TDS METERS VS. AA SPECTROPHOTOMETERS

Measuring silver in solution and/or suspension:
Using the right tool for the job

A **Total Dissolved Solids Meter (TDS meter)** is used to indicate the concentration of dissolved solids in solution. Solids generally exist as ionic and non-ionic solids. A TDS meter measures the *electrical conductivity* of the sample solution and *estimates* the dissolved solids. Microscopic solid particles, such as colloids, do not affect the conductivity, so a TDS meter does not include them in its reading, thereby giving inaccurate results when used to measure concentration of colloidal silver. Silver nanoparticles are not dissolved, but suspended, and are not read by the meter. A non-ionic solid (sugar) does not change the conductivity of the solution and so a TDS meter will not detect sugar, even at very high concentrations. TDS meters are utilized to spot-check home water supply or reverse osmosis/de-ionized water; they are not intended to be used for analytical laboratory testing.

Atomic absorption spectroscopy (AAS) is a spectrophotometric analytical procedure for the qualitative and quantitative determination of chemical elements, employing the absorption of optical radiation (light) by free atoms in the gaseous state. In analytical chemistry, this technique is used for determining the concentration of a particular element in a sample, whether in solution, suspension or solid form.

Accurate measurement of silver concentration requires the use of either an atomic absorption or emission spectrometer, or a mass spectrometer, which are specifically designed to perform such measurements.

There are four critical things to consider when selecting equipment to perform precise analytical measurements: **appropriateness, sensitivity, specificity** and **calibration**.

Appropriateness of an instrument used to conduct a measurement is germane to the accuracy of the data reported. One never uses a scale to determine dimension, nor a ruler to determine weight, even though one could do so to provide an *estimate*, but only if certain other facts are known. Metallurgists and analytical chemists will use a spectrometer or spectrophotometer to determine the concentration of a particular element, since it is known to be the most appropriate and accurate instrument for such an assay. A TDS meter is appropriate only for measuring conductivity. Note: a TDS device costs around $20, whereas an AA spectrophotometer costs $12,000-$35,000.

Sensitivity of a measuring device, such as an atomic absorption spectrometer or TDS meter, refers to the ability to respond to small changes in the concentration of the material being measured. Spectrophotometers have sensitivities down to parts per billion and parts per trillion (or more), in contrast to the poor sensitivity of a TDS meter (parts per million at best). Conductivity is temperature dependent, by about 2% per degree Celsius, so a TDS reading may vary, whereas AA values will not change significantly over a range of temperature.

Specificity refers to the ability of an assay to measure one particular substance in a sample, to the exclusion of all others. An atomic absorption spectrophotometer is the ideal instrument for this task because it has the ability to give an accurate quantitative determination of one element, even if the solution contains dozens of other elements. In contrast, TDS meters have extremely poor specificity for measuring any single element because the meters will read any dissolved ionic solid. Furthermore, they ignore micro and macro colloidal particles, thereby giving an incomplete measurement, whereas an AA will measure all forms of a specific element, regardless of whether in solution, suspension or complexed.

Calibration is defined as a process of adjusting the output or reading on a measuring instrument to agree with the value of an applied standard, within a specified accuracy range. Only by calibrating against a known standard can a measurement's accuracy be confirmed. All analytical instruments must be calibrated on a regular basis - doing so is required by good laboratory practices (GLP) and good manufacturing practices (GMP), using National Institute of Science and Technology (NIST) or American Society for Testing and Materials (ASTM) traceable standards. Natural Immunogenics not only does this, but employs third-party calibration services and corroborates results via third-party laboratories. TDS devices are calibrated only when manufactured, and with a specific weight-per-liter of common salt (Sodium Chloride, or NaCl); however, the same weight of a different salt will have a different conductivity, and will thus give a different reading, further proving the inadequacy of the device in measuring concentration. An AA is calibrated to the specific metal being measured.

TDS meters are often sold in the same “buyer beware” manner as drug store thermometers and bathroom scales – with no calibration data and no suggested methods of calibration. These meters are also recommended by companies that sell do-it-yourself kits for making homemade colloidal silver solutions, and would never be used by an accredited laboratory to measure the concentration of a colloidal silver product.

In conclusion, selecting the right tool for the job is critical, and we at Natural Immunogenics have invested significantly in the appropriate analytical equipment to provide our customers with the best possible silver hydrosol product. These are reproducibly manufactured to an exacting concentration range, verified by approved (and appropriate), validated and regularly calibrated lab instrumentation. The concentration of Natural Immunogenics’ products have also been verified by universities, laboratories, as well as federal, national and international regulatory agencies, and never once been found to be under the label claim.

Natural Immunogenics’ facility has been certified as GMP compliant by NSF International, meaning all procedures (including concentration measurements) have been validated and conform to and/or exceed governing regulations and industry standards.