CSIR Results

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Microbiology – Pretoria

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Experimental Report – E02/03/15

EFFICACY TESTING OF PRODUCT

One Drop point of use water purifier

LABORATORY TESTS

Tested For:

Rob Etchells

Nutritional Holdings Ltd.
Suite 3, 49 Richefond Circle
Ridge side Office Estate
Umhlanga Rocks

Cell: 082 339 0270 E-mail: rob@nholdings.co.za

Tested By:

Everton Barnes: Microbiology laboratory manager
Zama Mochocho: Microbiology analyst

02 March 2015

1 Supplies Provided to Laboratory

- Product

2 Test Protocol

- An untreated sterilized tap water sample was spiked with a bacterial suspension containing *Vibrio cholerae*, *Escherichia coli* and *Pseudomonas aeruginosa*.
- The spiked sample was analysed to detect the levels of all the bacteria added before treatment with the product.
- The same sample was split into 3 and treated with the product as follows: 1, 2, and 4 drops per liter respectively.
- All three treated samples were analysed for the same parameters as the before sample at: 30 min, 60 min, 90min, 120min, 240min, and 24hours.
- The results can be found in tables 1 to 4 below.

3 Comments

The results of the experiment show that a total kill was achieved for all the microbes after the addition of 1 drop of the product per liter after 24 hours contact time. There is a general decrease in the bacterial number as the dosage is increased and with increased contact time. *Vibrio cholerae* appears to be the most susceptible to the treatment with the fastest rate of decrease in number with *Pseudomonas aeruginosa* the most resistant to the treatment amongst the three microbes tested.

Over all it appears that the product was effective at rendering the water fit for human consumption after 24 hours contact time with 1 drop per liter based on the microbes tested. Increased dosages appears to bring the contact times down, with a contact time of 90 minutes required for a dosage of 2 drops per liter to achieve a total kill of the microbes in question.

4 Results

Table 1: Before treatment

Determinant	Result
Escherichia coli (cfu/100ml)	100 000
Vibrio cholerae (cfu/100ml)	88 000
Pseudomonas aeruginosa (cfu/100ml)	91 000

Table 2: 1 drop per liter

Determinant	30 minutes	60 minutes	90 minutes	120 minutes	240 minutes	24 hours
Escherichia coli (cfu/100ml)	13 000	2 600	850	120	0	0
Vibrio cholerae (cfu/100ml)	2 100	500	160	2	0	0
Pseudomonas aeruginosa (cfu/100ml)	64000	8 000	3 000	1 800	210	0

Table 3: 2 drops per liter

Determinant	30 minutes	60 minutes	90 minutes	120 minutes	240 minutes	24 hours
Escherichia coli (cfu/100ml)	540	62	0	0	0	0
Vibrio cholerae (cfu/100ml)	70	10	0	0	0	0
Pseudomonas aeruginosa (cfu/100ml)	2 500	450	0	0	0	0

Table 4: 4 drops per liter

Determinant	30 minutes	60 minutes	90 minutes	120 minutes	240 minutes	24 hours
Escherichia coli (cfu/100ml)	0	0	0	0	0	0
Vibrio cholerae (cfu/100ml)	0	0	0	0	0	0
Pseudomonas aeruginosa (cfu/100ml)	20	0	0	0	0	0

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Analytical Report

for

Nutritional Holdings

This report is supplemental to report I-2015-14987. As the report contains opinions, it is not covered by the accreditation certification of the chemical laboratory.

The certificate of analyses issued, reports the analyses of a water quality sample (I-2015-121188) submitted for analysis to the laboratory. As such the laboratory cannot accept responsibility for the representative nature of the sample.

The sample submitted was analyzed according to selected water quality parameters as indicated on the MSDS of the product added to a water sample. The results for the analyzed parameters were evaluated against the relevant requirements as listed in the SANS 241 drinking water (2005, 1999) standard.

Report No	**14987**			
Lab No. / Sample ID	**121188**		"One Drop" water purification liquid	
Parameter analyzed	***Value after addition of product***		***SANS 241 limit***	***Units***
Aluminium	<0.03		<0.3	mg/L
Copper	<0.01		<2	mg/L
pH	7.36		>5 or <9.7	pH units
Zinc	<0.02		<5	mg/L

Clearly, after addition of the product – the concentration of the above listed chemical components are still far below the SANS 241 required limit and even lower than the detection limit of the instrument; indicating that addition of this product does not adversely affect the quality of the water.. This also indicates that – ***chemically speaking*** – the product can still be used in a much higher quantity than the volume used for this experiment.

The water can be deemed safe for human consumption with regards to the values obtained during the analysis of the indicated parameters on the report.

No conclusion about the excluded parameters ca be made or is implied with this report.

Signed:.....
pp. S. Knoetze (Ph.D)
Environmental Laboratory

Date:.....25/06/2015...

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Inorganic Laboratory- Pretoria

Amended Certificate Of Analysis

Report NO: I-2015-14987-A
Customer: Nutritional Holdings Ltd
Address: Suit3- 49 Ridgefond Circle Suit3- 49 Ridgefond Circle
Ridgeside Durban 4319 SA
Phone: 0315368066
Contact: Rob Etchells (rob@nholdings.co.za)

Sample Description: Water
No of Samples 1
Date Received: 13-Feb-2015
Sample Condition: Good
Date Completed: 25-Jun-2015

Analysis	Unit	Lab No / Sample ID / Method	I-15-121188 "One Drop" Water purification liquid
Aluminium	mg/l Al	CMP 1	<0.03
Copper	mg/l Cu	CMP 1	<0.01
pH	pH units [25°C]	CMP 11	7.36
Zinc as Zn	mg/l Zn	CMP 1	<0.02

Remarks: * Method is not SANAS accredited and is not included in the SANAS Schedule of accreditation for this laboratory.

Y F Singmin - Technical Signatory

Steyn Knoetze - Technical Signatory

A copy of the original of this certificate is available from the CSIR on request. This certificate is issued without any alteration or erasure
This certificate supersedes all previous documents bearing the reference (I-2015-14987)

Date Printed 25-Jun-2015

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Comments *

Note: This COA supersedes all previous documentation bearing the reference I-2015-14987
Amendment: Sample ID changed at client's request.

Remarks: * Method is not SANAS accredited and is not included in the SANAS Schedule of accreditation for this laboratory.

Y F Singmin - Technical Signatory

Steyn Knoetze - Technical Signatory

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Date Printed 25-Jun-2015

SANS 241:2011 Requirements

Table 1 – Microbiological Determinands			
1	2	3	4
Determinand	**Risk**	**Unit**	**Standard Limits**
E. coli [a] *or Faecal coliforms* [b]	Acute Health – 1	Count per 100ml	Not detected
Cytopathogenic viruses[c]	Acute Health – 2	Count per 10 L	Not detected
Protozoan parasites [d] *Cryptosporidium species* *Giardia species*	Acute Health – 2 Acute Health – 2	Count per 10 L Count per 10 L	Not detected Not detected
Total Coliforms [e]	Operational	Count per 100ml	≤ 10
Heterotrophic Plate Count [f]	Operational	Count per ml	≤ 1000
Somatic Coliphages [c g]	Operational	Count per 10ml	Not detected

[a] Definitive, preferred indicator of faecal pollution.
[b] Indicator of unacceptable microbial water quality, could be tested instead of *E. coli*, but is not preferred indicator of faecal pollution. Also provides information on treatment efficiency and aftergowth in distribution networks.
[c] Confirms a risk of human infection and faecal pollution, and also provides information on treatment efficiency. The detection of selected viruses confirms faecal pollution of human origin.
[d] Confirms a risk of infection and faecal pollution, and also provides information on treatment efficiency. The detection of selected protozoan parasites confirms a human health risk.
[e] Indicates potential faecal pollution and provides information on treatment efficiency and aftergrowth.
[f] Process indicator that provides information on treatment efficiency, aftergrowth in distribution networks and adequacy of disinfectant residuals.
[g] Process indicator that provides information on treatment efficiency.

Table 2 – Physical, Aesthetic, Operational and Chemical Determinands			
1	2	3	4
Determinand	**Risk**	**Unit**	**Standard Limits**
Free chlorine	Chronic Health	mg/L	≤ 5
Monochloramine or equivalent for other approved disinfectants	Chronic Health	mg/L	≤ 3
Colour	Aesthetic	mg/L Pt-Co	≤ 15
Conductivity at 25°C	Aesthetic	mS/m	≤ 170
Odour or Taste	Aesthetic	-	Inoffensive
Total Dissolved Solids	Aesthetic	mg/L	≤ 1200
Turbidity [b]	Operational	NTU	≤ 1
	Aesthetic	NTU	≤ 5
pH at 25°C [c]	Operational	pH Units	≥ 5 to ≤ 9.7
Chemical Determinands – Macro-Determinands			
Nitrate as N [d]	Acute Health – 1	mg/L	≤ 11
Nitrite as N [d]	Acute Health – 1	mg/L	≤ 0.9
Sulfate as SO_4^{2-}	Acute Health – 1	mg/L	≤ 500
	Aesthetic	mg/L	≤ 250
Fluoride as F^-	Chronic Health	mg/L	≤ 1.5
Ammonia as N	Aesthetic	mg/L	≤ 1.5
Chloride as Cl^-	Aesthetic	mg/L	≤ 300
Sodium as Na	Aesthetic	mg/L	≤ 200
Zinc as Zn	Aesthetic	mg/L	≤ 5
Chemical Determinands – Micro Determinands			
Antimony as Sb	Chronic Health	µg/L	≤ 20
Arsenic as As	Chronic Health	µg/L	≤ 10
Cadmium as Cd	Chronic Health	µg/L	≤ 3

Total Chromium as Cr	Chronic Health	µg/L	≤ 50
Cobalt as Co	Chronic Health	µg/L	≤ 500
Copper as Cu	Chronic Health	µg/L	≤ 2000
Cyanide (Recoverable) as CN^-	Acute Health – 1	µg/L	≤ 70
Iron as Fe	Chronic Health	µg/L	≤ 2000
	Aesthetic	µg/L	≤ 300
Lead as Pb	Chronic Health	µg/L	≤ 10
Manganese as Mn	Chronic Health	µg/L	≤ 500
	Aesthetic	µg/L	≤ 100
Mercury as Hg	Chronic Health	µg/L	≤ 6
Nickel as Ni	Chronic Health	µg/L	≤ 70
Selenium as Se	Chronic Health	µg/L	≤ 10
Uranium as U	Chronic Health	µg/L	≤ 15
Vanadium as V	Chronic Health	µg/L	≤ 200
Aluminium as Al	Operational	µg/L	≤ 300
Chemical Determinands – Organic determinands			
Total Organic Carbon as C	Chronic Health	mg/L	≤ 10
Trihalomethanes			
Chloroform	Chronic Health	mg/L	≤ 0.3
Bromoform	Chronic Health	mg/L	≤ 0.1
Dibromochloromethane	Chronic Health	mg/L	≤ 0.1
Bromodichloromethane	Chronic Health	mg/L	≤ 0.06
Microcystin as LR[e]	Chronic Health	µg/L	≤ 1
Phenols	Aesthetic	µg/L	≤ 10

[a] The health-related standards are based on the consumption of 2L of water per day by a person of a mass of 60 kg over a period of 70 years.

[b] Values in excess of those given in column 4 may negatively impact disinfection.

[c] Low pH values can result in structural problems in the distribution system.

[d] This is the equivalent to nitrate at 50 mg NO_3^-/L and nitrate as 3 mg NO_2^-/L.

[e] Microcystin only needs to be measured where an algal bloom (>20 000 Cyanobacteria cell per ml) is present in a raw water source. In the absence of algal monitoring, an algal bloom is deemed to occur where the surface water is visibly green in the vicinity of the abstraction, or samples taken have a strong musty odour.