or partially replace regular medication in whole or in part, by bringing the disturbed body processes back into balance. When someone prefers not to take regular medication because of (possible) side effects, precious metals (in combination with other supplements) could offer an alternative or lead to a better effect so that regular medication can be reduced.
- Nano gold has a reinforcing effect on antioxidants and other nutrients so it can strengthen and accelerate therapy.
- Gold particles above nano range, or gold compounds cán cause side effects. These are used for instance in regular medication against rheumatism or cancer, where negative side effects such as kidney strain, itching and skin rashes do occur, and sadly often are wrongly attributed to gold itself. However, research has shown that the side effects are exclusively caused by very large gold particles (different properties) or the linking substances from gold compounds. Nano gold, as we describe it, is always safe.

## In case of uncertainties about use:

Consult your health advisor, doctor, pharmacist, or a specialist in the field of nano minerals.

## Shelf life:

The dark violet glass optimally protects against oxidation. The bottles therefore do not need be kept in the refrigerator. After opening they can be kept for at least 12 months. Nano minerals are generally transparent, odorless, and tasteless. Sometimes there may be subtle changes in color, smell, and taste.
In case of major color, odor or taste changes the product may be oxidized in which case we no longer recommend it for internal use.

# Chapter 2: Symbolism and value of (nano) gold

## Value and symbolism of (nano) gold

Throughout the history of our planet, almost every established culture has used gold to symbolize strength, beauty, special achievements and divine influences. Today gold continues to be used for important, symbolic objects that represent status, power, honor, religion and wealth. Think wedding rings, Olympic medals, Oscars, Grammy awards, church statues, money and crowns. No other substance takes such a visible and prominent place in our society. Gold is not the most rare mineral/metal and is not necessarily more beautiful than silver, copper or platinum.  One could wonder why gold has been accorded so much value since the dawn of mankind. [1, 2, 75]

## What is gold?

Gold is a precious or noble metal. Metals are a subcategory of the mineral spectrum. Most of the minerals we know, such as magnesium, zinc and iron, fall under the subcategory of metals. Noble metals, in turn, are a subcategory of metals. They are distinguished from the metals by their solidity and the fact they do not easily bond with other metals (noble also means excellent in his or her kind). Precious metals are therefore much more resistant to corrosion and oxidation which also contributes to their shiny looks. They are very good at conducting current and heat.
In nano form, gold can also conduct “current” in the body, meaning that gold promotes the transmission of impulses between nerve cells.
The element gold carries the symbol Au 79, deriving from the Latin word aurum, with atomic number 79, meaning that each gold atom contains 79 electrons. This gives gold a very high density, which makes it heavy. For comparison. A liter pack of water filled with gold, weighs as much as 19 kilograms. [1, 2, 12,13,14,36,75]

## What is NANO gold?

Nano stands for nanometer. A nanometer is one millionth of a meter.
Nano gold is a “gold water”, consisting of purified water containing ultra-small, spherically shaped particles of pure gold. These particular nano gold particles are produced according to a unique method and consist out of groups of gold atoms that form a particle with each other through so-called metal bonds. We call these specifically made gold particles: nano gold clusters. For optimal health these nano gold clusters must be spherically shaped and ranged between 0.5 and 10 nm (nanometer). When “plain” gold, also called bulk gold, is reduced and transformed into nano gold clusters, the properties change and so do their applications. Compare it to a basketball and a ping-pong ball. Both balls, but with different sizes and shapes, resulting in different properties and applications. In this case size does matter. The size of the nano gold clusters determines the beneficial effects for both physical and mental health.
In addition to nano gold clusters, there also occur “particles” that consist of only one or two atoms: mono- and di-atomic gold. These are the most powerful and beneficial nano gold particles. They are extremely difficult to produce, however nano gold contains a small amount of these special particles, in addition to the many nano gold clusters.

## Nano gold: particles, clusters, compounds and dimensions.

In nanoland, many terms are mixed up. A cluster is a group of atoms but a particle can excist out of anything. Often gold is attached to other substances for stability, ability to measure or to be able to patent and register a type of gold as a medicine for instance. When referred to nano gold particles, it is important to know what substance we are exactly looking at. A cluster, a gold compound (gold attached to other substances), size, shape, purity… All these characteristics define effect, functionality, safety and efficacy.

Since nano stands for a measurable size, just like a meter or a mm, it says nothing about the particle, except its size. Nano particles per definition can be sized between 1 and 100 nm, which at the nano scale is a huge difference. Shape also determines effect. A rod creates a different effect from a ball or a triangle.
A nano cluster always consist of a group of atoms, but a “particle” can consist of anything. Gold is often attached to other materials for stability, measurability or, for example, to be able to patent a type of gold particle and register it as a medicine.
When talking about nano gold particles, it is important to know which substance we are looking at exactly. Is it a cluster or a gold compound (gold attached to other substances)? What size, shape, purity is it? All these characteristics determine and define effect, functionality, safety and efficacy.

Nano gold compounds are significantly influenced by the substance used to create a compound; is it chemical or natural, what properties does it have? A nano gold cluster can lose its effect if its size becomes too large. The most effective clusters are between 1 and 25 nm, preferably between 1 and 10 nm. It is thus impossible to compare a gold compound larger than 100 nm with a nano gold cluster of 5 nm, for example. Yet, this occurs not only in blogs and articles,  even in reports and studies.
Spherical nano gold clusters ranging between 0.5 and 10 nm, supplemented with mono- and di-atomic gold, have been proven to be safe and effective for a wide variety of health problems [24,39,40,42,43,44,45, 53, 75].

## Advantages of nano minerals for health

- 100 % bioavailable
- Nano gold consists of nanoclusters. These are pure gold particles, not bound to another substance, allowing it to be absorbed directly. No burden or obstruction for or by the intestine, liver, and kidneys.
- Because of the ultra-small clusters, it can already be absorbed from the oral mucosa into the bloodstream so that the effect is noticeable very quickly.
- Can directly cross the blood-brain barrier where it is needed to stimulate or inhibit

neurotransmitters and improve communication between the different brain areas for improved function.

- Both physiological and energetic action.
- Because of its powerful effect, the dosage for nano minerals is much lower than regular values, making it extremely safe in terms of intake. For example, an average magnesium supplement contains about 200 mg of magnesium, versus only 1,5 mg of nano magnesium. This is also called the oligodynamic effect: strong force of metals with minimum amounts.
- Nano minerals are 100% pure, completely free of additives.
- Nano minerals are tasteless, colorless, and odorless. Also easy to take for children, people with swallowing problems and pets.



VADEMECUM NANO GOLD 2: CHAPTER 2: SYMBOLISM AND VALUE OF (NANO) GOLD

# Chapter 3: Safety and origin

## Safety

The safety of nano particles depends on the substance. Sugar and water particles are between 0 and 1 nm. They are, like minerals (metals), essential substances for our health. They must therefore be this small, in order to reach all organs, including our brains as quickly as possible when in need for fuel. Nature therefore also provides small amounts of metals, such as zinc, magnesium and gold, in nano dimensions in our food chain. Coffee, your "black gold" also contains less then 1 nm sized caffeine molecules. This is why it can give you a fast kick-start, since the nano caffeine, is quickly absorbed into your bloodstream. The same counts for sugar, only white sugar robs you of minerals. **A sip of nano gold can often give you a "pick-me-up" as well**.

**Nano gold,** meaning purified water with spherical nano gold clusters, complimented with mono- and di-atomic gold, sized between 0 – 100 nm **is always safe.** Best effects are gained up to 10, max 25 nm.
Most **colloidal gold** waters (particles up to 1.000 nm) and **nano gold compounds** are **safe, but not** always **effective** (depending on the intended purpose).
Toxic substances reduced to nano-size can, of course, be dangerous, but that is due to the substance, not because of the nano size. Nano gold clusters are always safe. Large gold particles or synthetically formulated nano gold compounds, can however cause toxic effects. This is due to the inorganic, toxic compounds or the bigger size and different shape, associated with other properties. Current researchers are therefore increasingly focusing on nano gold clusters and or "green" gold compounds. Meaning: people- and environmentally friendly, biocompatible nanoparticles, synthesized using organic herbs and plants. **The U.S. Food and Drug Agency** (FDA) has **accepted these gold nanoparticles as safe to use in the field of pharmaceuticals** [39,40]. In Ayurveda and other ancient cultures, these green nano gold compounds and nano gold clusters have been used since around 600 BCE [53].
The **in vivo** (within the body) toxicity of nano gold clusters and "green nano gold particles" has been thoroughly investigated since the 50s, **proving to be non-toxic** time and again [24,42,43,44,45,75]. Ingesting these gold particles is non-toxic and non-irritating, thus completely safe. **Gold is approved by the EU for ingestion in food** as a colorant: E-number 175 (named in the codex Alimentarius) [46]. You can find it for example as a decoration in food and in alcoholic beverages such as Gold Strike or Goldwasser. Skin care products also contain gold to reduce wrinkles and promote elasticity [76]. This gold also enters the bloodstream and is therefore tested on safety.

## Origin and extraction

Gold is most commonly found in so-called "Placer" deposits. Placer deposits are natural concentrations of heavy metals (mineral ores), caused in nature by the effect of gravity on moving particles. When these heavy, stable metals are liberated from their matrix by weathering processes (e.g. from rocks), they are slowly washed away, ending up in riverbeds, streams, sands, and residual gravel. From here they enter our food chain. Gold, extracted from the so-called placer deposits (ores) is nowadays primarily mined for the manufacture of jewelry, electronics and symbolic objects and in lesser extend for medicinal use. A small part ends up in our food chain [1, 2, 75].

## Gold in food

Gold particles from the soil and are taken up by certain plants and transformed into human-absorbable (nano) particles. In particular, dark blue/purple colored fruits and vegetables such as blueberries and eggplant still contain traces of gold. Unfortunately, due to industrial processing, precious metals can hardly be found in our food anymore. For those who want to experience the optimal beneficial effects of gold, supplementation is recommended.

## Gold in the human body

Humans still obtain gold from foods. It is in our soils, and therefore also in our food-chain. like most minerals, the amount in our fods does not live up to our needs. Nevertheless, the human body contains an average of 0.35 µg of gold per gram of dry tissue, which, according to Merchant's calculations, is equivalent to 2.45 mg of gold in a human weighing 70 kg on average. Serum levels of gold in healthy humans have been reported to be around 0-0.001 ppm, with additional studies showing small amounts of gold in hair (0.3 µg/g), skin (0.03 µg/g) and nails (0.17 µg/g). g) report. Up to 0.8 µg of gold per dry weight has also been measured in fingers under gold wedding rings of normal individuals. Interestingly, gold is also sometimes used in food in very small amounts in baked goods, chocolates, and even alcoholic beverages. Gold is mainly excreted through the urine and feces. When gold is given orally, 85-95% is excreted in the stool and the remaining 15-5% in the urine, regardless of dose [75,76] Gold is used but not stored. Therefore you need it from your foods or supplement on a regular base.

# Chapter 4: Gold for our health The working mechanisms of nano gold

## Did you know you have gold in your brain?

In **each neuron** in your brain, there are a few **gold atoms** that keep the neuron charged (in motion), which **allows you to think and move**. Actually, it means that the gold atoms in your brain ensure that you can "exist." Without gold atoms, we would not function properly, or even be there, according to Michelle Thaller, astronomer and **NASA's** assistant director of science communications.

When we look far into space, we are essentially looking back in time. This is because stars and collisions between stars create energy in the form of light that travels through space. When the light has come close enough to the Earth, we can see it, but that star or collision existed much earlier, sometimes millions of years earlier. For example, it has been discovered that **gold in the universe is created by collisions of neutron stars** (extremely heavy stars). Because the sun, the earth, and everything that lives on our earth were created from stardust from colliding stars, **we are** therefore also **made up of stardust**, including the gold atoms that are now inside your brain. This is what Carl Sagan meant when he wrote, "we are made of star material." [54,56,75]

## Nano gold for the brain

From the oldest writings of mankind, it appears that gold has a positive effect on our brains. Not all mechanisms of action have been revealed yet, but we do know how to **explain** many of these **ancient claims**.

The brain contains more than a 100 billion capillaries with a total length of about 640 km. Capillaries are **small, thin blood vessels** that connect the arteries and the veins. Their thin walls allow oxygen, nutrients, carbon dioxide and waste products to pass to and from the tissue cells. This makes the brain the most complex and intelligent traffic network, and when working well, the best circulating and communicating organ in our body. The human brain, that weighs 1 to 1,5 kilograms, also consists of near to a 100 billion nerve cells (neurons) and a 1.000 billion glia cells (supporting cells, which under more produce the protecting myeline layer). Neurons are specialized cells transmitting nerve impulses. With this knowledge, we can have a better understanding of the impact of gold on our brain.

**Nano gold**, being an **antioxidant** [8,9,15,16,18,33,36,38], **anti-inflammatory** [18,21,24,36] and **activator of collagen** [10,51], has general **strengthening** effect on the **capillaries**, **veins** and **arteries**. From nano gold it has also been seen that it can **repair** damaged **nerve cells**. Nano gold can protect and (partially) repair the protective layer of the nerve cells (meyelin). It **improves neurotransmission**. [14,15,36]

The nerve cells depend on nutrients, such as glucose, fats and metals, including gold. **Quality of the capillaries and neurotransmitters are key for proper brain function**.



Nano gold also enhances the effect of other antioxidants. Thus, in both body and brain, it protects against damage and mutations of cells and their DNA (created by free radicals). Also as a powerful **anti-inflammatory** gold is able to prevent and repair lots of damage. One study assessed the anti-inflammatory effects of gold nanoparticles between 20 and 45 nm in diameter on focal brain lesions. The results showed that treatment with nano gold **decreased damage to DNA** (oxidative stress), and lowered the brain levels of the inflammatory cytokine TNF-α, as well as postapoptosis markers (cancer indication) [36]. Nano gold preventively **counteracts the formation of cancer cells**, but it can also be actively used in the fight against (brain) tumors.

The combined qualities of nano gold, as further explained below, promote focus, clarity of mind, improved memory, improved motor function, awareness, delay and recovery from various diseases, and emotional well-being. In short, we could call that **"rejuvenating"**, a claim that gold is known for from very early times [14,15,22, 44, 53].

## Neuroplasticity, awareness and behaviour

Everyone has about 1090 billion brain cells. Even as adults, we can still make new neurons, about 700 a day, in the hippocampus. [60, 71]

The nerve cells, together with neurotransmitters, are responsible for all communication transmission in the body. For example, the brain regulates your heart rate, body temperature, blood pressure and movements, but also your thoughts, feelings, consciousness, emotions, and behavior. Unwanted feeling and behavior can be caused by a disturbance within the nerve cells. This can be caused, for example, by toxic load, a lack of nutrients, physical injury or emotional trauma (in early childhood).

Awareness is a clear realization of your environment, the influence of it on yourself and others. Both behavior and awareness can be(come) aberrant when neurons are damaged. Repair or reprogramming of neurons can therefore change undesired behavior and certain ailmenets, as well as gaining more awareness. Since nano gold plays an important role in all brain functions, it has a positive influence on all regulatory functions [14,15,16, 22,31,35,36,37,44,63]. This given partly explains the ancient claim that gold can cure or ameliorate almost all diseases. Partly, because gold has even more "powers" to offer.

Note: Nano platinum and especially zinc also play an important role in neuroplasticity: repair or adjustment of brain structures.

## Gold as an antioxidant

Antioxidants are necessary for our health. **Antioxidants inhibit distortion to DNA, cells and organs** which increase aging and the risk of disease and tumors when damaged. We obtain antioxidants from healthy foods, but in need, our body can also create antioxidants from other (specific) nutrients such as zinc and copper.

**Antioxidants neutralize (disarm) free radicals.** Free radicals are harmful molecules who have lost some of their electrons during chemical processes such as growth, repair and energy production. In an attempt to replace them as soon as possible. They create damage by their aggressive taking of electrons. **Free radicals** (can) **cause**

**damage to all body parts**, like skin, joints, liver, brain, DNA, thyroid, eyes, etc. They accelerate the aging process (loss of vision, wrinkles, arthritis, sagging skin, stiffness, etc.), disrupt various processes and increase the risk of (skin) cancer. Therefore, the body has access to antioxidants, to arm itself against these radicals.

**Stress increases the need for antioxidants** since the body has a much higher need for energy production, and certain nutrients to recover from the stress respons.
Stress factors are not only a deadline or managing your household. A lack of sleep, pollutants in air, food and water, chemicals, UV radiation, WiFi, sugar, tobacco, alcohol, cosmetics, medication and cleaning products form stress factors for our body.
On top of that, eating healthy is quite a challenge and often **convenience foods** are an easy choice, providing way too little nutrients.
Therefore, the body often has a **lack of antioxidants** to prevent and reduce aging and ailments.

**Nano gold** works as an **antioxidant and increases** the effect of **other antioxidants** and even other nutrients like vitamin C and selenium. **Thus,** nano gold helps to protect our DNA, cells, organs, joint, skin and brain, **counteracting aging, ailments and diseases**. It also strengthens our immune system, growth and recovery, since those rely on the amount and quality of antioxidants as well.
[8,9,15,16,18,33,36,38].

## Nano gold as a catalyst for other antioxidants

Nano gold can allow antioxidants to penetrate deeper into the skin and tissues and enhance their effect. For example, antioxidants such as vitamin **C, lutein, selenium, turmeric**, and the flavonoid 3,6 - DHF (antibacterial and tumor inhibitor) have been shown to be **enhanced by gold.**

Compared to vitamin C, a very potent antioxidant, nano gold has a longer-lasting effect as an antioxidant. In addition, **unlike vitamin C**, nano **gold** is **not susceptible to oxidation** (free radical formation) [8,11,13]. One study showed that nano gold particles (clusters) attached to turmeric, had even higher antioxidant activity than turmeric or gold on its own (it showed elimination of the free radical DHPP) [33]. Gold is known to act as a **carrier for antioxidants**, and thus creates potentiating and or cumulative effects against aging. Active ingredients, including anti-cancer agents and the nucleic acids **DNA and RNA** can be **transported by gold** to the cells in need [35,36,37]. Regular medications, as well as natural substances such as zinc, silver, turmeric and platinum, which enables the body to **fight of cancer** throughout the day, are supported by nano gold.

## Studies nano gold as an antioxidant and catalyst

Many studies show the antioxidant effect of nano gold particles (and clusters). The working of gold is based on different mechanisms [9,13,18,19,21,27,28,31,32]. An example to show its effect: one study shows that **skin wounds** of mice **healed significantly faster** when nano gold was administered **in combination with ECGC** (green tea extract) **and alpha lipoic acid** > AuEA. AuEA significantly **increased SOD** in the wound area. SOD (Cu/Zn-superoxide dismutase) is one of the most **powerful antioxidants** (specific to the skin).
There was a clear **increase** of Hs68 cells: **nourishing** and supporting connective **tissue cells.**
The **proliferation** (growth) of HaCaT increased. HaCaT are **keratinocytes** (skin cells) that provide **growth**, development **and renewal** of the cells (growth factors).
The expression of **CD68 protein decreased:** marker for macrophages, cancerous tissue and inflammation, **indicating recovery** [9]. These results clearly show the accelerating antioxidant and anti-inflammatory effect of nano gold particles via different pathways.
**DNA protection** and reduction of inflammatory factors was also seen in a study with gold for **brain tissue** [36].

## Gold for skin, connective tissue, bones and joints

Gold has a rejuvenating effect on the skin and gives it a radiant appearance.
One of its methods is **activating** the production of **collagen**. Collagen is a protein that acts as the **"glue" of our body.** Bones, joints, muscles, connective tissue, blood vessels, skin, hair and nails, all contain collagen, varying from 10 to 70%.
**Collagen provides both firmness and suppleness.** It plays an important role in mobility, arthritis, arteriosclerosis (vascular stiffness), wrinkles and skin aging.
After the age of 25 we produce less and l**ess collagen** and the storage depots harden, hindering the release of collagen. [4,5,6,24, 75,76].
Applying **nano gold** directly to the skin **stimulates** the formation of **collagen**, promoting **firm skin**, **flexible** and strong bones, muscles and **joints**. It also supports our organs in functioning well.

## Gold stimulates the production of collagen through light.

The production and release of **collagen is activated by near-infrared light**. It is similar to infrared light but has a slightly lower frequency (620 nm) and is orange-red, instead of red. This specific light is
part of daylight that consists out of various colours and frequencies. Near-infrared light of 620 nm can penetrate the skin to a depth of 10 mm below the skin surface. There lie fibroblasts, cells that make and release collagen for all body tissues. The near-infrared light influences the cell activity of fibroblasts by its specific frequency [10].
**Nano gold clusters absorb and reflect light.** By ingesting and spraying on nano gold, the gold particles enter your fibroblasts. When exposed to daylight, your fibroblasts receive the near-infrared light, which is scattered by the nano gold clusters. This illuminating effect will **boost the production and release of collagen.**
All our cells, store a little light, to enable the light dependent processes. So even if you don't go outside, gold helps to intensify this stored light, resulting in increased production and release of collagen.
By reflecting light, nano gold literally gives shine and color to your complexion, when applied dermally. **A nano gold spray lets your face look radiant.** [11,12,13].

On top of that, gold **protects** your skin **against** the harmful effects of the sunlight, being an antioxidant. [11,12,13,44]

**Use nano gold along with your day cream, body lotion or muscle and joint gel.**
In addition to the fact that nano gold promotes firm and radiant skin, studies have also shown that nano gold acts as a carrier for other active ingredients and brings them deeper into the skin. Thus, **nano gold enhances the efficacy** and effect **of skin care products** [8].
Nano gold has also been shown to **accelerate** the **wound healing process** [9,51].
The wound healing process involves growth factors. Growth factors are specific proteins needed
for the skin's renewal process, whereby damaged cells are repaired and the skin regenerates. Healthy skin renewal is the key to youthful looking skin.

Skin care products combined with nano gold can help delay the signs of aging and reduce the appearance of wrinkles and lines, including expression lines [8,9,76]. It is highly recommended for skin that needs extra nourishment. It is not without reason that expensive brands such as L'Oreal use gold in their skin care products [76]. Spray or dab nano gold on the (facial) skin and then apply the desired cream for an optimal effect. Nano gold clusters can easily enter the target cell due to their small size, shape and molecular structure [76,77].

Also the collagen in your joints and the anti-inflammatory effects of a muscle and joint gel , can be activated and accelerated with nano gold. Dab or spray the nano gold on the skin and then apply the cream. Can be used for all muscle and joint pains.

## Nano gold in wound healing

Gold nanoparticle (AuNPs) biomaterials can accelerate wound healing through several mechanisms: by decreasing the septic phase of healing through an antioxidant activity, through migration of epithelial and mesenchymal cells in damaged skin, by distinguishing myofibroblasts and accelerating the angiogenesis cycle. The beneficial properties of AuNPs depend on their size, shape and surface area. For tissue regeneration, the ideal diameter of AuNPs is between 25 and 100 nm [78].
Nano gold can contribute to faster healing of wounds. A combination of nano gold, green tea extract (EGCG) and alpha lipoic acid, showed anti-inflammatory and antioxidant effects and significantly increased proliferation and migration of human skin cells (Hs68 and HaCaT cells). The expression of CD68 proteins decreased, a marker for the number of macrophages that clear up diseased and damaged cells, among other things. In addition, the amount of SOD (Cu/Zn-superoxide dismutase) increased significantly in the wound area: an enzyme that scavenges free radicals that cause a lot of damage to cells [9]. Gold nanoparticles (AuNPs) in combination with infrared treatment (PMBT) showed significantly accelerated wound closure in mice, compared to control groups. The application of AuNPs with PBMT has the potential to accelerate wound healing due to enhanced epithelialization (renewal of top layer cells), collagen deposition and vascularization [9,51].





## Nano gold in neuropathy - nerve disorders

Neuropathy is a **condition** (or disorder) **of one or more nerves.** This negatively effects the sensation in the arms, legs or face and the muscles no longer function as normal. There could be a single or multiple nerve dysfunction, mono or poly neuropathy. This condition is often not curable. Neuropathic pain occurs in about 1 in every 10 adults over age 30, but this number might be higher due to lack of diagnoses.
In sensory neuropathy, sensory disturbances such as a **numb feeling** or pain, predominate.
In motor neuropathy there is **weakness of the muscles**, often aside sensation distortion.
In autonomic neuropathy the organs such as the intestines, bladder, skin or heart do not function properly. A mixed form is also possible. The symptoms often develop slowly, over a period of months or years.

**Symptoms:**

- Tingling or burning and stinging sensations
- Dull or altered sensation
- The idea of walking on cotton wool
- Equilibrium disorder / vertigo
- Muscle weakness
- Difficulty writing, walking or for example opening lids (motor skills)
- Weak functioning organs (such as the bladder, intestines, and heart)

There are many different types of **neuropathies**, each with a **different underlying cause**.
Common causes are constriction, autoimmune disorders and damaged cells due to chemicals.
Excessive intake of sugar, alcohol, and food additives, as well as stress, medicine and pollution can also cause damaged cells.

**Practice has shown that many people experience relief from nervous disorders when using nano gold. Several studies have shown that certain types of nano gold particles can repair damaged nerve cells, resulting in less pain and improved motor skills** [14,15,].
**In MS**, an autoimmune disease, nerve cells are damaged as the protective fatty layer of the nerve cell, called **myelin**, is **compromised**. This disrupts the transmission of information, resulting in pain and movement limitations. **Nano gold** crystals, in particular gold crystals with a decahedron shape (ten-square), were found to be able to **induce re-myelination** of axons (runners of nerve cells) and even **improve motor function.**
Upon induced damage to myelin in animal models, gold was found to significantly delay the degradation of myelin.
Further analysis revealed that nano gold crystals were absorbed by oligodendrocytes ( a type of glia cells). These cells rebuild the myelin around the axons. Nano gold allowed the metabolism of these cells to be stimulated and myelin to be produced more quickly.

In response to gold nanocrystals, co-cultured cells (various types of cells originated from one type of tissue) from the central nervous system, showed **increased energy levels** and upregulation (increase) of myelin synthesis. An increase was seen of **NAD+** (the enzyme required for all metabolic processes), total intracellular **ATP** levels (energy supply) and extracellular lactate levels (lactate provides energy to skeletal muscle).
Nano gold crystals can penetrate cells and positively influence the efficiency of energy production there. "Energy efficiency through medicinal catalysis". Thereby, gold is the **catalyst** that accelerates processes within and between cells, such as **repair and information transfer** [14,15,36,51]. Given practical experience, nano gold clusters seem to have the same or similar effect. Future studies will have to prove this. Nano gold is safe and proven effective in various areas, so worth trying.

## Parkinson's, dopamine and gold

Parkinson's disease is a common **neurodegenerative disease** (nerve cells die) that affects more than 10 million people worldwide. It is characterized by **motor symptoms such as tremor** (uncontrolled shaking), stiffness, slowness of movement, and difficulty walking. It is often accompanied by fatigue, depression, pain and cognitive impairment. The main pathological features (causes) that are known are:

1. A dysfunction of alfa synuclein proteins. This protein plays a role, among other things, in sending messages between brain cells. In order to function properly, proteins must be "correctly folded". (A misfolded paper airplane doesn't fly either.) Misfolded (misformed) **alfa-synuclein proteins accumulate** and form agglomerates in **brain areas**, called Lewy Bodies. When the Lewy Bodies pile up in the Substantia Nigra, the brain area **where dopamine is produced**, it causes **disturbance of motor skills,** emotions and behaviour.
2. **Death of dopaminergic neurons** in the basal ganglia. The basal ganglia are areas of the brain that directly and indirectly control motor skills (movements), using dopamine from the Substantia Nigra. Due to a shortage of dopamine, the cells die, **making movements more and more difficult.**

3. Causes of these processes are still unclear, but **neurotoxicity and oxidative stress** (free radical damage) seem to **play an important role.** It was seen that by administration of antioxidants, apoptosis (cell suicide) was counteracted in dopaminergic SH-SY5Y cells. Recent research also shows that misfolding of alfa-synuclein proteins also occurs in the gut, which might be the root of Parkinson's [61, 62].

**Nano gold clusters,** smaller than 3 nm, **showed excellent ability to inhibit clumping** and undesired contraction **of alfa -synuclein proteins.** Also, in cell experiments, the gold clusters showed excellent **protection against neurotoxicity.** Animal experiments on mice in which Parkinson's was induced showed that **nano gold clusters could effectively reverse the behavioral disorders of the sick mice.** Remarkably, "immunohistochemical" and "western blot analysis" techniques showed a significant reduction in Parkinson's related neuronal loss in the brain, because of nano gold clusters: additional evidence of the neuroprotective effect of nano gold clusters [16].

The effect of nano gold as an antioxidant naturally counteracts oxidative stress and the anti-inflammatory effect of gold can also combat degenerative diseases such as Parkinson's. Many studies show the anti-inflammatory as well as the antioxdant functions of nano gold. [8,9,14,15,18,21,28,30,31,33,36,44,47,51,53,62,63]
One study specifically assessed the anti-inflammatory effects of GNPs between 20 and 45 nm in diameter on focal (local) brain injury. The results showed that treatment with GNPs reduced levels of the pro-inflammatory agent TNF-α, oxidative stress damage to DNA and post-apoptosis markers [36].

## Nano gold against feeling down and depression

The basal ganglia in the brain also play an important role in balance, rewarding behavior, response to stimuli, habits, depression, and addiction. Dopamine, being a key factor in these processes, therefore, has a major influence in these arias. Various studies show that gold has a positive influence on the amount of dopamine available in the brain. Nano gold clusters appear to help with mental complaints such as confusion, addiction and depression. Nano gold increasing neurotransmission, inhibiting inflammation and protecting against free radical damage in the brain, also contributes to proper functioning of mental processes, which counteracts depression and other complaints. More research into the role of gold as an antidepressant is in demand.

Paracelsus, a famous physician in the 16th century, described the therapeutic properties of gold as "quinta essentia auri", or the fifth element gold. The four elements: water, air, earth, and fire form a square. With five elements you create a circle in which energy can flow freely. The fifth element is able to reconnect us with a law to which every form of life is subject: the cyclic principle, the gate to enlightenment.
Paracelsus obtained colloidal gold by the reduction of gold chloride using vegetable extracts in alcohols or oils. He used the "potable gold" to treat a number of mental illnesses, as well as syphilis, an STD, which effected many people at that time, and often became fatal [74].

## Nano gold and Alzheimer's

Alzheimer's is a form of **dementia**. Due to a **defect in the nerve cells**, memory and often later also behaviour, motor movements, skills and speech are affected. [64,66]
As with Parkinson's, problems with the accumulation of misfolded proteins also play a major role here. The type of protein and the place of stacking define the disease [67]. The most common assumption about the cause of Alzheimer's is the formation of the so-called "plaques". **Plaques are clumps of misfolded beta-amyloid proteins that build up between nerve cells.** This makes **communication** between the brain cells more **difficult**. The stacking of the amyloid proteins can start as early as 15 years before the first symptoms are visible. In addition to plaque formation, in Alzheimer patients we also see "tangles". **Tangles are formed by accumulation of the protein Tau**, which form a kind of **tangle**

**within the brain cells.** Tau is responsible for delivering nutrients at the right place within the cell. Abnormal chemical connections cause a reaction that causes Tau proteins to stick together and pile up. It seems that Alzheimer's is caused by a combination of the accumulation of Beta-Amyloid and Tau proteins. [63,64,65,66,67]
As with Parkinson's, recent studies show that **Alzheimer's** is also **associated with inflammation and oxidative stress.**
Inflammation and oxidative stress contribute to further damage and destruction of neurons. Existing vascular problems such as arteriosclerosis or thrombosis can further accelerate or exacerbate neurological damage. Vice versa, vascular damage can also occur due to neurological disorders.
Excess amyloid is removed via the blood-brain barrier. A disturbance in this system can therefore also promote or worsen Alzheimer's and other neurological disorders. [63,66,68,70]

Gold nanoparticles (AuNP) have anti-inflammatory and antioxidant properties. Both functions counteract inflammation and oxidative stress. **Nano gold can** therefore **prevent and repair damage to cells and neurons.** [8,9,14,15,18,21,28,30,31,33,36,44,47,51,53,62,63]

In a rat study, okadaic acid was injected into the cerebral ventricles (central chambers of the brain). Okadaic acid (OA) has been shown to have neurotoxic and immunotoxic effects. The rats were divided into 4 groups: OA, AuNP, OA+AuNP and a control (sham) group.
OA increased Tau phosphorylation in the cortex and hippocampus, while AuNP treatment kept it normal. Spatial memory was impaired by OA while AuNP treatment prevented this effect.
Neurotrophic factors BDNF and NGF-β in the cortex and hippocampus were reduced by OA (substances that keep neurons alive and functioning properly). Both the OA and OA+AuNP groups (therefore) increased IL-1: an "alarming" protein. In the AuNP groups IL-4 was also activated: a "protective" protein. AuNP's prevented oxidative damage caused by OA.
S-100 levels were elevated in both the cortex and hippocampus, calcium-binding proteins involved in brain damage [69,70]. The antioxidant capacities were reduced by OA. AuNP's restored antioxidant status (SOD, catalase activities and GSH levels) in the brain. OA caused damage to brain tissue, while (long-term) treatment with AuNP's prevented neuroinflammation and maintained normal mitochondrial function.
Nano gold thus appears to be a promising remedy in the fight against Alzheimer's and other neurodegenerative diseases. [62,63,16]

## Gold in rheumatism and inflammation

Rheumatism is a collective term for more than **100 disorders of the joints, muscles and tendons**, often accompanied by **inflammation** and mineral deficiencies. Rheumatism is divided mainly into arthritis, osteoarthritis, gout and soft tissue rheumatism, among others. One in nine people in the Netherlands has some form of rheumatism, and every day 700 people are added (400.000 people in the Uk.) [17].
**Nano gold inhibits inflammation and stimulates tissue repair**
[9,15,18,21,24,31,33,36,44,51].

## Rheumatoid Arthritis

Rheumatoid arthritis is an autoimmune disease whereby the body attacks healthy cells, involving progressive **inflammation**, **breaking down** the **cartilage** in the joints. This leads to **pain**, thickening, **deformity** and immobility.
Progressive inflammation is caused by increased levels of certain proteins, hormones and fatty substances: cytokines, leukotrienes and prostaglandins, which regulate inflammation. The complex interaction between these inflammatory substances, is responsible for destruction of cartilage in joints. **Nano gold can inhibit several pro-inflammatory substances.** Moreover, nano gold shows that it enhances antioxidant activity and significantly inhibits free radical damage, offering protection against loss off cartilage. [8,9,11,15,16,18,21,22,24,51].

## How gold suppresses inflammation

The substances responsible for inflammation in the body include the cytokines: interleukin 6 (IL-6), interleukin-1β (IL- 1β ) and TNF-α (tumor necrosis factor-α), the enzyme cyclo-oxygenase-2 (COX-2), the immune complexes immunoglobulin G (IgG) and immunoglobulin M (IgM), rheumatoid factor, nitric oxide (NO) and nuclear factor-kB (NF-KB).
**Several studies show that nano gold can inhibit all these inflammatory mediators** in various inflammatory conditions such as arthritis, tendinitis, brain injury or sunburn [8,15,18,21,31,36,44,47]
In some studies, in addition to inhibition of inflammation, **loss of adipose tissue was also seen** [31].

## Gold injection for rheumatism?

In the early 1900s, the Empire Rheumatism Council sponsored a thirty-year **clinical trial** that **proved** the **effectiveness of** using **gold** compounds to treat **rheumatoid arthritis.** This resulted in a long-term and widespread use of gold for various types of rheumatism and other inflammatory conditions, with success. [1,2,3,20,21,22].
**Gold has been recommended for rheumatism since ancient times.** The first civilizations ground it into powder and mixed it with food. In India, to this day, gold is ground in a mortar with other herbs for various health purposes still. The alchemists brewed "aurum potable" or drinkable gold to cure lots of diseases. In all those varieties, the medics aimed for the smallest gold particles (or clusters) possible, for the sake of its health purposes. Nano gold, nowadays, offers the smallest possible clusters.

In order to conduct studies according to Western medical science, all gold particles must be the same, stable and traceable. In order to obtain **stability**, the gold particles were attached to other substances, which is how you get gold **compounds.** However, gold compounds often have adverse **side effects.**
The gold **compounds initially used** to treat rheumatoid arthritis **were thiolates:** sodiumurothiomalate (Myocrisin™) and aurothioglucose (Solganol™). These compounds could not be administered orally, and went via deep **intramuscular** injection > **gold injection**.
This promoted rapid absorption but also caused an important side effect. Gold was rapidly

cleared through the bloodstream and distributed to the kidneys, where it accumulated and caused nephro toxicity (kidney damage). Other side effects included occasional liver toxicity, mouth ulcers and skin reactions. In 1985, therefore, **auronofin** (Ridauro™) was introduced as the **first registered orally** available **gold-based therapeutic agent.** The major and unprecedented oral administration of Ridauro ™ provided several benefits, including reduced tissue retention of gold, which significantly reduced nephron toxicity. Unfortunately, the decrease in **side effects** is offset by a **decrease** in **efficacy** compared to gold thiolates [1,2,3,19,20,21,23].

## Nano gold the solution in rheumatism?

Although gold has been used medicinally for centuries and was also the primary registered therapy for active rheumatoid arthritis in Western medicine for decades, its use declined around 1995. This was due to its toxic side effects and lack of adequate long-term efficacy.

The **question** naturally **arises** whether the **gold itself causes** the **side effects or the other components.** A number of researchers argued that the active ingredient in the gold thiolates is colloidal gold (slightly less refined form than nano gold), and that the side effects were due to the other components of the thiolates, or gold compounds. Following that, they set up a **clinical trial** with 10 patients with long-term erosive rheumatoid arthritis. They were given 30 to 60 mg of colloidal gold daily for **6 months**. **Pure gold, "dissolved" in water**, with no binding agents. After extensive research, **no detectable toxic effects** of the colloidal gold were found. The effects of the colloidal gold on joints, both sensitivity and swelling, were rapid and **significant**, improving by a factor of about 8 after only one week to a factor of 10 after 6 months. Functionality of the joints was **improved** throughout the group with 1 person going from completely disabled to full-time reintegration.

**Inflammatory factors:** interleukin6 (IL-6), tumor necrosis factor alpha (TFN-alpha), immune globulines IgG and IgM, and rheumatoid factor **were significantly suppressed by colloidal gold.** The results of this open study in ten patients with long-term erosive RA who did not respond to previous treatments supported the contention that **colloidal gold** is indeed **the active ingredient in auro-thiolate therapy (gold compound)** and that the side effects are due to the other components in the gold compound, possibly generated by oxidation. Colloidal gold appears to be able to be an effective and safe alternative to auro-thiolates (gold compounds) in the treatment of RA patients [18,21].

Several studies and many practical examples have already supported this claim. **Nano gold**, which is **even more refined than colloidal gold**, proves time and again, to have **no** toxicity and **side effects** at all, and to be **very effective against several sterile inflammations such as rheumatoid arthritis.**

## Nano gold in the fight against cancer

Nano gold particles have long been used in the treatment of cancer. They serve as a tool to **detect** the **tumors** and or as a transporter to deliver both allopathic and natural drugs to the tumor, which are able to destroy the cancer cells. Also nano gold can be used as a tool, together with infrared radiation to **"blow up"** the **cancer cells**. Today, more and more research are being done to see weather gold in combination with natural medicines such as turmeric and Siberian ginseng, can cure cancer. Also, it is seen that **nano gold, on its own was capable of fighting cancer cells.** Increasingly sophisticated techniques are leading to ever better results in cancer treatment. The ancient Ayurvedic medicine, as well as that of the ancient Greeks, Chinese, Egyptians and Aztecs used (nano) gold in their medicine to keep cells healthy or repair when needed. Today, in the West as well as in the East, old knowledge is combined with contemporary knowledge for good insights and optimal results in medicinal techniques. [22,24,27, 39,40,43,52,53]

## What is cancer?

Cancer is a general term for an immensely complex disease that always involves **uncontrolled or abnormal cell division**. Cancer is caused by mutations in cells, caused by genetic and or environmental factors (tobacco, alcohol, UV radiation, sugar, chemicals...). Healthy cells have a control mechanism. They are programmed to kill themselves as soon as they become diseased or aged and therefore can no longer function properly. This process occurs without damage to surrounding cells and is called apoptosis. In cancer cells, the **cell's control mechanism is defective due to a mutation,** resulting in diseased cells continuing to divide over and over again. A growth (tumor) develops. Cancer cells can also create new blood vessels to provide additional nourishment and protection for themselves, growing uncontrolled, **torpedoing the body** [34,771].

According to the Center for Disease Control and Prevention, the most common, deadly cancers are prostate, breast, lung, colon and rectum cancer. Mortality rates worldwide exceed 9.6 million people per year. **In the Netherlands,** number 3 in Europe in terms of the number of cancer patients, **128 people a day die of cancer.** That's 46,720 deaths per year and the numbers continue to grow. [24,25,26,49]

## Cancer Treatments

The most ideal situation would be to completely remove the tumor tissue without affecting healthy cells. Surgery is preferred because of its minimal side effects, however, often not an option due to the fast spread of cancer. Chemotherapy or radiotherapy are then second best, but have devastating toxicity to both healthy cells as well. Other anticancer therapies such as immunotherapy, hormone therapy, targeted therapy, stem cell transplantation or precision medicine also run into various problems. The biggest challenges are: drug resistance, intolerable toxicity, poor bioavailability and non-specific systemic distribution (medication gets everywhere in the body with all its consequences). [24,26].

## Using nano gold to slow down the growth of cancer cells

Due to its role as an antioxidant, catalyst of other antioxidants, anti-inflammatory and enhancer of neurotransmission (communication), nano gold has a protective role

for cells and their DNA. This also offers protection against mutations that ultimately cause the development of cancer cells. The body can, in many cases, repair cells and DNA itself. Nano gold contributes to this healing process.

In regular medicine, various types of nano gold particles have been found to be able to localize cancer cells and tumors, enabling the diagnosis to be established more quickly and treatment to be initiated more quickly.

Nano gold particles also act as a means of transport. Instead of (orally) administering an anti-cancer drug that destroys all other fast-growing cells in addition to the cancer cells, medication can also be attached to a means of transport that releases the drug at the destination wanted. This way you only fight the tumor: targeted therapy or "targeting" [77].
Administered nano gold particles also appear to accumulate more easily in tumor tissue due to the poor quality blood vessels of the tumors. With sufficient accumulation of nano gold particles or clusters, targeted near-infrared radiation is able to heat up the tumor in such extremes, that it "inflates". [28, 35,36,37,39,40,41,42,43,44]

Based on this knowledge, it is possible to hypothesize that free nano gold clusters (from food or a supplement) in the body can detect cancer cells and fight them with the help of other nutrients such as silver, zinc, turmeric or platinum. The body has a self-healing capacity in which it uses specific nutrients, tailored to the circumstance.
Hopefully this will be investigated soon. Such studies are not easy to carry out in view of their complexity. In any case, nano gold can be part of immuno therapy against cancer, since it strengthens the body in fighting mutations and helping cells, DNA and RNA to repair itself. Traditionally, gold has been known as a healing agent that, in the right shap and size, can bring about transformation. The alchemists, forerunners of today's chemists and pharmacists, were convinced of the power of colloidal gold.

## "Targeting" or targeted therapy

The chemically formulated nano gold targeting compounds cause less damage to surrounding cells than other therapies. However, due to their inorganic and sometimes toxic nature, they often still have toxic side effects. With naturally stabilized (synthesized) nano gold particles, these side effects do not occur.
Compounds used as "medicine" can also be formulated out of natural substances.

For example, a study found that nano gold particles attached to Siberian ginseng could effectively destroy melanomas (skin cancer cells) without causing damage to surrounding cells [39].
Nano gold particles bound to turmeric showed higher antioxidant and cytotoxic capacities than their chemical siblings. Gold turned out to be not only the transporter but also the catalyst of turmeric. **Nano gold increased the effect of turmeric** [33].

A common, highly aggressive brain tumor, "glioblastoma" (GBM), is often treated with the gold-compound drug: anthracycline ring antibiotic doxorubicin hydrochloride. By replacing the chemical compounds with natural gum, these newly synthesized gold nanoparticles were found to work much better than the traditional citrate- and borohydride-synthesized gold nanoparticles [40].
Gold nanoparticles or clusters, bound to chemical or natural anti-cancer substances, can have a destructive effect on cancer cells. The true-to-nature particles had little or no side effects at all [31,33,37,39,40,44].
One study has also shown that nano gold particles counteract the growth of new blood vessels in tumors [36].

## Synergy of silver and gold

Silver nanoparticles (AgNPs) are known to generate ROS, Reactive Oxygen Species, with subsequent DNA damage. Silver nanoparticles have been shown to kill pathogens such as bacteria, yeasts and moulds, distinguishing between pathogens and healthy bacteria and cells. Cancer cells were also effectively combated by silver nano particles, while healthy cells were left untouched [24,30,72,73].
As a transporter, gold can deliver silver and other materials to their destination.
A whimsical example of this are the nanobots of Catalan researchers. They developed nano-sized round robots made exclusively of pure metals, to purify water. They consist of magnesium, which acts as a propeller, gold to adhere to the pathogenic, polluting substances, silver to kill those substances and iron as a magnet to easily collect the nanobots from the water again. Its effect is based solely on the natural properties of the metals themselves. [27,32].
In a 2017 cancer cell-fighting study, compound nanoparticles of gold and silver bound to chitosan were found to target and then destroy the cancer cells by inducing apoptosis [31].

## 3.6 DHF: Natural antioxidant, anti-cancer, antibacterial and anti-inflammatory agent, enhanced by nano gold.

As already described, in addition to regular medication, nano gold can also enhance the effect of the natural anti-cancer agents turmeric, Siberian ginseng and nano silver.
These are chemopreventive agents: drugs, vitamins, or other agents to lower the risk of cancer, slow its development, or prevent cancer recurrence.
3,6-DHF (3,6-Dihydroxyflavone) is a potent flavonoid known to prevent chemotherapy. It is used in the treatment of various cancers, including breast cancer. 3,6-DHF effectively inhibits the formation and proliferation of breast cancer stem cells and thus reduces the tumor-initiating capacity of tumor cells [47, 52]. It plays a role in various signaling substances, regulators, inhibitors and activators that control the immune system. (JNK kinase, an enzyme involved in apoptosis, TLR2, a molecule that can stimulate inflammation when fighting pathogens, tumor necrosis factor (TNF)-α, which can kill tumor cells, and the interleukins: IL-6 , IL- 12, IL-1β.) 3,6-DHF is also an antioxidant, antibacterial and anti-inflammatory agent. It combats tuberculosis and pneumonia by effectively fighting the bacterium mycobacterium tuberculosis [47,50].
Nano gold particles have been shown to enhance the effect of 3,6-DHF [8].

## Nano gold as a natural aid in the fight against cancer

Nano gold cluster (particles) can attach to natural substances in the body and function as a carrier, bringing them to their destination and or enhance their effect. We have seen this with antioxidants, flavonoids, metals (such as silver and platinum) and the cytostatic herb turmeric. A 2017 study also showed that nano gold particles without any other substance fought cancer cells, acted like an anti-inflammatory and an analgesic (painkiller) [31]. Nano gold can therefore also help the body in its daily (preventive) fight against cancer cells without the help of doctors and chemists. After all, nano gold helps to protect our DNA, which prevents mutations and enhances the effect of immune strengthening nutrients which fight cancer cells on a daily basis.

The body is incredibly intelligent and can in many cases prevent, slow down or bring about a cure for disease. It applies targeted therapy or "targeting" by itself, provided that the right resources are available. In addition to healthy foods, relaxation,rest, proper sleep, exercise and positive thoughts, those resources are nutrients.

Nano gold is a nutrient that itself possesses anti-inflammatory, conductive, analgesic, anti-oxidative and anti-bacterial properties. On top of that, it enhances other substances with the same properties. [9,11,18,21,30,33,38,39,41] Nano gold helps protect and repair DNA, cells and tissues which prevents the formation of cancer cells or restores derailed cells. Several studies have now shown that elemental nano gold particles have a preventive effect on the formation of cancerous cells, as well as a toxic effect on cancer cells, without affecting healthy cells. [11,21,31,44,45]

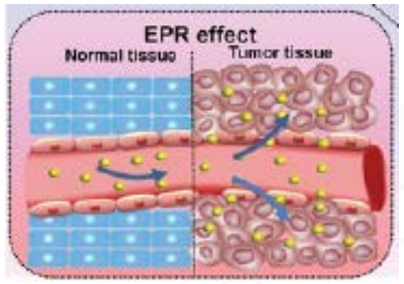
At the level of consciousness, nano gold helps to form positive thoughts, by stimulation of dopamine and neurotransmission. Positive thoughts are increasingly recognized as a means of promoting healing.
Gold can thus bring about transformation within the body both mentally and physically. This is what the ancient alchemists and many doctors of the (late) Middle Ages praised gold for. Paracelsus said: "Gold makes the heart happy".

## In-depth article on cancer and the role of nano gold

For those who want to know more about targeting, brain tumors and the (possible) role of nano gold in this, underlined by studies, you can read the article below.

## Targeting with nano gold particles

In "active targeting" (actively targeted or targeted therapy), the nano gold particles are bound to a ligand on their surface. A ligand is a "tailor-made substance" (chemical or natural), which can bind to specific receptors, abundantly present. The nano gold particles or clusters transport the drug through the bloodstream until it encounters the tumor receptors, where the ligand binds to the tumor, and this binding triggers a process that leads to apoptosis: a key-lock principle. The effectiveness of active targeting relies on the effectiveness of the ligand and the amount of matching tumor receptors (overexpression).[22,24,25,28,31,49,77]




"Passive targeting" is based on a controversial concept called Enhanced Permeablity and Retention or EPR.
In EPR or Improved Permeability and Retention, molecules of certain sizes, such as liposomes, nanoparticles and macromolecular drugs, tend to accumulate much more in tumor tissue than in normal tissue. The common explanation for this phenomenon is the poor quality of blood vessels that the cancer cells feed on. Tumors must provide themselves with a continuous blood supply for their extraordinary growth. They do this by Angiogenesis: Creation of extra blood vessels from existing blood vessels. Cancer cells make use of growth factors (such as VEGF). The newly formed tumor vessels are usually abnormal in shape and structure. They have poorly executed, defective endothelial cells with wide fenestrations (openings). When the gold particles flow through these vessels, they encounter openings in the wall of the blood vessels where the tumors are located. Hence they can easily reach (target) the tumor and a small part of these gold particles naturally attach themselves to the tumor. The gold particles can carry a drug that triggers processes that lead to apoptosis. The nano gold particles can also be heated with the aid of near-infrared radiation, causing the tumor to "inflate".

## Nano gold potent candidate for targeted anticancer therapy

Gold nanoparticles are increasingly being studied and applied in passive or active targeting. Its small size (nano) and its transporter properties increase local concentration, cell penetration and drug delivery, making it a potent candidate for targeted anticancer therapy. [38,39]. This improves the effectiveness of the treatments. The resistance to various drugs can be circumvented or reduced and the toxicity (destruction of healthy cells) can be minimized. Natural or "green" nanoparticles are now being used more and more. These green nanoparticles are synthesized using herbs and plants such as Siberian ginseng and turmeric instead of unnaturally toxic, inorganic reducing agents. "Green" nanoparticles are much more powerful than the chemically and physically synthesized nanoparticles because no toxic chemicals, heat or pressure are applied during the synthesis process. [24,25,28,29,38,48,77].

## Brain tumors

The Blood-brain tumor barrier involves existing and newly formed blood vessels (angiogenesis) that contribute to the delivery of nutrients and oxygen to the tumor, facilitating the migration of glioma cells to other parts of the brain. A glioma is a cancerous tumor (tumour) in the glial cells [42]. The pore size of the blood brain tumor barrier is approximately 11.7 to 11.9 nm. Therefore, effective transvascular drug delivery in malignant glioma cells can be achieved by using nanoparticles smaller than 11.7 to 11.9 nm in diameter and having a long blood half-life [41]. Gold nanoparticles can thus fight the brain tumor through active targeting.

## Killing Cancer Cells With "Nanotheranostics"

Nanotheranostics is a contraction of "therapeutics" and "diagnosis" [27].

Gold can detect tumors and silver can penetrate and destroy them from within. Research has shown that nano particles, consisting of silver and gold, attached to a polysaccharide (chitosan), could detect tumors and kill the cancer cells.

These composition nanoparticles were made from AgNP-AuNC-CSNPs (silver nanoparticles, gold nanoclusters, and colloidal silver nanoparticles), embedded in chitosan.

The individual size of the NPs (here stands for nanoparticle, typically no larger than 10 nm) and NCs (represents nano cluster, typically no larger than 2nm) ranged between 0.41 - 10 nm. The mean hydrodynamic diameter of the thus prepared composite NPs (AgNP-Au-NC-CSNPs with chitosan) was 155.5 nm, with a zeta potential of +19.3 mV, which are generally considered favorable for cellular delivery applications.

The prepared composite NPs were successfully internalized by HeLa cells (human cancer cells) due to the favorable size and surface charge. The uptake and subsequent morphological changes of the cell after treatment with the composite NPs were evident. These composite nanoparticles of gold and silver tracked down the cancer cells and then killed them by apoptosis. In addition, they provided the option for simultaneous cellular imaging, thanks to the presence of luminescent AuNCs without the use of organic dyes [27].

To be efficient, nanotheranostics must possess special characteristics: specificity (marking only disease-causing cells, using gold), intracellular environmental monitoring or process control (gold and silver), cell penetration capability (silver and gold compound), and tumor toxicity (silver).

## Nano gold as a stimulator of apoptosis, reduction of pain and inflammation.

A 2017 study found that nano-gold particles (AuNPs) caused cell apoptosis on their own, without any other substance. The AuNPs were synthesized from gold chloride and bound to a polymer, both from natural resources. After human colon cancer cells (HT-29 cells) were exposed to the AuNPs, apoptosis was observed. AuNPs were characterized (shown) by TEM (transmission electron microscopy) and UV-vis microscopy. Apoptosis was assessed using the markers Annexin V and propidium iodide staining, as well as the activity of caspase-3, an enzyme that can initiate apoptosis. The apoptosis effect appeared to be dose dependent, at concentrations ranging from 40 g/ml to 80 g/ml ($p < 0.05$). The same AuNPs also showed anti-inflammatory activity in mice, where a dose of 1500 g/kg produced a 49.3% reduction in leukocyte migration. (Inflammation causes leukocytes to act). The AuNPs also showed peripheral analgesia (pain relief) at a dose of 1500 g/kg.

Conclusion: The study confirms that gold nanoparticles have anti-inflammatory, analgesic and anti-tumor effects. AuNPs deserve more research to assess their full interaction with organic systems [31].

# Chapter 5: History of gold

## Gold metallurgy and artefacts

The use of gold dates back as far as history goes. The **first signs of raw metallurgy** occurred between **9000-7000 BCE**. From Iran to Egypt and Greece, gold was mined on a large scale. Since then, some 161,000 tons of gold have been mined by mankind.
The oldest gold artifacts were found in a necropolis, which means "city of the dead" (large cemetery), dating from 4600 - 4200 BCE, in Varna, present-day Bulgaria. The tombs contained about 300 pure gold sceptres, axes, bracelets, idols, etc. The find attests to the advanced skills of the goldsmiths of the time. In 1200 BCE, the much more famous, **largest gold collection ever,** was found in the **tomb of Tutankhamun** (Pharaoh 1333 - 1324 BCE), with much jewellery and even a gold coffin. [1,2,3,6,11,22]

## First undeniable evidence of nano gold dates from the fourth cenury

The **"Lycurgus cup"** is a beautifully decorated glass cup from the Roman period, in the 4th century AD. The cup looks green in reflected light but looks red in transmitted light. This is due to the presence of **gold and silver nano particles** (40 and 300 ppm respectively). The Lycurgus cup is an extraordinary example of the unique optical properties of nano particles and proves that the Romans were already able to manufacture colloidal metals back then. [6,12,14].

Some experts claim that the Romans manufactured the Lycurgus Cup "by accident." This is because the most commonly found red glass from that time was coloured using copper. However, it is highly unlikely that the one "accidental cup" from that era was actually found. A recent study by researchers Verità and Santopadre, has shown that **mosaic tiles** (tesserae) **from 9** prominent **churches in ancient Rome** also **contain 10 to 30 ppm gold** or gold-silver particles. It is precisely the gold and silver particles that are **responsible for** the specific **pink skin color** in the images. Given the large number of tesserae used, the researchers assume that it was routine work rather than a coincidence and that the **Romans, mastered this complex colouring process with nano gold particles.** [3,58]

## Gold and money

In addition to objects for beauty, status and symbolism, gold was also used as a gift and a means of exchange and became an official method of payment in the form of gold coins centuries before Christ. The piled-up gold bars in banks are an image that everyone can picture. **In 1944**, however, the Bretton Woods Agreement created a system of fixed exchange rates and **gold was replaced by U.S. dollars.** Nevertheless, gold still remains a popular investment. A **kilogram of gold** today costs about **50,000 euros.** [3,11].

## Ancient use of gold

The use of nano gold has its **roots** in the oldest civilizations from **Sumer,** Mesopotamia, to ancient China and Egypt. The Aztecs literally considered gold to be the product of the gods [3,14,44,53].
Gold in potable form, has unprecedented value to our bodies.
It **enhances our natural physiological, energetic and spiritual processes** and nano gold is also **widely used in the medical field.**
Since ancient times, gold has been described as a means of **rejuvenation** and **magical-religious properties.** The oldest Chinese writings, dating back to 2500 BCE, describe how gold was used for physical ailments such as fistula and haemorrhoids (venous disorders) in addition to spiritual purposes.

## Does gold have anything to do with the origins of humanity?

If we came from stardust and that **stardust** contained gold, then the answer is yes. **The origin of mankind**, of course, **has many** stories or **legends** and everyone may hold their own truth or keep it as an open question.
**One such story** is based on the work of a group of scholars who have studied the historiography of the oldest civilization: the Sumerians. Translations of their cuneiform writing can be interpreted in a variety of ways. Together with archaeological findings, astronomical discoveries and lures from various cultures and areas, an interpretation and historiography have emerged from this. It describes the creation of man, in which gold plays a key role, supplements biblical stories and puts inexplicable discoveries into perspective. To say the least, it is a very **fascinating and engaging narrative, by Zecheria Sitchen,** Michael Tellinger, David Hudson and others. [54,56,57]
Those who want to know more can read **"Gold and the Origins of Mankind**.

# Chapter 6: alchemy

## Alchemists, wizards or chemists?

When the word "alchemy" comes to mind, most people think of old men or "wizards," in secret workspots with bubbling and steaming glass flasks and chalices filled with mystical, colored liquids and mysterious concoctions. But the **alchemists were the first physicists and chemists** of great knowledge and skill. Many of them were also physicians, toxicologists, philosophers, astrologers or theologians, and all had an extraordinary fascination with gold.  A large number of **modern developments are the result of their efforts**. Think of porcelain, alcohol, acetone, gunpowder or benzene. Numerous laboratory devices and processes were also developed by the alchemists, such as: furnaces, distillation equipment, extraction, filtration, and the separation of gold and silver.

## What exactly is alchemy?

According to Mahdihassan, author of the book Indian Alchemy and many articles related to alchemy, the word alchemy is originally derived from two **Chinese** words: "Kim" (gold) and "Yeh" (juice). So **"Kimyeh" means "gold liquid."** In Arabia, forerunner in the field of alchemy, this word came in as "kimiya", and **with the article "al" the Arabic word "alkimiya" was created.** This became the word "alchemy" in the Western world. Alchemy thus means gold liquid, which referred to what we today call **colloidal gold.**
According to emythologists, alchemy means "gold-making art". Other historians assign a broader meaning to the term alchemy. They claim that alchemy is derived from the Arabic or Egyptian Al-kemi, meaning **"divine chemistry" or "art of the gods.** Remarkably, gold on hieroglyphs is almost always depicted with gods. [3,44,55,56]

## Gold as an elixir of life

Alchemists turned "ordinary" gold**,** often described as bulk gold, into a red-colored, potable gold water, also called **"aurum potable."** Today we call this gold water colloidal gold. Gold particles made so small that it "dissolves" in water, as it were. If the particles are smaller than 100 nanometers (nm), we speak of nano gold.
The brewing of **colloidal gold was intended for spiritual, mental, emotional and physical effects.** Gold was used for a range of diseases such as: venereal diseases, heart problems, vascular disorders, tumors, eye complaints, skin complaints, dysentery, depression, epilepsy, the diagnosis of syphilis, etc. [3,44,53].

## Turning lead into gold

The alchemists were known for searching for the magical agent, also called **"The Philospers stone,"** that could transform base metals such as lead and zinc into gold.
Most people think that producing gold from simple metals is an urban legend. However, in 1980 **Glen Seaborg managed to convert the chemical element Bismuth into gold** at the Lawrence Berkeley Laboratory using nuclear physics! So it is indeed possible. However, the cost is many times higher than the yield. [1,2].
Whether the alchemists of ancient times were proficient in this process is disputed and certainly remains a question, but the fact is that there are several ancient sources that indicate this.
The fact is also that they were at least able to produce colloidal, nano gold and were so keen on it that they risked their lives for it. [3,11,44,53].

## Ban on alchemy

On January 13, 1404, King Henry IV of England imposed a ban on alchemy. He signed a law that made it **a crime to "create gold and silver out of thin air."** There was a ban on "multiplication," which in alchemy meant somehow creating a multiple or something more valuable from a particular material, such as gold. [59]
Alchemists who still attempted to transform base metals into gold were persecuted by the church and **risked torture and even death penalty.** [3,59]

## Inner transformation

Alchemy In its deepest essence means inner transformation.
A transformation in ourselves that can give deep insights, awareness and spiritual growth. But also, a change at cellular level leading to inhibition of ailments and diseases, possibly healing.
**"The body achieves what the mind believes"** Nano gold activates and accelerates the transmission of impulses allowing thoughts to be transformed into actions. It improves cell functions, and it inhibits inflammation which is at the root of depression and other diseases. That is transformation.

# Verdiepingsartikel kanker en de rol van nano goud

Voor wie meer wil weten over targeting, hersentumoren en de (mogelijke) rol van nano goud daarin, met studies, kan onderstaand artikel lezen.

## Targeting met nano goud deeltjes

Bij **"actieve targeting"** (actief gerichte of doelgerichte therapie) worden de nano gouddeeltjes aan hun oppervlak gebonden aan een ligand. Een ligand is een "op maat gemaakt stofje" (chemisch of natuurlijk), welke kan binden aan specifieke receptoren die in overvloed aanwezig zijn op het oppervlak van tumorcellen. Het nano gouddeeltje transporteert het medicijn door de bloedbaan heen, tot het de tumorreceptoren tegenkomt. Daar bindt het ligand aan de tumor. Vervolgens wordt door deze binding een proces in gang gezet die tot apoptose leidt: een sleutel-slot principe. De effectiviteit van actieve targeting berust op de doeltreffendheid van de ligandverbinding en de hoeveelheid passende tumorreceptoren (overexpressie). [22,24,25,28,31,49, 77]

**"Passieve targeting"** berust op een controversieel concept, Enhanced Permeablity and Retention of EPR genaamd.
Bij EPR ofwel verbeterde permeabiliteit en retentie (verbeterde doorlaatbaarheid en vasthouding), hebben moleculen van bepaalde afmetingen zoals liposomen, nanodeeltjes en macromoleculaire geneesmiddelen, de neiging om zich veel meer in tumorweefsel op te hopen dan in normaal weefsel. De algemene verklaring voor dit fenomeen is de slechte kwaliteit van bloedvaten waar de kankercellen zichzelf mee voeden. Tumoren moeten voor hun buitengewone groei, zichzelf continu in bloedtoevoer voorzien. Dit doen ze d.m.v. angiogenese: aanmaak van extra bloedvaten vanuit bestaande bloedvaten. Kankercellen maken daarbij gebruik van groeifactoren (zoals VEGF). De nieuwgevormde tumorvaten zijn meestal abnormaal van vorm en structuur. Ze hebben slecht uitgevoerde, defecte endotheelcellen met brede fenestraties (openingen). Wanneer de gouddeeltjes door deze vaten stromen, stuiten ze op openingen in de wand van de bloedvaten waar de tumoren zich bevinden. Nu kunnen ze de tumor dus makkelijk bereiken (targeten) en hecht een klein deel van deze gouddeeltjes zich van nature aan de tumor. De gouddeeltjes kunnen een medicijn dragen dat processen in gang zet welke tot apoptose leiden. De nano gouddeeltjes kunnen ook met behulp van bijna-infraroodstraling verhit worden waardoor de tumor "opgeblazen" wordt.

## Nano goud potente kandidaat voor gerichte antikankertherapie

Gouden nanodeeltjes worden steeds vaker bestudeerd en toegepast bij passieve of actieve targeting. Het kleine formaat (nano) en zijn eigenschap als transporteur verhoogt de lokale concentratie, celpenetratie en medicijnafgifte, wat haar een potente kandidaat maakt voor gerichte antikankertherapie. [38,39]. De effectiviteit van de behandelingen wordt hiermee verbeterd. De resistentie tegen diverse geneesmiddelen kan worden omzeild of verminderd en de toxiciteit (vernietiging van gezonde cellen) kan worden geminimaliseerd. Daarbij worden nu steeds vaker natuurlijke of "groene" nanodeeltjes gebruikt. Deze groene nanodeeltjes worden gesynthetiseerd met behulp van kruiden en planten zoals Siberische ginseng en kurkuma i.p.v. onnatuurlijke giftige, anorganische reductiemiddelen. "Groene" nanodeeltjes zijn veel krachtiger dan de chemisch en fysisch gesynthetiseerde nanodeeltjes omdat er tijdens het syntheseproces geen giftige chemicaliën, hitte of druk worden toegepast. [24,25,28,29,38,48, 77]

## Hersentumoren

De bloed-hersentumorbarrière omvat bestaande en nieuwgevormde bloedvaten (angiogenese) die bijdragen aan de afgifte van voedingsstoffen en zuurstof aan de tumor, die de migratie van glioomcellen naar andere delen van de hersenen vergemakkelijken. Een glioom is een kankergezwel (tumor) in de gliacellen [42].
De poriegrootte van de bloed-hersentumorbarrière is ongeveer 11,7 tot 11,9 nm. Daarom kan een effectieve transvasculaire medicijnafgifte in kwaadaardige glioomcellen worden bereikt door nanodeeltjes te gebruiken die kleiner zijn dan 11,7 tot 11,9 nm in diameter en een lange bloedhalfwaardetijd hebben [41]. Gouden nanodeeltjes kunnen zo via actieve targeting de hersentumor bestrijden.

## Kankercellen doden met "Nanotheranostics"

Nanotheranostics is een samentrekking van het Engelse "therapeutics" en "diagnosis" [27].
Goud kan tumoren opsporen en zilver kan ze binnendringen en van binnenuit kapot maken. Uit onderzoek is gebleken dat nanodeeltjes, bestaande uit zilver en goud, vastgemaakt aan een polysacharide (chitosan), tumoren konden opsporen en de kankercellen konden doden.
Deze compositie-nanodeeltjes werden gemaakt van AgNP-AuNC-CSNP's (zilveren nanodeeltjes, gouden nanoclusters en colloïdaal zilver nanodeeltjes), ingebed in chitosan.
De individuele grootte van de NP's (staat hier voor nano partikel, doorgaans niet groter dan 10 nm) en NC's (staat voor nano cluster, doorgaans niet groter dan 2nm) varieerde tussen 0,41 - 10 nm. De gemiddelde hydrodynamische diameter van de aldus bereide samengestelde NP's (AgNP-AuNC-CSNP's met chitosan) was 155,5 nm, met een zeta-potentiaal van +19,3 mV, die over het algemeen als gunstig worden beschouwd voor cellulaire leveringstoepassingen.
De bereide samengestelde NP's werden vanwege de gunstige grootte en oppervlaktelading met succes geïnternaliseerd door HeLa-cellen (menselijke kankercellen). De opname en daaropvolgende morfologische veranderingen van de cel na behandeling met de samengestelde NP's waren duidelijk. **Deze samengestelde nanodeeltjes van goud en zilver, spoorden de kankercellen op en doodden ze vervolgens** middels apoptose. Daarnaast boden ze de optie voor gelijktijdige cellulaire beeldvorming, dankzij de aanwezigheid van luminescerende AuNC's zonder het gebruik van organische kleurstoffen [27]. Om efficiënt te zijn moeten nanotheranostics speciale kenmerken bezitten: specificiteit (alleen ziekmakende cellen markeren, d.m.v. goud), intracellulaire omgevingsmo-

nitoring ofwel controle over het proces hebben (goud en zilver), celpenetratievermogen (zilver en goudverbinding) en toxiciteit voor tumoren (zilver).

## Nano goud als stimulator van apoptose, vermindering van pijn en ontstekingen.

Een onderzoek uit 2017 wees uit dat nano gouddeeltjes (AuNP's) op zichzelf celapoptose veroorzaakten, zonder enige andere stof. De AuNP's werden gesynthetiseerd uit goudchloride en gebonden aan een polymeer. Nadat menselijke darmkankercellen (HT-29-cellen) waren blootgesteld aan de AuNP's, werd apoptose waargenomen. AuNP's werden gekarakteriseerd (afgebeeld) met TEM (transmissie-elektronenmicroscopie) en UV-vis-microscopie. Apoptose werd beoordeeld met behulp van de markers Annexin V en propidiumjodidekleuring, evenals de activiteit van caspase-3, een enzym dat apoptose kan initiëren. Het apoptose-effect bleek dosisafhankelijk te zijn, bij concentraties variërend van 40 g/ml tot 80 g/ml ($p < 0,05$). Dezelfde AuNP's vertoonden ook anti-inflammatoire activiteit bij muizen, waar een dosis van 1500 µg/kg een vermindering van 49,3% opleverde in de migratie van leukocyten. (Bij ontstekingen komen leukocyten in actie). De AuNP's toonden ook perifere analgesie (pijnverlichting) bij een dosis van 1500 µg/kg.

**Conclusie: De studie bevestigt dat gouden nanodeeltjes ontstekingsremmende, pijnstillende en antitumorale effecten hebben. AuNP's verdienen meer onderzoek om hun volledige interactie met organische systemen te beoordelen [31].**

# Glossary

## Ag NPs:
silver nanoparticle, short for: argentinum (Latin for silver) nano particle.

## Angiogenesis:
the formation of new blood vessels from existing blood vessels. This process takes place during embryogenesis and embryo implantation in the endometrium, wound repair and during many different disease processes such as cancer.

## Chemotherapy:
treatment with cytostatics. These are drugs that inhibit or kill rapidly dividing cells. Cancer cells divide quickly, but so do skin, hair and blood cells. That's why it causes side effects.

## Cyclo-oxygenase
also abbreviated to COX, is an enzyme that initiates the cyclo-oxygenase cascade. In the cyclo-oxygenase cascade, prostaglandins are made that cause vasodilation (vasodilation), fever and pain. COX therefore plays a major role in the process of inflammation. COX-2 causes the production of pro-inflammatory prostaglandins.

## Cytokines
cytokines are proteins involved in defense, the immune system and the formation of blood cells. They play an important role in the development and reduction of inflammation. They are produced by multiple cell types in response to foreign substances and microorganisms. They transmit signals to executive cells. Cytokines include interleukins, chemokines, interferons and tumor necrosis factor (TNF).

## Eicosanoids
lipid (fat-like) substances that regulate inflammatory responses. From arachidonic acid, pro-inflammatory eicosomaids are produced. And from the polyunsaturated omega-3 fatty acids EPA and DHA the anti-inflammatory ones. Eicosonaids include prostaglandins, leukotrienes, prostacyclins and thromboxanes

## Epithelialization
is defined as a process of covering denuded epithelial surface. The cellular and molecular processes involved in initiation, maintenance, and completion of epithelialization are essential for successful wound closure.

## Heterogeneous
Different, of various origins. Different in construction and properties.

## Intracellular environmental monitoring
exert control within cells. To keep an eye on, to follow closely, to monitor the process IL-6: IL-6 is a cytokine, involved in both pro-inflammatory and anti-inflammatory responses. T cells and macrophages produce IL-6 to stimulate the immune system during tissue damage.

## IL-1 :
Interleukin 1 beta is a primary inflammatory cytokine made primarily by monocytes and macrophages in response to viruses, immune complexes, microbial products and other cytokines.

## Immunohistochemistry
laboratory technique that investigates antibodies in, for example, tumor tissue. Antibodies are substances the body makes to clean up diseased cells. These attach themselves to certain proteins.

## Leukotrienes
type of eicosonaids, pro-inflammatory. Leukotrienes are intense inflammatory mediators and play a role in allergies, respiratory infections and asthma.

## Ligand
in the biochemical sense of the word, a ligand is a molecule that can bind to another, usually larger molecule, such as a signaling molecule to a membrane protein. A ligand can only bind to a specific target molecule (a nucleic acid or protein). When a ligand binds, it has functional consequences for various molecular processes, such as stabilization, catalysis, regulation of an enzymatic activity, or signal transduction. The binding often causes a conformational change in the target molecule.

## Mutations
when the cell's hereditary material (DNA) is damaged without being repaired, a defect occurs. This is called a mutation.

## Migration of cells
Cell migration is a physiological process essential in the development and homeostasis of multicellular organisms. Various body processes, such as embryonic development, wound healing, and immune responses all require the regulated movement of cells in certain directions to specific locations.

## NF-KB:
nuclear factor-kB is a protein complex that regulates DNA transcription, cytokine production and cell survival. NF-KB is found in almost all animal cell types and is involved in cellular responses to stimuli such as stress, cytokines, free radicals, heavy metals, ultraviolet radiation, oxidized LDL, and bacterial or viral antigens. NF-KB plays a key role

in regulating the immune response to infection. Improper regulation of NF-KB has been associated with cancer, inflammatory and autoimmune diseases, septic shock, viral infection, and improper immune development.

## Proton therapy

radiation using protons, small charged particles. The main advantage of proton therapy is that the proton beam does not deliver a dose behind the tumor. As a result, the dose in healthy tissue is less and the risk of side effects is lower.

## Proliferation

Cell proliferation is the process by which a cell grows and divides to produce two daughter cells. Cell proliferation leads to an exponential increase in the number of cells and is therefore a rapid mechanism for tissue growth.

## PPE (Photobiomodulation Therapy)

is the application of red and near-infrared light over injuries or lesions to improve wound and soft tissue healing, reduce inflammation, and provide relief from both acute and chronic pain.

## Protaglandins:

hormone-like substances that regulate many physiological processes, such as: inflammation, the dilation and constriction of blood vessels, pain, fever, lung softening, childbirth and blood clotting. Furthermore, they protect the stomach wall from the acidic stomach contents. There are anti-inflammatory and pro-inflammatory prostaglandins, depending on the type of fat from which they are formed.

## Rheumatoid Factors (RF)

are autoantibodies or, antibodies against one's own body. The immune system makes autoantibodies against the body's own tissue because this tissue is mistakenly seen as foreign and must be destroyed.

## Radiofrequency ablation (RFA)

is a treatment in which the interventional radiologist or surgeon destroys the tumor with heat. This is also called thermal ablation or heat ablation. Radiofrequency means using the energy (heat) of radio waves. Ablation means removal of tissue. Note that thermal ablation can also mean destruction of tumors using extreme cold/freeze.

## Reduction

is the chemical process by which a substance (the oxidizer) picks up electrons from another substance (the reductor). The oxidizer is reduced to a reductor. Reduction never takes place by itself; after all, the electrons have to come from somewhere. Thus, reduction is always only half of the entire process; the other half is oxidation. Therefore, wherever a particle takes in electrons (reduction), a particle also gives up electrons (oxidation). It is therefore a redox reaction.

## Radiotherapy

radiotherapy or radiation is the treatment of patients with cancer that uses ionizing radiation (X-rays) to destroy the cancer cells. When radiated with X-rays, the beam releases its radiation in front of, inside and behind the tumor. Thus, the tumor is damaged but also healthy tissue surrounding the tumor, which causes side effects.

## Nitric oxide (NO)

is involved in the human body in communication between cells in the immuno-inflammatory system, in the central nervous system and in the cardiovascular system.

## TNF :

TNF-alpha is a cytokine that can cause cell death (apoptosis) or cell survival. It stimulates the inflammatory response in the body, resulting in tissue death (= necrosis). This enables it to kill tumor cells. However, it also plays a key role as a messenger in rheumatoid arthritis and Crohn's disease.

## Thiol(ates):

A thiol is an organic compound, derived from an alcohol, in which the oxygen atom of the alcohol group has been replaced by a sulfur atom

## Vascularization

is the process of growing blood vessels into a tissue to improve oxygen and nutrient supply.

## VEGF

or vascular endothelial growth factor, is a signaling protein produced by fibroblasts which stimulates the formation of blood vessels.

# References


1. https://geology.com/minerals/gold/uses-of-gold.shtml#:~:text=Gold%20is%20used%20as%20a,used%20to%20treat%20rheumatoid%20arthritis.&text=Many%20surgical%20instruments%2C%20electronic%20equipment,using%20small%20amounts%20of%20gold.

2. https://www.goudtest.nl/de-geschiedenis-van-goud-en-wat-je-moet-weten-over-goud/#:~:text=De%20ontdekking%20van%20goud%20wordt,al%20goud%20gebruikten%20als%20betaalmiddel.

3. http://www.vrijmetselaarsgilde.eu/Maconnieke%20Encyclopedie/AMAP~1/alchemie/Alchemie.htm

4. https://www.triggerpointcoach.nl/index.mchil?page=artikel&id=1522&artid=10368&artikel=de-kernen-van-bindweefsel fibroblasten

5. https://www.orthokennis.nl/nutrienten/collageen

6. **Age-related vascular stiffening: causes and consequences (collagen)**
REVIEW ARTICLE Front. Genet., 30 March 2015 Julie C. Kohn†, Marsha C. Lampi† and Cynthia A. Reinhart-King | https://doi.org/10.3389/fgene.2015.00112

7. https://www.velthuiskliniek.nl/actueel/blog-rode-huid-couperose-rosacea/

8. **Enhanced antioxidant activity of gold nanoparticle embedded 3,6-dihydroxyflavone: a combinational study, Applied Nanoscience, February 2014, Volume 4, Issue 2, pp 153–161**
https://link.springer.com/article/10.1007/s13204-012-0182-9

9. **The effects of gold nanoparticles in wound healing with antioxidant epigallocatechin gallate and α-lipoic acid**, Nanomedicine: Nanotechnology, Biology, and Medicine 8 (2012) 767–775. https://www.sciencedirect.com/science/article/abs/pii/S1549963411003509

10. Collageen licht therapie https://mens-en-gezondheid.infonu.nl/beauty/63937-rimpels-verdwijnen-zonder-botox-collageen-lichttherapie.html

11. https://www.sigmaaldrich.com/technical-documents/articles/materials-science/nanomaterials/gold-nanoparticles.html

12. Biofotonen, licht in cellen https://www.energise-me.nl/biofotonen#:~:text=Lichaamscellen%20zenden%20niet%20alleen%20licht,100.000%20lichtimpulsen%20per%20seconde%20uit.

13. **Control of Particle Size in the Preparation of Colloidal Gold**
S. M. Saraiva, J. E. de Oliveira, 2002. Chemistry, Journal of Dispersion Science and Technology https://www.semanticscholar.org/paper/Control-of-Particle-Size-in-the-Preparation-of-Gold-Saraiva-Oliveira/e877a6f99aa94feddee7dbc07526fdc0736b21b4

14. **Gold Nanocrystals May Remyelinate Lesions in Multiple Sclerosis,** Medscape Medical News, ACTRIMS 2018. Caroline Helwick. 04 februari 2018 https://www.medscape.com/viewarticle/892250

15. **Nanocatalytic activity of clean-surfaced, faceted nanocrystalline gold enhances remyelination in animal models of multiple sclerosis**, 11 February 2020
Andrew P. Robinson, Joanne Zhongyan Zhang, Haley E. Titus, Molly Karl, Mikhail Merzliakov, Adam R. Dorfman, Stephen Karlik, Michael G. Stewart, Richard K. Watt, Benjin D. Facer, Jon D. Facer, Noah D. Christian, Karen S. Ho, Michael T. Hotchkin, Mark G. Mortenson, Robert H. Miller & Stephen D. Miller
Scientific Reports volume 10, Article number: 1936 (2020)
https://www.nature.com/articles/s41598-020-58709-w

16. **Gouden nanoclusters voor de behandeling van de ziekte van Parkinson**, Elsevier, Volume 194 , februari 2019 , pagina's 36-46
Guanbin Gao a 1Rui Chen b 1Meng He b 1Jing Li b 1Jing Li aLiyun Wang cTaolei Sun
https://www.sciencedirect.com/science/article/abs/pii/S0142961218308354

17. Info reuma https://reumanederland.nl/reuma/wat-is-reuma/

18. **Nano-gold displayed anti-inflammatory property via NF-kB pathways by suppressing COX-2 activity.** Khan MA1, Khan MJ2. https://www.ncbi.nlm.nih.gov/pubmed/29553845

19. Auronafin medicijn op basis van goud tegen reuma https://pubchem.ncbi.nlm.nih.gov/compound/Auranofin#section=Other-Identifiers

20. Auronafin, https://en.wikipedia.org/wiki/Auranofin

21. Case Report: **Management of Rheumatoid Arthritis (RA): Rationale for the use of colloidal metallic gold.** By Guy E. Abraham MD FACN, and Peter B. Himmel MD. Journal of Nutritional en Environmental Medicine (1997) 7, 295-305. Himmel Health, Wakefield, Ri, USA

22. **Medical Uses of Gold Compounds: Past, Present and Future, Simon P. Fricker** https://link.springer.com/content/pdf/10.1007/BF03215464.pdf

23. https://pubchem.ncbi.nlm.nih.gov/compound/Auranofin#section=3D-Conformer

24. **Cancer Nanotechnology: Emerging Role of Gold Nanoconjugates**. Rachel A. Kudgus, Resham Bhattacharya, and Priyabrata Mukherjee* Department of Biochemistry and Molecular Biology, College of Medicine, Mayo Clinic, Rochester, Minnesota 55905, USA https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4684088/

25. https://www.chron.com/news/houston-texas/article/Houston-company-testing-in-humans-a-bold-new-1667361.php

26. https://www.cancer.gov/about-cancer/treatment/types

27. **Bimetallic silver nanoparticle–gold nanocluster embedded composite nanoparticles for cancer theranostics.** Juli 2015 Journal of Materials Chemistry B. Deepanjalee Dutta, Amaresh Kumar Sahoo. https://www.researchgate.net/publication/289540192_Bimetallic_silver_nanoparticle-gold_nanocluster_embedded_composite_nanoparticles_for_cancer_theranostics

28. **Site-specific drug delivery, targeting, and gene therapy.** Tripti Shukla, M.S. Sudheesh, in Nanoarchitectonics in Biomedicine, 2019 https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/enhanced-permeability-and-retention-effect

29. https://en.wikipedia.org/wiki/Enhanced_permeability_and_retention_effect

30. **Gold and Silver Nanotechology on Medicine,** Journal of Chemistry and Biochemistry June 2015, Vol. 3, No. 1, pp. 21-33, Solano-Umaña, Victor1 & Vega-Baudrit, José Roberto2 http://repositorio.conare.ac.cr/bitstream/handle/20.500.12337/3297/GOLD%20AND%20SILVER%20NANOTECHOLOGY_SOLANO.pdf?sequence=1&isAllowed=y

31. **Anti-inflammatory, analgesic and anti-tumor properties of gold nanoparticles**. Pharmacol Rep. 2017 Feb. Epub 2016 Sep 21 https://pubmed.ncbi.nlm.nih.gov/27915185/

32. **Microbots Decorated with Silver Nanoparticles Kill Bacteria in Aqueous Media,** Samuel Sánchez Ordóñez, Ph.D., Diana Vilela, Ph.D. IBEC, Institute for bioengineering Catalonia. https://www.acs.org/content/acs/en/pressroom/presspacs/2017/acs-press-pac-june-28-2017/swimming-microbots-can-remove-pathogenic-bacteria-from-water-video.html

33. **Curcumin coated gold nanoparticles: synthesis, characterization, cytotoxicity, antioxidant activity and its comparison with citrate coated gold nanoparticles,** Elnaz Shaabani 1 Seyed Mohammad Amini 1 Sharmin Kharrazi 1 Roksana Tajerian 2 1 Department of Medical Nanotechnology, School of Advanced Technologies in Medicine (SATiM), Tehran University of Medical Sciences (TUMS), Tehran, Iran 2 Department of Tissue Engineering and Applied Cell Sciences, School of Advanced Technologies in Medicine (SATiM), Tehran University of Medical Sciences (TUMS), Tehran, Iran https://nmj.mums.ac.ir/article_8413.html

34. https://www.kanker.be/alles-over-kanker/wat-kanker

35. **Gouden nanodeeltjes voor levering van nucleïnezuur.** Moleculaire therapie Volume 22, nummer 6, juni 2014, pagina's 1075-1083, Ya Ding 1 2 *Ziwen Jiang 1Krishnendu Saha 1Chang Soo Kim 1Sung Tae Kim 1Ryan F Landis 1Vincent M Rotello 1 https://www.sciencedirect.com/science/article/pii/S1525001616306967

36. **Gouden nanodeeltjes en diclofenac diethylammonium toegediend door iontoforese verminderen de expressie van inflammatoire cytokines bij achillespeesontsteking.** Marcelo B Dohnert , 1, 2 Mirelli Venâncio , 1 Jonathann C Possato , 1 Rodrigo C Zeferino , 1 Luciana H Dohnert , 2 Alexandra I Zugno , 1 Cláudio T De Souza , 1 Marcos MS Paula , 1en Thais F Luciano 1 Int J Naogeneeskunde. 2012; 7: 1651-1657. Online gepubliceerd 26 maart 2012. doi: 10.2147 / IJN.S25164 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3356204/

37. **Gold nanoparticles in delivery applications**, 2008 Aug 17. Partha Ghosh 1, Gang Han, Mrinmoy De, Chae Kyu Kim, Vincent M Rotello. PMID: 18555555 DOI: 10.1016/j.addr.2008.03.016 https://pubmed.ncbi.nlm.nih.gov/18555555/

38. **Green synthesis of multifunctional silver and gold nanoparticles from the oriental herbal adaptogen: Siberian ginseng** Nanomedicine, 2016 jul. Ragavendran Abbai 1, Ramya Mathiyalagan 1, Josua Markus 1, Yeon-Ju Kim 2, Chao Wang 2, Priyanka Singh 2, Sungeun Ahn 2, Mohamed El-Agamy Farh 2, Deok Chun Yang 3 https://pubmed.ncbi.nlm.nih.gov/27468232/

39. **Biologisch gesynthetiseerde groen-gouden nanodeeltjes uit Siberische ginseng induceren een groeiremmend effect op melanoomcellen (B16).** Artif Cells Nanomed Biotechnol. 2019 Dec; Fenglian Wu 1 2, Juni Zhu 3, Guoliang Li 4, Jiaxin

Wang 5, Vishnu Priya Veeraraghavan 6, Surapaneni Krishna Mohan 7, Qingfu Zhang 1 https://www.tandfonline.com/doi/full/10.1080/21691401.2019.1647224

40. **Natural gum reduced/stabilized gold nanoparticles for drug delivery formulations** Chemistry, 2008;14(33):10244-50. Sheetal Dhar 1, E Maheswara Reddy, Anjali Shiras, Varsha Pokharkar, B L V Prasad. https://pubmed.ncbi.nlm.nih.gov/18850613/

41. **Effective transvascular delivery of nanoparticles across the blood-brain tumor barrier into malignant glioma cells.** Hemant Sarin, Ariel S Kanevsky, Haitao Wu. J Transl Med. 2008 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2639552/

42. **Overcoming the blood-brain tumor barrier for effective glioblastoma treatment** Drug Resist Update, 2015 March. O. van Tellingen, B Yetkin-Arik, M C de Gooijer https://pubmed.ncbi.nlm.nih.gov/25791797/

43. **Gold nanoparticles are taken up by human cells but do not cause acute cytotoxicity.** March 2005, Ellen E Connor 1 , Judith Mwamuka, Anand Gole, Catherine J Murphy, Michael D Wyatt https://onlinelibrary.wiley.com/doi/abs/10.1002/smll.200400093

44. **Book: Gold Nanoparticles For Physics, Chemistry And Biology.** By Catherine Louis and Olivier Pluchery, Imperial College Press, Co-auteur: Bruce Douglas Edgar Andreas George, august 2012

45. **Gold nanoparticles in biology: beyond toxicity to cellular imaging** Catherine J Murphy 1, Anand M Gole, John W Stone, Patrick N Sisco, Alaaldin M Alkilany, dec. 2008 https://pubmed.ncbi.nlm.nih.gov/18712884/

46. Goud E-nummer https://www.dermnetnz.org/topics/food-additives-and-e-numbers/

47. **3,6-Dihydroxyflavone: A Potent Inhibitor with Anti-Inflammatory Activity Targeting Toll-like Receptor 2** Pavithra K. Balasubramanian Jieun Kim Kkabi Son Prasannavenkatesh Durai Yangmee Kim First published: 18 December 2018 https://doi.org/10.1002/bkcs.11644

48. **Curcumine en kankercellen: op hoeveel manieren kan kurkuma tumorcellen selectief doden?** Jayaraj Ravindran , Sahdeo Prasad ,en Bharat B. Aggarwal. 2009 Sep, 11 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2758121/

49. **Global cancer incidence** http://globalcancermap.com/

50. **3,6-Dihydroxyflavone Has Antituberculosis Activity and Suppresses Lung Inflammation** Chulhee Kwak Yeongjoon Lee Dasom Jeon Prasannavenkatesh Durai Sungweon Ryoo Yangmee Kim 13 july, 2017 https://onlinelibrary.wiley.com/doi/abs/10.1002/bkcs.11175

51. **Influence of gold nanoparticles on wound healing treatment in rat model: Photobiomodulation therapy** PikSuan Lau 1, Noriah Bidin 1, Shumaila Islam 1, Wan Norsyuhada Binti Wan Mohd Shukri 1, Nurlaily Zakaria 1, Nurfatin Musa 2, Ganesan Krishnan 1 April 2017 PMID: 27859389

52. **3,6-dihydroxyflavone suppresses the epithelial-mesenchymal transition in breast cancer cells by inhibiting the Notch signaling pathway** 2016 Jun 27. PMCID: PMC4921838 PMID: 27345219 Junli Chen,1 Hui Chang,a,1 Xiaoli Peng,1,2 Yeyun Gu,1 Long Yi,1 Qianyong Zhang,1 Jundong Zhu,1 and Mantian Mib,1

53. **Book: Alchemy and metallic medicines in Ayurveda.** Vaidya Bhagwan Dash. ISBN 81-7022-077-7. First published 1986

54. https://bigthink.com/videos/michelle-thaller-how-neutron-star-collisions-created-all-the-gold-in-the-universe

55. https://etymologiebank.nl/trefwoord/alchemie

56. https://www.space.com/21995-gold-origins-neutron-star-collisions.html

57. **Boek:** De twaalfde planet van Zecheria Sitchin

58. https://www.jstor.org/stable/24191199

59. https://www.forbes.com/sites/kionasmith/2018/01/13/the-day-england-outlawed-alchemy/

60. https://www.kcl.ac.uk/people/sandrine-thuret

61. https://www.parkinson-vereniging.nl/archief/bericht/2019/12/02/Lopende-onderzoeken-naar-parkinson-en-het-eiwit-alpha-synucle%C3%AFne

62. **Cell death of dopamine neurons in aging and Parkinson's disease** M Naoi 1, W Maruyama, nov 1999 https://pubmed.ncbi.nlm.nih.gov/10656535/

63. Gold nanoparticle treatment reverses brain damage in Alzheimer's disease model. Oct 14, 2019 Natalia Dos Santos Tramontin 1, Sabrina da Silva 1, Rychard Arruda 2, Kellen Simon Ugioni 1, Paula Bortuluzzi Canteiro 1, Gustavo de Bem Silveira 1, Caroline Mendes 1, Paulo Cesar Lock Silveira 1, Alexandre Pastoris Muller 3 4 https://pubmed.ncbi.nlm.nih.gov/31612296/

64. https://www.alzheimer-nederland.nl/dementie/oorzaken-preventie/oorzaken/oorzaken-alzheimer-amyloid.nl

65. https://www.sciencedaily.com/releases/2019/10/191015140243.htm

66. https://www.nia.nih.gov/health/what-happens-brain-alzheimers-disease

67. https://hematologiegroningen.nl/patienten/content/3amyloidose.htm

68. https://nl.wikinohr.top/wiki/Okadaic_acid

69. https://ichgcp.net/nl/clinical-trials-registry/NCT03453047#

70. https://sanbiobv.wordpress.com/2012/02/24/de-invloed-van-de-s100-eiwit-familie-op-alzheimer/

71. https://www.kanker.nl/algemene-onderwerpen/wat-is-kanker/eigenschappen-van-kankercellen/hoe-ontstaat-kanker#:~:text=Kanker%20ontstaat%20door%20veranderingen%20in,dat%20de%20cel%20moet%20delen.

72. Anti-tumor Activity of Silver Nanoparticles in Dalton's Lymphoma Ascites Tumor Model, Department of Biotechnology, Division of Molecular and Cellular Biology, at Kalasalingam University in India, 2010

73. Antitumor activity of colloidal silver on MCF-7 human breast cancer cells, J.Excp, clinical cancer Res, 16 nov. 2010

74. https://ninaelshoffengshui.nl/het-vijfde-element-als-oplossing-uit-de-crisis/

75. GOLD NANOPARTICLES: A REVIVAL IN PRECIOUS METAL ADMINISTRATION TO PATIENTS, Nano Lett, 2011 AS Thakor,1,2 J Jokerst,1 C Zaveleta,1 TF Massoud,1,2 and SS Gambhir1
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195547/

76. Role of Nanotechnology in Cosmeceuticals: A Review of Recent Advances, J Pharm, 2018.
Shreya Kaul, Neha Gulati, Deepali Verma, Siddhartha Mukherjee, and Upendra Nagaich https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5892223/

77. Gold Nanoparticles: Preparation, Properties, and Applications in Bionanotechnology, Nanoscale 2 014
Yi-Cheun Yeh, Brian Creran, and Vincent M. Rotello
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4101904/

78. The Impact of Composites with Silicate-Based Glasses and Gold Nanoparticles on Skin Wound Regeneration, Molecules, 2021
Sorin M. Mârza,1,2 Klara Magyari,3,4,* Sidonia Bogdan,1 Mirela Moldovan,5 Cosmin Peștean,1 Andras Nagy,1 Adrian Florin Gal,1 Flaviu Tăbăran,1 Robert Cristian Purdoiu,1 Emilia Licărete,3 Sorina Suarasan,3 Lucian Baia,2,3,* and Ionel Papuc1
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7866013/