

## Competitors

There are a few brands of silver colloid products on the shelves. Many silver colloid companies claim to have the smallest particle size or the most uniform shape but do the shape and size really matter? All the competitor products were tested against Klearsen's silver colloids to determine which silver colloid are the most antibacterial as illustrated in vitro tests.

### The competitors:

Wellness Nasal Spray: 10 PPM silver

Sovereign silver: 10 PPM silver

Natural Path Silver Protein: 250 PPM silver bound to protein

Meso silver: 20 PPM silver

Invision International: 100 PPM silver bound to a citride

### Abstract:

These competitors were tested against Klearsen's Silver Colloid, Throat Rescue, or Stomach Rescue. The products were tested against *Staphylococcus*, *E. coli*, and *Streptococcus*. Wellness nasal spray was also tested against *Curvularia spicifera*. All of the tests were done in 5 ml of solution unless otherwise stated. Klearsen's pure silver colloid, Throat Rescue, and Stomach Rescue were much more successful at killing bacteria and fungus in most exposure times for these experiments. The enhancements to the effectiveness of the Klearsen products produced by the synergistic addition of the KC-20 widened the performance gap. Although the concentrations varied, each product was purchased and used as it was delivered to the retail shelf for the stated purpose.

### Lab Tests with Silver Colloid:

#### *Staphylococcus:*

#### Wellness nasal spray, Sovereign silver, and Natural Path Test

##### Methods:

One hundred  $\mu\text{l}$  of an unknown concentration of bacteria was added to 5 ml Sovereign Silver, Natural Path/Silver Wings, Wellness Nasal Spray, and Klearsen's Stomach Rescue. All solutions with bacteria were incubated at 37° C for 30 minutes and all solutions were incubated at 37° C before the addition of bacteria.

The bacteria in the silver colloid solutions incubated at 37° C for 30 minutes. After 30 minutes 100  $\mu\text{l}$  of the bacteria-silver colloid solution was plated on LB agar plates and incubated overnight at 37° C. The following day the colonies were counted.

##### Control Plates:

The original culture was diluted by serial dilution. One hundred  $\mu\text{l}$  of bacteria was added to 900  $\mu\text{l}$  of DI water, and 100  $\mu\text{l}$  of the new DI water-bacteria solution was added to another 900  $\mu\text{l}$  of DI water. This was repeated a total of 6 times to obtain a -5 and -6 dilution. One hundred  $\mu\text{l}$  of these dilutions were then plated on LB-agar plates and grown over night at 37° C.

##### Results:

##### Control plates:

Dilutions of -5 and -6 were plated and grown over night at 37° C. The colonies were counted and the quantity of bacteria in the original culture was determined.

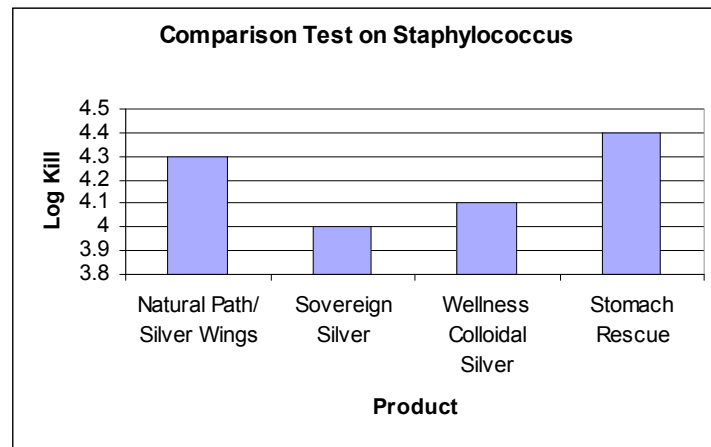
Dilution	colonies	CFU in 100 $\mu$ l of original culture	average	CFU/ml in original culture
-5	130	$1.3 \times 10^7$		
-6	11	$1.1 \times 10^7$	$1.2 \times 10^7$	$1.2 \times 10^8$

There is  $2.4 \times 10^5$  CFU plated if no CFU are killed.

Experimental plates:

30 minute

	Colonies Remaining Total Colonies	Log Kill Ratio
Natural Path/ Silver Wings	$\frac{10}{2.4 \times 10^5}$	4.3
Sovereign Silver	$\frac{23}{2.4 \times 10^5}$	4.0
wellness colloidal Silver	$\frac{20}{2.4 \times 10^5}$	4.1
Stomach Rescue	$\frac{9}{2.4 \times 10^5}$	4.4



Although all of the products had similar kill ratios, Klearsen's Stomach performed the best in 30 minutes.

### Meso silver Test

#### **Methods:**

Five ml of the Stomach Rescue and Meso silver were incubated at  $37^\circ \text{C}$  before addition of bacteria. After the solutions were at  $37^\circ \text{C}$ ,  $300 \mu\text{l}$  of bacteria was added to tubes containing 5 mls of meso silver and stomach rescue. The solutions were incubated at  $37^\circ \text{C}$  for 20, and 30 minutes. One hundred  $\mu\text{l}$  of the solution was then plated on LB-agar plates and grown for 40 hours at  $37^\circ \text{C}$ .

Control Plates:

The original culture was diluted by serial dilution. One hundred  $\mu\text{l}$  of bacteria was added to 900  $\mu\text{l}$  of DI water, and 100  $\mu\text{l}$  of the new DI water-bacteria solution was added to another 900  $\mu\text{l}$  of DI water. This was repeated a total of 6 times to obtain a -6. One hundred  $\mu\text{l}$  of the -5, and -6 dilutions were then plated on LB-agar plates and grown over night at 37° C.

**Results:**

Control Plates

Dilution	colonies	CFU in 100 $\mu\text{l}$ of original culture	average	CFU/ml in original culture
-5	80	$8.0 \times 10^6$		
-6	8	$8.0 \times 10^6$	$8.0 \times 10^6$	$8.0 \times 10^7$

With  $8.0 \times 10^6$  CFU placed in 5 ml, in 100  $\mu\text{l}$  taken from the 5 ml there would be about  $1.6 \times 10^5$  CFU plated if no CFU were killed.

Experimental Plates:

20 minutes:

	$\frac{\text{Colonies Remaining}}{\text{Total colonies}}$	Log Kill Ratio
Meso Silver	$\frac{2500}{1.6 \times 10^5}$	1.8
Stomach Rescue	$\frac{600}{1.6 \times 10^5}$	2.4

30 minutes:

	$\frac{\text{Colonies Remaining}}{\text{Total colonies}}$	Log Kill Ratio
Meso Silver	$\frac{2000}{1.6 \times 10^5}$	1.9
Stomach Rescue	$\frac{0}{1.6 \times 10^5}$	5.2

Stomach rescue was 1000 times more effective than meso silver in this test against *Staphylococcus*.

*E. Coli*

**Wellness nasal spray, Sovereign silver, and Natural Path Test**

**Methods:**

One hundred µl of an unknown concentration of bacteria was added to 5 ml Sovereign Silver, Natural Path/Silver Wings, Wellness Zinc Spray, Wellness Nasal Spray, Future Biotics and Klearsen’s Stomach Rescue. All solutions with bacteria were incubated at 37° C for 30 minutes and all solutions were incubated at 37° C before the addition of bacteria. Some dilutions were made of the competitor products because of the low concentration of colloidal silver.

<b>Product</b>	<b>Dilutions</b>
Natural Path/ Silver Wings	0
Sovereign Silver	0, -1
Wellness Zinc	0, -1
wellness colloidal Silver	0, -1
Stomach Rescue	0

The bacteria in the silver colloid solutions incubated at 37° C for 30. After 30 minutes 100 µl of the bacteria-silver colloid solution was plated on LB agar plates and incubated overnight at 37° C. The following day the colonies were counted.

**Control Plates:**

The original culture was diluted by serial dilution. One hundred µl of bacteria was added to 900 µl of DI water, and 100 µl of the new DI water-bacteria solution was added to another 900 µl of DI water. This was repeated a total of 6 times to obtain a –5 and –6 dilution. One hundred µl of these dilutions were then plated on LB-agar plates and grown over night at 37° C.

**Results:**

**Control plates:**

Dilutions of –5 and –6 were plated and grown over night at 37° C. The colonies were counted and the quantity of bacteria in the original culture was determined.

<b>Dilution</b>	<b>colonies</b>	<b>CFU in 100 µl of original culture</b>	<b>average</b>	<b>CFU/ml in original culture</b>
-4	320	$3.2 \times 10^6$		
-5	38	$3.8 \times 10^6$	$3.5 \times 10^6$	$3.5 \times 10^7$

**Experimental plates:**

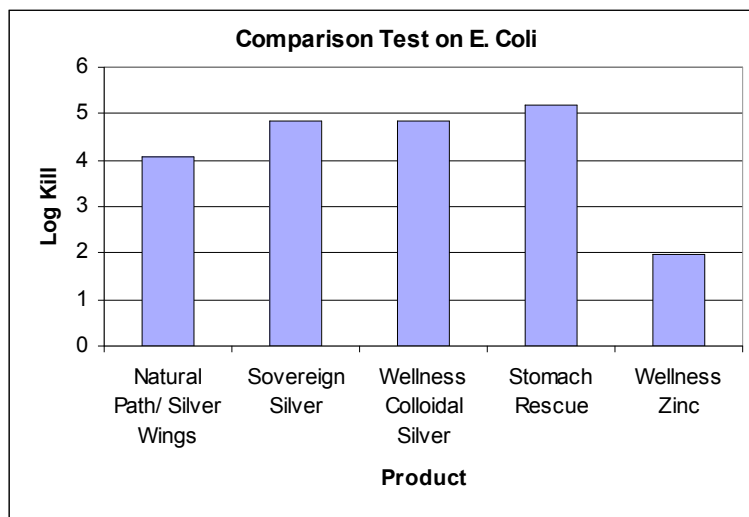
One hundred  $\mu\text{l}$  of the bacteria colloid solution was plated after a 30-minute incubation at  $37^\circ\text{C}$ . In  $100\ \mu\text{l}$  there should have been approximately  $7.0 \times 10^4$  CFU. Some samples were plated twice.  $1.4 \times 10^5$  CFU would be plated total for those plates.

CFU/plate at the dilutions

Product	0	-1	CFU/Plate with out dilution
Natural Path/Silver Wings	0, 12	-	12
Sovereign Silver	1	0	1
Wellness Zinc	700, 800	0	1500
wellness colloidal Silver	1	0	1
Stomach Rescue	0, 0	-	0

30 minute

	<b>Colonies Remaining</b> <b>Total Colonies</b>	<b>Log Kill Ratio</b>
Natural Path/Silver Wings	$\frac{12}{1.4 \times 10^5}$	4.066
Sovereign Silver	$\frac{1}{7.0 \times 10^4}$	4.84
Wellness Zinc	$\frac{1500}{1.4 \times 10^5}$	1.97
wellness colloidal Silver	$\frac{1}{7.0 \times 10^4}$	4.84
Stomach Rescue	$\frac{0}{1.4 \times 10^5}$	5.19



The graph shows the log kill ratio of Stomach Rescue and the competitor products at a 30 minute incubation time.

**Invision International ionic silver complex**

**Methods:**

Three dilutions of each solution were used. The Throat Rescue full strength concentration is 50 ppm and a 1:1 dilution with DI water was used to make a 25 ppm solution and then a 12.5 ppm solution. Invision International's silver colloid's full concentration is 100 ppm and a 1:1 serial dilution was used to make a 50 ppm solution and a 25 ppm solution. The solutions were heated to 37° C. After solutions reached the desired temperature, 100 µl of bacteria was added to each solution. The solutions were then incubated at 37° C for 20 minutes. After incubation 100 µl of the solution was plated on LB agar plates and grown overnight at 37° C.

Control plates:

Control plates were made to determine the original concentration of bacteria. A serial dilution of 1:10 was used. One hundred microliters of the original concentration was diluted in 900 µl of DI water. This dilution was continued 5 more times to make a -6 dilution. The -5 and -6 dilution was plated on LB agar plates and grown overnight at 37° C.

**Results:**

Control plates:

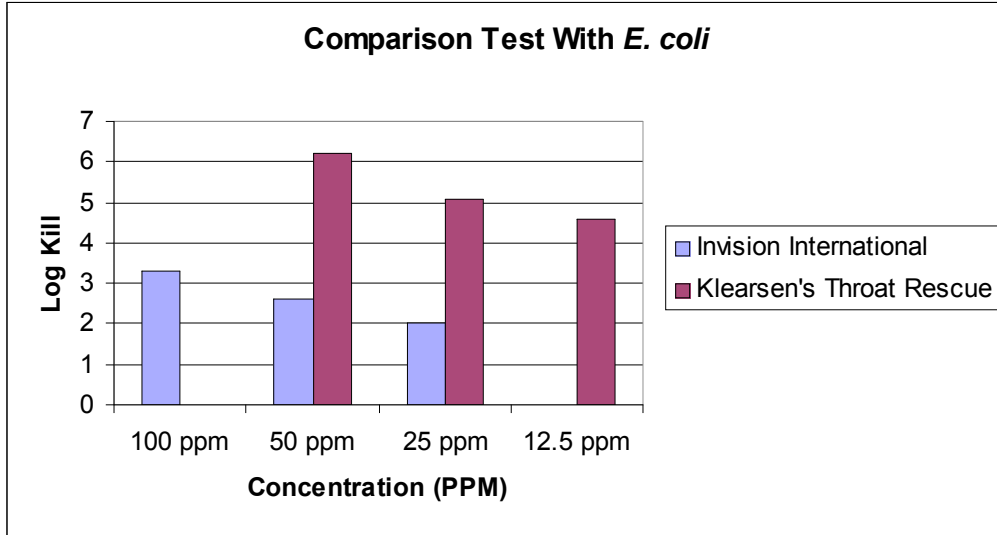
Dilution	CFU	CFU/ml in original culture
-5	500	$5 \times 10^8$
-6	46	$4.6 \times 10^8$

With an average concentration of  $4.8 \times 10^8$  CFU/ml, there would have only been  $9.6 \times 10^6$  CFU plated after incubation in the solutions.

Test Plates:

Invision International	CFU	Log Kill
100 ppm	$5 \times 10^3$	3.3
50 ppm	$2 \times 10^4$	2.6
25 ppm	$8 \times 10^4$	2

Klearsen's Throat Rescue	CFU	Log Kill
50 ppm	6	6.2
25 ppm	70	5.1
12.5 ppm	250	4.6



**Conclusion:**

Klearsen’s Throat Rescue at the lowest concentration worked better than the highest concentration of Invison International’s silver colloid. The Throat Rescue at full strength was almost 3 log better, or 1000 times better than the full concentration of Invison Internationals Silver Colloid.

***Streptococcus:***

**Sovereign silver, and Natural Path Test**

**Methods:**

One hundred µl of an unknown concentration of bacteria was added to 5 ml sovereign silver, Natural Path/ Silver Wings, and Klearsens Throat Rescue. All solutions with bacteria were incubated at 37° C for 60 minutes and all solutions were incubated at 37° C before the addition of bacteria. The bacteria in the silver colloid solutions incubated at 37° C for 60 minutes. After incubation 100 µl of the bacteria-silver colloid solution was plated on LB agar plates and incubated for 40 hours at 37° C. The following day the colonies were counted.

**Control Plates:**

The original culture was diluted by serial dilution. One hundred µl of bacteria was added to 900 µl of DI water, and 100 µl of the new DI water-bacteria solution was added to another 900 µl of DI water. This was repeated a total of 6 times to obtain a –5 and –6 dilution. One hundred µl of these dilutions were then plated on LB-agar plates and grown for 40 hours at 37° C.

**Results:**

**Control plates:**

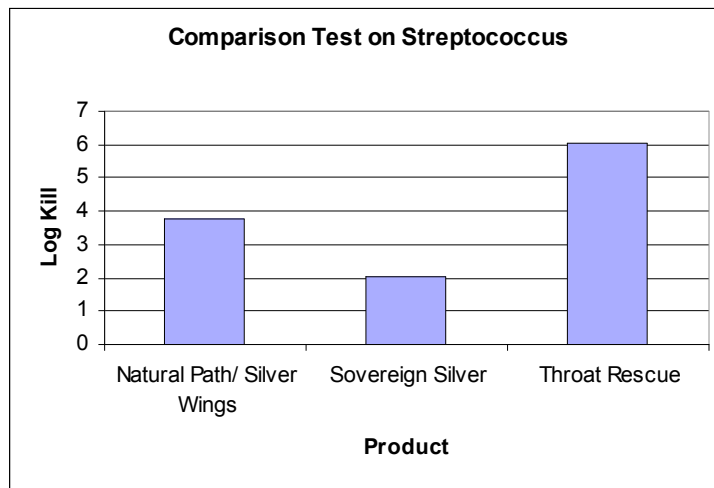
Dilutions of –5 and –6 were plated and grown over night at 37° C. The colonies were counted and the quantity of bacteria in the original culture was determined.

Dilution	colonies	CFU in 100 µl of original culture	average	CFU/ml in original culture
-5	800	8.0 x 10 <sup>7</sup>		

-6	150	$1.5 \times 10^8$	$1.15 \times 10^8$	$1.15 \times 10^9$
----	-----	-------------------	--------------------	--------------------

With  $2.3 \times 10^6$  CFU will be plated if no CFU killed.  
60 minutes

	<b>Colonies Remaining Total Colonies</b>	<b>Log Kill Ratio</b>
Natural Path/ Silver Wings	$\frac{200}{1.15 \times 10^6}$	3.76
Sovereign Silver	$\frac{10^4}{1.15 \times 10^6}$	2.06
Throat Rescue	$\frac{1}{1.15 \times 10^6}$	6.06



Throat rescue was the most effective on streptococcus. Wellness nasal spray was not tested in this experiment because there was none available.