Proposed Registration Decision PRD2025-18

Benzoic Acid and Microban Additive GS

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Overview

Proposed Registration Decision for Benzoic Acid and Microban Additive GS

Health Canada's Pest Management Regulatory Agency (PMRA), pursuant to subsection 28(1) of the *Pest Control Products Act*, is proposing registration for the sale and use of Ascera X-TA and Microban Additive GS belonging to Microban Canada Inc., containing the technical grade active ingredient benzoic acid, for use as a material preservative to inhibit the growth of bacteria, mould, mildew, fungus and yeast in products with household, institutional, and industrial uses including non-food contact polymers and plastics, textiles, paints, industrial maintenance coatings, and hygroscopic inorganic, cellulose materials.

Benzoic acid and Mircroban Additive GS were evaluated in accordance with PMRA Guidance Document, *Registration of Non-Conventional Pest Control Products.* The evaluation of available scientific information found that, under the approved conditions of use, the health and environmental risks and the value of the pest control products are acceptable.

This Overview describes the key points of the evaluation, while the Science evaluation provides detailed technical information on the human health, environmental and value assessments of benzoic acid and Microban Additive GS.

What does Health Canada consider when making a registration decision?

The primary objective of the *Pest Control Products Act* is to prevent unacceptable risks to individuals and the environment from the use of pest control products. Health or environmental risk is considered acceptable[1] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The Act also requires that products have value[2] when used according to the label directions. Conditions of registration may include precautionary measures on the product label to further reduce risk.

To reach its decisions, Health Canada's PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (for example, children). They also consider the unique characteristics of organisms in the environment. These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how Health Canada's PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the Pesticides and pest management portion of Canada.ca.

1 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act.*

2 "Value" as defined by subsection 2(1) of the *Pest Control Products Act*: "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (*a*) efficacy; (*b*) effect on host organisms in connection with which it is intended to be used; and (*c*) health, safety and environmental benefits and social and economic impact."

Before making a final registration decision on benzoic acid and Microban Additive GS, Health Canada's PMRA will consider any written comments received from the public directly related to the proposed decision in this consultation document.[3] Health Canada will then publish a Registration Decision[4] on benzoic acid and Microban Additive GS, which will include the decision, the reasons for it, a summary of comments received on the proposed registration decision, and Health Canada's response to these comments.

For more details on the information presented in this Overview, please refer to the Science evaluation of this consultation document.

What is benzoic acid?

Benzoic acid, when used in the production of several different types of products (household, industrial and institutional), is able to inhibit the growth of bacteria, mould, mildew, fungus and yeast.

The benzoic acid mode of action includes changes in cell membrane integrity, loss of energy generation, reduction of intracellular pH and inhibition of specific enzymes.

Health considerations

Can approved uses of benzoic acid affect human health?

Benzoic acid is unlikely to affect human health when used according to label directions.

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose where no effects are observed. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers). As such, sex and gender are taken into account in the risk assessment. Only uses for which the exposure is well below levels that cause no effect in animal testing are considered acceptable for registration.

Published scientific literature, publicly available toxicology information and a submitted animal study were assessed for benzoic acid. In the body, benzoic acid is broken down in the liver and excreted in the urine within 24 hours. Benzoates, precursors of benzoic acid, are present in some foods, and are used as food flavouring agents and fragrance ingredients in household cleaning products and cosmetics. Benzoic acid is permitted as a food preservative in Canada.

Potential exposure to benzoic acid may occur when handling the product. Benzoic acid is expected to be of low acute toxicity via the oral and inhalation routes, mildly irritating to the eyes, slightly irritating to the skin and not a dermal sensitizer.

[3] "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

[4] "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Animals given repeated doses of benzoic acid did not experience adverse effects. There was no indication that the young were more sensitive than the adult animal. Benzoic acid is not expected to be mutagenic or carcinogenic.

The end-use product, Microban Additive GS, is expected to be of low acute toxicity via the oral and inhalation routes, mildly irritating to the eyes, slightly irritating to the skin and not a dermal sensitizer.

Residues in food and drinking water

Dietary risks from food and drinking water are acceptable.

The end-use product, Microban Additive GS, is not proposed for food or feed uses. Dietary or drinking water exposure is not expected from the proposed use of benzoic acid as a material preservative. Consequently, a dietary risk assessment is not required.

Risks in residential and other non-occupational environments

Estimated risk for residential and other non-occupational exposure is acceptable.

Microban Additive GS will only be added to products for material preservation in an industrial setting. Microban Additive GS-treated products are proposed for use in households, institutions or indoor industrial settings. Treated products will be used by professional or residential users. Standard mitigating label statements are required on commercial and consumer products sold in Canada. Consequently, the health risk to residents and the general public is acceptable.

Occupational risks from handling Microban Additive GS

Occupational risks are acceptable when Microban Additive GS is used according to the label directions, which include protective measures.

Workers handling Microban Additive GS may be exposed to benzoic acid through contact with the skin or by inhalation during loading, open mixing, clean-up and repair.

To protect workers from exposure to the end-use product, the label requires workers to wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during loading, open mixing, clean-up and repair. For loading and open mixing activities, workers are also required to wear a NIOSH-approved N95 (minimum) filtering facepiece respirator (dust mask) that is properly fit tested. Precautionary and hygiene statements on the label are considered adequate to protect individuals from occupational exposure.

The health risks to workers are acceptable when the precautionary statements on the label are observed.

Environmental considerations

What happens when benzoic acid is introduced into the environment?

When benzoic acid is used according to label directions, the risks to the environment have been determined to be acceptable.

Benzoic acid is a naturally occurring substance found in many plants and is also used as a food preservative. It is an antimicrobial agent and controls yeast and fungal growth. Microban Additive GS is used as a material preservative in finished products such as fabrics, coatings, plastics, and paints.

Benzoic acid undergoes rapid biodegradation in the environment in soil and water. It is, therefore, not expected to be persistent in the environment. Benzoic acid does not bioconcentrate in fish. The toxicity of benzoic acid to aquatic and terrestrial organisms is low. Given that benzoic acid is incorporated into products and not applied directly in the environment, the potential for exposure of non-target terrestrial and aquatic organisms is expected to be low. Therefore, the environmental risk associated with the use of this product as a material preservative is expected to be acceptable.

Value considerations

What is the value of Microban Additive GS?

Microban Additive GS is used to provide microbiostatic material preservation of household, industrial and institutional products.

Microban Additive GS will serve as an alternative material preservative for household, industrial and institutional products.

Measures to minimize risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human health and the environment. These directions must be followed by law.

The key risk-reduction measures being proposed on the labels of Ascera X-TA and Microban Additive GS to address the potential risks identified in this assessment are as follows.

Key risk-reduction measures

Human health

The hazard signal words “DANGER CORROSIVE” and “EYE IRRITANT” are required on the principal display panels of the labels for both Ascera X-TA and Microban Additive GS. Standard precautionary statements are also required on the labels to inform users that the products cause eye irritation.

Workers are required to wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during loading, open mixing, clean-up and repair. For loading and open mixing activities, workers are also required to wear a NIOSH-approved N95 (minimum) filtering facepiece respirator (dust mask) that is properly fit tested.

To limit bystander exposure, the end-use product label requires a statement indicating only authorized access is permitted in the area during handling.

Environment

Standard label statements are required to prevent release to the environment, such as during cleaning of equipment, storage and disposal of waste.

Next steps

Before making a final registration decision on Ascera X-TA and Microban Additive GS, Health Canada's PMRA will consider any written comments received from the public that are directly related to this proposed decision, such as comments directed to the science evaluation, in response to this consultation document up to 30 days from the date of publication (by 15 January 2026) of this document. If more time is required to provide comments, a request for an extension of an additional 15 days can be made. Your request must be submitted in writing to the PMRA's Publications Section (pmra.publications-arla@hc-sc.gc.ca) within the 30-day consultation period.

Please forward all comments to PMRA Publications, through the Public Engagement Portal (Public Engagement Forms – Consultation Comment). Health Canada will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed decision and Health Canada's response to these comments.

Other information

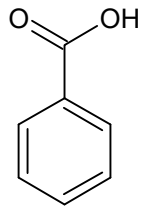
When Health Canada's PMRA makes its registration decision, it will publish a Registration Decision on Ascera X-TA and Microban Additive GS (based on the Science evaluation of this consultation document). In addition, the test data referenced in this consultation document will be available for public inspection, upon application, in the PMRA's Reading Room. For more information or if you have questions, please contact the PMRA's Pest Management Information Service.

Science evaluation

Ascera X-TA and Microban Additive GS

1.0 The active ingredient, its properties and uses

1.1 Identity of the active ingredient

Active substance	Benzoic acid
Function	Material preservative
Chemical name	
1. International Union of Pure and Applied Chemistry (IUPAC)	Benzoic acid
2. Chemical Abstracts Service (CAS)	Benzoic acid
CAS number	65-85-0
Molecular formula	$C_7H_6O_2$
Molecular weight	122.123 g/mol
Structural formula	
Purity of the active ingredient	99.79%

1.2 Physical and chemical properties of the active ingredient and end-use product

Technical product — Ascera X-TA

Property	Result
Colour and physical state	White solid
Odour	Odour of benzaldehyde
Melting range	121–122˚C
Boiling point or range	250°C
Specific gravity at 20°C	1.32
Vapour pressure at 96°C	0.133 kPa

Property	Result		
Ultraviolet (UV)-visible spectrum	The active ingredient is not expected to absorb > 300 nm		
Solubility in water at 20°C	2.9 mg/g		
Solubility in organic solvents	Solvent	Temperature	Solubility (g/100g)
	Acetone	25	55.60
	Benzene	25	12.17
	Carbon tetrachloride	25	4.14
	Ethanol	25	58.40
	Hexane	17	0.94
	Methanol	23	71.50
	Toluene	25	10.60
n-Octanol-water partition coefficient (K_{ow})	log K_{ow} = 1.87		
Dissociation constant (p*Ka*)	4.2 at 25°C		
Stability (temperature, metal)	Benzoic acid dehydrates at above 150°C and forms benzoic anhydride. It reacts with copper(II) salts above 220°C and forms phenol and its derivatives; and with ammonia under similar conditions it forms aniline. Decarboxylation of benzoic acid occurs at temperatures above 245°C in the presence of catalysts and forms benzene and a small amount of phenol.		

End-use product — Microban Additive GS

Property	Result
Colour	White
Odour	Slight odour
Physical state	Solid
Formulation type	Dust
Label concentration	99.79%
Container material and description	Polyethylene plastic bags and multi-wall polyethylene/paper bags (22.7–24.9 kg)
Specific gravity at 20°C	1.32
pH of 1% dispersion in water	2.8
Oxidizing or reducing action	Expected to be incompatible with strong oxidizing and reducing agents.
Storage stability	Stable for 14 days when stored at 54°C.
Corrosion characteristics	Not corrosive to plastic lined paper packaging.
Explodability	Not explosive.

1.3 Directions for use

Microban Additive GS is an end-use product containing benzoic acid. This product is present in dust form and is intended for use as an in-can and dry-film material preservative to be incorporated into a wide variety of product types during the manufacturing process.

Microban Additive GS is meant to be added at a suitable point during manufacture to ensure even dispersion throughout the material at a rate of 0.1–1.0% w/w (non-food contact polymers and plastics), 0.05–6.7% w/w (natural fibres), 0.1–6.7% w/w (synthetic fibers), 0.5% w/w (paints), 0.5–6.7% w/w (industrial maintenance coatings), 0.05–6.7% w/w (hygroscopic inorganic, cellulose materials).

Microban Additive GS is also meant for use in manufacturing/industrial intermediates and concentrates (organic solvents, water with dispersing aids, surfactants, polymer resins and/or components compatible with the finished materials/product types) at active ingredient levels up to 50% on a weight basis for further processing in an industrial environment into finished products.

1.4 Mode of action

Benzoic acid penetrates microbial cells in its undissociated form. Once inside, it dissociates, releasing protons that acidify the cell, disrupting enzymatic activity and energy production. This process also impairs membrane function and induces oxidative stress.

2.0 Methods of analysis

2.1 Methods for analysis of the active ingredient

The methods provided for the analysis of the active ingredient and impurities in the technical product have been validated and assessed to be acceptable.

2.2 Method for formulation analysis

The method provided for the analysis of the active ingredient in the formulation has been validated and assessed to be acceptable for use as an enforcement analytical method.

2.3 Methods for residue analysis

No methods are required to quantify residues of benzoic acid as there is no proposed food use (see section 3.3.1 for additional details).

3.0 Impact on human and animal health

3.1 Toxicology summary

A detailed review of toxicology information was conducted in support of Ascera X-TA and Microban Additive GS. The data package for Ascera X-TA is considered acceptable (Appendix I, Table 1) to assess the toxic effects that may result from exposure to benzoic acid for use in Microban Additive GS.

The toxicological database for Ascera X-TA and Microban Additive GS consists of publicly available information, an unpublished in vivo toxicology study, published in vitro and in vivo toxicological studies, as well as Health Canada and foreign reviews. Short-term and chronic oral toxicity testing, prenatal developmental and reproductive toxicity testing, genotoxicity/mutagenicity, and carcinogenicity testing data were assessed for the active ingredient, when available.

When conjugated with glycine, benzoic acid is predominantly metabolized into hippuric acid and excreted in the urine within 24 hours. Benzoates, precursors of benzoic acid, are present naturally in some foods, are used as food flavouring agents globally and are present in Canadian consumer products including fragrance ingredients in household cleaning products and cosmetics. Benzoic acid is permitted as a food preservative in Canada.

Benzoic acid is expected to be of low acute toxicity via the oral and inhalation routes, mildly irritating to the eyes, slightly irritating to the skin and not a dermal sensitizer.

Health Canada's most recent toxicological review of benzoic acid was published in the 2019 Environment and Climate Change Canada and Health Canada Chemicals Management Plan Screening Assessment Report for benzoates. The assessment concluded that the short-term toxicity as well as the reproductive and developmental toxicity of benzoic acid was low based on a 21-day dermal toxicity study which identified a no observed adverse effect level (NOAEL) of 2500 mg/kg bw/day and a multigeneration study which identified the systemic, reproductive and developmental toxicity NOAELs to be 500 mg/kg bw/day. Both values were the highest dose tested (HDT). The European Food Safety Authority (EFSA) peer review of benzoic acid (2016) cites a subacute rat inhalation toxicity study with a systemic no observed adverse effect concentration (NOAEC) of 0.025 mg/L with incidence of pulmonary fibrosis and inflammatory cell infiltrate starting at 0.025 mg/L.

Submitted short-term and reproductive toxicity studies support the low toxicity of benzoic acid.

In an unpublished short-term (28-day) inhalation toxicity study, rats were exposed to aerosolized benzoic acid (99.6% active ingredient) for 6 hours/day, 5 days/week for a total of 20 days. There were no treatment-related effects, and the NOAEC was 0.0126 mg/L (HDT).

In a 1954 non-guideline 90-day oral (diet) toxicity study in rats dosed with sodium benzoate, there were treatment-related effects on mortality, body weight and histopathology in the liver and kidneys at the lowest observed adverse effect level (LOAEL) of 6290 mg/kg bw/day. The NOAEL was 2620 mg/kg bw/day, a value that exceeds the generally accepted upper limit of 1000 mg/kg bw/day for repeat dose studies.

In a 2021 published Extended One-Generation Reproductive Toxicity (EOGRT) study, rats were dosed with benzoic acid (>99% purity). There were no treatment-related parental, reproductive or offspring effects. The parental, reproductive and offspring NOAEL for benzoic acid was 1000 mg/kg bw/day (HDT). There was no evidence of sensitivity of the young.

Benzoic acid was not mutagenic in bacterial mutation assays, and yielded positive, negative and equivocal results in in vitro mammalian gene mutation assays. No genotoxicity was observed in in vivo studies. Consequently, based on a weight of evidence, benzoic acid is not expected to be mutagenic. Benzoic acid does not exhibit carcinogenicity.

Microban Additive GS is expected to be of low acute toxicity via the oral and inhalation routes, mildly irritating to the eyes, slightly irritating to the skin and not a dermal sensitizer.

3.2 Occupational, residential and bystander exposure and risk assessment

3.2.1 Use description

Microban Additive GS is proposed for use as a material preservative in household, institutional and industrial (indoor only) goods. Microban Additive GS (dust form) is intended for use as an in-can and dry-film material preservative to be added at a suitable point during manufacturing to ensure even dispersion throughout the material to be treated. Microban Additive GS can be used to: protect non-food contact polymers and plastics from deterioration; protect textiles (natural and synthetic fibers) and paints from bacterial deterioration; extend the service life of industrial maintenance coatings by protecting them from bacterial deterioration; control growth of fungi, yeast and bacteria in hygroscopic inorganic, cellulose materials; and protect treated intermediates/concentrates (liquid or solid intermediates) and treated manufacturing/industrial products from the growth of microorganisms, including mould, mildew and fungus.

Treated products could be used by both professional and residential users.

3.2.2 Occupational exposure and risk assessment

3.2.2.1 Mixer, loader, and applicator exposure and risk assessment

When handled according to label instructions, occupational exposure to Microban Additive GS is characterized as short- to intermediate-term in duration and is expected to occur by the dermal and inhalation routes during loading, open mixing, clean-up and repair. To protect workers from exposure to Microban Additive GS, workers are required to wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during loading, open mixing, clean-up and repair. For loading and open mixing activities, workers are also required to wear a NIOSH-approved N95 (minimum) filtering facepiece respirator (dust mask) that is properly fit tested.

Precautionary statements on the end-use product label aimed at mitigating exposure are adequate to protect individuals from any risk due to occupational exposure. Overall, health risks to workers are acceptable when the precautionary statements on the label are followed which include personal protective equipment (PPE).

3.2.2.2 Postapplication exposure and risk assessment

Postapplication activities include typical activities related to packaging and distributing manufactured products. Precautionary statements on the end-use product label aimed at mitigating exposure are adequate to protect workers from risk due to postapplication exposure. Consequently, the health risks to workers due to postapplication exposure are acceptable.

3.2.3 Residential and bystander exposure and risk assessment

Bystander exposure is not expected to be of concern from the use of Microban Additive GS. Due to the automated systems used in manufacturing facilities, bystander exposure to Microban Additive GS is not expected to occur. Additionally, only workers wearing PPE may be in the area during loading, open mixing, clean-up and repair.

Microban Additive GS-treated products are proposed for use in households, institutions or indoor industrial settings. Microban Additive GS-treated commodities will be used by secondary handlers (professional or residential users). Treated commercial or consumer products would be used in a similar way to untreated products. Products treated with antimicrobial preservative do not require registration if the pesticide treating the article is registered under the *Pest Control Products Act*. Refer to Health Canada's Information Note - Treated Articles 2024 for additional details.

Standard mitigating statements are required on products sold in Canada to protect professional and residential users.

Consequently, the health risks to bystanders and individuals in residential areas are considered acceptable.

3.3 Dietary exposure risk assessment

3.3.1 Food

Microban Additive GS is not proposed for food or feed use. Consequently, dietary exposure to benzoic acid from the proposed use is not of concern and a dietary risk assessment is not required.

3.3.2 Drinking water

Based on the proposed use pattern (see section 1.3), exposure from drinking water is not expected. The label has the necessary mitigative measures to prevent contamination of drinking water from the proposed use of benzoic acid. Consequently, health risks from residues of benzoic acid in drinking water are not of concern.

3.3.3 Acute and chronic dietary risks for sensitive subpopulations

Based on the proposed uses, calculations of acute reference doses (ARfDs) and acceptable daily intakes (ADIs) are not required for benzoic acid as there are no food or feed uses and contamination of drinking water sources is not expected.

3.4 Aggregate exposure and risk

Aggregate exposure is the total exposure to a single pesticide that may occur from food, drinking water, residential and other non-occupational sources, and from all known or plausible exposure routes (oral, dermal and inhalation).

In an aggregate risk assessment, the combined potential risk associated with food, drinking water and various residential exposure pathways is assessed. A major consideration is the likelihood of co-occurrence of exposures. Additionally, only exposures from routes that share common toxicological endpoints can be aggregated.

Benzoic acid is considered to be of low acute toxicity via the oral and inhalation routes. The end-use product is not proposed for food use and will not be applied near, or to, drinking water. Furthermore, non-occupational exposure will be low when Microban Additive GS is used as directed on the label. When the end-use product is used as labelled, there is reasonable certainty that no harm will result from aggregate exposure of residues of benzoic acid. This includes all anticipated dietary (food and drinking water) exposures and all other non-occupational exposures (dermal and inhalation) for which there is reliable information.

3.5 Cumulative assessment

The *Pest Control Products Act* requires that the PMRA consider the cumulative non-occupational exposure to pesticides with a common mechanism of toxicity, based on the likelihood that people may be exposed to more than one of these pesticides at the same time. Accordingly, assessments of potential common mechanisms of toxicity with other pesticides were undertaken for benzoic acid.

For the current evaluation, the PMRA did not identify information indicating that benzoic acid shares a common mechanism of toxicity with other registered pest control products. Therefore, there is no requirement for a cumulative health risk assessment at this time.

3.5 Maximum residue limits

The specification of a maximum residue limit for benzoic acid was not required for the proposed non-food use of the end-use product.

3.6 Health incident reports

As of 18 June 2025, no human or domestic animal incidents involving benzoic acid have been submitted to the PMRA.

4.0 Impact on the environment

4.1 Fate and behaviour in the environment

The physical and chemical properties of benzoic acid are summarized in section 1.2. The environmental fate properties of benzoic acid are summarized in Appendix I, Table 2. In terrestrial environments, benzoic acid biotransforms rapidly in soil with a half-life of less than 1 day and undergoes microbial mineralization.

In aquatic environments, it is readily biodegraded with half-lives of 0.2 to 3.6 days. Benzoic acid is, therefore, not expected to be persistent in the environment. Benzoic acid has a log K_{ow} of 1.87 and fish bioconcentration values (BCF) of 14 to 21, which indicates low potential for bioaccumulation.

4.2 Environmental risk characterization

The environmental toxicity profile of benzoic acid is summarized in Appendix I, Table 3. For terrestrial organisms, earthworms have an acute EC_{50} of 384 mg/kg soil, indicating slight toxicity of benzoic acid. Birds and mammals have very low acute and chronic sensitivity to benzoic acid, with acute LD_{50} values >2000 mg/kg bw and sub-chronic NOEC values of > 1000 mg/kg diet.

For aquatic organisms, the data set indicates low acute and chronic toxicity of benzoic acid to aquatic organisms, such as invertebrates ($EC_{50} \geq 39.47$ mg/L) and fish ($LC_{50} \geq 90.5$ mg/L). Algae have EC_{50} values of > 10 mg/L (slightly toxic), while benzoic acid is of moderate toxicity to cyanobacteria ($EC_{50} = 9$ mg/L).

Due to the nature of the proposed uses of Microban Additive GS as a material preservative in finished products, environmental exposure is not expected. In addition, the lack of persistence in the environment, combined with low toxicity and minimal exposure, result in the environmental risks being acceptable.

4.2.1 Environmental incident reports

As of 21 July 2025, no environmental incident reports involving benzoic acid have been submitted to the PMRA.

5.0 Value

Odour-causing bacteria, as well as mould and mildew that can cause staining and degradation of materials can lead to the deterioration of products. The incorporation of a material preservative into a wide-range of product types during the manufacturing process is intended to extend their service life.

Several material preservatives containing a variety of active ingredients are registered for material preservation in a range of types of materials. Microban Additive GS contains a new active ingredient for use as a material preservative for non-food contact polymers and plastics, natural and synthetic fibers, paints, industrial maintenance coatings and hygroscopic inorganic, cellulose materials.

The applicant submitted multiple laboratory studies to demonstrate the product efficacy against *Escherichia coli, Staphylococcus aureus, Aspergillus niger, Candida albicans* and *Klebsiella pneumoniae* on various materials.

The product was incorporated into the test materials (non-food contact polymers and plastics, textiles, paints, industrial maintenance coatings and hygroscopic inorganic materials) during manufacturing, and the testing was conducted according to ASTM Standard Method E2180 using *Aspergillus niger* and *Candida albicans* as the challenge microorganisms, according to the ISO 22196 against *Escherichia coli* and *Staphylococcus aureus* and according to AATCC TM100 against *Klebsiella pneumoniae*.

Results demonstrated that the product was able to reduce bacteria, fungi and yeast by a minimum of 94% across all materials tested, with the majority of the results showing a 2- to 3-log reduction. One exception was reported where 85.4% reduction was found for *Aspergillus niger* at the lowest rate tested (0.1%), however this does not impact the overall conclusions.

A table of supported uses is found in Appendix I, Table 5.

6.0 Pest Control Product Policy considerations

6.1 Toxic Substances Management Policy considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances, in other words, those that meet all four criteria outlined in the policy: persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity, and toxic as defined by the *Canadian Environmental Protection Act*. The *Pest Control Products Act* requires that the TSMP be given effect in evaluating the risks of a pest control product.

During the review process, Ascera X-TA (benzoic acid) and its transformation products were assessed in accordance with the PMRA Regulatory Directive DIR99-03[5] and evaluated against the Track 1 criteria. Health Canada has reached the conclusion that Ascera X-TA (benzoic acid) and its transformation products do not meet all of the TSMP Track 1 criteria.

Health Canada has reached the conclusion that Ascera X-TA (benzoic acid) does not meet all of the TSMP Track 1 criteria because it is not expected to bioaccumulate (in accordance with PMRA Guidance Document, *Registration of Non-Conventional Pest Control Uses*) and is not expected to form any transformation products that meet all of the TSMP Track 1 criteria.

Please refer to Appendix I, Table 4 for further information on the TSMP assessment.

[5] DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6.2 Formulants and contaminants of health or environmental concern

During the review process, contaminants in the active ingredient as well as formulants and contaminants in the end-use products are compared against Parts 1 and 3 of the *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern*.[6] The list is used as described in the Science Policy Note SPN2020-01[7] and is based on existing policies and regulations, including the *Toxic Substance Management Policy and Formulants Policy*,[8] and taking into consideration the *Ozone-depleting Substances and Halocarbon Alternatives Regulations* under the *Canadian Environmental Protection Act, 1999*, (substances designated under the *Montreal Protocol*).

Health Canada has reached the conclusion that Ascera X-TA (benzoic acid) and its end-use product Microban Additive GS do not contain any formulants or contaminants identified on Parts 1 or 3 of the *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern*.

The use of formulants in registered pest control products is assessed on an ongoing basis through Health Canada formulant initiatives and Regulatory Directive DIR2006-02.

7.0 Proposed Regulatory Decision

Health Canada's PMRA, pursuant to subsection 28(1) of the *Pest Control Products Act*, is proposing registration for the sale and use of Ascera X-TA and Microban Additive GS, containing the technical grade active ingredient benzoic acid, for use as a material preservative to inhibit the growth of bacteria, mould, mildew, fungus and yeast in products with household, institutional, and industrial uses including non-food contact polymers and plastics, textiles, paints, industrial maintenance coatings, and hygroscopic inorganic, cellulose materials.

An evaluation of available scientific information found that, under the approved conditions of use, the health and environmental risks and the value of the pest control products are acceptable.

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6 SI/2005-114, last amended on June 24, 2020. See Justice Laws website, Consolidated Regulations, *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern.*

7 PMRA's Science Policy Note SPN2020-01, *Policy on the List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* under paragraph 43(5)(b) of the *Pest Control Products Act*.

8 DIR2006-02, *Formulants Policy and Implementation Guidance Document*

List of abbreviations

♀	female
♂	male
↑	increase
↓	decrease
≥	greater than or equal to
°C	degrees centigrade
AATCC	American Association of Textile Chemists and Colorists
ABS	acrylonitrile butadiene styrene
ADI	acceptable daily intake
ARfDs	acute reference doses
ASTM	American Society for Testing and Materials
bw	body weight
BAF	bioaccumulation factor
BCF	bioconcentration factor
CAS	Chemical Abstracts Service
CEPA	*Canadian Environmental Protection Act*
d	day(s)
DIR	Regulatory Directive
DT_{50}	dissipation time 50% (the dose required to observe a 50% decline in concentration)
DT_{90}	dissipation time 90% (the dose required to observe a 90% decline in concentration)
DT_{98}	dissipation time 98% (the dose required to observe a 98% decline in concentration)
EC_{50}	effective concentration on 50% of the population
EOGRT	extended one-generation reproductive toxicity
g	gram
GSD	geometric standard deviation
h	hour
HDT	highest dose tested
HIPS	high impact polystyrene
IC_{50}	inhibitory concentration 50%
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
kg	kilogram
K_{ow}	*n*–octanol-water partition coefficient
k*P*a	kiloPascal
L	litre
LC_{50}	lethal concentration 50%
LD_{50}	lethal dose 50%
LLNA	local lymph node assay
LOAEL	lowest observed adverse effect level
mg	milligram
MMAD	Mass Median Aerodynamic Diameter
mol	mole

NIOSH	National Institute for Occupational Safety and Health
nm	nanometre
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
OH	hydroxyl radical
PA	polyamide
PC	polycarbonate
PE	polyethylene
p*K*a	dissociation constant
PMMA	polymethyl methacrylate
PMRA	Pest Management Regulatory Agency
PP	polypropylene
PPE	personal protective equipment
PS	polystyrene
PU	polyurethane
PVC	polyvinyl chloride
SPN	Science Policy Note
TPE	thermoplastic elastomer
TSMP	Toxic Substances Management Policy
USEPA	United States Environmental Protection Agency
UV	ultraviolet
wt	weight

Appendix I Tables and figures

Table 1 Toxicity profile of benzoic acid

(Effects are known or assumed to occur in both sexes unless otherwise noted.)

Study type/Animal/ PMRA No.	Study Results
Acute toxicity studies	
Acute Oral LD_{50} Rat (♂♀) PMRA No. 3472477	LD_{50} = 2100 mg/kg bw (fasted) LD_{50} = 3450 mg/kg bw (unfasted) **Low toxicity**
Skin Sensitization LLNA Mouse PMRA No. 3472483	Negative Not a dermal sensitizer
Short-term studies	
90-Day oral (diet) Sherman rats PMRA No. 3472477	LOAEL = 6290 mg/kg/day (♂/♀) ≥ 6290 mg/kg/day: mortality, ↑ body weight, ↑ rel. liver and kidney wt, lesions in liver and kidney. body weight and histopathological changes in the liver and kidneys (♂/♀) NOAEL = 2620 mg/kg/day (♂/♀)
21-day inhalation (nose-only) Rat – Crl:CD(SD) PMRA No. 3472506	MMAD: 2.1 and 2.5 GSD: 3.66 and 3.03 NOAEC = 0.0126 mg/L, HDT
Special studies	
Reproduction (Extended One-Generation Toxicity) Rat – Sprague-Dawley PMRA No. 3472515	Parental, Reproductive, Offspring NOAEL = 1000 mg/kg bw/day, HDT No evidence of sensitivity of the young

Table 2 Environmental fate properties of benzoic acid

Endpoint type	Degradation rate	
Mineralization in silt loam soil	Half-life	4.5 h
	Complete	1 d
Aerobic soil	DT_{50}	0.5 d
	DT_{90}	2.1 d
Anaerobic mineralization in soil	Half-life	18.2 h
Biodegradation in surface waters (river, reservoir)	Half-life	0.85–3.6 d
Aerobic mineralization in eutrophic water	Half-life	0.22 d
	DT_{98}	7 d
Atmospheric degradation by OH	Lifetime in air	0.51 d
Bioconcentration	BCF	14-21

Sources:
[1] National Center for Biotechnology Information (2025). PubChem Annotation Record for Benzoic Acid, Source: Hazardous Substances Data Bank (HSDB). Retrieved January 19, 2025 from https://pubchem.ncbi.nlm.nih.gov/source/hsdb/704
[2] Environmental Chemistry and Fate. Microban Canada Inc. 2023. DACO 8.2.3 (PMRA No. 3472586)

Table 3 Environmental toxicity data for benzoic acid

Name	Species	Exposure	Endpoint value	Comment
Earthworms	*Eisenia foetida*	Acute 14-d EC_{50}	384 mg/kg	Slightly toxic
Mammals, Rat	*Rattus sp.*	Acute oral LD_{50}	> 2000 mg/kg bw	-
		Subchronic NOEC	> 1000 mg/kg diet	-
Bobwhite quail	*Colinus virginianus*	8-d LC_{50}	> 5620 mg/L	-
Mallard duck	*Anas platyrhynchos*	8-d LC_{50} 14-d LD_{50}	> 5620 mg/L > 2510 mg/kg	-
Water flea	*Daphnia magna*	Acute 24-h EC_{50}	102 mg/L, at acidic pH 500 mg/L, at neutral pH	Practically non-toxic
		Acute 48-h EC_{50}	> 120 mg/L, 860 mg/L	Practically non-toxic
		Acute 24-h IC_{50}	pH 6.0: 222 mg/L pH 7.8: 703 mg/L pH 9.0: 1090 mg/L	Practically non-toxic
		Chronic 21-d NOEC	55 mg/L	-
Oligochaete worm	*Branchiura sowerbyi*	Acute 96-h LC_{50}	39.47 mg/L	Slightly toxic
Cladoceran crustacea	*Moina micrura*	Acute 96-h LC_{50}	71.65 mg/L	Slightly toxic
Freshwater fish, Golden ide	*Leuciscus idus*	Acute 48-h LC_{50}	460 mg/L	Practically non-toxic
Freshwater	*Oncorhynchus*	Acute 96-h LC_{50}	> 120 mg/L	Practically

Name	Species	Exposure	Endpoint value	Comment
fish, Rainbow trout	*mykiss*			non-toxic
		Chronic 21-d NOEC	90.5 mg/L	-
Freshwater fish, Common carp	*Cyprinus carpio*	Acute 48-h LC_{50}	pH 7.0: 500 mg/L	Practically non-toxic
Freshwater fish, Tilapia	*Oreochromis mossambicus*	Acute 96-h LC_{50}	276.74 mg/L	Practically non-toxic
Cyanobacteria	*Anabaena inaequalis*	Acute 14-d EC_{50}	9 mg/L	Moderately toxic
Algae	*Scenedesmus quadricauda*	Acute 72-h EC_{50}, growth	> 10 mg/L	Slightly toxic
	Pseudokirchneriella subcapita	Acute 48-h EC_{50}, Growth rate EC_{50}, Final Yield	83.29 mg/L 36.39 mg/L	Slightly toxic

Sources:

1 National Center for Biotechnology Information (2025). PubChem Compound Summary for CID 243, Benzoic Acid. Retrieved January 19, 2025 from https://pubchem.ncbi.nlm.nih.gov/compound/Benzoic-Acid.

2 US EPA, September 30, 2020. Registration Review Draft Risk Assessment for Benzoic Acid, Benzoic Acid Human Health and Ecological Draft Risk Assessment. DP No. 459118.

3 Pesticide Properties DataBase (PPDB). 2025. University of Hertfordshire. Retrieved January 19, 2025 from https://sitem.herts.ac.uk/aeru/ppdb/en/Reports/1475.htm.

4 Environmental toxicity summary. Microban Canada Inc. 2023. DACO 9.1 (PMRA No. 3508557)

5 European Commission Health & Consumer Protection Directorate-General. Benzoic Acid, Sanco/1396/2001-Final. 28 November, 2003.

Table 4 Toxic Substances Management Policy considerations - Comparison to TSMP Track 1 Criteria

TSMP Track 1 Criteria	TSMP Track 1 Criterion value		Active ingredient endpoints
CEPA toxic or CEPA toxic equivalent[1]	Yes		No
Predominantly anthropogenic[2]	Yes		No, naturally occurs in fruits and by bacterial action.
Persistence[3]	Soil	Half-life ≥ 182 days	No Aerobic soil DT_{50}: 0.5 d Anaerobic soil DT_{50}: 18.2 h
	Water	Half-life ≥ 182 days	No DT_{50} in water: 0.22–3.6 d
	Sediment	Half-life ≥ 365 days	
	Air	Half-life ≥ 2 days, or evidence of atmospheric transport to remote regions such as the Arctic	No lifetime in air < 0.51 d

TSMP Track 1 Criteria	TSMP Track 1 Criterion value	Active ingredient endpoints
Bioaccumulation[4]	Log $K_{ow} \geq 5$	No, Log K_{ow} = 1.87
	BCF ≥ 5000	No, BCF = 14–21
	BAF ≥ 5000	Not Available
Is the chemical a TSMP Track 1 substance (all four criteria must be met)?		No, does not meet all of the TSMP Track 1 criteria.

[1] All pesticides will be considered CEPA-toxic or CEPA toxic equivalent for the purpose of initially assessing a pesticide against the TSMP criteria. Assessment of the CEPA toxicity criteria may be refined if required (in other words, all other TSMP criteria are met).

[2] The policy considers a substance "predominantly anthropogenic" if, based on expert judgement, its concentration in the environment medium is largely due to human activity, rather than to natural sources or releases.

[3] The pesticide and/or the transformation product(s) is considered persistent when the criterion is met in any one medium.

[4] Bioaccumulation describes the process by which a substance accumulates in a living organism – either from the surrounding medium or through food containing the substance. A substance's potential to bioaccumulate can be expressed by the bioaccumulation factor (BAF), the bioconcentration factor (BCF), or the octanol-water partition coefficient (Log K_{ow}). The BAF and the BCF measure the concentration of a substance in a living organism relative to its concentration in the surrounding medium. The BAF accounts for substance intake from both food and the surrounding medium, while the BCF accounts for intake from the surrounding medium only. The Log K_{ow} estimates a substance's tendency to partition from water to organic media, such as lipids present in living organisms. In the absence of BAF or BCF data, the log K_{ow} may be used.

Table 5 List of supported uses

Supported use	Supported use claim
Non-food Contact Polymers and Plastics	Purpose: To protect the following systems from deterioration during manufacture, storage and service life: natural or synthetic thermoplastics (for example but not limited to TPE, PVC, PE, PP, PS, HIPS, PC, ABS, PA, PU, Styrenics, PMMA, Acrylics), thermosets (for example, cross-linked urethanes, rubber, epoxies, cementitious products, polyesters, melamine-formaldehyde laminates, acrylics, silicones) other polymer dispersions. Concentration: 0.1–1.0% by weight of material to be protected
Textiles	Purpose: To protect the following systems from bacterial deterioration during manufacture, storage, and service life: natural and synthetic fabrics/fibres, such as wearable textiles, yarns, household textiles, industrial textiles, and carpets. Concentration: for natural fiber, use 0.05–6.7%; for synthetic fiber, 0.1–6.7% by weight of material to be protected.

Supported use	Supported use claim
Paints	Purpose: To extend the service life of the dried paint film of paints and architectural coatings by protecting them from bacterial deterioration. Paint/architectural coatings may be latex, PVA, acrylic, latex acrylic, or solvent/oil based. Concentration: 0.5% by weight of material to be protected.
Industrial Maintenance Coatings	Purpose: To extend the service life of the dried industrially-applied coating by protecting them from bacterial deterioration. Coatings include clearcoats, enamels, lacquers, shellacs, urethanes, polyurethanes, and acrylic-polyurethane dispersions, etc. Concentration: 0.5–6.7% by weight of material to be protected
Hygroscopic Inorganic, Cellulose Materials	Purpose: To control the growth of fungi, yeast and bacteria during manufacture, storage and service life of clay, calcium carbonate, kaolin and other inorganic or cellulosic based mixtures that tend to absorb moisture for use in animal litter. Concentration: 0.05–6.7% by weight of material to be protected.
Treated Intermediates/ Concentrates	Purpose: This product is an antimicrobial additive that protects treated intermediate manufacturing/industrial products and treated manufacturing/industrial products from the growth of microorganisms, including mould, mildew and fungus. Maximum Concentration: For use in manufacturing/industrial intermediates at active ingredient levels up to 50% on a weight basis for further processing in an industrial environment into finished products. This dosage applies only to intermediate manufacturing/industrial uses. It does not apply to active ingredient concentrations in consumer finished products. The intermediate treated concentrate must be used in proportion to other inputs in the manufacture of treated articles entering commerce so that the final concentration of this product does not exceed the application rate of 6.7% on a weight basis in the consumer finished product articles to be preserved. Specific materials for Liquid Intermediates: Microban Additive GS can be dissolved or dispersed in organic solvents or water with dispersing aids, surfactants, and/or other formula auxiliaries in support of the finished product types listed on the label. Specific materials for Solid Intermediates: Microban Additive GS can be added to polymer resins and/or components compatible with the finished materials/product types listed on the label.

References

A. List of studies/Information submitted by registrant

1.0 Chemistry

PMRA Document Number	Reference
3472451	2023, Manufacturing methods for the TGAI, DACO: 2.11.1, 2.11.2, 2.11.3, 2.11.4 CBI
3472453	2023, Preliminary analysis, DACO: 2.13.1, 2.13.2, 2.13.3 CBI
3472455	2023, Chemical and physical properties, DACO: 2.14.1, 2.14.10, 2.14.11, 2.14.12, 2.14.13, 2.14.14, 2.14.15, 2.14.2, 2.14.3, 2.14.4, 2.14.6, 2.14.7, 2.14.8, 2.14.9, CBI
3472465	2021, Five batch analysis of Microban Additive GS (benzoic acid), DACO: 2.13.1, 2.13.2, 2.13.3, 2.14.12, 3.4.1 CBI
3472496	Maki, T. & Takeda, K., 2000, Benzoic acid and derivates in Ullmanns Encyclopedia of Industrial Chemistry, 6th ed., Vol. 5, DACO: 2.14.10,2.14.11,2.14.13,2.14.15,2.14.4,2.14.6,2.14.7,2.14.8,2.14.9,4.2.2,4.2.4,4.3.5,8.2.1, 3.5.11, 3.5.6, 3.5.7, 3.5.8
3472504	2020, Accelerated storage stability of test substance, DACO: 2.14.14, 3.5.10, 3.5.14 CBI
3637094	2024, Heavy metal analysis, DACO: 2.13.4 CBI
3743244	2024, Validation of an "CBI Removed" method for determination of elemental impurities in benzoic acid "CBI Removed", DACO: 2.13.1
3472579	2023, Chemical and Physical Properties, DACO: 3.5, 3.5.1, 3.5.10, 3.5.11, 3.5.12, 3.5.13, 3.5.14, 3.5.15, 3.5.2, 3.5.3, 3.5.4, 3.5.5, 3.5.6,3.5.7, 3.5.8,3.5.9 CBI

2.0 Human and animal health

PMRA Document Number	Reference
3472457	2023, Toxicology profile summary, DACO: 4.1
3472458	2023, Acute studies, DACO: 4.2.1,4.2.2,4.2.3,4.2.4,4.2.5,4.2.6
3472459	2023, Short-term studies, DACO: 4.3.1,4.3.3,4.3.5,4.3.7,4.3.8
3472460	2023, Long-term studies, DACO: 4.4.1,4.4.2,4.4.3
3472461	2023, Special studies, DACO: 4.5.1,4.5.12,4.5.2,4.5.3,4.5.4,4.5.5,4.5.7,4.5.9
3472462	2023, Other studies, DACO: 4.8
3472469	Baer, R.L., Serri, F., Weissenbach-Vial, C., 1955, Studies on allergic sensitization to certain topical therapeutic agents, A.M.A. Archives of Dermatology, Vol. 71, No.1, p.19-23, DACO: 4.2.5
3472471	Bogar, F., Tuylu, B.A., 2019, Determination of genotoxic effects of some food additives with the help of CBMN technique, Fresenius Environmental Bulletin, Vol 28, No.9, p. 6601-6611, DACO: 4.5.5

PMRA Document Number	Reference
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3472476	Demir. E., Kocaoglu, S., Kaya, B., 2010, Assessment of genotoxic effects of benzyl derivatives by the comet assay, Food and Chemical Toxicology 48 1239-1242, DACO: 4.5.5
3472477	Deuel, H.J. (Jr.); Alfin-Slater, R.B.; Weil, C.S.; & Smyth, H.F. (Jr.), 1954, Sorbic acid as a fungistatic agent for foods. I. Harmlessness of sorbic acid as a dietary component., Journal of Food Science, Vol 19 Issue 1-6, p 1-643, DACO: 4.2.1,4.3.1
3472479	Frosch, P.J., Kligman, A.M., 1976, The chamber-scarification test for irritancy, Contact Dermatitis, Vol. 2, No. 6, p. 314-324, DACO: 4.2.5
3472481	Gad, S.C., Dunn, B.J., Dobbs, D.W., Reilly, C., & Walsh, R.D., 1986, Development and validation of an alternative dermal sensitization test: the mouse ear swelling test (MEST), Toxicology and Applied Pharmacology 84, 93-114, DACO: 4.2.6
3472483	Gerberick, G.F., House, R.V., Fletcher, E.R., & Ryan, C.A., 1992, Examination of the local lymph node assay for use in contact sensitization risk assessment, Fundamental and Applied Toxicology 19, 438-445, DACO: 4.2.6
3472492	Lahti, A., & Maibach, H.I., 1984, An animal model for nonimmunologic contact urticaria, Toxicology and Applied Pharmacology 76, 219-224, DACO: 4.2.5
3472493	Lahti, A., & Maibach, H.I., 1985, Species specificity of nonimmunologic contact urticaria: Guinea pig, rat, and mouse, Journal of the American Academy of Dermatology, Vol 13 No. 1 p. 66-69, DACO: 4.2.5
3472495	Leyden, J.J., Kligman, A.M., 1977, Contact sensitization to benzoyl peroxide, Contact Dermatitis, Vol. 3, No. 5, p. 273-275, DACO: 4.2.5
3472505	Pandir, D., 2014, DNA damage in human germ cell exposed to the some food additives in vitro, Cytotechnology 68:725-733, DACO: 4.5.5
3472506	2010, A 4-week inhalation toxicity study of aerosolized benzyl alcohol and benzoic acid in Sprague-Dawley rats, DACO: 4.2.3,4.3.7
3472508	Smyth, H.F. (Jr.); Carpenter, C.P., 1948, Further experience with the range finding test in the industrial toxicology laboratory, Journal of Industrial Hygiene and Toxicology, Vol. 30, No.1 p.63-68, DACO: 4.2.1
3472510	Stol, M,, Cifkova, I., Brynda, E., 1988, Irritation effects of residual products derived from poly(2-hydroxyethyl methacrylate) gels. I. Testing of some model compounds, Biomaterials Vol 9 p 273-276, DACO: 4.2.5
3472515	Turnbull, D., Jack, M.M., Coder, P.S., Picut, C.A., Rodricks, J.V., 2021, Extended One-Generation Reproductive Toxicity (EOGRT) study of benzoic acid in Sprague Dawley rats, Regulatory Toxicology and Pharmacology 122 104897 DACO: 4.5.1
3472518	Yilmaz, S., Unal, F., Yuzbasioglu, D., Celik, M., 2014, DNA damage in human lymphocytes exposed to four food additives in vitro, Toxicology and Industrial Health Vol. 30(10) p 926-937 DACO: 4.5.5
3472585	2023, Exposure assessment, DACO: 5.1,5.2,5.3,5.6

3.0 Environment

i) Published information

PMRA Document Number	Reference
3472587	Banerjee, S. et al., Syracuse Research Corporation, 1984, Development of a General Kinetic model for Biodegradation and Its Application to Chlorophenols and Related Compounds, DACO: 8.2.3
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3472589	Jaroszynski,T. & Gomolka, E., 1979, Biodegradability of Benzoic Acid in Activated Sludge Process, DACO: 8.2.3
3472590	King, E.F. & Painter, H.A., Water Research Centre (UK), 1982, Ring-test Programme 1981-82: Assessment of Biodegradability of Chemicals in Water by Manometric Respirometry (Final Report), DACO: 8.2.3
3472591	Rubin, H. et al., Cornell University, 1982, Rates of Mineralization of Trace Concentrations of Aromatic Compounds in Lake Water and Sewage Samples, DACO: 8.2.3
3472592	Ward, T.E., The Proctor and Gamble Company, 1985, Characterizing the Aerobic and Anaerobic Microbial Activities in Surface and Subsurface Soils, DACO: 8.2.3
3508559	Kamaya, Fukaya, Suzuki, 2005, Acute toxicity of benzoic acids to the crustacean Daphnia magna, DACO: 9.3.2
3508560	Chang, Liaw, Wang, 2020, Effects of benzoic acid and sodium nitrite toxicity on Daphnia magna embryos, DACO: 9.3.2
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3508563	Saha, Bhunia, Kaviraj, 2005, Comparative Toxicity of Three Organic Acids to Freshwater Organisms and Their Impact on Aquatic Ecosystems, DACO: 9.3.4,9.5.2.3,9.9
3508564	CICADS, 1999, Benzoic acid and sodium benzoate, DACO: 9.3.2,9.5.2.3,9.8.2
3508566	Lee & Chen, 2008, Toxicity and quantitative structure-activity relationships of benzoic acids to Pseudokirchneriella subcapitata, DACO: 9.8.2

ii) Unpublished information

PMRA Document Number	Reference
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3472586	2023, Environmental Chemistry and Fate, DACO: 8.1,8.2.3,8.4
3508557	2023, Environmental toxicity summary, DACO: 9.1
3472464	2023, Storage, Disposal and Decontamination, DACO: 8.4.1

4.0 Value

PMRA Document Number	Reference
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3472568	2021, Durability of Microban Additive GS efficacy in polyspandex textiles, DACO: 10.2.3.2(E)
3637523	2024, Rationales for label use groupings and proposed use rates, DACO: 10.2
3637525	2024, Quantitative microbial efficacy determination for hygroscopic inorganic substances, DACO: 10.2.3.2(E)
3637526	2024, Quantitative microbial efficacy determination for polymeric substances, DACO: 10.2.3.2(E)
3637527	2024, Quantitative microbial efficacy determination for natural fiber, DACO: 10.2.3.2(E)
3637528	2024, Quantitative microbial efficacy determination for coating substrates, DACO: 10.2.3.2(E)
3637529	2024, Quantitative microbial efficacy determination for coating substances, DACO: 10.2.3.2(E)
3637530	2024, Quantitative microbial efficacy determination for polymer substrates, DACO: 10.2.3.2(E)
3637531	2024, Quantitative microbial efficacy determination for synthetic fiber, DACO: 10.2.3.2(E)
3637532	2021, Quantitative microbial efficacy determination for dry film paint, DACO: 10.2.3.2(E)

B. Additional information considered

i) Published information

1.0 Human and animal health

PMRA Document Number	Reference
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3731080	European Chemical Agency (ECHA), 2025, Registration Dossier - Benzoic acid toxicology information acute toxicity: inhalation, DACO: 4.2.3
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