TEST PROGRAM FOR POLY-BIO-MARINE, INC 'S FIN-L-FILTER SYSTEM AND CHEMICAL SORBENT MEDIA

Lead (Pb)		(Pb) Concentration: ng/ml (ppb)
filtered tap water (background)	6.19 pH	6.04
spike + buffer 1.5ml 2.5N (Na OH)	7.75pH	116.85
(2) 12/Pk's (2.75" Dia.)	6.65pH	43.87 (62.45%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. Ru	inning Time: 34 sec	conds
Controls: (75ng/ml) & (150ng/ml)		82.61 & 170.90
filtered synthetic seawater	8.21pH	12.34
spike (200ng/ml)	8.12pH	248.38
(1) 12/Pk (2.75" Dia.)	8.39pH	90.72 (63.47%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. R	tunning Time: 14 m	inutes & 16 seconds
500ml Resin Mixture *	3.26рН	206.94 (16.68%Reduction)
* commercial mixture designed for		`
heavy metals.		
Lead (Pb) in Synergistic Mixture:		
Cadmium, Mercury, Lead		
filtered tap water	6.12pH	27.26
spike: 100ng/ml	5.90pH	117.89
(2) 12/Pk's (2.75" Dia.) Regular Grade		61.94 (47.45%Reduction)
(2) 12/Pk's (2.75"Dia.) Higher Grad		48.52 (58.84%Reduction)
** Flow Rate: 3.78 gpm @ 40psig. I	Running Time: 65 s	econds
(2) 12/Pk's (2.75" Dia) ***		28.94 (75.45%Reduction)
(2) 12/Pk's (2.75" Dia.) ***		31.17 (73.56%Reduction)
***Flow Rate: 3.78 gpm @ 40psig.	Running Time: 14	minutes
& 16 seconds (Recirculating - clo	osed system)	
Controls: 75ng/ml		70.90
150ng/ml		157.05
Filtration Procedure:		
System designed for single pass or reci	rculation.	
Tank: 10 gal. Nalgene FDA Approved.		
Pump: 4-Stage piston (Flojet)Approved	d for potable water	
Tubing: PVC (reinforced) nontoxic		
Canisters: 2 #10 Clear Ametek (NSF)		
Pipe: polypropylene for ultrapure water	with teflon tape.	
Media Retainer: UMHW polyethylene	end caps with cast	acrylic tube.
	od for Blood and U	
(Atomic Absorption under CAP R	egulations for Hos	pitals and Medical Schools.
w/ Graphite Furnace) (EPA Method	1: 7421) CAP: Col	llege of American Pathologists
		0 3

	Α		В		С	D	E	F	G
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2	116.85	5 Spil	ked Sa	mple	na/ml				
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26			orbed	120 -		116.85			Filtrate
27	7		13	100 -					43.87
28		25 24	12						
29		23	10	80 -				NA	
30		22	9	60 -				NNA	
31		21 20	8						
32 33		19	6 F	40 -				MMI	
34		18	5	20 -				1 1/1 1/1	
35		17	4						
36		16 15	3	0 -	Spike	ed Sample no	43.87	MMI	
37		14	1		1	(3/6)	N Inches	MAIN	
38					2 3		A Property		
39					4	5	Filtrate		
40						6			
41						7			
-	O Seconda			-					
72	0 Seconds								34 Seconds

Mercury (Hg)		(Hg) Concentration: ng/ml (ppb)
filtered tapwater	6.12 pH	0.00
spike (573 ul / 990 ug/ml)	7.76 pH	40.09
+ 2 ml Na OH (2.5N)	•	
(2) PMA 12/Pk's (85seconds)/5 gal.	7.25 pH	25.36 (36.74% Reduction)
(same 12/Pk's 15 minutes)	6.51 pH	22.23 (44.54% Reduction)
synthetic seawater	8.24 pH	3.43
spike (1.728ml /990 ug/ml)	8.16 pH	77.02 *
diluted 1:2 * concentration obtained	0.10 pm	11.02
multiply by #3		
(22) PMA Discs (Bypass Noted)	8.53 pH	57.28 *
diluted 1:2 *	0.55 pm	37.20
extreme amount of -		
media bypass noted test run 16 minute	es with muliple ston	
silcon grease used to attempt correction		13
later, through testing, silicone grease		
control (1) 10ng/ml	oontains moreary.	10.01
control (2) 20ng/ml		20.35
Mercury (Hg) in Synergistic Mixture:		20.33
Mercury, Cadmium, Lead		
filtered tapwater (background)	6.12 pH	0.00
spike (sample diluted 1:5)	5.90 pH	122.86
(2) PMA-1 12/Pk's (90 seconds/18.9		44.54 (63.74%Reduc.)
same 12/pk's running 14min.& 16 sec		48.04 (60.89%Reduc.)
(2) PMA-1 12/Pk's (90 seconds/18.9	25 I) 6 40 pH	63.76
(heavy grade /washed in 1.0 microsie	men/cm)	03.70
same 12/pk's running 14min. & 16 se		70.74
(heavy grade/washed in 1.0 microsier		70.74
Note: all other samples diluted 1:2	11011/0111/11/20)	
control (1) 10 ng/ml		11.16
control (2) 20 ng/ml		21.83
Analyis Method : Clinical Method	for blood and win	a analysis
(Atomic Absorption approved under	CAP Regulations fo	e unuiysis,
w/Graphite and Medical Sci	hools	n 110spilais
Furnace) EPA Method 7		
Flow Rate :3.78 gpm (14.30 Liters p		neia
Filtration Procedure:		Joig.
10 gal.(37.85 L) Nalgene polyethylene	FDA Approved for	Food Contact
System may be used for single pass or	recirculation of filt	ration solution
Tubing/hose PVC (reinforced) FDA N	VonToxic Receipe	action solution.
Pump: (all plastic) Four piston, Flow I	Rate (constant) 3 79	gram @ 40 nsig
(Flojet approved for potable wa	ater)	gpin (a) 40 psig.
Canister: #10 Clear Ametek (NSF) Ty	NO Connected in Sa	mac
Pipe: polypropylene rated for ultra-pure	e water w/ teffen **	no
Media Retainer: UMHW polyethylene	end cans with cost	pe. ecrelic tubo
Distriction of the state of the	ond caps with cast a	ioryne tube.

\$140 St. \$200 St. \$20	Α	В	С	D	E	F	G
1							
2	122.8	6 Spiked Samp	ole ng/ml				
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11						7	
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16						-	
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20							
21							
22							Filtrate
23		la control de la					44.54
24		Mercury Sorbed	140				
25		22 11	120	122.86			
26		21 10	100				
27	7	20 9 9 19 8				INY	
28		18 7	80			MMA	
29		17 6	60			NNNI	
30		16 5 15 4	40			K X X J	
31		15 4 3 14				1 M M M	
32		13 2	20			HHHH	
33		12 1	0 Sr	oiked Sample	ng/44 54	MMM	
34			-	and dample	44.54	ANNI	
35			2 7		The House	BINI	
36			3	4	Filtrete		
37				5 6	Filtrate		
38				7			
39	L						
40						-	
41							
42 (0 Seconds						90 Seconds

Cadmium (Cd)		(Cd) Concentration: ng/ml (ppb)
filtered tapwater (background)	6.30pH	0.00
spiked sample (50ng/ml)	6.30pH	64.83
(1) PMA-1 12/Pk (34 seconds)	6.44pH	64.64
(2) PMA-1 12/Pk's(34 seconds)	6.20pH	63.98
pH Test Ametek NSF (carbon-resin)	9.11pH	n/a
(running time: 34 seconds)	p	44 6
synthetic seawater (background)	8.11pH	0.00
spiked sample (200 ng/ml)	8.11pH	243.20
(2)PMA-1 12/Pk's (used above)	8.44pH	172.12 (29.33% Reduction)
(running time: 14 minutes)	***	(23.3370 1000001011)
Ametek NSF (carbon/resin filter)	9.15pH	29.50 (87.87% Reduction)
(running time: 14minutes)		(3,,3,,4,2,000,000,000,000,000,000,000,000,00
	unaccentable ai	kaline pH level. If this filter was used o
tapwater containing buffers sufficient to	nroduce a mod	erate alkaline nH level (2 00) it would
raise the pH level over 2.91 units. The	is would produce	8.00 + 2.01 = 10.01 pH/sec. pH test
above) which is far to high for most add	ult human skin	6.00 2.91 - 10.91 pii (see pii test
Control (1) 15ng/ml	est istilitant Same.	14.86
Control (2) 30ng/ml		30.30
Dilutions: tapwater 1: 1		30.30
seawater 1:9		
Note: as pH value rises above 8.00pH -	Cadmium is sor	had The next test will show and more
sorhing Cadmium requires addit	ion of a huffer of	r other metals which form complexes
(synergistic reaction).	ion of a buffer of	other metals which form complexes
Cadmium (Cd) in synergistic mixture:		
Mercury (Hg), Lead (Pb), Cadmium (Co	1)	
NSF filtered tapwater (background)		410 * (0
* sample diluted 1: 2	6.12pH	4.12 * (Concentration X 3)
spike (100ng/ml)	5.00mII	70.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)	5.90pH	79.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)*	6.30pH	36.33 * 54.26%Reduction
(2) PMA-1 12/Pk's (14minutes & 16 sec		29.22 *63.27%Reduction
(2) PMA-1 12/Pk's (14minutes & 16 seconds)	onds) 5.88pH	20.93 *73.65%Reduction
**(washed in 1.0 microSiemens/cm H20	onus) · · o.4opH	27.80 *65.00%Reduction
Control (1) 15ng/ml	0)	17.11
Control (2) 30ng/ml		16.14
	1. 1. 1. 1. 1	29.88
Cadmium (Cd) like Zinc (Zn) is not stab	ie in slightly acid	c, neutral or basic solutions.
The solute Cadmium, in nature, synergy	istically bonds C	opper,Iron,Lead or Mercury.
Therefore, sorbing Cadmium requires eit	ther shifting the p	H values alkaline very slow
flow rates, or a synergistic reaction simu		
Analysis Method: Clinical Method for	or blood and uri	ne analysis
(Atomic Absorption under CAP Regula	ations for Hospit	als and
w/Graphite Medical Schools.		
Furnace) (EPA Method: 7		
Flow Rate: 3.78 gpm (14.30 liters per		

	Α	В	С	D	Е	F	G
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2	79.44	Spiked Sampl	e ng/ml				
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17							
18			7				Filtrate
19	C	admium Sorbed		79.44			29.22
20		18 9	70				
21		17 8 8 16 7	60				
22		15 6	50				
23		14 5	40			KMM	
24		13 4	30			MMM	
25		12 3 11 2	20			MMM	
26		10 1				MAM	
27		***************************************	10			HHM	
28			0 Sp	iked Sample	ng 29.22	MMM	
29 30			1 \			MMM	
31			2 3				
32				4 5	Filtrate		
33				6			
34				7			
35							
36							
37							
38							
39							
40							
41							
42	0 Seconds						85 Seconds
							05 Seconds

Copper (Cu) Ionic		(Cu) Concentration: ng/ml (ppb)
filtered tapwater NSF	7.78pH	105.866
spike (600ng/ml)	8.00pH	718.951
(1)PMA-1 12/Pk (17seconds)	7.65pH	489.04(31.97%Reduction)
(2)PMA-1 12/Pk's(20seconds)	7.30pH	374.09(47.96%Reduction)
Mega Media (zeolite)(17 seconds)	8.80pH	613.577
Mega Media weight (170 grams)		0.10.17
Bio-Chem-Zorb(carbon-resin)(30sec	s.) 7.17pH	575.259
Bio-Chem weight (283 grams)		
Control (1)		96.286
Control (2)		1102.130
Flow Rate: 3.87 gpm (14.30 liters	per minute) @ 40 p	osig.
Copper (Cu) Reagent Grade (Synerge	istic)	
synthetic seawater (background)	8.17pH	31.700
spike sample (200 ng/ml)	8.00pH	211.730
(2) PMA-1 12/Pk's (60seconds)	8.06pH	80.80(61.8% Reduc.)
same media reused (14minutes &16s	ecs.) 8.03pH	72.62(65.7%Reduc.)
synthetic seawater (background)	8.20pH	59.052
spike sample	8.35pH	2418.385
(2) PMA-1 12/Pks(14minutes&16sed	conds) 8.56pH	1860.183
Toxic Metal Sponge(14mins.&16 sec	cs.) 8.31pH	2284.416
Control (1) 650ng/ml		637.270
Control (2)1300ng/ml		1324.660
Copper (Cu) Chelated		
synthetic seawater (background)	8.30pH	13.091
spiked sample (Chleated Copper)	8.35pH	1454.748
(1)PMA-1 12/Pk (20seconds)	8.35pH	1375.098(5.47%Red.)
same 12/Pk (14minutes & 16seconds	8.50pH	1128.185(22.4%Red.)
Toxic Metal Sponge (20 seconds)	8.40pH	1367.133
Bio-Chem-Zorb (20 seconds)	8.35pH	1375.098
Mega Media (20 seconds)	8.30pH	1391.028
Control (1) 650 ng/ml		642.322
Control (2) 1300 ng/ml		1391.028
synthetic seawater (background)	8.18pH	31.700
spiked sample (1450 ng/ml)	8.19pH	1570.160
(2)PMA-1 12/Pk's(14mins.&16secs.)	8.50pH	841.85(46.38%Rd)
1000ml Toxic Metal Sponge	7.91pH	1365.580
running: 14mins. & 16secs.		
Control (1) 650ng/ml		637.270
Control (2) 1300ng/ml		1324.660
Analysis Method: ASTM D1688	-90 (Test Method B -	- Chelation/Extraction)
(Atomic Absorption (EPA Method)	: 7210)	,
w/chelation/extraction)		
Flow Rate: 3.78 gpm (14.30 liters n	er minute) @ 40 m	Side

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	Α	В	С	D	Е	F	G
1							
2	718.951	Spiked Sam	ple(ng/ml)				
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16						-	
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18							
19				-			
20							
21							Filtrate
22	C	opper Sorbed	800	718.951			374.09
23		22 11	700	110.931			
24 25		21 10 10 20 9 9	600				
26							
		19 8	500			NXA	
		18 7					
27	4	18 7 7 6	400				
28	7	18 7 17 6 16 5	400				
28 29	Y	18 7 17 6 16 5 15 4 14 3	400 300 200				
28 29 30	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100		374.09		
28 29 30 31	Y	18 7 17 6 16 5 15 4 14 3	400 300 200 100	ked Sample(n	374.09 g/ml)		
28 29 30 31 32	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 Spi	ked Sample(n	374.09 g/ml)		
28 29 30 31 32 33	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi		374.09		
28 29 30 31 32 33 34	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4	ig/ml)		
28 29 30 31 32 33 34 35	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	374.09 g/ml) Filtrate		
28 29 30 31 32 33 34 35 36	Y	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5	g/ml)		
28 29 30 31 32 33 34 35 36 37	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39		18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39 40		18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39 40 41	0 Seconds	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		20 Seconds

The first of the second second

Iron (Fe)		(Fe)Concentration: ng/ml (ppb)
filtered tapwater NSF	6.65pH	42.923
spiked sample + 1ml NaOH(2.5N)	8.00pH	272.136
Poly-Filter Discs 12 (34seconds)	7.86pH	243.485(10.53%Reduction)
Poly-Filter Discs 24 (34seconds)	7.28pH	214.833(21.05%Reduction)
synthetic seawater	8.35pH	358.091
spiked sample	8.30pH	630.282
24 used P.F. Discs(14min.&16sec.)	7.34pH	358.091(100% Sorbed)
Control (1) (450ng/ml)		444.046
Control (2) (1020ng/ml)		1031.405
Iron (Fe) Synergistic Mixture		
Copper, Zinc, Iron 200ng/ml Ea.		
synthetic seawater	8.17pH	306.098
spiked sample	8.00pH	418.424(26%Increase)
(2)PMA-1 12/Pk's (60secs.)	8.06pH	356.02(14.9%Reduction)
same (2)12/Pk's(14min.& 16secs.)	8.03pH	281.136(106.8% Sorbed)
Control (1) 150ng/ml		156.330
Control (2) 300ng/ml		318.578
Analyis Method: ASTM D.	1691-90	
(Atomic Absorption EPA 7	380	
Flame emission)		
Flow Rate: 3.78 gpm (14.30 liters	per minute)	@ 40 psig.

Note:

Synthetic seawater mixtures contain large amounts of Iron as a background impurity. Morton Salt Purex (food grade), higher grade than most synthetic

seawater mixtures, contains 0.15 mg/L - 0.25 mg/L trace Iron.

Reference: Morton Salt Literature for Purex and pharmaceutical grade sodium chloride.

	Α	В		C	D	E	F	G
1								
2	Spiked Sar	mple ng/ml						
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9								
10								
11								
12								Filtrate
13								214.136
14								
15		Iron Sorbed					h	
16		7	300	T				
17		6	250	1070 400		+++		
18		5		272.136			NN	
19		3	200				111	
20		2	150					
21		2					MMI	
22			100				214.136	
23			50					
24			0				MI	
25		S	piked	Sample n	g/ml		711	
26				123	# ##			
27	7			456-	g/ml 891912	###		
28 29				0/	89		Hiltrate	
The second second					7912			
30	L		-					
32								
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41			-					
THE PERSON NAMED IN	0 Seconds							
14.	U Securius							34 Seconds

Zinc (Zn)		(Zn)Concentration:ng/ml (ppb)
filtered tapwater NSF	6.11pH	0.00
spiked sample + 2ml NaOH(2.5N)	7.09pH	242.12
Poly-Filter Discs (2) 12/Pk's(34secs.)	6.34pH	200.62(17.14% Reduction)
same (2) 12/Pk's (15 minutes)	6.16pH	150.63(37.78%Reduction)
synthetic seawater	8.17pH	7.65
spiked sample	7.97pH	390.09
Poly-Filter Discs (2) 12/Pk's	8.37pH	386.60(0.8%Reduction)
(running 14mins.& 16 secs.)		
Purigen (Organic Sorbent Resin)	7.34pH	321.60
500ml (running 14mins. & 16 secs.)		
Control (1) 300ng/ml		337.60
Control (2) 600ng/ml		648.56
Zinc (Zn) Synergistic Mixture		
Copper, Iron, Zinc (200ng/ml Ea)		
synthetic seawater	8.17pH	0.00
spiked sample	8.00pH	140.72
(2) PMA-1 12/Pk's (60 secs.)	8.06pH	21.57(84.7%Reduc.)
same (2) 12/Pk's (14mins.& 16 secs.)	8.03pH	0.00(100%Reduc.)
Control (1) 150 ng/ml		179.02
Control (2) 300 ng/ml		319.45
Flow Rate: 3.78 gpm (14.30 liters per		ig.
Analysis Method: ASTM D169	1-90	
(Atomic Absorption EPA 79:	50	
Flame emission)		

Note:

Zinc (Zn) like Cadmium(Cd) is not stable in slightly acidic, neutral or basic solutions.

The solute Zinc (Zn), in nature, synergistically bonds Iron, Copper, Lead or Mercury.

Synthetic seawater, a mix of cations and anions in solution, reacts bonding Zinc therby inhibiting removal via chemical filtration. However through the addition of Two new metals (Copper & Iron) our filtration media: sorbs the Zinc quantatively

	Α	В	С	D	Е	F	G
1	223,000,000,000				_	•	
2	140.12	Spiked S	ample ng/ml				
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18							
19							
20							
21							Filtrate
22	Z	inc Sorbed	160 —				21.57
23		21 10	140	140.12			
24		20 9	120				
25		19 8			M	M I	
26		18 7 7 6	100			XNN	
27	1	16 5	80			AMM	
28		15 📉 4	60			11/11/1	
29		14 3 13 2	40			11/11	
30		12 1	20			17/1	
31		11	0 Sr	iked Sample ng	·/ml	1/1/1	
32			1	and Jample 119	WITH THE TENT	MMH	
33			2 \		21.57	T///	
34			3	4			
35				5 6	Filtrate		
36				7			
37		-					
38							
39							
40							
41							
42	0 Seconds						60 Seconds

PHOSPHOROUS		
Ortho Phosphate (PO 4)		(PO 4)Concentration: ng/ml (ppb)
(Freshwater Tests)		
city tapwater filtered	6.58pH	100.25
spiked sample (125ng/ml	7.35pH	227.82
(monobasic ortho phosphate)		
(1) PMA-1 12/Pk's	7.30pH	99.81(56.2% Reduc.)
running time: 34 seconds		
(2) PMA-1 12/Pk's	7.25pH	140.14(38.48%Reduc.)
(1) 12Pk used + (1)12Pk new		
running time: 34 seconds		
(Synthetic Seawater)		
background syn. seawater	8.10pH	22.66
spiked sample (125ng/ml)	8.12pH	115.59
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	62.99(45.50%Reduc)
running time: 14mins. & 16 secs.)		
TOTAL PHOSPHOROUS		
Hydrolyzable Phosphate (PO 3)		(PO 3) Concentration: ng/ml (ppb)
(Meta, Hexa, Poly, Tri Poly)		
(Freshwater Test)		
city tapwater filter w/NSF Carbon	6.10pH	280.42
city tapwater filter w/Fin-L-Filter	6.15pH	75.10
spiked sample(250ng/ml)	6.35pH	315.49
(meta phosphoric acid)		
(1) PMA-1 12/Pk's	6.90pH	205.02(35%Red.)
running time: 34 seconds		`
(1) PMA-1 12/Pk (used)	6.50pH	203.27(35.6%Red.)
running time: 5 minutes		
(Synthetic Seawater)		
background syn. seawater	8.10pH	52.47
spiked sample (125ng/ml)	8.12pH	124.36
(meta phosphoric acid)		
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	99.81(19.74%Red.)
running time: 14mins. & 16 secs.)		
Control (1) 150 ng/ml		159.43
Control (2) 300 ng/ml		283.93

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method: ASTM D 515 - 88 + Hydrolyzable Phosphorous

(Colorimetric:880nm EPA 365.4

w/20mm light path)

	Α		В	С	D	Е	F	G
1						-	•	
2	227.8	2 Spike	Sample	e na/ml				/
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4	A					,		
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6					-			
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10	The second secon							
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13								
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15								
16							-	
17	7							
18								
19								
20								
21								
22								
23								
24	* .							
25								Filtrate
26		PO 4 Sor	rbed					99.81
27	7	25	12					
28		24	11					
29		23 22	10			$H \cap H$		
30		21	8		1111111111			
31		20	7 25	50 227.82	HIIIIHI		99.8	
32		19				1111111111		
33		18	5 4 20	00				
34		16		50			Filtrate	
35		15	2					
36		14	1 10	00				
37		13		50				
38			Sp	ike Sample r	ng/ml			
39								
40	,			1234	567			
41	L							
42	0 Seconds							34 Seconds

	Α	В	С	D	E	F	G
1							
2	315.49	Spiked Sam	ple ng/ml				
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4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16						-	
17							
18							
19							Filtrate
20							205.02
21	P	O 3 Sorbed 3	350 —				
22			300	315.49			
23		18 8					
24			250				
25		16 6 2 15 5 2	200			MN	
26		and the same of th	50				
27	1	13 3			IN	MMM,	
28		The same of the sa	00		205.02	MMM	
29		11 1 1	50		205.02	MM	
30			0 0-11			MMMI	
31				ked Sample no	g/mi	INMI	
32			1 2			NIM	
33			3 4			= XN	
34			-	5	Filtrate		
35				6 7	, T		
36			7	,			
37							
38							
39							
40							
41							
	0 Seconds						34 Seconds
		1					34 Seconds

VOLATILE ORGANIC CHEMICALS (V.O.C.)

Tribalomethanes:

11maiomethanes.		
Chloroform (CH CL3)		(CH CL3)Concentration:ng/ml (ppb)
water: 5 megohm/cm	n/a pH	6.53
Spike: *30.28ml preparation	8.00pH	347.01
added to 7.57 liters		
(1) PMA-1 12/Pk **		152.45 (56.06% Reduc.)
(2) PMA-1 12/Pk s **		70.13 (79.79%Reduc.)
(1) PMA-1 12/Pk		90.71 (73.85%Reduc.)
(2) PMA-1 12/Pks		66.39 (80.86%Reduc.)
Control (1) 75ng/ml		75.75
Control (2) 150ng/ml		161.80

Flow Rate: 1-2 liters per minute

- * Spike Preparation: 68 microliters of spectrograde CH CL3 added to 100ml volumetric flask to make 1mg/ml CH CL3 in ethanol. Take 10ml of the previous solution and add to new 100ml volumetric flask filled with 90ml ethanol (100 micrograms/ml). Take 30.28ml of 100ug/ml mixture and add to 7.57 liters of 5 megohm/cm water Sodium Hydroxide (electronics grade) added to produce 8.00pH solution... Mixed in closed plastic bottle for Thirty minutes.
- ** Filter Media prewashed in 1.0 microSiemens/cm water (pH 5.00 6.35) pH was not tested to avoid the Chloroform offgassing/volatilizing from filtered

Analysis Method: Microextraction into pentane prior to Gas Chromatography with electron capture detector.

Clinical Method: Journal of Applied Toxicology, Vol.2, NO..3, 1982

The Presence of Trihalomethanes in Soft Drinks.

Mohamed S. Abdel-Rahman

UMD Dept. of Pharmacology, Toxicology Lab.

State of New Jersey Medical School

	Α	В		С	D	Е	F	G
1								
2	347.0	1 Spiked Sar	nple r	ng/ml				
3	,							
4								
5								
6								
7								
8								
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10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25				1				Filtrate
26		Chloroform S	orbed	350 —	347.01			90.71
27	7	26	13	300				
28		25 24	12 11	250 —				
29		23	10				MMM	
30		22	9	200 +				
31		21	8	150 —			MMM	
32		20 19	7 6	100 +			MMM	
33		18	5	50 —			MMM	
34		17	4				NNN	
35		16	3	0	Spiked Samp	ole na/ml	NNN	
36		15 14	2 1	1	Spiked Samp	90.71	ZINN	
37					2 3			
38					4	Filtrate		
39					5 6	1 mate		
40					7			
41								
42	0 Seconds							60 Seconds

STANDARDS and FORMULATION of SPIKE SOLUTIONS

Lead (Pb)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 07307PG					
Cadmium (Cd)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 995ug/ml Lot No.07823AN					
Mercury (Hg)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 990ug/ml Lot No. 04111A					
Copper (Cu)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 05224CN					
Ionic	Sea Cure (Copper Sulfate) Aquarium Systems Concentration: 1 drop per 3.785 L. = 0.15mg/l					
Chelated	Copper Safe (Chelated Copper Sulfate) Mardel Labs Concentration: 4.3ml/37.85 Liters = 500ng/ml					
Zinc (Zn)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 990 ug/ml Lot No. 05313DF					
Iron (Fe)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration 1010ug/ml Lot No. 05212BP					
Ortho Phosphate Aldrich Chemical Co. Standard (Potassium phosphate monobasic) (PO 4)						
Meta Phosp Acid (PO 3	()					
Chloroform (CH CL 3)	Spectrographic Grade					

SYNERGISTIC MIXTURE SPIKE METHOD

Copper Iron Zinc 7.5ml of Copper Standard 1010ug/ml 7.6ml of Zinc Standard 990ug/ml 7.5ml of Iron Standard 1010ug/ml added to 37.85 Liters of Premixed Synthetic Seawater (Nalgene Tank)

Lead Cadmium Mercury 3.75ml of Lead Standard 1010ug/ml 3.80ml of Cadmium Standard 995ug/ml 3.82ml of Mercury Standard 990ug/ml added to 37.85 Liters of Filtered (2) Ametek (CBR 2-10), tapwater. Solution was mixed for seven minutes. The pH adjusted via Na OH (2.5N) sufficient to buffer the 37.85 Liters to 5.90 pH.

Phosphorous

9.0ml of Ortho phosphate standard 0.522mg/l + 4.7 mg. of metaphosphoric acid (weighed dry on analytical balance) added to 100ml (5 megaohm/cm H 2 O) beaker. The spike solution was placed on heater/mixer for ten minutes. The spike solution 's pH 8.12 in 100ml beaker. The entire contents of 100ml beaker-spike solution were added to the 37.85 Liters.

ANALYTICAL EQUIPMENT

pH Meter: Orion Research digital ion analyzer Model 501

Calibrated daily & electrode maintained in

standard solution .(7.000 pH)

Atomic Absorption Varian AA-875 Recalibrated and certified

prior to test program. Graphite Furnace attachment by Varian. Cold Vapor/Hot Vapor collection method for Mercury.

vapor concetion method for interestry.

Spectrophotometer Varian DMS-90 ultraviolet & visible light

Conductivity Cole-Parmer Model 1481-61

Gold Conductivity cell for low range.

Gas Chromatograph Varian Model 3700

Flame, ECD Detector

Glassware Washed in HNO 3 - Rinsed in

5-9 megaohm/cm and oven dried.

Distilled Water Rainwater collected and run through

a pyrogen-free still then piped to lab's Milli - Q Water System. Produces Certified 18 megaohm/cm water.

Tapwater Filtration Fin-L-Filter (r) Kold Ster-iL (r) *

(2) Model Pma-1's w/ 12pks

(1) Model Psm-1 w/ 0.20micron

* U.S. Patent Pending.

Ametek NSF System: 0.50micron, heavy metals, VOCs & pesticides.

(2) Ametek #10 ultrapure canisters w/ (2) CBR 2-10 cartridges.

TEST PROGRAM FOR POLY-BIO-MARINE, INC 'S FIN-L-FILTER SYSTEM AND CHEMICAL SORBENT MEDIA

Lead (Pb)		(Pb) Concentration: ng/ml (ppb)					
filtered tap water (background)	6.19 pH	6.04					
spike + buffer 1.5ml 2.5N (Na OH)	7.75pH	116.85					
(2) 12/Pk's (2.75" Dia.)	6.65pH	43.87 (62.45%Reduction)					
cut from standard resale Poly-Filters							
Flow Rate: 3.78 gpm @ 40 psig. Ru	inning Time: 34 sec	conds					
Controls: (75ng/ml) & (150ng/ml)		82.61 & 170.90					
filtered synthetic seawater	8.21pH	12.34					
spike (200ng/ml)	8.12pH	248.38					
(1) 12/Pk (2.75" Dia.)	8.39pH	90.72 (63.47%Reduction)					
cut from standard resale Poly-Filters							
Flow Rate: 3.78 gpm @ 40 psig. R	tunning Time: 14 m	inutes & 16 seconds					
500ml Resin Mixture *	3.26рН	206.94 (16.68%Reduction)					
* commercial mixture designed for							
heavy metals.							
Lead (Pb) in Synergistic Mixture:							
Cadmium, Mercury, Lead							
filtered tap water	6.12pH	27.26					
spike: 100ng/ml	5.90pH	117.89					
(2) 12/Pk's (2.75" Dia.) Regular Grade		61.94 (47.45%Reduction)					
(2) 12/Pk's (2.75"Dia.) Higher Grad		48.52 (58.84%Reduction)					
** Flow Rate: 3.78 gpm @ 40psig. I	Running Time: 65 s	econds					
(2) 12/Pk's (2.75" Dia) ***		28.94 (75.45%Reduction)					
(2) 12/Pk's (2.75" Dia.) ***		31.17 (73.56%Reduction)					
***Flow Rate: 3.78 gpm @ 40psig.	Running Time: 14	minutes					
& 16 seconds (Recirculating - clo	osed system)						
Controls: 75ng/ml		70.90					
150ng/ml		157.05					
Filtration Procedure:							
System designed for single pass or reci	rculation.						
Tank: 10 gal. Nalgene FDA Approved.							
Pump: 4-Stage piston (Flojet)Approved	d for potable water						
Tubing: PVC (reinforced) nontoxic							
Canisters: 2 #10 Clear Ametek (NSF)							
Pipe: polypropylene for ultrapure water	with teflon tape.						
Media Retainer: UMHW polyethylene end caps with cast acrylic tube.							
Analysis Method: Clinical Method for Blood and Urine Analysis							
(Atomic Absorption under CAP R	egulations for Hos	pitals and Medical Schools.					
w/ Graphite Furnace) (EPA Method	1: 7421) CAP: Col	llege of American Pathologists					
		0 3					

	Α		В		С	D	E	F	G
1								•	
2	116.85	5 Spil	ked Sa	mple	na/ml				
3									
4							,		
5									
6						-			
7									
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19									
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22									
23									
24									
25									
26			orbed	120 -		116.85			Filtrate
27	7		13	100 -					43.87
28		25 24	12						
29		23	10	80 -				NA	
30		22	9	60 -				NNA	
31		21 20	8						
32 33		19	6 F	40 -				MMI	
34		18	5	20 -				1 1/1 1/1	
35		17	4						
36		16 15	3	0 -	Spike	ed Sample no	43.87	MMI	
37		14	1		1	(345)	N Inches	MAIN	
38					2 3		A Property		
39					4	5	Filtrate		
40						6			
41						7			
-	O Seconda			-					
72	0 Seconds								34 Seconds

Mercury (Hg)		(Hg) Concentration: ng/ml (ppb)
filtered tapwater	6.12 pH	0.00
spike (573 ul / 990 ug/ml)	7.76 pH	40.09
+ 2 ml Na OH (2.5N)	•	
(2) PMA 12/Pk's (85seconds)/5 gal.	7.25 pH	25.36 (36.74% Reduction)
(same 12/Pk's 15 minutes)	6.51 pH	22.23 (44.54% Reduction)
synthetic seawater	8.24 pH	3.43
spike (1.728ml /990 ug/ml)	8.16 pH	77.02 *
diluted 1:2 * concentration obtained	0.10 pm	11.02
multiply by #3		
(22) PMA Discs (Bypass Noted)	8.53 pH	57.28 *
diluted 1:2 *	0.55 pm	37.20
extreme amount of -		
media bypass noted test run 16 minute	es with muliple ston	
silcon grease used to attempt correction		13
later, through testing, silicone grease		
control (1) 10ng/ml	oontains moreary.	10.01
control (2) 20ng/ml		20.35
Mercury (Hg) in Synergistic Mixture:		20.33
Mercury, Cadmium, Lead		
filtered tapwater (background)	6.12 pH	0.00
spike (sample diluted 1:5)	5.90 pH	122.86
(2) PMA-1 12/Pk's (90 seconds/18.9		44.54 (63.74%Reduc.)
same 12/pk's running 14min.& 16 sec		48.04 (60.89%Reduc.)
(2) PMA-1 12/Pk's (90 seconds/18.9	25 I) 6 40 pH	63.76
(heavy grade /washed in 1.0 microsie	men/cm)	03.70
same 12/pk's running 14min. & 16 se		70.74
(heavy grade/washed in 1.0 microsier		70.74
Note: all other samples diluted 1:2	11011/0111/11/20)	
control (1) 10 ng/ml		11.16
control (2) 20 ng/ml		21.83
Analyis Method : Clinical Method	for blood and win	a analysis
(Atomic Absorption approved under	CAP Regulations fo	e unuiysis,
w/Graphite and Medical Sci	hools	n 110spilais
Furnace) EPA Method 7		
Flow Rate :3.78 gpm (14.30 Liters p		neia
Filtration Procedure:		Joig.
10 gal.(37.85 L) Nalgene polyethylene	FDA Approved for	Food Contact
System may be used for single pass or	recirculation of filt	ration solution
Tubing/hose PVC (reinforced) FDA N	VonToxic Receipe	action solution.
Pump: (all plastic) Four piston, Flow I	Rate (constant) 3 79	gram @ 40 nsig
(Flojet approved for potable wa	ater)	gpin (a) 40 psig.
Canister: #10 Clear Ametek (NSF) Ty	NO Connected in Sa	mac
Pipe: polypropylene rated for ultra-pure	e water w/ teffen **	no
Media Retainer: UMHW polyethylene	end cans with cost	pe. ecrelic tubo
Distriction of the state of the	ond caps with cast a	ioryne tube.

\$140 St. \$200 St. \$20	Α	В	С	D	E	F	G
1							
2	122.8	6 Spiked Samp	ole ng/ml				
3							
4							
5							
6							
7							
8							
9							
10							
11						7	
12							
13							
14							
15							
16						-	
17							
18							
19							
20							
21							
22							Filtrate
23		la control de la					44.54
24		Mercury Sorbed	140				
25		22 11	120	122.86			
26		21 10	100				
27	7	20 9 9 19 8				INY	
28		18 7	80			MMA	
29		17 6	60			NNNI	
30		16 5 15 4	40			K X X J	
31		15 4 3 14				1 M M M	
32		13 2	20			MMM	
33		12 1	0 Sr	oiked Sample	ng/44 54	MMM	
34			-	and dample	44.54	ANNI	
35			2 7		The House	BINI	
36			3	4	Filtrete		
37				5 6	Filtrate		
38				7			
39	L						
40						-	
41							
42 (0 Seconds						90 Seconds

Cadmium (Cd)		(Cd) Concentration: ng/ml (ppb)
filtered tapwater (background)	6.30pH	0.00
spiked sample (50ng/ml)	6.30pH	64.83
(1) PMA-1 12/Pk (34 seconds)	6.44pH	64.64
(2) PMA-1 12/Pk's(34 seconds)	6.20pH	63.98
pH Test Ametek NSF (carbon-resin)	9.11pH	n/a
(running time: 34 seconds)	p	44 6
synthetic seawater (background)	8.11pH	0.00
spiked sample (200 ng/ml)	8.11pH	243.20
(2)PMA-1 12/Pk's (used above)	8.44pH	172.12 (29.33% Reduction)
(running time: 14 minutes)	***	(23.3370 1000001011)
Ametek NSF (carbon/resin filter)	9.15pH	29.50 (87.87% Reduction)
(running time: 14minutes)		(3,,3,,4,2,000,000,000,000,000,000,000,000,00
	unaccentable ai	kaline pH level. If this filter was used o
tapwater containing buffers sufficient to	nroduce a mod	erate alkaline nH level (2 00) it would
raise the pH level over 2.91 units. The	is would produce	8.00 + 2.01 = 10.01 pH/sec. pH test
above) which is far to high for most add	ult human skin	6.00 2.91 - 10.91 pii (see pii test
Control (1) 15ng/ml	est istilitant Same.	14.86
Control (2) 30ng/ml		30.30
Dilutions: tapwater 1: 1		30.30
seawater 1:9		
Note: as pH value rises above 8.00pH -	Cadmium is sor	had The next test will show and more
sorhing Cadmium requires addit	ion of a huffer of	r other metals which form complexes
(synergistic reaction).	ion of a buffer of	other metals which form complexes
Cadmium (Cd) in synergistic mixture:		
Mercury (Hg), Lead (Pb), Cadmium (Co	1)	
NSF filtered tapwater (background)		410 * (0
* sample diluted 1: 2	6.12pH	4.12 * (Concentration X 3)
spike (100ng/ml)	5.00mII	70.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)	5.90pH	79.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)*	6.30pH	36.33 * 54.26%Reduction
(2) PMA-1 12/Pk's (14minutes & 16 sec		29.22 *63.27%Reduction
(2) PMA-1 12/Pk's (14minutes & 16 seconds)	onds) 5.88pH	20.93 *73.65%Reduction
**(washed in 1.0 microSiemens/cm H20	onus) · · o.4opH	27.80 *65.00%Reduction
Control (1) 15ng/ml	0)	17.11
Control (2) 30ng/ml		16.14
	1. 1. 1. 1. 1	29.88
Cadmium (Cd) like Zinc (Zn) is not stab	ie in slightly acid	c, neutral or basic solutions.
The solute Cadmium, in nature, synergy	istically bonds C	opper,Iron,Lead or Mercury.
Therefore, sorbing Cadmium requires eit	ther shifting the p	H values alkaline very slow
flow rates, or a synergistic reaction simu		
Analysis Method: Clinical Method for	or blood and uri	ne analysis
(Atomic Absorption under CAP Regula	ations for Hospit	als and
w/Graphite Medical Schools.		
Furnace) (EPA Method: 7		
Flow Rate: 3.78 gpm (14.30 liters per		

	Α	В	С	D	Е	F	G
1							
2	79.44	Spiked Sampl	e ng/ml				
3	4						
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18			7				Filtrate
19	C	admium Sorbed		79.44			29.22
20		18 9	70				
21		17 8 8 16 7	60				
22		15 6	50				
23		14 5	40			KMM	
24		13 4	30			MMM	
25		12 3 11 2	20			MMM	
26		10 1				MAM	
27		***************************************	10			HHM	
28			0 Sp	iked Sample	ng 29.22	MMM	
29 30			1 \			MMM	
31			2 3				
32				4 5	Filtrate		
33				6			
34				7			
35							
36							
37							
38							
39							
40							
41							
42	0 Seconds						85 Seconds
							05 Seconds

Copper (Cu) Ionic		(Cu) Concentration: ng/ml (ppb)
filtered tapwater NSF	7.78pH	105.866
spike (600ng/ml)	8.00pH	718.951
(1)PMA-1 12/Pk (17seconds)	7.65pH	489.04(31.97%Reduction)
(2)PMA-1 12/Pk's(20seconds)	7.30pH	374.09(47.96%Reduction)
Mega Media (zeolite)(17 seconds)	8.80pH	613.577
Mega Media weight (170 grams)		0.10.17
Bio-Chem-Zorb(carbon-resin)(30sec	s.) 7.17pH	575.259
Bio-Chem weight (283 grams)		
Control (1)		96.286
Control (2)		1102.130
Flow Rate: 3.87 gpm (14.30 liters	per minute) @ 40 p	osig.
Copper (Cu) Reagent Grade (Synerge	istic)	
synthetic seawater (background)	8.17pH	31.700
spike sample (200 ng/ml)	8.00pH	211.730
(2) PMA-1 12/Pk's (60seconds)	8.06pH	80.80(61.8% Reduc.)
same media reused (14minutes &16s	ecs.) 8.03pH	72.62(65.7%Reduc.)
synthetic seawater (background)	8.20pH	59.052
spike sample	8.35pH	2418.385
(2) PMA-1 12/Pks(14minutes&16sed	conds) 8.56pH	1860.183
Toxic Metal Sponge(14mins.&16 sec	cs.) 8.31pH	2284.416
Control (1) 650ng/ml		637.270
Control (2)1300ng/ml		1324.660
Copper (Cu) Chelated		
synthetic seawater (background)	8.30pH	13.091
spiked sample (Chleated Copper)	8.35pH	1454.748
(1)PMA-1 12/Pk (20seconds)	8.35pH	1375.098(5.47%Red.)
same 12/Pk (14minutes & 16seconds	8.50pH	1128.185(22.4%Red.)
Toxic Metal Sponge (20 seconds)	8.40pH	1367.133
Bio-Chem-Zorb (20 seconds)	8.35pH	1375.098
Mega Media (20 seconds)	8.30pH	1391.028
Control (1) 650 ng/ml		642.322
Control (2) 1300 ng/ml		1391.028
synthetic seawater (background)	8.18pH	31.700
spiked sample (1450 ng/ml)	8.19pH	1570.160
(2)PMA-1 12/Pk's(14mins.&16secs.)	8.50pH	841.85(46.38%Rd)
1000ml Toxic Metal Sponge	7.91pH	1365.580
running: 14mins. & 16secs.		
Control (1) 650ng/ml		637.270
Control (2) 1300ng/ml		1324.660
Analysis Method: ASTM D1688	-90 (Test Method B -	- Chelation/Extraction)
(Atomic Absorption (EPA Method)	: 7210)	,
w/chelation/extraction)		
Flow Rate: 3.78 gpm (14.30 liters n	er minute) @ 40 m	Side

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	Α	В	С	D	Е	F	G
1							
2	718.951	Spiked Sam	ple(ng/ml)				
3	,						
4					,		
5							
6							
7			· ·				
8							
9							
10							
11							
12							
13							
14							
15							
16						-	
17							
18							
19				-			
20							
21							Filtrate
22	C	opper Sorbed	800	718.951			374.09
23		22 11	700	110.931			
24 25		21 10 10 20 9 9	600				
26							
		19 8	500			NXA	
		18 7					
27	4	18 7 7 6	400				
28	7	18 7 17 6 16 5	400				
28 29	Y	18 7 17 6 16 5 15 4 14 3	400 300 200				
28 29 30	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100		374.09		
28 29 30 31	Y	18 7 17 6 16 5 15 4 14 3	400 300 200 100	ked Sample(n	374.09 g/ml)		
28 29 30 31 32	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 Spi	ked Sample(n	374.09 g/ml)		
28 29 30 31 32 33	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi		374.09		
28 29 30 31 32 33 34	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4	g/ml)		
28 29 30 31 32 33 34 35	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	374.09 g/ml) Filtrate		
28 29 30 31 32 33 34 35 36	Y	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5	g/ml)		
28 29 30 31 32 33 34 35 36 37	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37	7	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39		18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39 40		18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		
28 29 30 31 32 33 34 35 36 37 38 39 40 41	0 Seconds	18 7 17 6 16 5 15 4 14 3 13 2	400 300 200 100 0 Spi	4 5 6	g/ml)		20 Seconds

The first of the second second

Iron (Fe)		(Fe)Concentration: ng/ml (ppb)
filtered tapwater NSF	6.65pH	42.923
spiked sample + 1ml NaOH(2.5N)	8.00pH	272.136
Poly-Filter Discs 12 (34seconds)	7.86pH	243.485(10.53%Reduction)
Poly-Filter Discs 24 (34seconds)	7.28pH	214.833(21.05%Reduction)
synthetic seawater	8.35pH	358.091
spiked sample	8.30pH	630.282
24 used P.F. Discs(14min.&16sec.)	7.34pH	358.091(100% Sorbed)
Control (1) (450ng/ml)		444.046
Control (2) (1020ng/ml)		1031.405
Iron (Fe) Synergistic Mixture		
Copper, Zinc, Iron 200ng/ml Ea.		
synthetic seawater	8.17pH	306.098
spiked sample	8.00pH	418.424(26%Increase)
(2)PMA-1 12/Pk's (60secs.)	8.06pH	356.02(14.9%Reduction)
same (2)12/Pk's(14min.& 16secs.)	8.03pH	281.136(106.8% Sorbed)
Control (1) 150ng/ml		156.330
Control (2) 300ng/ml		318.578
Analyis Method: ASTM D.	1691-90	
(Atomic Absorption EPA 7	380	
Flame emission)		
Flow Rate: 3.78 gpm (14.30 liters	per minute) (@ 40 psig.

Note:

Synthetic seawater mixtures contain large amounts of Iron as a background impurity. Morton Salt Purex (food grade), higher grade than most synthetic

seawater mixtures, contains 0.15 mg/L - 0.25 mg/L trace Iron.

Reference: Morton Salt Literature for Purex and pharmaceutical grade sodium chloride.

	Α	В		C	D	E	F	G
1								
2	Spiked Sar	mple ng/ml						
3	272.13							
4						,		
5								
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11								
12								Filtrate
13								214.136
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15		Iron Sorbed					h	
16		7	300	T				
17		6	250	1070 400		+++		
18		5		272.136			NN	
19		3	200				111	
20		2	150					
21		2					MMI	
22			100				214.136	
23			50					
24			0				MI	
25		S	piked	Sample n	g/ml		711	
26				123	# ##			
27	7			456-	g/ml 891912	###		
28 29				0/	89		Hiltrate	
The second second					7912			
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THE PERSON NAMED IN	0 Seconds							
14.	U Securius							34 Seconds

Zinc (Zn)		(Zn)Concentration:ng/ml (ppb)
filtered tapwater NSF	6.11pH	0.00
spiked sample + 2ml NaOH(2.5N)	7.09pH	242.12
Poly-Filter Discs (2) 12/Pk's(34secs.)	6.34pH	200.62(17.14% Reduction)
same (2) 12/Pk's (15 minutes)	6.16pH	150.63(37.78%Reduction)
synthetic seawater	8.17pH	7.65
spiked sample	7.97pH	390.09
Poly-Filter Discs (2) 12/Pk's	8.37pH	386.60(0.8%Reduction)
(running 14mins.& 16 secs.)		
Purigen (Organic Sorbent Resin)	7.34pH	321.60
500ml (running 14mins. & 16 secs.)		
Control (1) 300ng/ml		337.60
Control (2) 600ng/ml		648.56
Zinc (Zn) Synergistic Mixture		
Copper, Iron, Zinc (200ng/ml Ea)		
synthetic seawater	8.17pH	0.00
spiked sample	8.00pH	140.72
(2) PMA-1 12/Pk's (60 secs.)	8.06pH	21.57(84.7%Reduc.)
same (2) 12/Pk's (14mins.& 16 secs.)	8.03pH	0.00(100%Reduc.)
Control (1) 150 ng/ml		179.02
Control (2) 300 ng/ml		319.45
Flow Rate: 3.78 gpm (14.30 liters per		ig.
Analysis Method: ASTM D169	1-90	
(Atomic Absorption EPA 79:	50	
Flame emission)		

Note:

Zinc (Zn) like Cadmium(Cd) is not stable in slightly acidic, neutral or basic solutions.

The solute Zinc (Zn), in nature, synergistically bonds Iron, Copper, Lead or Mercury.

Synthetic seawater, a mix of cations and anions in solution, reacts bonding Zinc therby inhibiting removal via chemical filtration. However through the addition of Two new metals (Copper & Iron) our filtration media: sorbs the Zinc quantatively

	Α	В		С	D	Е	F	G
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9			-	***************************************				
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17	7							
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20								
21								Filtrate
22	Z	inc Sorbed	160 ¬					21.57
23		21 10	140		140.12			21.07
24		20 9	120 -	L		M		
25		19 8						
26		18 3 7 1 17 6 6	100				MM	
27	7	16 5	80 -				11111	
28		15 4	60				11/1/11	
29		14 3	40 -				1/1/1	
30		13 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	20 -		_	-	MMH	
31		11	0	C-11-	d Commit		MMM	
32					ed Sample ng	/mi	MMM	
33				1 2		24 57	M/M	
34				3 4		21.57		
35				7		Filtrate		
36					6 7			
37								
38								
39								
40								
41								
42	0 Seconds							60 Seconds

PHOSPHOROUS		
Ortho Phosphate (PO 4)		(PO 4)Concentration: ng/ml (ppb)
(Freshwater Tests)		
city tapwater filtered	6.58pH	100.25
spiked sample (125ng/ml	7.35pH	227.82
(monobasic ortho phosphate)		
(1) PMA-1 12/Pk's	7.30pH	99.81(56.2% Reduc.)
running time: 34 seconds		
(2) PMA-1 12/Pk's	7.25pH	140.14(38.48%Reduc.)
(1) 12Pk used + (1)12Pk new		
running time: 34 seconds		
(Synthetic Seawater)		
background syn. seawater	8.10pH	22.66
spiked sample (125ng/ml)	8.12pH	115.59
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	62.99(45.50%Reduc)
running time: 14mins. & 16 secs.)		
TOTAL PHOSPHOROUS		
Hydrolyzable Phosphate (PO 3)		(PO 3) Concentration: ng/ml (ppb)
(Meta, Hexa, Poly, Tri Poly)		
(Freshwater Test)		
city tapwater filter w/NSF Carbon	6.10pH	280.42
city tapwater filter w/Fin-L-Filter	6.15pH	75.10
spiked sample(250ng/ml)	6.35pH	315.49
(meta phosphoric acid)		
(1) PMA-1 12/Pk's	6.90pH	205.02(35%Red.)
running time: 34 seconds		`
(1) PMA-1 12/Pk (used)	6.50pH	203.27(35.6%Red.)
running time: 5 minutes		
(Synthetic Seawater)		
background syn. seawater	8.10pH	52.47
spiked sample (125ng/ml)	8.12pH	124.36
(meta phosphoric acid)		
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	99.81(19.74%Red.)
running time: 14mins. & 16 secs.)		
Control (1) 150 ng/ml		159.43
Control (2) 300 ng/ml		283.93

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method: ASTM D 515 - 88 + Hydrolyzable Phosphorous

(Colorimetric:880nm EPA 365.4

w/20mm light path)

	Α		В	С	D	Е	F	G
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17	7							
18								
19								
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21								
22								
23								
24	* .							
25								Filtrate
26		PO 4 Sor	rbed					99.81
27	7	25	12					
28		24	11					
29		23 22	10			$H \cap H$		
30		21	8		1111111111			
31		20	7 25	50 227.82	HIIIIHI		99.8	
32		19				1111111111		
33		18	5 4 20	00				
34		16		50			Filtrate	
35		15	2					
36		14	1 10	00				
37		13		50				
38			Sp	ike Sample r	ng/ml			
39								
40	,			1234	567			
41	L							
42	0 Seconds							34 Seconds

	Α	В	С	D	E	F	G
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2	315.49	Spiked Sam	ple ng/ml				
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8							
9							
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11							
12							
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16						-	
17							
18							
19							Filtrate
20							205.02
21	P	O 3 Sorbed 3	350 —				
22			300	315.49			
23		18 8					
24			250				
25		16 6 2 15 5 2	200			MN	
26		and the same of th	50				
27	1	13 3			IN	MMM,	
28		The same of the sa	00		205.02	MMM	
29		11 1 1	50		205.02	MM	
30			0 0-11			MMMI	
31				ked Sample no	g/mi	INMI	
32			1 2			NIM	
33			3 4			= XN	
34			-	5	Filtrate		
35				6 7	, T		
36			7	,			
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40							
41							
	0 Seconds						34 Seconds
		1					34 Seconds

VOLATILE ORGANIC CHEMICALS (V.O.C.)

Tribalomethanes:

11maiomethanes.		
Chloroform (CH CL3)		(CH CL3)Concentration:ng/ml (ppb)
water: 5 megohm/cm	n/a pH	6.53
Spike: *30.28ml preparation	8.00pH	347.01
added to 7.57 liters		
(1) PMA-1 12/Pk **		152.45 (56.06% Reduc.)
(2) PMA-1 12/Pk s **		70.13 (79.79%Reduc.)
(1) PMA-1 12/Pk		90.71 (73.85%Reduc.)
(2) PMA-1 12/Pks		66.39 (80.86%Reduc.)
Control (1) 75ng/ml		75.75
Control (2) 150ng/ml		161.80

Flow Rate: 1-2 liters per minute

- * Spike Preparation: 68 microliters of spectrograde CH CL3 added to 100ml volumetric flask to make 1mg/ml CH CL3 in ethanol. Take 10ml of the previous solution and add to new 100ml volumetric flask filled with 90ml ethanol (100 micrograms/ml). Take 30.28ml of 100ug/ml mixture and add to 7.57 liters of 5 megohm/cm water Sodium Hydroxide (electronics grade) added to produce 8.00pH solution... Mixed in closed plastic bottle for Thirty minutes.
- ** Filter Media prewashed in 1.0 microSiemens/cm water (pH 5.00 6.35) pH was not tested to avoid the Chloroform offgassing/volatilizing from filtered

Analysis Method: Microextraction into pentane prior to Gas Chromatography with electron capture detector.

Clinical Method: Journal of Applied Toxicology, Vol.2, NO..3, 1982

The Presence of Trihalomethanes in Soft Drinks.

Mohamed S. Abdel-Rahman

UMD Dept. of Pharmacology, Toxicology Lab.

State of New Jersey Medical School

	Α	В		С	D	Е	F	G
1								
2	347.0	1 Spiked Sar	nple r	ng/ml				
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24								
25				1				Filtrate
26		Chloroform S	orbed	350 —	347.01			90.71
27	7	26	13	300 +				
28		25 24	12 11	250 —				
29		23	10				MMM	
30		22	9	200 +				
31		21	8	150 —			MMM	
32		20 19	7 6	100 +			MMM	
33		18	5	50 —			MMM	
34		17	4				NNN	
35		16	3	0	Spiked Samp	ole na/ml	NNN	
36		15 14	2 1	1	Spiked Samp	90.71	ZINN	
37					2 3			
38					4	Filtrate		
39					5 6	1 mate		
40					7			
41								
42	0 Seconds							60 Seconds

STANDARDS and FORMULATION of SPIKE SOLUTIONS

Lead (Pb)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 07307PG
Cadmium (Cd)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 995ug/ml Lot No.07823AN
Mercury (Hg)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 990ug/ml Lot No. 04111A
Copper (Cu)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 05224CN
Ionic	Sea Cure (Copper Sulfate) Aquarium Systems Concentration: 1 drop per 3.785 L. = 0.15mg/l
Chelated	Copper Safe (Chelated Copper Sulfate) Mardel Labs Concentration: 4.3ml/37.85 Liters = 500ng/ml
Zinc (Zn)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 990 ug/ml Lot No. 05313DF
Iron (Fe)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration 1010ug/ml Lot No. 05212BP
Ortho Phosp (PO 4)	ohate Aldrich Chemical Co. Standard (Potassium phosphate monobasic) 1ml = 0.522mg PO 4 Lot No. 05130LZ
Meta Phosp Acid (PO 3	()
Chloroform (CH CL 3)	Spectrographic Grade

SYNERGISTIC MIXTURE SPIKE METHOD

Copper Iron Zinc 7.5ml of Copper Standard 1010ug/ml 7.6ml of Zinc Standard 990ug/ml 7.5ml of Iron Standard 1010ug/ml added to 37.85 Liters of Premixed Synthetic Seawater (Nalgene Tank)

Lead Cadmium Mercury 3.75ml of Lead Standard 1010ug/ml 3.80ml of Cadmium Standard 995ug/ml 3.82ml of Mercury Standard 990ug/ml added to 37.85 Liters of Filtered (2) Ametek (CBR 2-10), tapwater. Solution was mixed for seven minutes. The pH adjusted via Na OH (2.5N) sufficient to buffer the 37.85 Liters to 5.90 pH.

Phosphorous

9.0ml of Ortho phosphate standard 0.522mg/l + 4.7 mg. of metaphosphoric acid (weighed dry on analytical balance) added to 100ml (5 megaohm/cm H 2 O) beaker. The spike solution was placed on heater/mixer for ten minutes. The spike solution 's pH 8.12 in 100ml beaker. The entire contents of 100ml beaker-spike solution were added to the 37.85 Liters.

ANALYTICAL EQUIPMENT

pH Meter: Orion Research digital ion analyzer Model 501

Calibrated daily & electrode maintained in

standard solution .(7.000 pH)

Atomic Absorption Varian AA-875 Recalibrated and certified

prior to test program. Graphite Furnace attachment by Varian. Cold Vapor/Hot Vapor collection method for Mercury.

vapor concetion method for interestry.

Spectrophotometer Varian DMS-90 ultraviolet & visible light

Conductivity Cole-Parmer Model 1481-61

Gold Conductivity cell for low range.

Gas Chromatograph Varian Model 3700

Flame, ECD Detector

Glassware Washed in HNO 3 - Rinsed in

5-9 megaohm/cm and oven dried.

Distilled Water Rainwater collected and run through

a pyrogen-free still then piped to lab's Milli - Q Water System. Produces Certified 18 megaohm/cm water.

Tapwater Filtration Fin-L-Filter (r) Kold Ster-iL (r) *

(2) Model Pma-1's w/ 12pks

(1) Model Psm-1 w/ 0.20micron

* U.S. Patent Pending.

Ametek NSF System: 0.50micron, heavy metals, VOCs & pesticides.

(2) Ametek #10 ultrapure canisters w/ (2) CBR 2-10 cartridges.