DISINFECTION ENERGIZED BY

LANXESS
Energizing Chemistry

Phenolic derivatives for more effective disinfectants

Preventol®

LEARNING FROM MOTHER NATURE

Numerous phenolic derivatives are generated in nature. They can be found in almost every plant – e.g. thymol in thyme, tannin as protection against herbivores or quercetin, a natural antioxidant. Phenolic derivatives protect plants against bacteria and fungi. Therefore, they serve as a natural role model for the industrial use of phenolic derivatives.

Phenolic derivatives for heavy-duty surface disinfection

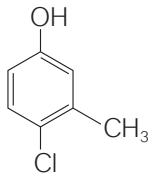
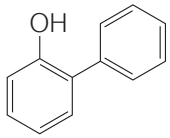
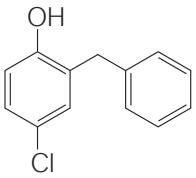
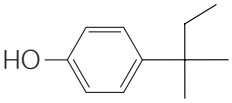
Modern phenolic active ingredients are an excellent choice for surface disinfection in a variety of fields, such as hospitals, doctors' offices, retirement homes, (medical) instruments, hotels, public institutions and industrial surfaces.

Disinfectants based on our phenolic active ingredients offer decisive advantages: they have a broad spectrum against bacteria, fungi, and enveloped viruses. They are effective against *Mycobacterium tuberculosis* and provide reliable disinfection even in the presence of dirt, blood or sputum.

Naturally effective and environmentally sound

Our phenolics have favorable toxicity and ecotoxicity profiles. As LANXESS specializes in the production and marketing of phenolics, we have large data packages available on product safety. Naturally, we also provide necessary registrations of the actives. Whatever technical or regulatory matter comes up – we are dedicated to offering extensive support to our customers.

Preventol® Phenolics

Name	Preventol® CMK[1]	Preventol® O extra[1]	Preventol® BP	Preventol® PTAP
Picture				
Chemical structure				
Chemistry	*p*-chloro-*m*-cresol	*o*-phenylphenol	*o*-benzyl-*p*-chlorophenol	*p*-tert-amylphenol
Synonyms	Chlorocresol, 4-chloro-3-methylphenol	2-phenylphenol, biphenyl-2-ol	Chlorophene, 2-benzyl-4-chlorophenol	4-tert-amylphenol, 4-(1,1-dimethylpropyl) phenol
CAS number	59-50-7	90-43-7	120-32-1	80-46-6
Assay (GC)	Min. 99.8%	Min. 99.5%	Min. 95%	Min. 99.0 %
Melting point	63–65 °C	≥ 56 °C	≥ 45 °C	92.8° C

[1] Also available as solid alkaline formulations under the names Preventol® CMK Na and Preventol® ON extra

Combining phenolic actives achieves a broader spectrum of activity and, at the same time, keeps overall concentrations as low as possible.

Benefits at a glance

- Broad-spectrum efficacy against bacteria, fungi and enveloped viruses
- Proven efficacy against *Mycobacterium tuberculosis*
- No risk of developing resistances
- Reliable performance also in the presence of dirt, blood or sputum
- Favorable toxicity and ecotoxicity profiles
- Supported worldwide by necessary registrations
- Excellent performance in a wide *p*H range (*p*H 2–10)
- Compatible with other common actives
- Outstanding compatibility with anionic surfactants allows the formulation of disinfectants with high cleaning powers (disinfectant cleaners)
- Microbiological and technical laboratories as well as regulatory experts in all regions to provide extensive customer support

At last but not least:

- Phenolics have been well tried and used in the market for many years

BROAD EFFICACY – ALSO IN THE PRESENCE OF DIRT, BLOOD AND SPUTUM

The choice of a highly effective disinfectant is crucial to effectively control contamination and reduce the risk that pathogenic germs are transmitted.

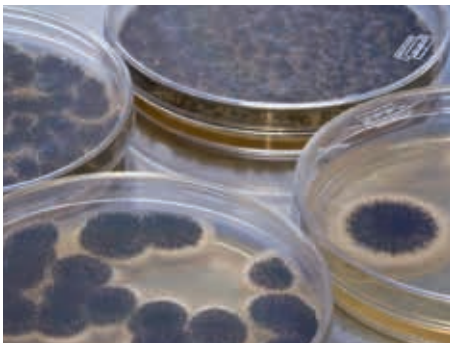
Our Phenolics are perfectly suited for heavy-duty surface disinfection:

- Broad efficacy against bacteria, fungi and enveloped viruses, especially effective against *Mycobacterium tuberculosis*
- Reliable under difficult conditions
  - No problem with dirt, blood or sputum
  - No problem with hard water
- Quick reaction rate

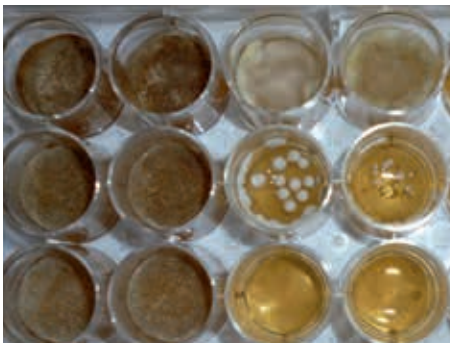
Efficacy spectrum of common active ingredients for disinfectants

	Reaction rate	Gram⁺ bacteria			Gram⁻ bacteria	Fungi	Viruses	Influence of environment on efficacy
		Vegetative forms	Mycobacteria	Spores				
Phenolics	fast	■	■		■	■		low
Quats	slow	■			▪	■		strong
Glutardialdehyde	fast	■	■	■	■	▪	■	strong
Alcohols	fast	■	■		■	▪		low
Chlorine releasers	fast	■	▪	■	■	▪	■	strong
Peracetic acid	fast	■	■	■	■	■	■	strong
Formaldehyde	slow	■	■	■	■	▪	■	strong
Iodine	fast	■	▪	■	■	▪	■	strong
Guanidines	fast	■			■	▪		strong

■ very effective ▪ moderately effective selectively effective □ effectless



Close-up view of mould



MIC test

Counting of bacteria

Selected minimum inhibitory concentrations (MIC) in mg/l (ppm)

Bacteria					
	Strain	**Preventol® CMK**	**Preventol® O extra**	**Preventol® BP**	**Preventol® PTAP**
Gram$^+$	*Staphylococcus aureus*	250-500	250	10	50
Gram$^+$	*Staphylococcus aureus MRSA*	200	200	10	75
Gram$^+$	*Enterococcus hirae*	500	500	20	150
Gram$^-$	*Escherichia coli*	250	250	100	250
Gram$^-$	*Pseudomonas aeruginosa*	500	500-1000	>1000	>1000
Gram$^-$	*Pseudomonas fluorescens*	200	200	100	200

Fungi					
	Strain	**Preventol® CMK**	**Preventol® O extra**	**Preventol® BP**	**Preventol® PTAP**
Yeast	*Candida albicans*	250-500	100	50	50
Yeast	*Rhodotorula mucilaginosa*	250-500	50	25	15
Mould	*Aspergillus brasiliensis*	250	250	100	150
Mould	*Stachybotrys chartarum*	50	25	25	50
Mould	*Trichophyton mentagrophytes*	100	100	<10	35
Mould	*Aspergillus versicolor*	100	75	50	50

Mycobacteria				
Strain	**Preventol® CMK**	**Preventol® O extra**	**Preventol® BP**	**Preventol® PTAP**
Mycobacterium avium	175	175	75	175
Mycobacterium phlei	250	500	100	250
Mycobacterium terrae [1]	250	250	75	500

[1] *Mycobacterium terrae* is the surrogate for *Mycobacterium tuberculosis* in national and international standards on testing of the efficacy of chemical disinfectants. Both species show similar resistance.

OUR PHENOLICS HAVE FAVOURABLE TOXICITY AND ECOTOXICITY PROFILES

"The development of microbicidally active phenol derivatives started from phenol itself, first used by Lister in 1867 to kill bacteria on medical instruments, surgical dressings and wounds.

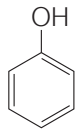
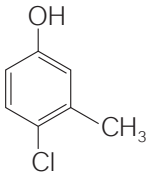
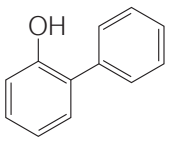
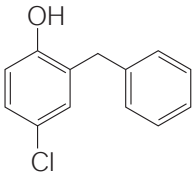
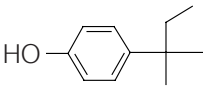
The substance class of microbicidally active phenol derivatives, in short phenolics, was also developed. Hundreds of different derivatives were isolated, synthesized and investigated with the aim of finding phenol derivatives which were more effective and at the same time less toxic and less irritating to the skin than the parent chemical carbolic acid.

It is frequently claimed that phenolics possess high oral toxicity, are percutaneously toxic and are generally difficult to degrade. Such blanket condemnations of the phenolics are based on invalid generalizations not confirmed by the facts. It is in no way justified to disqualify the whole class of phenolics out of hand simply because some of them are highly toxic, persistent, ecotoxic or dioxin-containing.

There is nothing inappropriate or irresponsible in the continued large-scale use of phenol derivatives as microbicides for the protection of materials and as active ingredients for disinfectants."

Quote: W. Paulus (2005): Directory of Microbicides for the Protection of Materials, p. 534, 536

The safety profiles of Phenolics are much better than the one of phenol

Chemistry		Phenol	Preventol® CMK	Preventol® O extra	Preventol® BP	Preventol® PTAP
Chemical structure						
Classification according to CLP/GHS (Health hazards)		Acute Tox. 3, H301	Acute Tox 4, H302	Skin Irrit. 2, H315	Skin Irrit. 2, H315	Skin Corr. 1, H314
		Acute Tox. 3, H311	Acute Tox 4, H312	Eye Irrit. 2, H319	Eye Dam.1, H318	Eye Dam. 1, H314
		Acute Tox. 3, H331	Eye Dam. 1, H318	STOT SE 3, H335		STOT SE 1, H370
		Skin Corr. 1B, H314	Skin Sens. 1, H317			STOT SE 3, H336
		Muta. 2, H341				STOT RE 2, H373
		STOT RE 2, H373				
LD_{50}[1] (rat)	Oral	340 mg/kg	1830 mg/kg	2980 mg/kg	> 5000 mg/kg	> 2000 mg/kg
	Dermal	660 mg/kg	> 2000 mg/kg	> 5000 mg/kg	> 2500 mg/kg	> 5000 mg/kg
Biodegradability		Readily biodegradable	Readily biodegradable	Readily biodegradable	Inherently biodegradable	Inherently biodegradable

[1] LD_{50}: Median lethal dose. A statistically derived single dose that can be expected to cause death in 50 % of the test animals. Expressed in mg per animal body weight. **The higher the value, the less toxic.**

Explanation for classification can be found on page 7.

PREVENTOL® CD 601 – EFFECTIVELY COMBATING PATHOGENIC ORGANISMS

Preventol® CD 601 is a hard surface disinfectant concentrate developed for use in hospitals, doctor's offices as well as in industrial and institutional areas.

Composition Active ingredients:
Synergistic blend of

- Preventol® CMK ..... 4.5 %
- Preventol® O extra ..... 7.0 %
- Preventol® GDA 50 ..... 7.5 %

Other ingredients:
Surfactants, solvents, water and auxiliaries

Appearance:

- As concentrate: Clear, slightly viscous liquid, *p*H of approx. 3
- Diluted in tap water: Opaque, neutral *p*H

Benefits at a glance

- Broad spectrum of efficacy
  - Outstanding bactericidal, fungicidal and full virucidal effect
  - Proven effectiveness against *Mycobacterium tuberculosis*
  - Reliable performance in the presence of dirt, blood and proteins
- Very cost-effective
  - High efficacy at low dosages
  - Cleans and disinfects in one step
- All components are biodegradable

Overview of selected dilution rates and contact times

Application/Organism	Dilution	Contact time
Surface disinfection (medical, I&I)	1.0%	60 min
Mycobacterium tuberculosis	2.0 %	30 min
Viral inactivation	0.5 – 4.0 %	60 min

See product information for detailed test results.

Acute Tox.: Acute toxicity
Skin Corr.: Skin corrosion
Skin Irrit.: Skin irritation
Eye Dam.: Serious eye damage
Eye Irrit.: Eye irritation
Skin Sens.: Skin sensitisation
Muta.: Germ cell mutagenicity
STOT SE: Specific target organ toxicity – single exposure
STOT RE: Specific target organ toxicity – repeated exposure

H301 Toxic if swallowed
H302 Harmful if swallowed
H311 Toxic in contact with skin
H312 Harmful in contact with skin
H314 Causes severe skin burns and eye damage
H315 Causes skin irritation
H317 May cause an allergic skin reaction
H318 Causes serious eye damage
H319 Causes serious eye irritation
H331 Toxic if inhaled
H335 May cause respiratory irritation
H336 May cause drowsiness or dizziness
H341 Suspected of causing genetic defects
H370 Causes damage to organs
H373 May cause damage to organs through prolonged or repeated exposure

Pathogenic bacteria

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