

**PTG-D1****Soyethyl Morpholinium Ethosulfate****Biocide Coadjuvant****Description**

PTG-D1 is a cationic product that has been specifically designed to eliminate a wide range of odors, while providing a number of performance benefits to household and personal care formulations. PTG-D1 complexes with many different malodorous materials and fixes them in place, thus rendering them nonvolatile. In addition, PTG-D1 is highly substantive to proteinaceous materials such as skin and hair, and being made from soybeans, it can be considered as a naturally-derived ingredient and should be favorably viewed in green products. It has been demonstrated to be an effective alternative to the popular deodorant and antiperspirant actives such as aluminum chlorohydrate and aluminum zirconium salts,

although it is strictly a deodorant and not an antiperspirant. PTG-D1 is a proven odor reduction ingredient, the properties of which can be used to advantage in certain permanent hair dye formulations, carpet and fabric treatments, pet care (e.g., in pet deodorizing products, cat litter, etc.), and many other applications. It should be especially beneficial in fabric softeners including dryer sheets, since it is cationic and demonstrates inherent antistatic and softening properties. In addition to providing odor reduction and elimination, PTG-D1 also provides antistatic properties, lubricity and detangling to hair, and improved sensory effects in a wide variety of formulations.

**Benefits**

- **Eliminates a wide variety of malodors**
- **Patent pending antimicrobial quaternary**
- **Biocide coadjuvant helps to improve formulation performance**
- **Economical in use-only 1-2% (0.35- 0.70% active) use level in most formulations**
- **Liquid and easy to formulate**
- **Conditions and softens hair**
- **Provides long lasting antistatic properties on hair, carpet, fabric and other substrates**
- **Broad pH tolerance (pH 3-11)**

**TYPICAL PROPERTIES**

Appearance	Clear, brown liquid
Ionic Character	Cationic
% Moisture	64
pH	8
% Natural on active basis	>51
HLB	30

**APPLICATIONS**

Deodorizing/Antibacterial Hand Wash
Homes, hotels and cars deodorizer
Garbage deodorizer
Textile & laundry deodorizer
Effluent/ sanitary, landfill odor control
Food processing plant odor control
Permanent & hair dye deodorizer

## Antimicrobial Properties\*

### Biocide Coadjuvant

PTG-D1 is not a registered biocide but ideal for use as a biocide coadjuvant where it helps to improve the performance deficiencies of various biocides in formulations.

### Marr Antimicrobial Esters and Use patent pending data

A 1.0% active solution of the test product was prepared by adding 3.5mL of test material to 96.5mL of sterile deionized water. This study was conducted by inoculating 0.1 ml of the standardized suspensions of each test organism specified into separate 20.0 ml aliquots of 1.0% finished product formulation.

TABLE 1: TIME KILL RESULTS (% AND LOG REDUCTIONS) PTG-D1 (2)

Challenge Organism	Units	Inoculum Count	Count/g sample	1 min.	5 min.	10 min.	30 min.
Escherichia coli ATC 25922	CFU/mL	$9.8 \times 10^9$	$4.9 \times 10^7$	< 10	< 10	< 10	< 10
	Log CFU/mL	9.9912	7.6902	< 1.0000	< 1.0000	< 1.0000	< 1.0000
	% reduction	N/A	N/A	> 99.999	> 99.999	> 99.999	> 99.999
	Log10 reduction	N/A	N/A	6.6902	6.6902	6.6902	6.6902
Challenge Organism	Units	Inoculum Count	Count/g sample	1 min.	5 min.	10 min.	30 min.
Staphylococcus aureus ATCC 29213	CFU/mL	$9.6 \times 10^9$	$4.8 \times 10^7$	< 10	< 10	< 10	< 10
	Log CFU/mL	9.9823	7.6812	< 1.0000	< 1.0000	< 1.0000	< 1.0000
	% reduction	N/A	N/A	> 99.999	> 99.999	> 99.999	> 99.999
	Log10 reduction	N/A	N/A	6.6812	6.6812	6.6812	6.6812
Challenge Organism	Units	Inoculum Count	Count/g sample	1 min.	5 min.	10 min.	30 min.
Staphylococcus saprophyticus ATCC 15305	CFU/mL	$2.5 \times 10^9$	$1.2 \times 10^7$	< 10	< 10	< 10	< 10
	Log CFU/mL	9.3979	7.0792	< 1.0000	< 1.0000	< 1.0000	< 1.0000
	% reduction	N/A	N/A	> 99.999	> 99.999	> 99.999	> 99.999
	Log10 reduction	N/A	N/A	6.0792	6.0792	6.0792	6.0792
Challenge Organism	Units	Inoculum Count	Count/g sample	1 min.	5 min.	10 min.	30 min.
Candida albicans ATCC 10231	CFU/mL	$3.8 \times 10^7$	$1.9 \times 10^5$	$1.4 \times 10^3$	$6.0 \times 10^1$	< 10	< 10
	Log CFU/mL	7.5798	5.2788	3.1461	1.7782	< 1.0000	< 1.0000
	% reduction	N/A	N/A	99.263	99.968	> 99.999	> 99.999
	Log10 reduction	N/A	N/A	2.1327	3.5006	4.2788	4.2788
Challenge Organism	Units	Inoculum Count	Count/g sample	1 min.	5 min.	10 min.	30 min.
Aspergillus brasiliensis ATCC 16404	CFU/mL	$2.8 \times 10^8$	$1.4 \times 10^6$	$2.8 \times 10^5$	$3.2 \times 10^5$	$2.1 \times 10^5$	$2.2 \times 10^5$
	Log CFU/mL	8.4472	6.1461	5.4472	5.5051	5.3222	5.3424
	% reduction	N/A	N/A	79.997	77.144	85.000	84.286
	Log10 reduction	N/A	N/A	0.6989	0.6410	0.8239	0.8037

## NEUTRALIZATION

A neutralization assay was performed on one Gram positive, one Gram negative and Yeast.

## RESULTS

Results of this study are presented in the attached tables. Percent reductions were calculated for each time period (also recorded in the attached tables).

**TABLE 2: NEUTRALIZER EFFECTIVENESS RESULTS (CFU/mL)**

Gram Reaction	Challenge Organism	Control		PTG-D1 (2)	
		0 minute contact time	30 minutes contact time	0 minute contact time	30 minutes contact time
Gram Positive	<i>Staphylococcus aureus</i> ATCC 29213	88 cfu/g	82 cfu/g	72 cfu/g	76 cfu/g
Gram Reaction	Challenge Organism	Control		PTG-D1 (2)	
		0 minute contact time	30 minutes contact time	0 minute contact time	30 minutes contact time
Gram Negative	<i>Escherichia coli</i> ATC 25922	73 cfu/g	83 cfu/g	77 cfu/g	77 cfu/g
Gram Reaction	Challenge Organism	Control		PTG-D1 (2)	
		0 minute contact time	30 minutes contact time	0 minute contact time	30 minutes contact time
Yeast/ Mold	<i>Candida albicans</i> ATCC 10231	40 cfu/g	40 cfu/g	46 cfu/g	48 cfu/g

\*PTG-D1 is not a registered antimicrobial and should not be used alone in regulated formulations.

### PTG-D1 Global Inventory Status

USA (TSCA)	Compliant
EU (EINECS/REACH)	Compliant
China (IECSC)	Compliant
Canada (DSL)	Compliant
Korea (ECL)	Compliant
Philippines (PICCS)	Compliant
Australia (AICS)	Compliant
New Zealand	Compliant
Japan	Compliant

## Formulations

Natural Deodorant Stick	
	Wt. %
<b>Part A</b>	
Ethylhexyl palmitate	10.00
Stearyl alcohol	20.00
Tribehenin	5.00
Butyrospermum Parkii (shea butter)	5.00
Cetearyl alcohol	6.00
<b>Part B</b>	
Zea Mays (corn starch)	17.00
Sodium bicarbonate	10.00
Zinc ricinoleate	1.00
<b>Part C</b>	
<b>PTG-D1</b>	2.00
Ceteth-20	10.00
Tocopheryl acetate	2.00
Cyclopentasiloxane	5.00
Melaleuca Alternifolia (tea tree oil)	3.00
PEG-30 Dipolyhydroxystearate	4.00
<b>Part D</b>	
Fragrance	qs
<b>Part E</b>	
1,3-butylene glycol	qs to 100

Procedure: In a clean, dry vessel, mix Part A ingredients and heat to 80°C. Add Part B ingredients to Part A with vigorous mixing to disperse, while maintaining temperature at 80°C. Cool Part A-B to 70°C. In a separate vessel, mix Part C ingredients together with vigorous mixing and heating to 60-65°C. When homogeneous, add Part C to Part A-B with vigorous mixing, maintaining temperature at 65-70°C. Cool to 50°C and add fragrance. Add butylene glycol as needed to adjust pour point and pouring viscosity before filling.

Air Freshener	
	Wt. %
<b>PTG-D1</b>	0.50
1,3-butylene glycol	2.50
Ethyl Alcohol, Denatured	48.00
Propellant	49.00
Fragrance	qs

Permanent Wave Neutralizer	
	Wt. %
<b>Part A</b>	
Water	90.80
Polyquaternium 10	0.20
<b>PTG-D1</b>	1.50
Ceteth-20	2.50
Tetrasodium EDTA (40%)	0.50
<b>Part B</b>	
Hydrogen Peroxide, 35%	4.50
<b>Part C</b>	
Phosphoric Acid	qs
Fragrance	qs

Procedure: Part A--Charge water. Add Polyquaternium-10 with mixing until dissolved. Add remaining Part A ingredients and mix until homogeneous. Add Part B. Add Part C. Adjust pH to 4.5 using Phosphoric Acid.

Permanent Wave Lotion	
	Wt. %
<b>Part A</b>	
Water	79.20
Polyquaternium 10	0.20
<b>PTG-D1</b>	1.50
Ceteth-20	2.50
<b>Part B</b>	
Ethanolamine	9.60
<b>Part C</b>	
Thioglycolic acid	7.00
Fragrance	qs

Procedure: Part A--Charge water. Add Polyquaternium-10 with mixing until dissolved. Add remaining Part A ingredients and mix until homogeneous. Add Part B. Add Part C. Adjust pH to 9.0 using ethanolamine or thioglycolic acid.