Proposed Registration Decision PRD2012-08

Ammonium Bromide Fuzzicide

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Overview

Proposed Registration Decision for Ammonium Bromide (Fuzzicide)

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Fuzzicide (Ammonium Bromide) and Fuzzicide Solution, containing the technical grade active ingredient ammonium bromide.

Fuzzicide (Ammonium Bromide) (Registration Number 28687) and end use-product, Fuzzicide Solution (Registration Number 28688), are conditionally registered in Canada. The detailed review for Fuzzicide (Ammonium Bromide) and Fuzzicide Solution can be found in Evaluation Report ERC 2007-09 *Ammonium Bromide Fuzzicide*. The current applications were submitted to convert Fuzzicide (Ammonium Bromide) and Fuzzicide Solution from conditional registration to full registration.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

This Overview describes the key points of the evaluation, while the Science Evaluation section provides detailed technical information on the human health, environmental and value assessments of Fuzzicide (Ammonium Bromide) and the end-use product Fuzzicide Solution.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people 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 special precautionary measures on the product label to further reduce risk.

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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."

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (for example, children) as well as organisms in the environment (for example, those most sensitive to environmental contaminants). 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 the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the PMRA's website at healthcanada.gc.ca/pmra.

Before making a final registration decision on ammonium bromide, the PMRA will consider all comments received from the public in response to this consultation document[3]. The PMRA will then publish a Registration Decision[4] on ammonium bromide, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA'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 Ammonium Bromide?

Ammonium Bromide is the active ingredient in Fuzzicide (Ammonium Bromide) at a concentration of 99% and the end-use product Fuzzicide Solution at a concentration of 35% . Fuzzicide Solution is used as a slimicide in pulp and paper mill whitewater systems and starch slurries. Fuzzicide Solution is used with sodium hypochlorite to produce the active biocide, Fuzzicide biocide, which is the active biocide that prevents the presence of undesirable organisms.

Health Considerations

Can Approved Uses of Ammonium Bromide Affect Human Health?

Ammonium bromide is unlikely to affect your health when used according to the label directions.

When assessing health risks, the PMRA considers two key factors: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers). The risk assessment is conducted to ensure that the level of human exposure is well below the lowest dose at which effects occurred in animal tests. Only uses for which the exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

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[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*.

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose at which no effects are observed. Some of the toxicology studies routinely required to register a pesticide were not available for ammonium bromide. However, because exposure was determined to be negligible for the proposed use on pulp and paper, no further studies were requested. For any future use expansions, however, the PMRA will reconsider the need to address data gaps.

The technical grade active ingredient ammonium bromide caused mild eye irritation in animals and showed the potential to cause acute health effects in animals when it was inhaled. Consequently, the statement "Caution—Poison, Eye Irritant" is required on the label as well as the skull and crossbones symbol. Health effects in animals given daily doses of ammonium bromide over short periods (4 weeks to 3 months) included clinical signs of toxicity, decreased body- and organ-weights as well as effects on blood and urine. Although ammonium bromide was not tested to see if it causes cancer, it was not found to be genotoxic[5]. Ammonia on its own, however, has been found to cause some forms of genotoxicity. Some effects were noted on the nervous system, including clinical signs of toxicity, behavioural effects and some indications of effects on nervous tissue. When ammonium bromide was given to pregnant animals, effects on the developing fetus and on offspring were observed at doses that were not toxic to the mother, indicating that the fetus or young animal was more sensitive to ammonium bromide than the adult animal. Effects on reproduction were also seen, but at doses that were toxic to adult animals.

Studies conducted with sodium bromide were also provided to supplement the ammonium bromide toxicology database. When given to pregnant animals, sodium bromide caused effects on offspring at doses that were also toxic to the mother. Effects on reproduction were seen at doses that were toxic to adult animals. Other effects on adult animals included decreased thyroid-hormone levels, decreased body weights and organ weights as well as effects on blood at very high doses.

Risks in Residential and Other Non-Occupational Environments

Estimated risk for non-occupational exposure is not of concern when directions specified on the label are observed.

Residential exposure to individuals contacting treated paper is not expected to result in unacceptable risk when Fuzzicide Solution is used according to label directions.

Occupational Risks From Handling Fuzzicide Solution

Occupational risks are not of concern when Fuzzicide Solution is used according to the label directions, which include protective measures.

Due to the requirement for closed loading and transfer of Fuzzicide Solution, workers mixing and loading the product are not expected to have direct contact with Fuzzicide Solution. In addition, the label will specify that anyone mixing or loading Fuzzicide Solution must wear face protection, a long-sleeved shirt and long pants, chemical-resistant gloves and chemical-resistant footwear. Taking into consideration these label requirements, risk to workers handling Fuzzicide Solution is not of concern.

For post-application workers in pulp and paper facilities, exposure to bromide in the re-circulating water following the use of Fuzzicide Solution is not expected to be greater than the exposure to bromide from currently registered products.

Environmental Considerations

What Happens When Fuzzicide Biocide Is Introduced Into the Environment?

Fuzzicide biocide is toxic to freshwater alga and vascular plants and to both freshwater and marine invertebrates and fish; therefore, label instructions are required to protect these organisms and to minimize exposure to the aquatic environment.

Fuzzicide Solution has to be reacted with a 12.5% aqueous solution of sodium hypochlorite to form the active biocide, Fuzzicide biocide or bromide-activated chloramine (BAC). Fuzzicide biocide has the potential to enter into the environment when used as a slimicide in pulp and paper mills. This active biocide is not persistent in the aquatic system and is rapidly degraded to substances such as ammonia/ammonium, nitrate, chloride, bromide, bromoform and chloroform which are already found in natural and effluent waters. With the exception of ammonium, the transformation products of BAC are not expected to adsorb to sediment. Under actual use conditions in an operational pulp and paper mill, Fuzzicide biocide concentrations were below the detection limit (0.05 mg Cl_2/L) at the point of discharge into the watercourse. Soil is not expected to be exposed to Fuzzicide residues; therefore, these residues are not expected to be found in the terrestrial environment.

Based on the specific use pattern for Fuzzicide Solution in pulp and paper mills, Fuzzicide biocide presents a negligible risk to aquatic organisms. Specific statements regarding its toxicity to aquatic organisms and statements to minimize exposure to the aquatic environment are provided on the product label.

Value Considerations

What Is the Value of Fuzzicide Solution?

Fuzzicide Solution is a slimicide for use in pulp and paper mill whitewater systems and starch slurries. Fuzzicide Solution is used with sodium hypochlorite (12.5%) via the Fuzzicide feeder/delivery system to produce Fuzzicide biocide. This product is a new alternative slimicide that can be used to prevent the fouling of whitewater systems and starch slurries caused by bacterial, fungal and algal contamination that have been known to result in loss of productivity in pulp and paper mills.

Measures to Minimize Risk

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

The key risk-reduction measures on the label of Fuzzicide Solution to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

Human Health

To avoid direct contact with ammonium bromide on the skin, only closed loading and transfer is permitted for Fuzzicide Solution. In addition, anyone handling Fuzzicide Solution or contacting treated process fluids must wear face protection, a long-sleeved shirt and long pants, chemical-resistant gloves and chemical-resistant footwear.

Environment

Fuzzicide biocide is toxic to freshwater alga, vascular plants, freshwater and marine invertebrates as well as to fish; therefore, specific statements to minimize exposure to the aquatic environment are provided on the product label.

Next Steps

Before making a final registration decision on Ammonium Bromide, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency’s response to these comments.

Other Information

When the PMRA makes its registration decision, it will publish a Registration Decision on Ammonium Bromide (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 (located in Ottawa).

Science Evaluation

Ammonium Bromide

1.0 The Active Ingredient, Its Properties and Uses

For a review of the active ingredient, its properties and uses please refer to ERC2007-09 - *Ammonium Bromide Fuzzicide*.

2.0 Methods of Analysis

For a review of the methods of analysis, please refer to ERC2007-09 - *Ammonium Bromide Fuzzicide*.

3.0 Impact on Human and Animal Health

For a review of the impact on human and animal health, please refer to ERC2007-09 - *Ammonium Bromide Fuzzicide*.

3.1 Occupational and Bystander Risk Assessment

Recent information about pulp and paper facilities, received subsequent to the conditional registration of Fuzzicide Solution, revealed that post-application workers may be exposed to antimicrobials at two different levels: workers exposed to the mist from re-circulating waters downstream from where the product is loaded and those handling the treated material (i.e. paper). The registrant also identified that during the paper production process, dermal and inhalation exposure of a worker to the liquid, aerosols or vapours of the bromide-activated chloramine (BAC) solution released from the paper machine may occur. Based on this recent information, a supplemental occupational and risk bystander risk assessment was conducted.

3.1.1 Toxicological Endpoints

Occupational exposure to ammonium bromide is characterized as intermittent long-term in duration and is predominately by the dermal route.

3.1.2 Occupational Exposure and Risk

3.1.2.1 Handler Exposure and Risk

There is potential for exposure to workers mixing/loading and applying the Fuzzicide Solution. To mitigate exposure to handlers mixing, loading and applying Fuzzicide Solution via closed systems, a statement limiting the use of Fuzzicide Solution to closed loading and transfer systems (i.e. dry coupling) is required on the principal display panel of the Fuzzicide Solution label and the applicant is required to design their delivery system to satisfy the criteria of this definition. This requirement is expected to result in negligible exposure to occupational handlers.

3.1.2.2 Post-application Exposure and Risk

The biocide BAC, formed from ammonium bromide and sodium hypochlorite in water, is very reactive and degrades rapidly to form nitrogen, nitrate, ammonium, chloride and bromide. Therefore, BAC will not become systemically available and will not be distributed beyond the site of first contact due to its rapid breakdown. Among the degradation products formed, bromide ion was further evaluated within the context of this review and determined to be the most relevant chemical for which exposure should be assessed.

Bromide is a stable ion that accumulates in the re-circulating water. Therefore, workers may be exposed to aqueous dilution of bromide via inhalation and skin contact with the re-circulating water. The range of bromide residues as indicated by the registrant ranged from 8.7 to 46 ppm,

Bromide is a degradate of other active ingredients such as sodium bromide. Products containing sodium bromide are currently registered as slimicides for pulp and paper, as well as used in swimming pools in combination with products containing hydantoins.

The Fuzzicide Solution rate is 0.63 kg (0.52 L) per 1000 kg of dry weight fibre, which, according to the submitted information, corresponds to 0.6 kg to 1.35 kg per 10000 L. This is similar to the currently registered rate of Liquibrom 4000 as a slimicide for pulp and paper (sodium bromide rate 40%); 0.7 kg in 10000 L.

Several products (containing bromide releasing active ingredient (available bromine present as hydantoins 39.2%)) are registered for swimming pool and spa disinfection. For one of these pool products, it is recommended that sodium bromide be added for the first time use in the season, which may result in the accumulation of bromide ion in the swimming pool. The level of bromide reserve required is 30 ppm. The level of bromide in re-circulating water from the use of Fuzzicide solution (46 ppm) may exceed that which is in swimming pool (30 ppm). However, frequency and duration of exposure to secondary workers in a pulp and paper facility (few minutes per day) is considered to be much less than the exposure of a swimmer (few hours per day). Further to this, workers in an industrial facility such as a pulp and paper mill must wear, at minimum, the baseline PPE (single layer and boots).

Based on the above, post-application worker exposure to bromide from the use of Fuzzicide solution in a pulp and paper facility is not expected to exceed the exposure to swimmers from currently registered swimming pool products.

3.1.3 Residential Exposure and Risk

3.1.3.1 Handler Exposure and Risk

There are no domestic class products; therefore, a residential handler assessment was not required.

3.1.3.2 Post-application Exposure and Risk

There is potential for consumer exposure to Fuzzicide Solution and its by-products from contacting treated paper and paper products. Ammonia, bromide, chloride and nitrate have been identified as quantifiable by-products in paper and paperboard products treated with Fuzzicide Solution. However, there are several products currently registered for use in pulp and paper mills that are expected to have similar by-products in treated paper. Based on the low quantities of by-products measured in treated paper products and the lack of sensitization triggers for the by-products identified, exposure to treated paper and paper products is not of concern.

3.1.4 Bystander Exposure and Risk Assessment

No bystanders exposure is expected in the pulp and paper facility other than post-application exposure.

4.0 Impact on the Environment

For a review of the impact on the environment, please refer to ERC2007-09 - *Ammonium Bromide Fuzzicide*.

4.1 Fate and Behaviour in the Environment

As indicated in ERC2007-09 *Ammonium Bromide Fuzzicide*, a hydrolysis study on bromide-activated chloramines (BAC) was to be submitted as a condition of full-registration. The review of this study indicates BAC is not persistent in the aquatic system and BAC rapidly hydrolyses in the aquatic system with a half-life of between 15.9 minutes to 184 hours.

5.0 Value

For the value assessment, please refer to ERC 2007-09 - *Ammonium Bromide Fuzzicide*.

6.0 Pest Control Product Policy Considerations

For a review of the Pest Control Product Policy considerations, please refer to ERC2007-09 - *Ammonium Bromide Fuzzicide*.

7.0 Summary

7.1 Human Health and Safety

The toxicology database was reduced in comparison to current standard toxicology data requirements. Further hazard characterization of ammonium bromide was not undertaken, however, since exposure was determined to be negligible for the proposed scenario on pulp and paper. For any further use expansions, the need to address deficiencies in several areas including neurotoxicity, chronic/carcinogenicity, developmental toxicity in a second species, as well as reproductive toxicity will be reconsidered.

Mixer, loader, applicators and post-application workers exposed to treated process water are not expected to be exposed to levels of ammonium bromide that will result in unacceptable risk when Fuzzicide Solution is used according to label directions. The label specifies the personal protective equipment required to protect workers mixing and loading Fuzzicide Solution and handling treated process water.

Residential exposure to individuals contacting treated paper is not expected to result in unacceptable risk when Fuzzicide Solution is used according to label directions.

7.2 Environmental Risk

Based on the use pattern for Fuzzicide Solution in pulp and paper mills, Fuzzicide biocide presents a negligible risk to aquatic organisms. Specific statements regarding its toxicity to aquatic organisms and statements to minimize exposure to the aquatic environment are provided on the product label.

7.3 Value

The submitted data indicated that Fuzzicide Solution used in conjunction with sodium hypochlorite via the Fuzzicide feeder/delivery system effectively prevented the fouling of pulp and paper mill whitewater systems and starch slurries caused by bacterial, fungal and algal contamination.

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Fuzzicide (Ammonium Bromide) and Fuzzicide Solution, containing the technical grade active ingredient ammonium bromide for use as a slimicide in pulp and paper mill whitewater systems and starch slurries

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

List of Abbreviations

BAC	bromide-actived chloramine
kg	kilogram
L	litre
PMRA	Pest Management Regulatory Agency
PPE	personal protective equipment

Appendix I

Table 1 Fate and Behaviour in the Environment

Property	Test substance	Value	Comments	References (PMRA #)
Aquatic systems				
Hydrolysis	BAC	Half-life at pH 5: 15.9 minutes Half-life at pH 9: 184 hours		1772024

References

A. List of Studies/Information Submitted by Registrant

1.0 Human and Animal Health

PMRA Document Number : 1421938
Reference: 2007, Worker Exposure in Paper Mills, DACO: 0.8

PMRA Document Number : 1456285
Reference: 2004, Tolcide PS Exposure Study Paper Manufacture, DACO: 5.2 CBI

2.0 Environment

PMRA Document Number : 1772024
Reference: 2008, Fuzzicide biocide: determination of the abiotic degradation of the test item by hydrolysis at two different pH values. 1108.003.715, DACO: 8.2.3.2

PMRA Document Number : 1772024
Reference: 2008, Fuzzicide biocide: synthesis of the biocide. 1108.006.804. DACO: 8.2.3.2