TDS: PROTECSIL NPs

TECHNOLOGY INFORMATION of PRODUCT

Name and address of applicant: TRÈSBIEN BIOSYNTH PRIVATE LIMITED
Trade name: PROTECSIL NPs
Formulation type: Liquid
Active ingredient (A.I.): Silver (Ag+), and Cu (2+) with their powerful oligodynamic and catalytic effect, are combined with stabilizers to form a complex solution.

Manufacturer of technical, agricultural, aquacultural and poultry input for use in soil and water.

BIOFAC INPUTS PRIVATE LIMITED
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Telangana, India
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Email: biofactor.in@gmail.com

Hazard Ingredients/Identity Information - None

Hazardous Components (Specific Chemical Identity; Common Name(s)
OSHA PEL ACGIH TLV Other Limits Recommended %*(optional)*

I. Active ingredient

I.1. Product chemistry

I.1.1. Active ingredient

Common name: Silver (Ag+) & Copper (Cu2+)

Name	CAS #	% by Weight
Water	7732-18-5	98.49
Colloidal Silver	9015-51-4	0.005%
Colloidal Copper	7440-50-8	0.005%
Food Grade Stabilisers	NA	1.5%

Silver

Synonyms for Silver: Ag, Argentum, Silver, Silver Particles, Ultra-fine Silver, Nano Silver, Silber (German), Silver atoms,
Atomic weight: 107.87
Molecular Formula: Ag
Boiling point: 2162 °C for pure silver

Melting point: 961.78 °C for pure Silver

Heat of Decomposition: Currently not available

Reid Vapor Pressure: Currently not available

Bulk Density : 10490 kg/m³ as pure silver

Solubility in water and organic solvents

Silver is insoluble. In this product is in colloidal form and the particles are nano.

Viscosity (liquid form): Not Pertinent

SILVER CLASSIFICATION:

Silver is a Block D, Group 11, Period 5 element. The number of electrons in each of Silver's shells is 2, 8, 18, 18, 1 and its electronic configuration is $[Kr]4d^{10}\ 5s^{1}$. In its elemental form silver's CAS number is 7440-22-4. The silver atom has a radius of 144.5.pm and it's Van der Waals radius is 144.pm.

CAS NO.: 7440-22-4
EINECS Number: 231-131-3
RTECS Number: VW3500000

Hazards identification

HMIS RATING

- Health: 0
- Flammability: 0
- Reactivity: 1

NFPA RATING

- Health: 0
- Flammability: 0
- Reactivity: 1

Colloidal Silver:

CAS#: 9015-51-4
RTECS: Not available.
TSCA: TSCA 8(b) inventory: No products were found.
CI#: Not available.
Synonym: Silver nucleate; silver protein, mild; Silvol; mild portaging; silver metal, colloidal
Chemical Name: Colloidal Silver

Chemical Formula: Not available.
Appearance, color, odor, physical state: Nano particles
Particle Size: ≤400-600 nm

Toxicological Data on Ingredients:
Colloidal Silver LD50: Not available. LC50: Not available.

Federal and State Regulations: TSCA 8(b) inventory: No products were found.
Other Regulations: Not available.
Other Classifications:
WHMIS (Canada): Not controlled under WHMIS (Canada).
DSCL (EEC):
R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S46- If swallowed, seek medical advice immediately and show this container or label.
HMIS (U.S.A.):
Health Hazard: 2
Fire Hazard: 1
Reactivity: 0
Personal Protection: E
National Fire Protection Association (U.S.A.):
Health: 2
Flammability: 1
Reactivity: 0
Specific hazard:.
Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Health Hazarads
Routes of Entry:
1. Inhalation: None. **2. Skin:** None**. 3. Ingestion:** None.

Signs and Symptom of Exposure: None

Medical Conditions Generally Aggravated by Exposure: None

Acute Health Hazard: None

Chronic Health Hazard: None
Carcinogenicity: None

COPPER

Symbol:	Cu
Atomic Number:	29
Atomic Weight:	63.546
Density:	8.96 gm/cc
Melting Point:	1083.4^0C
Boiling Point:	2567^0C
Thermal Conductivity:	4.01 W/cm/^{0}K @ 298.2^0K
Electrical Resistivity:	1.678 microhm-cm @ 20^0C
Electronegativity:	1.9 Paulings
Specific Heat:	0.092 Cal/g/^{0}K @ 25^0C
Heat of Vaporization:	72.8 K-cal/gm atom at 2567^0C
Heat of Fusion:	3.11 Cal/gm mole

Copper is an essential trace element for humans and animals. Although Hippocrates is said to have recommended copper compounds as early as 400 B.C., scientists are still uncovering new information regarding the functions of copper in the human body. Copper is an essential trace mineral that facilitates the activity of several enzymes. The mineral provides a role in the development and maintenance of the cardiovascular system, including the heart, arteries, and other blood vessels, the skeletal system, and the structure and function of the nervous system, including the brain.

Copper is a critical functional component of a number of essential enzymes, known as cuproenzymes. The copper-dependent enzyme, cytochrome *c* oxidase, plays a critical role in cellular energy production. Another cuproenzyme, lysyl oxidase, is required for the cross-linking of collagen and elastin, which are essential for the formation of strong and flexible connective tissue. The action of lysyl oxidase helps maintain the integrity of connective tissue in the heart and blood vessels and plays a role in bone formation.

A number of reactions essential to normal function of the brain and nervous system are catalyzed by cuproenzymes.

Copper is involved in respiration and the synthesis of hemoglobin. It is essential in the production of collagen and the neurotransmitter noradrenalin. It is an important blood antioxidant and prevents the rancidity of polyunsaturated fats.

Copper is involved in numerous enzyme systems that break down or build up body tissues. It plays a role in the production of the skin pigment melanin by converting the amino acid tyrosine. The mineral is essential for the synthesis of phospholipids, which are a component of the myelin sheath that surrounds nerves.

Copper works with iron in the development and maintenance of red blood cells and their protein hemoglobin.

Copper is tasteless - tastes like water.

TOXICOLOGY OF COPPER

INHALATION

No studies were located regarding cardiovascular, musculoskeletal, renal, dermal, or body weight effects in humans or animals following inhalation exposure to copper.

In rabbits (strain not reported) exposed to 0.6 mg Cu/m^3 as copper chloride for 6 hours/day, 5 days/week for 4–6 weeks, the only histological alteration in the lungs was a slight increase in alveolar type II cell volume density (Johansson et al. 1984); this effect was not considered adverse. No functional or morphological alterations were observed in the alveolar macrophages of similarly exposed rabbits (Johansson et al. 1983).

No studies were located regarding gastrointestinal effects in animals following inhalation exposure to copper.

No studies were located regarding hematological effects in animals following inhalation exposure to copper.

No studies were located regarding hepatic effects in animals following inhalation exposure to copper.

No studies were located regarding immunological effects in humans following inhalation exposure to copper.

Headache, vertigo, and drowsiness were reported in factory workers exposed to 111–434 mg/m^3copper dust (Suciu et al. 1981).

No studies were located regarding reproductive effects in animals following inhalation exposure to copper.

No studies were located regarding developmental effects in humans and animals following inhalation exposure to copper.

Oral Exposure

No studies were located regarding endocrine, dermal, ocular, or metabolic effects in humans or animals following oral exposure to copper.

Data on the potential of copper to induce respiratory effects are limited to the NTP (1993) study that found no histological alterations in the lungs of rats exposed to 285 or 134 mg Cu/kg/day as copper sulfate in the diet for 14 or 90 days, respectively, or in mice exposed to 717 or 814 mg Cu/kg/day for 14 or 90 days.

A significant increase in systolic blood pressure was observed in rats exposed to 14 mg Cu/kg/day as copper carbonate in the diet for 15 weeks (Liu and Mederios 1986). No histological alterations were observed in the hearts of rats or mice exposed to 285 or 717 mg Cu/kg/day, respectively, for 14 days or 134 or 814 mg Cu/kg/day for 90 days (NTP 1993)

There are numerous reports of acute gastrointestinal effects in humans after ingestion of large amounts of copper in drinking water or beverages. The most prevalent effects are nausea and vomiting, which typically occur shortly after ingestion and are not persistent (Araya et al. 2001, 2003a, 2003b, 2003c; Chuttani et al. 1965; Eife et al. 1999; Gill and Bhagat 1999; Gotteland et al. 2001; Holleran 1981; Jantsch et al. 1984, 1985; Karlsson and Noren 1965; Knobeloch et al. 1994, 1998; Nicholas and Brist 1968; Olivares et al. 2001; Pizarro et al. 1999, 2001; Semple et al. 1960; Spitalny et al. 1984; Walsh et al. 1977). Abdominal pain and diarrhea have also been reported, but their incidence is typically much lower than nausea and vomiting.

In two multinational studies conducted by Araya and associates (Araya et al. 2001, 2003a), NOAEL and LOAEL values of 4 and 6 ppm (0.042 and 0.091 mg Cu/kg), respectively, were identified for nausea.

Hyperplasia with hyperkeratosis of the squamous mucosa on the limiting ridge separating the forestomach from the glandular stomach was observed in rats and mice exposed to 44 and 197 mg Cu/kg/day, respectively, as copper sulfate in the diet for 14 days or 33 and 267 mg Cu/kg/day, respectively, as copper sulfate in the diet for 13 weeks (NTP 1990a). No gastrointestinal effects were observed in rats and mice exposed to 23 or 92 mg Cu/kg/day for 14 days or in rats and mice exposed to 16 or 126 mg Cu/kg/day 13 weeks. Additionally, no gastrointestinal effects were observed in rats and mice exposed to 29 or 24 mg Cu/kg/day as copper sulfate in drinking water (NTP 1990a).

No alterations in hematocrit level or mean corpuscular volume were observed in individuals ingesting 0.14 mg Cu/kg/day as copper gluconate in a capsule for 12 weeks (Pratt et al. 1985).

Decreased hemoglobin and hematocrit values were observed in rats exposed to ≥66 mg Cu/kg/day (Kumar and Sharma 1987; NTP 1993; Rana and Kumar 1980) for 20–90 days and in pigs exposed to ≥24 mg Cu/kg/day for 48– 54 days (Kline et al. 1971; Suttle and Mills 1966a, 1966b). Depletion of hematopoietic cells in the bone marrow was observed in rats exposed to 196 mg Cu/kg/day as copper sulfate in the diet for 14 days (NTP 1993). Contrary to these findings, Liu and Medeiros (1986) observed an increase in hemoglobin levels and no change in hematocrit levels in rats fed a diet containing 14 mg Cu/kg/day as copper carbonate for 20 weeks.

Musculoskeletal Effects - No studies were located regarding musculoskeletal effects in humans following oral exposure to copper.

No alterations in biomarkers of liver damage (serum aspartate aminotransferase, alanine aminotransferase, gamma glutamyl transferase) were observed in adults exposed to 0.17 mg Cu/kg/day as copper sulfate in drinking water for 2 months (Araya et al. 2003b).

Two recent surveys of infants exposed to 0.8 mg Cu/L in household water did not find significant alterations in serum parameters of liver function or alterations in liver ultrasound imaging tests (Zietz et al. 2003a, 2003b).

Renal Effects. There is limited information on the renal toxicity of copper in humans. An increase in protein droplets in epithelial cell cytoplasm and the lumen of the proximal

convoluted tubules was observed in rats exposed to 10 or 92 mg Cu/kg/day as copper sulfate in drinking water or diet, respectively, for 2 weeks or to 33 mg Cu/kg/day as copper sulfate in the diet for 13 weeks. At 134 mg Cu/kg/day, karyomegaly and tubule cell degeneration were also observed.

Body Weight Effects. No studies were located regarding body weight effects in humans following oral exposure to copper.

Neurological Effects

No studies were located regarding neurological effects in humans following oral exposure to copper.

No effects on spontaneous motor activity (assessed using an actophometer), learning ability (assessed using a pole climbing chamber), or relearning capacity and memory (assessed using a Y-maze) were observed in rats fed a diet containing 23 mg Cu/kg/day as copper sulfate (Murthy et al. 1981).

Reproductive Effects

No studies were located regarding reproductive effects in humans following oral exposure to copper.

Reproductive performance, as assessed by the length of gestation, number of kits whelped, and average kit weight, was not adversely affected in minks fed a diet containing 12 mg Cu/kg/day as copper sulfate (Aulerich et al. 1982).

Developmental Effects

No studies were located regarding developmental effects of humans following oral exposure to copper

Cancer

No studies were located regarding carcinogenic effects in humans following oral exposure to copper.

<u>Dermal Exposure</u>

Death

No studies were located regarding death in humans and animals following dermal exposure to copper.

Systemic Effects

No studies were located regarding respiratory, cardiovascular, gastrointestinal, musculoskeletal, hepatic, renal, endocrine, dermal, or body weight effects in humans or animals following dermal exposure to copper.

Hematological Effects. No studies were located regarding hematological effects in animals following dermal exposure to copper.

Ocular Effects. Eye irritation has been reported by factory workers exposed to copper dust (Askergren and Mellgren 1975). No studies were located regarding ocular effects in animals following exposure to copper.

Immunological and Lymphoreticular Effects

No studies were located regarding the following health effects in humans and/or animals after dermal exposure to copper:

GENOTOXICITY

No studies were located regarding genotoxicity in humans after inhalation, oral, or dermal exposure to copper or its compounds.

COLLOIDAL COPPER

Copper is an essential micro-nutrient, needed at 1.3 milligrams per day, according to the International Copper Association. It is needed for red blood cell formation, protein metabolism, the production of RNA, enzyme activity, hair and skin color, and the health of the nerves.
Copper is important to the synthesis of both collagen and elastin. It has also been shown to increase the thickness of the skin.

Colloidal Copper has been used as a remedy for gray hair, burns, arthritis, parasites and viral and bacterial infections. Colloidal Copper has been found helpful against multi-cellular parasites such as malaria, Ring-worm, Cryptosporidium, Toxoplasma, chronic bladder infections where bacteria have formed a multi-cellular biofilm.

Copper Content in PROTECSIL NPS

PROTECSIL NPs contains 50 parts-per-million (PPM) of copper nanoparticles. PROTECSIL NPs tastes like water.

Copper Uses

- Promotes healthy skin.
- Supports healthy cartilage and tendon regeneration.
- Plays a critical role in cellular energy production.
- Helps maintain the integrity of connective tissue in the heart and blood vessels.
- Plays a role in bone formation.
- Plays a role in the metabolism of the neurotransmitters norepinephrine, epinephrine, and dopamine.
- Functions as an antioxidant.
- Necessary for normal iron metabolism and red blood cell formation.
- Copper is known to play an important role in the development and maintenance of immune system function.
- Copper increases the body's ability to absorb iron.

PROTECSIL NPS

Accidental release measures

- **PROCEDURE(S) OF PERSONAL PRECAUTION(S):**
  Exercise appropriate precautions to minimize direct contact with skin or eyes and prevent inhalation of dust.

- **METHODS FOR CLEANING UP:**
  Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

I.1.2. Technical product
Composition:
Name and content of the active ingredient, impurities, name and rate of the isomer
AI: Nano silver (Ag+)

Name	**CAS #**	
Colloidal Silver	9015-51-4	99% Purity

Appearance, color, odor, physical state: Nano particles
Particle Size: ≤400-600 nm

Manufacturing process

COLLOIDAL SILVER
There are several methods to obtain Nanosilver like Grind method.

With the grind method, the particles of silver are usually no finer than four one-thousands of an inch. They may or may not be electrically charged. The size of the silver particle is so large compared to the possible charge, that the repelling forces would not be strong enough to offset the pull of gravity on the particles, which will tend to settle to the bottom of the solution, producing a less effective product.

Colloidal silver that involve a simple mixture of metal and liquid (grind process) cannot possess as much potential as electro-colloids and are therefore of questionable value. The proper electrical process allows silver particles to be drawn off the ingot that are much smaller than four one-thousandths of an inch diameter. If the silver particles are within the range of four one-hundred-thousands to four one-millionths of an inch in diameter, and are uniformly charged, a stabilizer is not required to keep the particles suspended. The repelling magnetic force will offset the pull of gravity on the particles, which are animated by "Brownian Movement", and remain in suspension in a liquid medium almost indefinitely, their stability depending on the size of' the particles, the medium used and the manufacturing process employed.

The electro-colloidal/non-chemical method used by us gives the highest quality colloidal silver.

The silver particles and water have been completely "colloided" and evenly dispersed and held in suspension by an electrical current sent through the combination. This process is the best method to create a truly homogeneous (evenly distributed) solution, containing super-fine silver particles in the range of 400-600 nm in diameter, suspended in water, without the need of any chemical, stabilizer, dye, or other ingredient.

The transparent solution obtained in this process converts to a characteristic pale yellow color and then a silver suspension is created. There is very little or no visible accumulation of silver particles either in the solution or settled on the bottom. The best products will contain the largest number of particles from the smallest total amount of silver.

The colloidal silver is then collected for inspection and analysis by the SEM technique and optical properties are studied by the UV-VIS spectrometry.

The silver nanoparticles in water are stable for several months at room temperature without changing their properties.

COLLOIDAL COPPER
Composition:
Name and content of the active ingredient, impurities, name and rate of the isomer
AI: Nano Copper (Cu2+)

Name	**CAS #**	
Colloidal Copper	NA	99% Purity

Appearance, color, odor, physical state: Nano particles
Particle Size: ≤400-600 nm

Manufacturing process

COLLOIDAL COPPER

Copper sulfate, ascorbic acid, PVP-K30 (Mw = 40,000), and ethylene glycol (E.G) all of analytical grade were used. Copper colloids were synthesized by two procedures, using deionized water and E.G as reaction solvents, respectively. In a typical procedure, a certain amount of PVP and ascorbic acid was dissolved in the 200 mL 0.2 mmol/L $CuSO_4$ aqueous (or E.G) solution under mechanical stirring, and the reaction mixture was kept at 80 °C for some time. The colloidal suspension was then taken out from the oil bath and cooled to room temperature. For further characterization, the colloid was diluted by ethanol and centrifuged at 8000 rpm for 15 min to separate the particles from the suspension. The particles separated were then resuspended in ethanol and the centrifugation was repeated 3 times so as to remove the surfactant. After that, the precipitates were dried under vacuum overnight and then collected.

Analytical method

COLLOIDAL SILVER

A Field Emission Scanning Electron Microscope (FE-SEM, HITACHI S4700) was used to demonstrate the silver nanoparticles' size distribution. Several drops of silver colloid were

deposited on a conductive silicon wafer and then the sample was gently dried on a heating plate. The secondary electron SEM image was taken. To study the optical properties of the Ag nanoparticles, a double-beam UV-VIS spectrometer (9423UVA1002E Helios Alpha) was applied in the range of 200-700 nm. A 1 cm optical wide cuvette was used at room temperature.
(Reports from RADOSOM)

Characterization of Copper Nanoparticles

XRD measurements were recorded using a (D8-Advance, Germany) X-ray diffractometer equipped with a back monochromator operating at 40 kV and a copper cathode as the X-ray source ($\lambda = 0.154$ nm). XRD patterns were recorded from 20° to 80° (2θ) with a scanning step of 0.01. The size and morphology of the Cu nanoparticles were examined by using transmission electron microscopy (TEM, JEOL 2100F). The TEM samples were prepared by dispersing the powder products in alcohol by ultrasonic treatment, dropping the suspension onto a holey carbon film supported on a copper grid, and drying it in air. A thermo-gravimetric (TG-DTG, Netzsch STA 449C) analyzer (sample mass: about 15.0 mg; atmosphere, flowing dry oxygen; heating rate, 10 K/min) was used for thermo-gravimetric analysis.

I.2. Toxicology

SILVER

Toxicity class WHO: II

Silver has been used for generations in goblets, silverware, and other food areas because of the belief that it inhibits diseases. In more recent times, the former Soviet Union used silver to sterilize recycled
water on their space shuttles. Many international airlines use silver water filters to ensure safe drinking water for passengers.

The Swiss have approved use of these filters in homes and offices. Some US city municipalities use silver in treatment of sewage and is sometimes used to purify swimming pool water to avoid the stinging of the eyes that chlorine causes. Silver also purifies drinking water. Silver has become the latest agent in the fight against airborne toxins, as well other industrial poisons, in the Japanese work place.

Dr.Henry Crooks (Use of Colloids in Health-Disease) found that silver in the colloidal state is highly germicidal, quite harmless to humans and absolutely non-toxic.

Dr. Becker's experiments conclude that silver works on the full spectrum of pathogens without any side effects or damage to any part of the body.

Each EPA approved product is required to have safety information, and according to that information a toxic spill or EPA reportable spill amount is required to be printed in the product MSDS sheet (Material Safety Data Sheet). For example, a chlorine-type cleaning product (found

for open purchase on store shelves right now) has a toxic spill rating of about three gallons, meaning that a spill of three gallons or more must be reported to the EPA and handled by HAZMAT authorities. In comparison, PROTECSIL NPS nano-silver product has a toxic spill rating of 12,500,000 gallons. An oil tanker will hold about a million gallons, which means that 12.5 oil tankers full of the ASAP nano silver disinfectant would have to spill their entire loads of the product together to be deemed a toxic event to the environment. The management of American Biotech Labs believes that there is no tank or vat large enough in the entire world that could hold and subsequently spill enough of the ASAP disinfectant product to actually be reportable as a toxic spill to the environment. In other words, American Biotech Labs™ nano-silver disinfectant product is perhaps the safest disinfectant product, for environmental reasons, ever approved to kill bacteria, mold, yeast and other pathogens.

Numerous ingested toxicity studies have been completed on American Biotech Labs™ nano-silver products. Some of the studies are outlined below. Independent LD-50 tests on animals at levels equivalent to approximately 200 times the normal internal use adult dosage were found to be non-toxic to the animals. A 28-day bird flu study completed by a U.S. NIH virology lab also included a toxicity study in which the animals were fed levels of the nano-silver at 10-200 times the normal dosage daily. The ASAP nano-silver products were found to be non-toxic to the animals in the long term study. A separate medical college study tested the ingestion of American Biotech Labs™ nano-silver product in animals at levels of 0.5 ml, 1.0 ml, and 1.5 ml daily for 28 days, and again found the product completely non-toxic to the animals. An Indian (WHO approved) lab tested the ASAP nano-silver products for toxicity in a mouse-model study at levels of 50, 500, 5,000 mg/kg. The product was again found to be completely non-toxic to the animals at all levels tested in the Indian study. A peer-reviewed preliminary HIV Human study found that the oral ingestion of 2 ounces daily for four months of the 10 ppm ASAP nano-silver product, had no negative effect on the seven human patients. A U.S. Congressional Testimony outlines the use of the ASAP nano-silver product at between 0.5-1.0 ounce daily use at 10 ppm, for human use of the product against malaria and other human ailments (120+ cases). In all cases, no negative effects were reported from any of the four hospitals and clinics that tested the product, by either external or internal use (mostly internal use).

Excessive exposure to silver also can cause lung and kidney lesions; exposure to dusts can cause breathing problems, lung and throat infections and abdominal pain; and skin contact can cause mild allergic reactions such as rashes, swelling, and inflammation.

Silver is not known to have human carcinogenic potential, and does not appear to be a mutagen. Although long term ingestion of silver may cause argyria in humans and animals, this effect is cosmetic only and is not harmful to health.

ORAL LD50:
Silver LD_{50} is 2854 mg/Kg of animal body weight (Silver).
The silver level is well below 180 micrograms / person / day permitted by W.H.O.
Hence it is safe for human as well as aquatic and terrestrial animal life.

Airborne Exposure Limits for Silver Pure:
- OSHA Permissible Exposure Limit (PEL) 0.01 mg/m^3 (TWA)
- NIOSH Recommended Exposure Level (REL) 0.01 mg/m^3 (TWA)
- NIOSH Immediately Dangerous to Life or Health Concentration (IDLH) 10 mg/m^3
- ACGIH Threshold Limit Value (TLV) 0.1 mg/m^3 (TWA)

Non-corrosive for skin.
Non-corrosive to the eyes.
Non-corrosive for lungs.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Special Remarks on other Toxic Effects on Humans:

Effect on suckling and lactating dams: Not determined

Irritation to Mucous membrane:
Irritating to mucous membrane and eyes; irritating to the respiratory tract.

Neurotoxicity in Hens: No Neuro-toxic effect at the recommend dosage

COPPER

INHALATION

No studies were located regarding cardiovascular, musculoskeletal, renal, dermal, or body weight effects in humans or animals following inhalation exposure to copper.

In rabbits (strain not reported) exposed to 0.6 mg Cu/m^3 as copper chloride for 6 hours/day, 5 days/week for 4–6 weeks, the only histological alteration in the lungs was a slight increase in alveolar type II cell volume density (Johansson et al. 1984); this effect was not considered adverse. No functional or morphological alterations were observed in the alveolar macrophages of similarly exposed rabbits (Johansson et al. 1983).

No studies were located regarding gastrointestinal effects in animals following inhalation exposure to copper.

No studies were located regarding hematological effects in animals following inhalation exposure to copper.

No studies were located regarding hepatic effects in animals following inhalation exposure to copper.

No studies were located regarding immunological effects in humans following inhalation exposure to copper.

Headache, vertigo, and drowsiness were reported in factory workers exposed to 111–434 mg/m^3copper dust (Suciu et al. 1981).

No studies were located regarding reproductive effects in animals following inhalation exposure to copper.

No studies were located regarding developmental effects in humans and animals following inhalation exposure to copper.

Oral Exposure

No studies were located regarding endocrine, dermal, ocular, or metabolic effects in humans or animals following oral exposure to copper.

Data on the potential of copper to induce respiratory effects are limited to the NTP (1993) study that found no histological alterations in the lungs of rats exposed to 285 or 134 mg Cu/kg/day as copper sulfate in the diet for 14 or 90 days, respectively, or in mice exposed to 717 or 814 mg Cu/kg/day for 14 or 90 days.

A significant increase in systolic blood pressure was observed in rats exposed to 14 mg Cu/kg/day as copper carbonate in the diet for 15 weeks (Liu and Mederios 1986). No histological alterations were observed in the hearts of rats or mice exposed to 285 or 717 mg Cu/kg/day, respectively, for 14 days or 134 or 814 mg Cu/kg/day for 90 days (NTP 1993).

There are numerous reports of acute gastrointestinal effects in humans after ingestion of large amounts of copper in drinking water or beverages. The most prevalent effects are nausea and vomiting, which typically occur shortly after ingestion and are not persistent (Araya et al. 2001, 2003a, 2003b, 2003c; Chuttani et al. 1965; Eife et al. 1999; Gill and Bhagat 1999; Gotteland et al. 2001; Holleran 1981; Jantsch et al. 1984, 1985; Karlsson and Noren 1965; Knobeloch et al. 1994, 1998; Nicholas and Brist 1968; Olivares et al. 2001; Pizarro et al. 1999, 2001; Semple et al. 1960; Spitalny et al. 1984; Walsh et al. 1977). Abdominal pain and diarrhea have also been reported, but their incidence is typically much lower than nausea and vomiting.

In two multinational studies conducted by Araya and associates (Araya et al. 2001, 2003a), NOAEL and LOAEL values of 4 and 6 ppm (0.042 and 0.091 mg Cu/kg), respectively, were identified for nausea.

Hyperplasia with hyperkeratosis of the squamous mucosa on the limiting ridge separating the forestomach from the glandular stomach was observed in rats and mice exposed to 44 and 197 mg Cu/kg/day, respectively, as copper sulfate in the diet for 14 days or 33 and 267 mg Cu/kg/day, respectively, as copper sulfate in the diet for 13 weeks (NTP 1990a). No gastrointestinal effects were observed in rats and mice exposed to 23 or 92 mg Cu/kg/day for 14 days or in rats and mice exposed to 16 or 126 mg Cu/kg/day 13 weeks. Additionally, no gastrointestinal effects were observed in rats and mice exposed to 29 or 24 mg Cu/kg/day as copper sulfate in drinking water (NTP 1990a).

No alterations in hematocrit level or mean corpuscular volume were observed in individuals ingesting 0.14 mg Cu/kg/day as copper gluconate in a capsule for 12 weeks (Pratt et al. 1985).

Decreased hemoglobin and hematocrit values were observed in rats exposed to ≥66 mg Cu/kg/day (Kumar and Sharma 1987; NTP 1993; Rana and Kumar 1980) for 20–90 days and in pigs exposed to ≥24 mg Cu/kg/day for 48– 54 days (Kline et al. 1971; Suttle and Mills 1966a, 1966b). Depletion of hematopoietic cells in the bone marrow was observed in rats exposed to 196 mg Cu/kg/day as copper sulfate in the diet for 14 days (NTP 1993). Contrary to these findings, Liu and Medeiros (1986) observed an increase in hemoglobin levels and no change in hematocrit levels in rats fed a diet containing 14 mg Cu/kg/day as copper carbonate for 20 weeks.

Musculoskeletal Effects. No studies were located regarding musculoskeletal effects in humans following oral exposure to copper.

No alterations in biomarkers of liver damage (serum aspartate aminotransferase, alanine aminotransferase, gamma glutamyl transferase) were observed in adults exposed to 0.17 mg Cu/kg/day as copper sulfate in drinking water for 2 months (Araya et al. 2003b).

Two recent surveys of infants exposed to 0.8 mg Cu/L in household water did not find significant alterations in serum parameters of liver function or alterations in liver ultrasound imaging tests (Zietz et al. 2003a, 2003b).

Renal Effects. There is limited information on the renal toxicity of copper in humans. An increase in protein droplets in epithelial cell cytoplasm and the lumen of the proximal convoluted tubules was observed in rats exposed to 10 or 92 mg Cu/kg/day as copper sulfate in drinking water or diet, respectively, for 2 weeks or to 33 mg Cu/kg/day as copper sulfate in the diet for 13 weeks. At 134 mg Cu/kg/day, karyomegaly and tubule cell degeneration were also observed.

Body Weight Effects. No studies were located regarding body weight effects in humans following oral exposure to copper.

Neurological Effects

No studies were located regarding neurological effects in humans following oral exposure to copper.

No effects on spontaneous motor activity (assessed using an actophometer), learning ability (assessed using a pole climbing chamber), or relearning capacity and memory (assessed using a Y-maze) were observed in rats fed a diet containing 23 mg Cu/kg/day as copper sulfate (Murthy et al. 1981).

Reproductive Effects

No studies were located regarding reproductive effects in humans following oral exposure to copper.

Reproductive performance, as assessed by the length of gestation, number of kits whelped, and average kit weight, was not adversely affected in minks fed a diet containing 12 mg Cu/kg/day as copper sulfate (Aulerich et al. 1982).

Developmental Effects

No studies were located regarding developmental effects of humans following oral exposure to copper

Cancer

No studies were located regarding carcinogenic effects in humans following oral exposure to copper.

<u>Dermal Exposure</u>

Death

No studies were located regarding death in humans and animals following dermal exposure to copper.

Systemic Effects

No studies were located regarding respiratory, cardiovascular, gastrointestinal, musculoskeletal, hepatic, renal, endocrine, dermal, or body weight effects in humans or animals following dermal exposure to copper.

Hematological Effects. No studies were located regarding hematological effects in animals following dermal exposure to copper.

Ocular Effects. Eye irritation has been reported by factory workers exposed to copper dust (Askergren and Mellgren 1975). No studies were located regarding ocular effects in animals following exposure to copper.

Immunological and Lymphoreticular Effects

No studies were located regarding the following health effects in humans and/or animals after dermal exposure to copper:

GENOTOXICITY

No studies were located regarding genotoxicity in humans after inhalation, oral, or dermal exposure to copper or its compounds.

I.3. Residue and effect on human

No occupational exposure limits have been established for silver (Ag^+) and copper(Cu^{2+}) . This does not mean that this substance is not harmful. Safe work practices should always be followed.

Occupational exposure to silver may occur; however, this exposure generally would be of such a low level, and silver is of sufficiently low toxicity, that it is not expected to present unreasonable risks or hazards.

Silver can be absorbed from the lungs and the gastrointestinal tract. When an excessive amount of silver is absorbed, tissues become impregnated with silver sulfite, which forms a complex in elastic fibers. Large amounts of this complex under the skin will give it bluish, grey-blue, or in extreme cases a black color. This condition is called argyria. Although it is not a toxic effect, argyria is undesirable and usually permanent. Although silver is generally considered benign, argyria has been associated with neurological, renal, optic and hepatic dysfunction (Kwon, Lee et al. 2009). There remains some conflicting evidence as to the toxicity of nanosilver solutions, with acute and subchronic toxicity testing in mice and guinea pigs indicating no signs of toxicity in short term administration of colloidal nanosilver (Maneewattanapinyo, Banlunara et al. 2011)

Metabolism in animal and human body

Asthmatics and people with a history of allergies are to avoid nearness to this.

silver (Ag^+) and Copper (Cu^{2+}) are able to decrease the number of living cells of pathogens in addition to influencing metabolism of pathogenic bacteria and their toxin yields.

Metabolism and degradation in plant, soil:

Silver (Ag+) and Copper (Cu2+) helps in bioremediation /bioaugmentation of the Soil and water by degrading the contaminants and pathogens.

Residue data from other countries:
Not Available

Residue analytical method on crops:
Since PROTECSIL NPS amounts involved are about 50 ppm Silver and about 50 ppm Copper product PROTECSIL NPS / Ha or say about 10 Tons total agricultural produce yield and waste, residues in the crop harvested will be around 4-8 ppb of Silver and 4-8 ppb of Copper approximately +/- 5-10%, which are considered tolerable.

Fatty tissue accumulation:
Not pertinent. Not determined. No dietary exposure is expected from the bioagri input uses of PROTECSIL NPS since no food or feed uses are registered.
Not suspected to be bio-accumulative

Max Residue Limit (MRLs):
Not Pertinent Substances covered by MRL's (residues) are those routinely used as agricultural compounds and this historically does not include silver – hence it is not included in MRL tables.
Metal levels in foods and medicines are typically considered **contaminants. S**ilver is historically not considered a concern due to the low level of exposure and use, and no specific limits have been set by regulatory authorities.

Acceptable daily intake (ADI):
No dietary exposure is expected from the bioagri input uses of PROTECSIL NPS since no food or feed uses are registered.
Designated as safe for general or specific, limited use in food

EPA established an oral Reference Dose (RfD), or daily intake limit, of 0.005 mg/kg/day for silver in 1991.

Pre-harvest interval (PHI) (into finished product): 4 Hours

I.4. Effect on environment
I.4.1. Environment fate;
Not suspected to be an environmental toxin
However, Products containing silver are not applied in marine/estuarine environments or oil fields.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.
Volatility: Low

Absorption in the soil: It has minimal tendency to bind to soil or sediment

Leaching- GUS leaching potential index: Not pertinent

Soil degradation and Hydrolysis: Not available

Photolysis DT50 (days) at pH 7:
Photolysis is part of the light-dependent reactions of photosynthesis.

I.4.2. Effect on non-target organisms
Effect on bird, bee and wild animals: Not available

Effect on fish, aquatics: *Not available*

Effect on natural enemies: Not Available

II. Formulation

II.1. Product chemistry
Trade name:
PROTECSIL NPS
PROTECSIL NPS is a cost effective, universally applicable sterilizing agent.
It eliminates all pathogenic amoebas, bacteria, biofilms, fungi, virus, Yeasts and mould etc. without any side effects.

Formulation type: Liquid
The two main components, silver (Ag+) and Copper (Cu2+) with its powerful oligodynamic and catalytic effect, are combined with stabilisers to form a complex solution.

Composition: content, solvent, additive

No Solvents
No additives.

Appearance:	Brownish yellow or yellow liquid
Oder:	None
PH:	7±0.2
Critical Temperature:	Not available.

Specific Gravity: Weighted average: 1.01 (Water = 1)
Vapor Pressure (mm Hg.): 23.8 @25 oC
Melting Point: NA
Boiling Point: The lowest known value is 100°C (212°F) (Water). Weighted average:
101.56°C (214.8°F)
Vapor Density (AIR=1): Weighted average: 0.023 g/cm3 (Air = 1)
Evaporation Rate (Butyl Acetate = 1)**:** Not available
Viscosity: Not available
Odor Threshold: Not available.
Water/Oil Dist. Coeff. Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water, diethyl ether.
Solubility: Soluble in cold water, diethyl ether.
Flash Point: Not available
Flammable Limits: Not available
Hazard Characteristic: None
Hazardous Combustion Products: None
Extinguishing Media: None

Combustion Molar Ratio (Reactant to Product): Not Pertinent

Corrosiveness: Non-corrosive

Compatibility with other pesticides: May oxidize the pesticides

Materials to be avoided: Alkaline substance.

Production process:

Active Ingredient (Nano Silver) which is passed in QC and Active Ingredient (Nano Copper) which is passed in QC and the stabilizers are weighed individually as per the desired ratios with sufficient overages and blended in a batch type planetary mixer for more than 30 minutes and packed.

Foam when mixed water NA

Stability at 50 degrees C:

Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Metal oxide fume.
Hazardous Polymerization: Will not occur.
Incompatibilities: Silver is incompatible with acetylene, ammonia.

Major Contaminants that contribute to instability:
Light, Heat, Alkalies

Active Ingredient:
Silver (Ag+) and Copper (Cu2+) Nanopartcles

Storage and shelf life:

- Store in a dry location away from heat and out of direct sunlight in containers fitted with a safety valve or vent. Storage temperature: <104°F (40°C).
- Store in an area away from acids, bases, metals, metal salts, reducing agents, organic Materials or flammable substances.
- Do not store near or expose to heat sources (ie: steam pipes, radiant heaters, hot hair vents or Welding sparks)
- Never return unused product to the storage container.
- Rotate inventories - first in, first out.

Fire and Explosion Hazard Data
Flash Point (Method Used) **NA**
Flammable Limits **NA**
LEL **None**
UEL **None**
Extinguishing Media **None**
Special Fire Fighting Procedures **None**
Unusual Fire and Explosion Hazards **None**

Reactivity Data
Stability Stable

Unstable Conditions to Avoid
Colloid can be broken by freezing or treatment with strong acids.

Incompatibility *(Materials to Avoid)* **None**

Hazardous Decomposition or Byproducts None

Hazardous Polymerization **Will Not Occur**

Conditions to Avoid **None**

Health Hazard Data
Route(s) of Entry:
Inhalation? **None**
Skin? **None**
Ingestion? **None**
Health Hazards *(Acute and Chronic)* **None**
Carcinogenicity: **None**
NTP? **Not listed**

IARC Monographs? **Not listed**
OSHA Regulated? **Not required**
Signs and Symptoms of Exposure **None**
Medical Conditions Generally Aggravated by Exposure **None**

Precautions for Safe Handling and Use
Steps to Be Taken in Case Material is Released or Spilled **None**
Waste Disposal Method **None required**
Precautions to be taken in Handling and Storing
Should be stored at temperatures above freezing
Other Precautions **None**

Control Measures
Respiratory Protection *(Specify Type)* **None required**
Ventilation Local Exhaust **None required**
Special **None required**
Mechanical *(General)* **None required**
Other **None required**
Protective Gloves **Not required**
Eye Protection **Not required**
Other Protective Clothing or Equipment **Not required**
Work/Hygienic Practices **No special practices required**

First aid
If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes.
Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye.
Call a poison control center or doctor for treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 10-15 minutes. Then use non-abrasive soap and large amounts of water for another 10-20 minutes.
Be particularly careful to clean folds, crevices, creases and groin.
Call a poison control center for treatment advice.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

If swallowed: Call poison control center or doctor immediately for treatment advice.
Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for treatment advice.

Notes to Physician:
Modest irritation is only expected effect and should have no serious consequences except in the case of direct eye contact. If ingested, gastrointestinal irritation is to be expected. If large quantities are ingested, gastric evacuation via emesis or lavage may be used. Demulcents should be helpful. No systemic effects are expected.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

Analytical methods:

COLLOIDAL SILVER

A Field Emission Scanning Electron Microscope (FE-SEM, HITACHI S4700) was used to demonstrate the silver nanoparticles' size distribution.
Several drops of silver colloid were deposited on a conductive silicon wafer and then the sample was gently dried on a heating plate. The secondary electron SEM image was taken. To study the optical properties of the Ag nanoparticles, a double-beam UV-VIS spectrometer (9423UVA1002E Helios Alpha) was applied in the range of 200-700 nm. A 1 cm optical wide cuvette was used at room temperature.
(Reports from RADOSOM)

Precision of the method

The relative standard deviation of the method was found to be +/- 1%

COLLOIDAL COPPER

XRD measurements were recorded using a (D8-Advance, Germany) X-ray diffractometer equipped with a back monochromator operating at 40 kV and a copper cathode as the X-ray source ($\lambda = 0.154$ nm). XRD patterns were recorded from 20° to 80° (2θ) with a scanning step of 0.01. The size and morphology of the Cu nanoparticles were examined by using transmission electron microscopy (TEM, JEOL 2100F). The TEM samples were prepared by dispersing the powder products in alcohol by ultrasonic treatment, dropping the suspension onto a holey carbon film supported on a copper grid, and drying it in air. A thermo-gravimetric (TG-DTG, Netzsch STA 449C) analyzer (sample mass: about 15.0 mg; atmosphere, flowing dry oxygen; heating rate, 10 K/min) was used for thermo-gravimetric analysis.

Precision of the method

The relative standard deviation of the method was found to be +/- 1%

II.2. Biological Particularity

Mode of action

Silver is well known for its oligo – dynamic action (cold sterilization).
The effect of the two components is enhanced in a propreitory manufacturing process

The active material is silver in Nan-ionic form and in 400-600 nm size. Silver is completely stable carrier in form of suspension.
The active material is Copper in Nan-ionic form and in 400-600 nm size. Copper is completely stable carrier in form of suspension

It's stability has been tested in accelerated and long terms studies. Silver is known antibacterial agent. Its nanoparticles can kill all kinds of bacteria in very low concentration (about 5 ppm). It is also an antiviral and can fight against various kinds of viruses.

Silver acts as a photo catalyst. In the presence of air oxygen, it can produce free radicals, and these free radicals can effect the micro organisms and kill them.

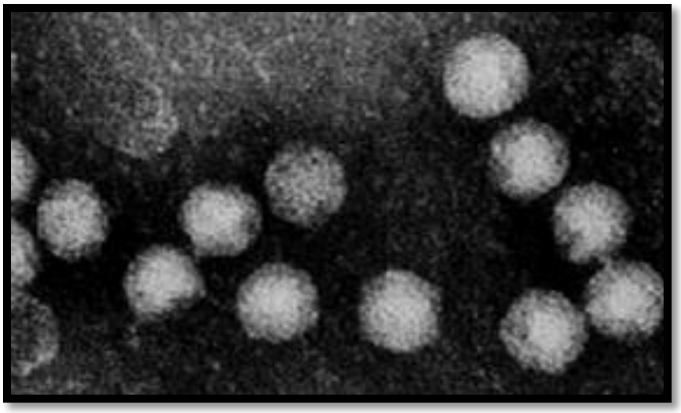
Silver can affect the di-sulficdic bands, between protein complexes. Thus the 3-d form of protein changes and it can not perform as an enzyme. In case this happens in bacteria cell wall, the selective permeability of cell wall changes, therefore, bacteria swallows and will destroy. If this process occurs in energy cycle enzymes, then, the production of ATP stops and the lack of energy will kill microorganisms.

On viruses, the glycoprotein knobs of viral envelop, that are virus antigenic receptors, has a di-sulfic band. This band could be attacked by silver nanoparticles and can destroy the virus and prevents its attachment with host cell. With this mechanism of actions, silver nanoparticles can be used instead of all antibacterial agents and in preventive form; it can be even used as a vaccine.

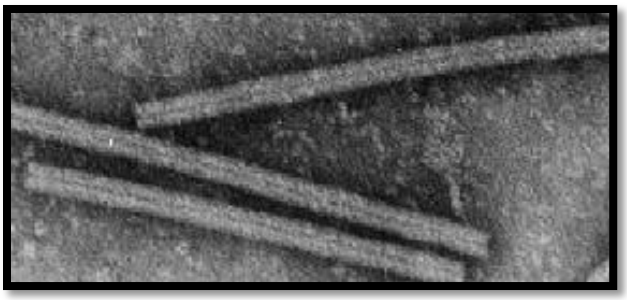
In the absence of pathogenic microorganisms and their stress on immune system and other systems of poultry, livestock, and aquatics, the produced energy can be used to make more tissues and especially muscular tissues. This can improve weight gaining in poultry, livestock and aquatics.

Scope of application:

Viruses cause many important plant diseases and are responsible for huge losses in crop production and quality in all parts of the world. Infected plants may show a range of symptoms depending on the disease but often there is leaf yellowing (either of the whole leaf or in a pattern of stripes or blotches), leaf distortion (e.g. curling) and/or other growth distortions (e.g. stunting of the whole plant, abnormalities in flower or fruit formation).

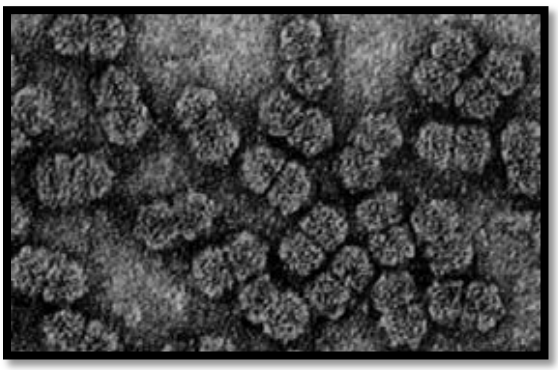


***Tobacco necrosis virus*, genus *Necrovirus* with particles 26 nm in diameter.**

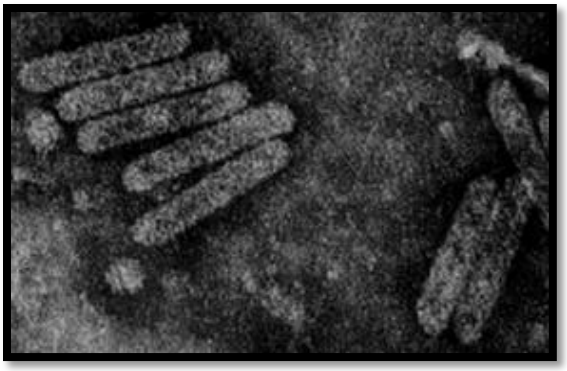


***Tobacco mosaic virus*, genus *Tobamovirus* with particles 300 nm long**

***Potato virus Y*, genus *Potyvirus* with particles 740 nm long**



***Maize streak virus*, genus *Mastrevirus*.**



***Cocoa swollen shoot virus*, genus *Badnavirus* with particles 28 x 130 nm.**

Bacterial diseases in plants may affect stems, leaves or roots or be carried internally. Generally, they belong to the genera *Erwinia, Pectobacterium, Pantoea, Agrobacterium, Pseudomonas, Ralstonia, Burkholderia, Acidovorax, Xanthomonas, Clavibacter, Streptomyces, Xyllella, Spiroplasma,* and *Phytoplasma.*

A bacterial disease may cause a variety of symptoms: blights, cankers, galls, leaf spots, overgrowths, specks, scabs, or wilts. Generally, the common name of the disease is a combination of the symptom or appearance and its location on the plant, like Bacterial Leaf Spot caused by *Pseudomonas cichorii* and fireblight in pears and apples, caused by *Erwinia amylovora.* In contrast to viruses that live inside plant cells, bacteria grow in the spaces between cells, producing toxins, special proteins or enzymes that damage the plant cells. *Agrobacterium* causes cells to genetically modify, producing cancer-like growths called galls.

Pecan Scab Disease

Fire Blight on Pear tree

Leaf Spot Disease

Apple Tree Fire Blight

Bacterial diseases are spread in many ways – rain, wind, birds or insects. People can also spread bacterial diseases by using infected pruning tools, by improper disposal of infected plant material, improperly managing plants in the winter, or introducing infected plants in an area. Bacteria require a wound or natural opening like stomata to get inside a plant to cause damage. Once inside, they kill host cells. Bacteria are hardy – if when spread, they find no ready host, they can go dormant until a suitable host is found.

Hydrogen peroxide (H_2O_2) and silver (Ag+) releases oxygen slowly in contact with atmospheric moisture and used to generate contaminated soils and lakes. It is used as a slow oxygen release source in agricultural application. It is used in the bleaching and deodorizing.

In "*Biosynthesis of silver nanoparticles from Staphylococcus aureus and its antimicrobial activity against MRSA and MRSE*" (Anima Nanda MSc, PhD and M. Saravanan MSc, MPhil) not only was nano-silver found to be effective in prohibiting the growth of 5 of the six bacteria strains tested, it was also found to be most effective against MRSA and MRSE, two well known "super bugs" resistant to antibiotics.

Antibiotic effectiveness was increased 20%-70% against test bacteria strains. *(Nanomedicine: Nanotechnology, Biology and Medicine*, Volume 6, Issue 1, Pages 103-109 A. Fayaz, K. Balaji, M. Girilal, R. Yadav, P. Kalaichelvan, R. Venketesan)

PROTECSIL NPS IS

- Anti Septic
- Astringent
- Biocide
- Bleaching Agent
- Cleanser
- Detergent.
- Disinfectant
- Pigment Degrader
- Sterilizer.
- UV Absorbent.

SILVER KILLS VIRUSES, STUDY FINDS

Tuesday, October 18, 2005 - FreeMarketNews.com

In a groundbreaking study, the Journal of Nanotechnology has published a study that found silver nanoparticles kills HIV-1 and is likely to kill virtually any other virus. The study, which was conducted by the University of Texas and Mexico University, is the first medical study to ever explore the benefits of silver nanoparticles, according to Physorg.

After incubating the HIV-1 virus at 37 C, the silver particles killed 100% of the virus within 3 hours for all three methods.

While further research is needed, researchers are optimistic that nanological silver may be the silver bullet to kill viruses.

UNIQUE FEATURES OF PROTECSIL NPS

1. Achieves the Target 100%
2. Almost harmless to waste water and environment
3. Bio Degradable
4. Cost Effective
5. Does not affect the chemistry or quality of the product treated
6. Does not alter the pH
7. Does not alter the taste, colour or smell of treated product

8. Does not create any odour
9. Does not form chemical compounds with other chemicals.
10. Effective in wide water temperatures ranging from 0°c - 95°c
11. Environmentally safe
12. Free from Chlorine
13. Free from carcinogenic or mutagenic effect
14. Free from danger of bacterial resistance
15. Free from danger when overdosed
16. International references in all field of application
17. Long-lasting effect.
18. No Need to use combinations of several disinfectants.
19. No need to bother to choose strain specific disinfectants
20. No neutralisation necessary after use
21. Non carcinogenic
22. Non Corrosive
23. Non inflammable
24. Non irritant.
25. Non mutagenic
26. Non polluting
27. Non staining
28. Non-toxic
29. Optimum Perfomance.
30. Parameters like Hardness, Salinity, pH cannot impair the efficiency of PROTECSIL NPS SILCOP
31. Prevents recontamination or reoccurance.
32. Rapid sterilization
33. Removes all foul odours
34. Rinsing not required
35. Sustained Results
36. Universal range of application

Antimicrobial Efficacy Test
* Antimicrobial efficacy test have been done by FDA
Test Strains: Escherichia coli, Staphylococcus Aureus, MRSA etc.
Anti-bacterial effect : 99.9%

* The paper have been released in Korean Journal of Medicine
Department of Internal Medicine, The Catholic University of Korea
The 54th Conference of The Korean Association of Internal Medicine
Test Strains: 27 kinds of bacteria etc.
Anti-bacterial effect : 99.9%

* Antimicrobial efficacy test have been done by Korea Consuming Science Research Center
Test Strains: Escherichia coli, Staphylococcus Aureus, MRSA etc.

Anti-bacterial effect : 99.9%

* Antimicrobial efficacy test have been done by Korea Testing and Research Institute for Chemical Industry
Test Strains: Escherichia coli, Staphylococcus Aureus, MRSA etc.
Anti-bacterial effect : 99.9%

PROTECSIL NPS ACTS EFFECTIVELY IN THE CASES OF

- Bacillus-Species (as Bacillus Anthracis, Anthrax)
- ECBO viruses (F. Herpesviridae)
- Fungi
- Gram+, gram- bacteria
- Legionnaires Disease
- Listeria Monocytogenes
- MRSA
- Mycoderins
- Sporogenesis
- Vibrio harveyi
- Vibrio parahaemolytus
- Viruses
- VRE
- Yeasts and mould

According to Water and Science Technology, Volume 31 5-6, a 1000:1 solution of colloidal silver to H2O2 is sufficient to increase the efficacy of colloidal silver by up to 100 times under some circumstances (which remain unknown) against bacterial infections.

High H2O2 colloidal silver strengths can be used externally with fine results. A 3% H2O2 colloidal silver solution can be mixed and used as an excellent disinfectant and water treatment method, and can be used as a skin cleanser/conditioner for healthy skin tissues.

INTERESTING FACTS ABOUT SILVER USAGE

In Americas Old West, it was common practice to use silver coins for various reasons such as dropping silver coins into drinking water barrels.

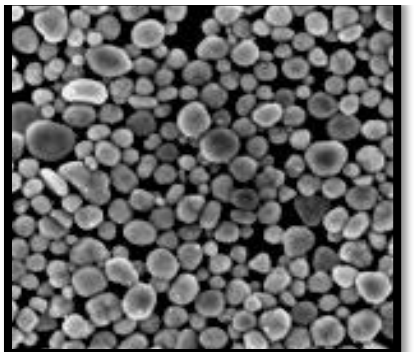
During the middle Ages, upper class Europeans often used silver utensils and goblets, ensuring the safety of their food and water.

The ancient cultures of Rome, Phoenicia, Macedonia and Greece all relied on silver to keep them well.

Around 400 B.C., Hippocrates, the "Father of Medicine," taught that silver supports the healing processes.

As recently as the 1930s, colloidal silver was the preferred choice of physicians to empower the immune system and support the bodys innate healing processes.

NASA has used silver in the water purification systems of the space shuttle and the international space station.



Nano Silver Particles

List of Pathogens on which PROTECSIL NPS is found to be effective

Absidia corymbiféra
Acinetobacter Iwoffii
Aeromonas salmonicida
Agrobacterium radiobacter
Alternaria alternata
Anthrax (Bacillus anthracis)
Aspergillus niger
Aspergillus niger-spores
Astenionella formosa
Bacillus cereus
Bacillus licheniformis
Bacillus mesenterious
Bacillus subtilis
Bacillus subtilis spores
(S.B.Aspergillus fumigatus Adenovirus)
Bacillus circulants vegetative and spores
Bacillus sp. marine
Bacteria cinerea
Bacteria erwinia
Botrytis cinerea
Burkholderia cepacia
Campylobacter jejuni
Candida albicans

CDC gr. IV c-2
Chlamidomonas sp.
Colera (V. cholerae)
Chryseomonas luteola
Chroomonas norstedtii
Ciliata g. sp.
Citro. fre.
Cladosporium cladosporoides
Clostidrium novyi
Clostidrium perfringens
Clostridium sporogenes
Coagulase +ve staphylococci
Comomonas acidovorans
Corynebact.
Criptomonas sp.
Dermatophagoides pteronyssinus
ECBO virus
Enterobacter aerogenes
Enterococcus faecium
Enterococcus faecalis
Enterococcus hirae
Erwinia carotovora
Eschericia coli
Flagellata apochromatica
Flavobacter/Cytophaga
Flavobacterium indologenes
Fragilaria sp.
Fusarium
Fusarium spp.
Galionella sp.
G. candidum
Hepatitis B
Hepatitis C surrogate (BVDV)
Herpes simplex type 1
HIV-1
Influenza A virus
Klebsiella oxytoca
Klebsiella pneumoniae
Lactobacillus brevis
Lactobacillus lindneri
Lactobacillus plantarum
Lactobacillus sp
Lactobacillus wild type
Legionella pneumophila

Leuconostoc mesenteroides
Listeria inoqua
Listeria monocytogenes
Melosira var.
MRSA
Microsporum gypseum
Micrococcus luteus
Micrococci marine
Micrococcus pyogenes aureus
Micrococcus roseus
Micrococcus candidus
Mucor
Mycobacterium phlei
Mycobacterium smegmatis
Mycobacterium spez.
Nagleria fowleri
Naumaniella sp.
Neisseria meningitidis
Newcastle Disease virus
Nitzschia sp.
Ochrobactrum anthorpi
Orthopoxvirus vaccinia
Papovavirus SV-40
Paramyxo virus
Pasteurella
Pedicoccus damnosus
Pedicoccus sp
Penicillium
Penicillium digitatum
Penicillium roqueforti
Penicillium verrucosum
Pestis (Y. Pestis)
Pichia membranaefaciens
Poliovirus 1
Proteus mirabilis
Proteus vulgaris
Pseudomonas aeruginosa
Pseudomonas alcaligenes
Pseudomonas chlororaphis
Pseudomonas fluorescens
Pseudomonas spec.
Pseudomonas syringae pv. Tomato
Ralstonia picketti
Rhizopus

Rotatoria g. sp.
Saccaromyces cerevisiae
Saccharomyces uvarum
Sacch.cereivisia var. uvarum
ssp.carlsbergensis
Salmonella enteritidis
Salmonella paratyphi
Salmonella sp.
Salmonella typhimurium
Salmonella typhi
Salmonella typhosa
Sarcina lutea
Staphylococcus agalactiae
Staphylococcus albus
Staphylococcus aureus
Staphylococcus faecium
Staphylococcus marcescens
Stephanodiscus hantzschii
Streptococcus faecalis
Streptococcus lactis
Streptococcus pyogenes
Trichophyton mentagrophytes
Pseudorabies virus
Trophozoite protozoa inl. Amoebae
Tuberculosis (Mycobacterium
Tuberculosis, resistant strain H37 Rv)
Tuberculosis (Mycobacterium
Tuberculosis, wild-type strain)
Vaccina virus
VRE
V. parahaemolyticus
Xanthomonas campestris
Zoogloea sp

Use In agriculture

Silver (Ag^+) and Copper (Cu^{2+}) are also known to be useful in land farming. In clayey soils it can provide a source of oxygen and improve hydraulic conductivity, permitting more efficient movement of nutrients and oxygen through the soil. Silver (Ag^+) treated soils shows increased total microbial populations and species diversity. Increasing species diversity suggests the ability to degrade a wilder range of chemical contaminants.

Use of silver (Ag+) and Copper (Cu2+) significantly increased crop emergence, plant population and their dry matter production; reduced the weed growth significantly. Also it may have certain effect on raising the soil pH up and thus on increasing nutrient availability.

PROTECSIL NPS is found to be very useful to combat the impact of flooding stress on plants and crops by supply of oxygen and rejuvenating the dying root tips and improve the ATP supply and demand

Surface application of a nanosilver (colloidal) solution to cucumbers in a greenhouse environment was found to be effective at controlling the development and spread of downy mildew, without any signs of phytotoxicity
(Alavi and Dehpour 2009).

The role of silver ions in the inhibition of ripening of fruit crops (tomatoes) has been investigated (Davies, Hobson et al. 1988).
There is a body of research in this field looking at mechanisms of ripening. In seed crops nanosilver has been investigated as an agent to promote seed abscission to enhance seed and hence oil recovery (Seif Sahandi, Sorooshzadeh et al. 2011).

Nanosilver is proven virucide and bacteriocide.

Silver, a naturally-occurring element, is registered in several countries for use in water filters to inhibit the growth of bacteria within the filter unit of water filter systems designed to remove objectionable taste, odors, and color from municipally treated tap water; these bacteriostatic water filters account for over 90% of its pesticidal use. Silver also is used to control several types of algae in swimming pool water systems; this algicide use accounts for only about 3% of silver's use as a pesticide.

Silver manufacturing use products are granular formulations, the bacteriostatic water filters are impregnated with silver, and the swimming pool algicides are formulated as soluble liquid concentrates.

Silver also has many other non-pesticidal, industrial uses including use in photo processing, mirror production, dental alloys, coinage, tableware and jewelry production, solder, electroplating, the manufacture of inks and dyes, the processing of food and beverages, and the etching of ivory. Silver salts and nitrate also are used as therapeutic agents in treating warts, burns, and eye infections.

IN THE CASE OF VIRUS LIKE RICE GRASSY STUNT VIRUS (RGSV)
Hoppers are vectors of virus

Farmers can easily know when the hoppers start attacking
The virus get transmitted from plant to plant by these hoppers
When hoppers suck the sap from rice stem - there is an injury made on plant
Virus enters on the injury
and goes in to cells of plants and stat multiplying

Therefore - killing the virus before they enter the cells is important
When the build up of hoppers starts - you know virus will start entering crops

There are no common Virucides in market.

PROTECSIL NPS is nano silver and copper based VIRUCIDE!

Application method:
RECOMMENDED DOSAGE:
DOSING IS DEPENDENT ON VARIOUS PARAMETERS LIKE:

- Contact Time
- Initial bacterial count
- Material & nature of the surface
- Nature of the microorganism
- PH of the target
- Presence of organic matter
- Temperature
- Thoroughness of cleaning

For Prevention
5 ml per Litre water to be sprayed on soil at land preparation before sowing for all crops
Can be mixed with Chemical fertilizers for soil applications

As Curative
10 ml per Litre water spray on soil and crops for all crops

IN THE CASE OF VIRUS LIKE RICE GRASSY STUNT VIRUS (RGSV)
Once farmers notice Hoppers - they can spray as under >
PROTECSIL NPS10 ml per Lt of water

And after a gap of a week repeat the spray
All virus that are on surface and yet to enter inside will get killed

Efficacy data from other countries: Not Available

Safe in use: Generally considered as safe

II. 3. Toxicology

Silver has been used for generations in goblets, silverware, and other food areas because of the belief that it inhibits diseases. In more recent times, the former Soviet Union used silver to sterilize recycled water on their space shuttles. Many international airlines use silver water filters to ensure safe drinking water for passengers.

The Swiss have approved use of these filters in homes and offices. Some US city municipalities use silver in treatment of sewage and is sometimes used to purify swimming pool water to avoid the stinging of the eyes that chlorine causes. CS also purifies drinking water. Silver has become the latest agent in the fight against airborne toxins, as well other industrial poisons, in the Japanese work place.

Dr.Henry Crooks (Use of Colloids in Health-Disease) found that silver in the colloidal state is highly germicidal, quite harmless to humans and absolutely non-toxic.

Dr. Becker's experiments conclude that silver works on the full spectrum of pathogens without any side effects or damage to any part of the body.

ORAL LD50:
LD50 is 2854 mg/Kg of animal body weight
The silver level is well below 180 micrograms / person / day permitted by W.H.O.
Hence it is safe for human as well as aquatic and terrestrial animal life.

Genetic toxicity in vitro
- In vitro tests did not show mutagenic effects

II.4. Effect on non-target organisms
Effect on bird, bee and wild animals: Not available

Effect on fish, aquatics: ***Not available***

Effect on natural enemies: Not Available