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NANO SILVER, THE NEED FOR AN INTERNATIONAL PRODUCTION STANDARD, MEDICAL LEGITIMACY, APPROPRIATE INSTRUMENTATION AND A CONCENTRATED EFFORT ON RESEARCH

Abstract:

The most recent revival of so-called colloidal silver, now known in the abbreviate form as nano silver, was in the 1930-1940s. Clinical trials were conducted on dogs to see how much silver they could tolerate until death ensued. In that era also humans were treated with this substance as well, until the new medications like penicillin and antibiotics came on the scene during and after the Second World War. Some pockets of alleged silver productions continued until this day, but most of what was made can now be considered questionable. The reason for that, the complete absence of a standard of production and instead a million ways to prepare colloidal silver, mostly ionic or worse, being Silver nitrate in origin. It seems to hark back to ancient ways of Alchemy practices in the middle Ages, but now continuing unabated in the 2ist Century.

In this essay, an attempt will be made to make us realise that with the current threat of biofilm protected bacterial colonies (Super Bugs) impervious to our current arsenal of antibiotics AND responsible for at least 60% of all infectious diseases worldwide, strategies need to be implemented as a matter of urgency. To enable this to occur, I will volunteer to take the first steps and offer my procedure to produce quantum sized atomic silver clusters in an aqueous electrical suspension (Zeta potential) for the purpose of creating an International production standard for this material as a start.

INTRODUCTION

Presently, so-called colloidal silver as a legitimate biocide is like a ‘dead duck in the water’. Research over the last eight years has revealed that most of those involved in either the production or clinical trials have absolutely no notion what actually constitutes nano silver. This is illustrated by many research and review papers published in not properly identifying the type of silver used. Those involved in production and marketing do not know the difference between neutral nano silver and the ionic type either, making claims that their colloidal silver is 100% pure ionic or the other way around. The irony of all this is that there is only one both technical and scientific way to produce a consistent and stable nano silver with very simple procedures. To also describe these procedures for use as a FIRST standard for adoption is equally simple and can be understood by almost anyone. The following text will illustrate this after a short preamble:

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Preamble.

There is sufficient anecdotal and recorded evidence that silver per se possesses antiseptic properties. This would not generally be realised that these antiseptic properties are not organic or inorganic in nature, but have an origin in quantum physics and electrical and thus relativistic. That makes them more akin to a killing instrument rather than an antibiotic medicine. Taking that to be the case, it is equally important to realise that the smaller the actual atomic silver clusters are, the better they are equipped for penetrating biofilm, a prerequisite for killing these so-called biofilm protected bacterial colony infestations. To consider silver clusters from a size of maximum 10nm and lower until a two atom silver molecule of just 0.66 pico metre, is a good start. For such a start, it is most fortunate that at an approximate wavelength of 420nm, where silver absorbs that energy, water becomes transparent and offering no impediment.

A proposed start at a reasonably acceptable standard.

1. The first step in the production of nano silver by electro-chemical means is ionic silver. This occurs by means of two silver electrodes of high purity separated some reasonable distance apart, e.g. 200mm and subjected to a voltage potential and controlled/limited current. Both the voltage potential and current levels must be sufficiently high and low respectively, to enable water to allow these parameters without any impediment. Simultaneously as ionic silver is being produced, a very specific wavelength of light (plus or minus 420nm violet light) of sufficient intensity and depending on volume of water and current flowing, irradiate the ionic silver for fast reduction to neutral silver. In order to accomplish this, any other light of longer wavelengths than 420nm must be barred from the production process and excess heat as well. Refrigerated conditions between 4^0 and 10^0 Centigrade are recommended.

2. Both the water and the silver need to be as pure as can be obtained commercially. Generally high quality deionised water at 0.1 micro Siemen (=10MOhm) and silver at 99.998% purity are acceptable. The quality of the tank, whatever size, must not be made of soda glass, but borosilicate, Pyrex type or high quality acrylic material and construction.

3. The reason for the need to instantaneous irradiate the ionic silver with sufficient 420nm light intensity, is to ensure ALL of the ionic silver is reduced to neutral atomic silver clusters. Also the further apart the electrodes are (cathode and anode), the more time is made available for the 420nm irradiation. In a way also the amount of light has to keep up with current flow. There is a direct relationship between current flow, silver extraction and irradiation, according to Michael Faraday's First and Second Laws of Electrolysis, formulated in the early 1800s.

4. A production system like this requires a modest power supply with a voltage doubling circuit to boost ac voltages to the required 300 odd DC voltage potential at a much reduced current of just 500 micro ampere. This is both the maximum current and minimum voltage

potential required for this process. Best ways to store the end product is to use blue glass bottles (not the soda glass types) or just recyclable plastic soft drink bottles thoroughly cleaned out with deionised or distilled water of known purity.

5. The violet light source is best made from a violet LEDs and soldered into an array of parallel columns of ten. Between 200 and 250 of such LEDs will fit on a standard PCB of 250x100mm. The power supply needs to provide about 30 volts DC (24 volt AC transformer). The current rating can be maximum 20mA per column. 20 columns would be 20x20mA= 400mA.

6. Done correctly, atomic silver nano sized clusters ranging from 4 to 10nm in size are generated. Concentration depends on duration of production run. About 12ppm (12mg/l) at 48 hours @ 500 micro A/h = a total of 24mA, in a 4 litre tank of water.

At this point a standard of sorts can now be formulated as shown as follows:

Production run:

Quantity of water	= 4 litre
Current flow	= 500 micro Ampere/h
Period of production	= 48 hours
Total current used	= 48x500= 24 mA

Technical Specifications:

Zeta potential (an indicator of stability)	e.g. – 35mV
Concentration	e.g. 12ppm or 12 mg/l
Ratio of neutral nano silver to ionic silver	e.g. zero
Ratio of water to contaminants	e.g. 10ppb
Production method	electro-photochemistry
Cluster/particle size	between 3 and 10nm
Cluster/particle shape	circular, rhombic, triangular, etc
Type of water used	deionised at 0.1 micro Siemen
Silver purity	99.998%

INSTRUMENTATION FOR TESTING

The most common instruments for testing the specifications of silver nano clusters that can range from 0.66pico meter to 100nm and larger are the so-called particle sizers. For concentration levels the mass spectrophotometers such as the ICP-MS are utilised, although their value is limited, being unable to distinguish between ionic and neutralised

silver. The problem with most production methods in vogue, is the large variety of cluster/particle sizes are produced simultaneiusly. These can only be sorted to batches of sizes in narrow distributions by the use of ultra-centrifuges that are very expensive. The better way is to use monochromatic light at short ionising wavelengths that by their very nature already produce 4 to 10nm distributions.

Regardless of these problems and the high expenses that come with purchasing these instruments or just hiring them, far more economical devises can be obtained. A listing of prototype equipment specially designed with production quality controls in mind are explained as follows.

1. A water ionic purity tester, consisting of nothing more than a sensitive analogue based direct current meter and a silver probe, is able to evaluate 1 micro ampere to 100 micro ampere in an instant.

2. A combination obscurity evaluator/90 degree light scattering device both able to quantify necessary information, in order to determine organic/inorganic contamination levels.

3. A fully analogue electronic sensing instrument able to determine neutral nano silver concentration in ppm accuracy. Useful for producing exact MIC (minimum inhibitory concentrations) and thus avoiding deteriorating action by dilution practices.

4. A linear cross polarised, coupled with light scattering action instrument able to distinguish between materials with and without refractive indexes in the visible spectral range.

5. More complex instrumentation is on the drawing board.

MEDICAL LEGITIMACY OF NANO SILVER

At the moment such a condition does not exist. Those involved since the early 1930s until now have never bothered to initiate an International Production and Specification Standard. Plenty of patents have been lodged, but as always intellectual property rights were involved and secrets about individual production methods kept a secret and more often than not a secret not even worth keeping. In Australia the crunch came in 2003, banning by legislation the medical use of so-called colloidal silver. The only claim that is allowed is the description is 'TREATED WATER", and I applaud such action. What this legislation also tells us: if you do make a claim about your silver product, you better bring a truck full of proof. The most unfortunate thing about this rigid legislation is it leaves little In the way of progress toward a concentrated research to determine if such silver products are a friend or foe?

CONCLUSION

Change has to be made if it can be determined technically and scientifically that an International Standard nano silver can be used with success and without danger in both in vitro and in vivo applications, by exercising the necessary controlled delivery systems to target area. Hence the need for a concentrated effort by all interested in this project.

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Needless to say there must also be a concentrated effort to introduce and maintain appropriate language and words to accurately describe all aspects of this silver.

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