

## **What is this substance called “COLLOIDAL SILVER”? How it can be produced efficiently, consistently and without FUSS? Part 1.**

*The answer to these questions is both complex and simple, but for the confusion created by ignorance what is and what is not colloidal silver. In order to understand this in a proper perspective we must accept that there are three types of Silver relevant to the title.*

**1. Bulk silver** – either as native silver or purified and turned into ingots, or other types of shapes as implements and jewellery. There is also a process of pulverising bulk silver into a very fine powder and meant to be released into water when required as if it were similar to colloidal silver, but nothing could be further from the truth. It is the only material that consists of metallic silver particles. Research has shown that these particles have proven fatal to human cells and fish embryos. ref. ant.1, ref ant.2. Note! Enquiries revealed dry pulverised metallic bulk silver was used in both experiments.

**2. Ionic silver** – bulk silver deprived of its outer unpaired (valence) electron by ( $\text{Ag}^+$ ), or bulk silver dissolved chemically in an acid such as Nitric acid and forming Silver nitrate ( $\text{AgNO}_3$ ). Neutralisation of Silver nitrate is claimed to be done by a variety of chemicals such as Sodium Borohydride, as an alleged substitute for electro-photochemically reduced colloidal silver but it is highly unstable and corrosive if not processed properly.

**3. Neutral silver** originates from Ionic silver  $\text{Ag}^+$  and produced by electrochemical action When it has subsequently been reduced by photonic irradiation (photo electron transfer) it forms small local groupings of nanometre sized atomic silver clusters. Note! Most so-called colloidal silver produced is mostly ionic silver and any colloidal silver that is in the sample is made up of a great variety of different sized particles. Only those that possess an ultra-centrifuge have some means of sorting out for particle sizes. Controlling and limiting current and using a single band of short wavelength of light is capable of producing a very narrow distribution.

Of the various types of dissolved silver, pulverised silver, Silver nitrate and ionic silver, only the electro-photochemically produced neutral silver is the closest identifiable with the term colloidal silver. Any form of ionic silver is totally dissolved in water and cannot be detected other than by measuring the current of its charge carriers. Ionic silver is not stable and will try and do anything to regain an electron even if it means forming a chemical compound or when exposed to violet or ultraviolet light and reduce to neutral silver. In its ionic form, silver, totally dissolved in water is considered hydrophilic. As soon as it is neutral silver again it reverts back to its natural hydrophobic state, i.e. water hating. Some time ago, I was handed a fresh batch of Silver Nitrate. Ten minutes exposure in the full sun, turned the ionic material turned into a colloidal silver suspension.

**4. There is no comparison** between so-called colloidal silver and true colloids such as milk and toothpaste. Instead, so-called colloidal silver would be best described as collections of nanometre sized atomic silver clusters in an electrical suspension in water. Technically it should not be given the description of a colloid.

### **COLLOIDAL SILVER IS LACKING A PROPER IDENTITY**

*Having been around for at least Eighty years, so-called colloidal silver had been used as a medication until alternative medicines like penicillin and antibiotics used during and after World War II and took over. Colloidal silver never regained that position. Instead a plethora of colloidal silver producers started up all over the world without most of them knowing what they were doing or making and protecting their so-called secrets not even worth keeping a secret. Eventually due to colloidal silver's questionable nature, silver medication in any form other than "treated water" was banned by Legislation in 2003 by the Australian Therapeutic Goods Act (TGA). In the USA, colloidal silver suffered a similar fate of being banned by the Food and Drug Administration (FDA) sometime prior to that date.*

*The main reasons for not recognising the possible therapeutic properties of suspended nano silver by the various Government Authorities lies fairly and squarely in the corner of scientists and commercial producers, never making the attempt of identifying what actually constitutes colloidal silver. In addition to that perpetual complacency the resulting consequence is a total absence of any type of definition and/or Standard what colloidal silver actually is. Other contributing factors are:*

- 1. Declaring that a particular production of so-called colloidal silver to be subject to intellectual property rights and the production being kept a secret.*
- 2. A complete lack of suitable and affordable testing instrumentation for establishing particle/cluster size and shape, Zeta potential as a measure of stability, an absence or inclusion of ionic silver in the mix and in particular, the concentration, i.e. how much silver is in the product.*
- 3. Inability to produce consistently the same material on a regular basis. The reason for that is ignorance of the reflective index of silver at 420nm, well known during the era of Black & White photography science.*
- 4. The erroneous calling of anything silver as either colloidal or ionic silver, even to the extent of commercial producers of silver products making claims that their ionic silver being guaranteed to contain 100% colloidal silver.*

### **THE PRODUCTION OF A HIGH GRADE COLLOIDAL SILVER**

*The most efficient and economical way of producing batches of "nanometre sized atomic silver clusters in suspension" is provided by the following elements:*

- 1. The use of electrodes made from the purest silver commercially available silver, preferably at least 99.999% pure. This level of purity is necessary to ensure minimising of hazardous contaminants such as lead and arsenic. It is a fact that the purer silver is, the lower will be the concentration and inclusion of such dangerous contaminants.*
- 2. The highest Commercial grade water with a conductance of no less than 0.1 to 0.01 micro Siemen/cm and a total of undissolved and immersed organic/inorganic solids below 1ppm.*
- 3. A glass tank made from moulded Borosilicate or' Pyrex type' glass between 1 and 4 litres in volume.*
- 4. An available refrigerator with the internal light removed and large enough to house the tank, the electrochemical power supply at 300 volts DC and controlled limited current of 500 micro*

*ampere/h. It will also need to house a violet light source consisting of an array of around 200 violet emitting LEDs (417-420nm) and its own low voltage high current power supply. Recommended refrigerator temperature between 4 and 10<sup>o</sup> Centigrade. Note! As always, the devil is in the detail.*

*5. The electrodes (cathode and anode) must be separated by at least 200mm to ensure total irradiation of all ionic material produced in the first instance and conversion to neutral silver before the silver cations reach the cathode.*

*6. The reason 300 volt DC and 500 micro ampere/h are used is to overcome the resistance of water. To prove this fact, applying a potential of 600 volt DC (a doubling of the voltage) allowed a maximum current of 1,500 micro ampere/h to flow (a tripling of the current).*

*7. Relatively pure water (a high quality commercial deionised water) without any turbidity of undissolved and immersed solids nevertheless absorbs most frequencies/wavelengths of electromagnetic radiation. That means irradiation with both visible and invisible light is impeded to a more or lesser extent. However for some natural physics reason, water becomes almost completely transparent at around 417 – 420nm. Now we have the best of both worlds: Silver absorbs energy at around these wavelengths and water allows those wavelengths to pass to the silver totally unobstructed and thus at a maximum efficiency.*

*8. Sometime ago, a test was done, comparing a refrigerated production of so-called colloidal silver with that of an ambient temperature situation. In all cases the refrigerated sample produced clusters/particle sized between 3.6 and 10.1nm as compared with much larger sized clusters that had been subjected to a much higher temperatures. See extracts of the reports. This means that even when small clusters/particles are created the thermal effects they are exposed to causes aggregation into larger sizes that biologically speaking may not be as suitable.*

*Extracts from tests conducted at Griffith University December 15, 2014 on a Malvern Zetasizer and ver. 7.02 and an ICP-MS (Inductively coupled plasma, Mass Spectrophotometer (concentration), respectively:*

**Size Results Export Report: Sample name 161 12014 QR, Record number 8**

<b>Size d.nm</b>	<b>Volume %</b>
3.615	0.4
4.187	8.7
4.849	16.2
5.615	7.9
6.503	5.6
7,531	22.1
8.721	27.5
10.10	11.0

This sample was produced with a current of 500 micro ampere/h @ a voltage potential of 300 volts DC over a period of 48 hours in refrigerated conditions. The volume of the water was 4 litres and a 167 violet LED array (250mm diameter disc format) was used for the reduction.

	<i>Particle size and distribution</i>	<i>volume percent</i>	<i>Concentration</i>
	<i>(d.nm)</i>	<i>%</i>	
<i>Sample –QR-</i>	<i>3.6 to 10.10nm</i>	<i>0.4 to 11.0</i>	<i>11.19mg/l</i>
<i>Sample –v-</i>	<i>28.21 to 91.28</i>	<i>1.3 to 6.6</i>	<i>7.184mg/l</i>
<i>Sample –b-</i>	<i>24.36 to 43.82</i>	<i>8.3 to 13.4</i>	<i>5.113mg/l</i>

*QR was produced inside a refrigerator, and irradiated with 176 violet LEDs, the other two samples had to endure temperatures in the high twenties and irradiated with near ultraviolet light at around 380nm from 40 watt so-called black light. It is obvious from these test results that the violet light is better absorbed and not finding the water an impediment.*

*Incidentally, the concentration of 11.19mg/l or (11.19ppm) was produced in a 4 litre moulded borosilicate glass tank over a period of 48 hours @ 500 micro ampere which equals a total of 24mA. A very slow process indeed. Needless to say that a one litre tank would have produced a concentration of 44.76mg/l in the same time*

*9. Atomic sized silver clusters of a size at 10nm and smaller, are considered to fall into the realm of quantum physics. This is when Classical Physics ceases to exist and forces like gravity no longer appear to have any effect. Electrons also undergo a change, being confined due to a limitation of space inside nanometre sized atomic cluster. Such electrons are referred as quantum confined electrons. This would suggest additional charged energy. When such confined electrons are released by photonic action, this may cause blue-shifting secondary radiation. It may also be that the wavelength/frequency of the irradiation applied during production may in fact determine the size of quantum silver cluster formation. Future research and experimentation will prove these properties once and for all.*

*10. It is considered that the most important aspect of so-called colloidal silver is its stability. It is well known that impure so-called colloidal silver produced with the use of Silver nitrate or containing ionic matter and in particular ionic silver, is bound to be unstable. It will quickly deteriorate, aggregate and become useless. This is because of the so-called colloidal silver is meant to have a high enough repelling action provided by its minus Zeta potential, an interfacial static electrical charge between it and the Hydrogen atoms or ions. Just think of it, here are atomic silver clusters/particles with let us say -30 mV Zeta potential and a positive ion comes in between two clusters/particles, it is most definitely going to cause an electrical disturbance that will have a de-stabilizing effect and allow the attractive forces of the 'van der Waal's force' to take over. In an*

*indirect way such interference can be demonstrated with two magnets that are placed so the identical magnets (two North or two South poles) have a repelling action. Bring a third magnet into the equation and see what happens. The symmetry will be broken. In the case of neutral silver, a close proximity by an ion will cause electrical bridging and unwanted aggregation.*

*11. A high minus Zeta potential is an indicator of long term stability as samples produced in 2009 indicate, but up to a point. Zeta potentials claimed to be as high as -100mV would obviously be considered to be extremely stable as a charge of -100mV extends over a greater distance than a charge of -30mV would. Increasing the number of clusters in a given space beyond these distances allowed will be detrimental to the stability of the substance. It is thought but not yet proven that this may occur at concentrations of 20ppm or higher. Generally a yellowish tinge caused by an increased density or larger sized clusters or particles, is a sure indicator of a too high a concentration. Besides, clinical trials held at a local university have indicated that the antiseptic properties of my samples have proven an effective eradication off pathogens and fungi at concentrations as small as 3ppm. ref. ant.3*

*12. CONCLUSION: There has been insufficient research into so-called colloidal silver, both as to its nature as well as its propensity to kill pathogens, albeit in a discriminate way. Whilst that can possess no serious consequences 'in vitro' testing, to actually research the material 'in vivo' is another matter altogether. There are some that think that it is totally safe to ingest ionic silver for an upset tummy, for ionic silver's ability to combine with the chlorine in the stomach and produce silver chloride, an insoluble material. This type of mindset is not the way to go. Instead research into so-called colloidal silver and other nanometre sized materials have to err on the side of caution. Other requirements are the need for an International Standard and the introduction of a protocol for nano materials such as so-called colloidal silver that cannot be diluted without damage to its integrity. An absence of technical and scientific knowledge about such materials and a complete lack of appropriate test equipment for proper analysis and quality control has placed these materials in limbo.*

*To be continued.*

*Hans Laroo*

#### REFERENCES:

Ref. ant.1, Insights into the Cellular Response Triggered by Silver Nanoparticles Using Quantitative Proteomics, Frank Kjeldsen et al, Dept. of Biochemistry and Molecular Biology, University of Southern Denmark February 10, 2014.

Ref. ant.2, The effects of silver nanoparticles on fathead minnow (*Pimephales promelas*) embryos) Purdue University, Ecotoxicology January 2010 Volume 19. Issue 1. Pp 185-195

Ref. ant.3, Colloidal Silver (CS) as an Antiseptic: Two opposing viewpoints, Ian Cock et al, Griffith University, Brisbane, Australia, January 1, 2012 Pharmacognosy Communication. DOI 10.5530/pc2012.1.9