



X-BAC®

Antibacterial Coating, Data and Standards

X-BAC® varnish effectively eliminates a wide range of bacteria, viruses and fungi. The antimicrobial effect of the coating is based on a patented additive system. The varnish contains no harmful substances, silver, nano silver or other nanoparticles.

Coatings with this product complies with the specifications beneath and can be marketed with the X-BAC® brand.

The coating is tested against the following bacteria:

- **E Coli** (representative of Gram-negative bacteria), complies with JIS Z 2801)¹
- **Pseudomonas Aeruginosa**, complies with JIS Z 2801)
- **Staphylococcus Aureus** ATCC 6538 (representative of Gram-positive bacteria) complies with JIS Z 2801)¹

The antimicrobial additive is further more tested against the following microorganisms:

Enterococcus Faecalis
Staphylococcus Aureus
Bacillus Subtilis
Streptococcus Pyogenes
Klebsiella Pneumoniae
Pseudomonas Aeruginosa
Escherichia Coli
Salmonella Choleraesuis
Salmonella Enteritidis
Legionella
Candida Albicans
Aspergillus Niger
Penicillium Funiculosum DSM
Paecilomyces Variotii DSM 1963
Cladobotryum Virens DSM 1963
Chaetomium Globosum DSM 1962
Various algae

Biocompatibility

The antimicrobial effect of the coating is based on metal ions. The additives have no harmful or hazardous effect on human cells. Resistance formation is also excluded.

Long-term Effect

The calculated durability of the antimicrobial effect of X-BAC® far exceeds normal industrial products lifetime.)² . The real life is only limited by the durability of the coating and the underlying material)³.

Particle Size

The antimicrobial additives particle size is 1-14µm and significantly larger than for nanomaterials, therefore the concerns and warnings that occur in connection with nanomaterials are not relevant to X-BAC®.



The additives are not listed in any negative lists and they are listed in the inventory lists or positive lists for chemical substances of the following countries:

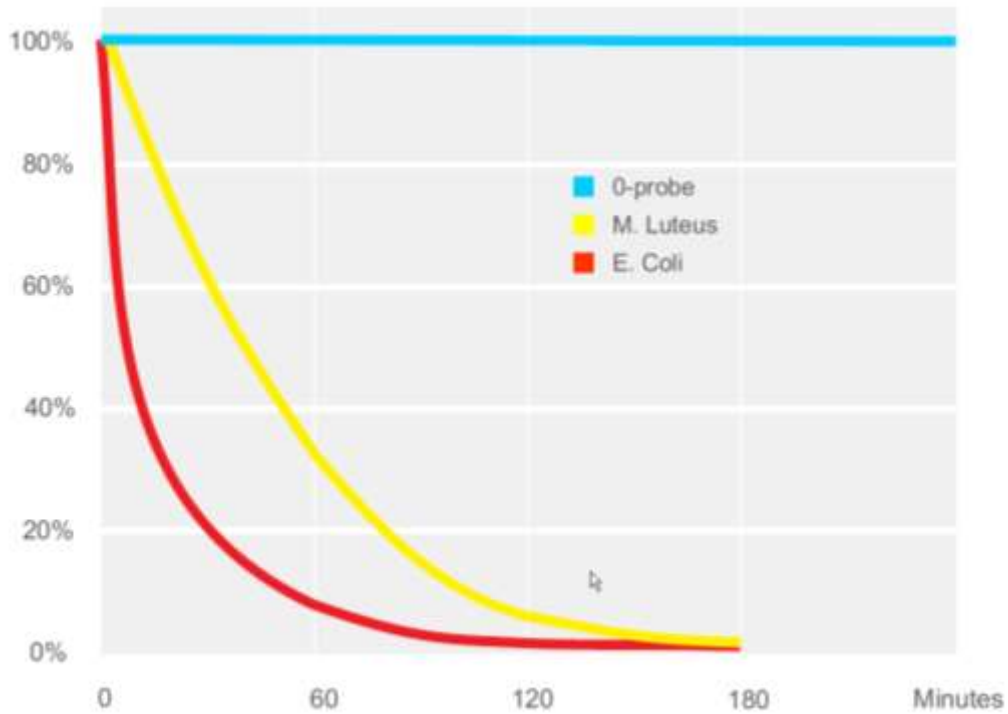
Canada DSL / NDSL	Japan (ENCS)
USA (TSCA)	Korea (ECL)
Europe (EINECS / ELINCS)	Philippines (PICCS)
China (NEPA)	Australia (AICS)

The additives comply with following standards and regulations:

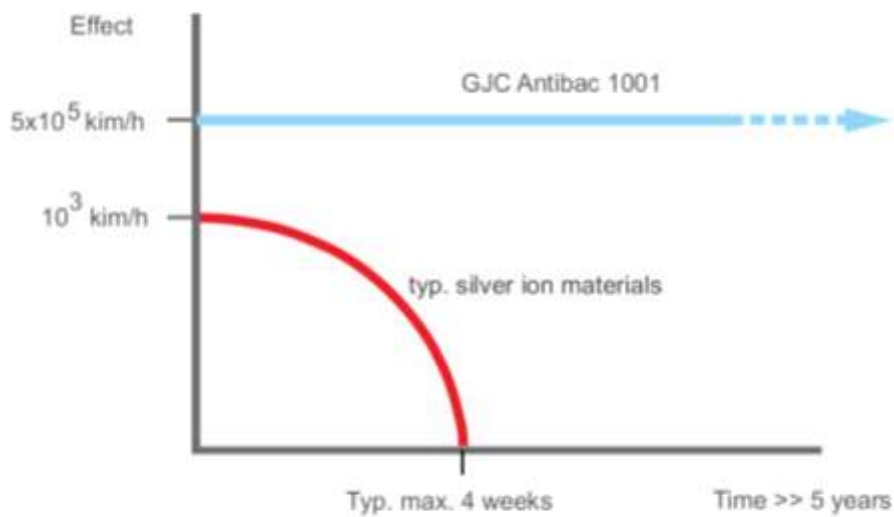
- **Safety of toys** European Norm I En71, part 3
- **Heavy metal purity requirements** of EN71, part 3
- **European Resolution AP (89) 1.** The substances fulfill the heavy metal purity requirements therefore they can be used for food packaging.
- **Europe Food Contact.** European Norm 2002/72/EG from 10. April 1992, 23 December 1997, 23. September 2009. Substances comply with EU-directive 2002/72/EC
- **USA.** The substances are listed under 21 CFR and can be used as additive for food contact polymers. Such use complies fully with the Federal Food, Drug and Cosmetic Act and all applicable food additive regulations.
- **Japan.** The substances comply with the requirements of JHOSPA.
- **EC.** Due to the applied ingredients and the functional principle the coating is not subject to the Biocide Directive 98/8/EC.

- 1) The JIS Z 2801 standard requires a reduction of $> \log_2$ bacteria after 24 hours, this requirement is met by X-BAC® in less than 3 hours.
A non-standardized and more practice-related test at 'Rigshospitalet, Copenhagen' with *Cerratia marcescens* bacteria showed a very high bacterial reduction in less than 45 minutes. The bacteria was transferred as by fingerprints and the sample was kept at room temperature.
- 2) The JIS Z 2801 standard does not include testing or documentation of the antimicrobial durability or life, and it therefore provides no information on the effect's duration, or lifetime. A series of tests and studies have shown that typical nano silver-based products have an extremely limited durability with lifetimes down to a few weeks.
- 3) The mechanical properties of the X-BAC® coating such as wear resistance, scratch resistance, chemical and UV resistance exceeds the properties of many typical engineering plastic materials. See separate data sheet.

Bacteria units



Bacteria reduction for GJC Antibac 1001



Typ. durability of the antibacterial effect