

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 30 April 2021**

Case Number: T 0723/19 - 3.3.09

Application Number: 15201119.3

Publication Number: 3023009

IPC: A23K20/195, A23K20/10,
A23K50/00, A01N31/00,
A23L3/3463, A23L3/3472,
A23K20/105, A23K20/111,
A23K20/121, A23L3/3508,
A23L3/3535, A01N37/02

Language of the proceedings: EN

Title of invention:
WATER AND FEED PRESERVATIVE

Patent Proprietor:
ANITOX CORPORATION

Opponent:
Arnold & Siedsma B.V.

Headword:
Water and feed preservative/ANITOX

Relevant legal provisions:
EPC Art. 56, 100(a), 100(b)
RPBA 2020 Art. 13(2)

Keyword:

Sufficiency of disclosure - main request (yes)

Inventive step - main request (yes)

Amendment to appeal case - taken into account (no)

Decisions cited:

G 0001/03, T 0038/11

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 0723/19 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 30 April 2021

Appellant: Arnold & Siedsma B.V.
(Opponent) Bezuidenhoutseweg 57
2594 AC Den Haag (NL)

Representative: van Kooij, Adriaan
Arnold & Siedsma
Bezuidenhoutseweg 57
2594 AC The Hague (NL)

Respondent: ANITOX CORPORATION
(Patent Proprietor) 1055 Progress Circle
Lawrenceville, GA 30043 (US)

Representative: HGF
1 City Walk
Leeds LS11 9DX (GB)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 8 January 2019
rejecting the opposition filed against European
patent No. 3023009 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman A. Haderlein
Members: C. Meiners
F. Blumer

Summary of Facts and Submissions

- I. This decision concerns the appeal filed by the opponent (appellant) against the opposition division's decision to reject the opposition against European patent No. 3023009.
- II. In the notice of opposition, the opponent had requested that the patent be revoked, *inter alia*, based on Article 100(a) EPC for lack of inventive step and on the ground of Article 100(b) EPC.
- III. In the present decision, reference is made to the following documents:
- 02: Result of experiments on the antimicrobial effects of the compositions claimed on various microorganisms
- 03: WO 2008/031087 A1, "Compositions comprising a C2-C14 carboxylic acid and a surfactant for treating hoof diseases"; publication date March 13 2008
- 04: Karabinos and Ferlin (1954), "Bactericidal Activity of Certain Fatty Acids"; The Journal of the American Oil Chemists' Society, Volume 31, pages 228-232
- 05: Opdyke, Food and Cosmetics Toxicology, Monographs on fragrance raw materials; 12, page 839, December 1974
- 06: WO 01/32020 A2, "Use of nonanoic acid as an antimicrobial agent, in particular an antifungal agent"; publication date May 10 2001

- 07: Crozier-Dodson et al.; "Formulating Food Safety: an overview of antimicrobial ingredients"; December 2004/January 2005
- 08: Johnston and Gaas; "Vinegar: Medical uses and antiglycemic effect"; May 2006
- 09: Study A and Study B - Experimental Evidence from the Patentee, filed with the reply to the statement setting out the grounds of appeal
- 010: Study C - Experimental evidence from the Patentee, filed with the reply to the statement setting out the grounds of appeal
- 011: Supplementary data filed by letter dated 20 April 2021 from the appellant/opponent

- IV. In the decision under appeal, the opposition division concluded that the patent as granted met the requirements of the EPC and rejected the opposition (Article 101(2) EPC). In particular, it found that the requirements of sufficiency of disclosure and inventive step were met starting from O3 as the closest prior art.
- V. With the reply to the statement setting out the grounds of appeal, the patent proprietor filed auxiliary requests 1-9.
- VI. Claim 1 of the patent as granted reads:
"An antimicrobial composition for extending the shelf-life of water, feed or feed ingredients, the antimicrobial composition comprising an organic acid aqueous solution that comprises:
a short-chain acid aqueous solution buffered to a pH between pH 1 and 5, wherein the short-chain acid is acetic acid, propionic acid, or a mixture thereof at a

concentration of 80 to 98 wt. % of the total organic acid content in the organic acid aqueous solution; and pelargonic acid at a concentration in a range of 2 to 20 wt. % of the total organic acid content in the organic acid aqueous solution."

Claims 2 to 6 are dependent product claims, and claims 7 to 10 are method or use claims referring back to the product claims.

- VII. The appellant filed a further submission dated 29 March 2021.
- VIII. The appellant filed further submissions, including the document O11, by letter dated 20 April 2021.
- IX. The appellant's (opponent's) arguments, where relevant for the decision, can be summarised as follows:

The submissions dated 29 March 2021 and 20 April 2021 including O11 should be taken into account. In particular, O11 had been provided in direct response to the filing of O10.

As regards the requirement of sufficiency of disclosure, claim 1 covered a multitude of embodiments that did not enable the invention but still fell within the ambit of the claims.

The results described in the patent were contradictory, and Table 9 showed *comparable* antimicrobial activity between compositions comprising a *single* acid component and those comprising the claimed *combinations* of acids for low acid contents.

There was also a gap in the information in the patent since it was not clear by means of which measures the

alleged synergistic effect, which was an inherent feature of claim 1, could be obtained.

All the ingredients listed in claim 1 and KOH were individually capable of providing an antimicrobial composition. Hence, claim 1 covered an almost unlimited number of antimicrobial compositions deriving their antimicrobial effects not from the invention related to the patent, but from an overkill presence of a single ingredient.

As demonstrated by the results displayed in Table 6 of the patent, the ranges for the weight percentages of the acid components recited in claim 1 were arbitrary, and the skilled person would not know whether they were working within the scope of claim 1.

What is more, there was no disclosure in the patent to show that the antimicrobial compositions were suitable for extending the shelf-life of feed or feed ingredients.

Furthermore, the invention was insufficiently disclosed since potassium hydroxide was needed to solubilise pelargonic acid in the aqueous phase. The use of the base in amounts needed for neutralisation of the acid would result in a pH of the compositions above pH 14. No enabling disclosure was provided in the patent as to how this pH could be lowered to a pH range of 1 to 5.

No synergistic effect that could be ascribed to the feature combination of claim 1 had been plausibly demonstrated for the claimed compositions. In the absence of a plausible synergistic effect, however, the subject-matter of claim 1 was just a juxtaposition of features, i.e. a combination of known antimicrobials,

used in a known concentration for a known use and was thus obvious. Consequently, the claims as granted lacked an inventive step within the terms of Article 56 EPC.

- X. The respondent's (proprietor's) arguments, where relevant for the decision, can be summarised as follows:

The arguments provided in appellant's letter dated 29 March 2021 and the submissions in its letter of 20 April 2021, including document O11, should not be admitted into the proceedings.

The patent exemplified several compositions in accordance with claim 1, such as those disclosed in Table 8. The amounts of propionic acid, acetic acid, and pelargonic acid therein covered the entirety of the numerical ranges for the concentrations of the acids in claim 1.

A technical effect (in this case a synergy between specific components of a composition) was only relevant to the ground of sufficiency if that effect was explicitly recited in the claim(s); however, no such technical effect was expressed in claim 1.

The effectiveness of the claimed compositions when treating feed had been confirmed in Study B of O9, and also Studies 6 to 8 of the patent plausibly demonstrated that the compositions of claim 1 extended the shelf-life of feed or feed ingredients due to their antimicrobial effect.

No potassium hydroxide was needed to solubilise large amounts of pelargonic acid. The solutions of the short

chain acids, buffered to a pH between 1 and 5, dissolved the pelargonic acid. This was also described in O3 in paragraphs [0059] and [0060]. Hence, for this reason too, not including potassium hydroxide as an ingredient in claim 1 did not render the patent insufficient.

Document O3 was the closest prior art for the assessment of inventive step. The specific combination of acids and their respective amounts required by claim 1 were not disclosed in O3.

The resulting technical effect which could be causally ascribed to this very difference was a synergistic effect in terms of antimicrobial activity. Such a synergy was plausible in view of the data provided in Tables 6 and 9 of the patent and documents O9 and O10. The solution to the corresponding objective technical problem of providing compositions having improved antimicrobial activity was not obvious in view of O3 as the closest prior art.

XI. The requests

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed or, in the alternative, that the patent be maintained on the basis of any of the first to ninth auxiliary requests filed with the reply to the appellant's statement setting out the grounds of appeal.

Reasons for the Decision

Main request

1. *Admission of late-filed submissions (Article 13(2) RPBA 2020)*

- 1.1 The respondent requested that the new arguments put forward by the appellant in the letter dated 29 March 2021 as regards inventive step concerning Study C in O10 and Study 5 in the patent not be admitted. The statement of grounds of appeal did not include the argument that the short-chain acid solutions featured in these studies were not buffered to a pH between 1 and 5.

Likewise, the respondent requested that document O11 not be admitted into the proceedings.

Document O10 had been submitted in direct response to the statement of grounds of appeal and had been on file for over 18 months before the appellant chose to comment on it in the submissions of 29 March 2021 and 20 April 2021. According to the respondent, it was entirely deprived of the possibility of replying to the experiments and arguments contained in these submissions by filing supplemental data.

- 1.2 The appellant argued that the supplemental data filed by letter dated 20 April 2021 were not new but provided the pH values of the compositions in O10 which were missing. The data had been provided in direct response to the filing of O10. In this document, a saline buffer solution having a pH of 7.4 had been used, whereas the claims of the patent required a pH between 1 and 5.

Finally, the document designated as "D8" in O11 was document O10.

- 1.3 The board considers that said arguments put forward by the appellant in its submission of 29 March 2021 as regards inventive step can be evaluated based on the data already on file and in this respect are considered a further development of appellant's arguments provided in its statement of grounds of appeal and thus cannot even be considered to be an amendment to the appellant's appeal case within the meaning of Article 13(2) RPBA 2020. Moreover, contrary to the appellant's assertion and as outlined by the respondent, the limitation that the short-chain acid aqueous solution is buffered to a pH between 1 and 5 does not apply to the antimicrobial compositions of claim 1 as a whole. Consequently, the board does not see any reason not to take said arguments into account.

- 1.4 O11 and the explanations provided in the letter dated 20 April 2021 were submitted after notification of the summons to oral proceedings and are an amendment to the appellant's appeal case in the sense of Article 13(2) RPBA 2020. This submission puts the respondent in a position in which this party is not only taken by surprise but also deprived of the possibility of responding by e.g. performing additional experiments in order to further evaluate the data provided in O11. In this context, the board observes that the submission O11 not only contains formulations which correspond to those described in O10, but also contains two further compositions, designated formulations 3 and 4, which are not mentioned in O10. In addition, O11 does not contain formulation 2 from O10, and it is uncontestedly erroneously referred to Table 3 of D8 in the first paragraph on page 1 of the letter filed together with

O11. As emphasised by the respondent, the appellant filed O11 about 18 months after the respondent's submission of O10 and only ten days prior to the oral proceedings before the board. The appellant's argument that the conduct of the experiments described in O11 had been delayed due to the coronavirus pandemic thus cannot convince the board that O11 and the corresponding explanations had been filed as early as possible. In the board's opinion, there are thus no exceptional circumstances which have been justified with cogent reasons by the appellant for the late submissions of 20 April 2021. Said submissions would also deprive the respondent of its right to be heard when admitted into the appeal proceedings for the mentioned reasons. Hence, the submissions of 20 April 2021 (including O11) are not admitted into the appeal proceedings.

2. *Sufficiency of disclosure (Article 100(b) EPC)*

2.1 Synergy between the components of the claimed antimicrobial compositions

2.1.1 The appellant argued that synergy between the components of the antimicrobial compositions of claim 1 of the patent was an implicit feature. In the absence of such implicit synergy, claim 1 would merely recite a list of known antimicrobial agents in known amounts for known purposes. If an implicit synergistic effect was not assumed in claim 1, a skilled person was not capable of reproducing the invention. Moreover, with reference to T 38/11, there was a lack of guidance in the patent in the event of failures, since no specific amounts of the acid components were indicated in claim 1. The presence of 2 wt. % of pelargonic acid in about 1 litre of aqueous antimicrobial composition could

result in the addition of large amounts of KOH, resulting in a pH > 14, which is thus outside the pH range of 1 to 5 recited in claim 1. As demonstrated in the patent in Tables 1 and 2, acetic acid and propionic acid did not exhibit antimicrobial properties at pH > 5.

- 2.1.2 The board is not convinced by this argument. Decision G 1/03 explains under point 2.5.2 of the Reasons for the Decision that if there is a lack of reproducibility of the claimed invention, this may become relevant under the requirements of inventive step or sufficiency of disclosure. If an effect is expressed in a claim, there is a lack of sufficient disclosure. Otherwise, i.e. if the effect is not expressed in a claim but is part of the problem to be solved, there is a problem of inventive step.

The independent claims of the requests underlying decision T 38/11 expressly require a synergistic effect. Hence, the considerations in relation to T 38/11 cannot be applied in this case, where no synergistic effect is recited in the claims.

In this case, there is no mention in claim 1 of the patent of a synergistic effect between the short-chain acids acetic acid and/or propionic acid on the one hand and pelargonic acid on the other. Hence, the alleged absence of a synergistic effect not mentioned in the claims would have to be dealt with under the provisions of Article 56 EPC and not of Article 100(b) or Article 83 EPC in this case.

- 2.2 Alleged absence of a selection rule and lack of enablement across the full scope of claim 1

2.2.1 According to the appellant, claim 1 covered a multitude of embodiments that did not enable the invention but still fell within the ambit of the claim. Claim 1 covered an almost unlimited number of antimicrobial compositions deriving their antimicrobial effects not from the present invention, but from an overkill presence of a single ingredient. The appellant referred to Studies 1 to 4, 6 and 7 in the patent in this context.

2.2.2 The board notes that in view of the considerations made under point 2.1.2 above, no synergistic effect needs to be obtained by a composition falling within the scope of claim 1 in structural terms (i.e. comprising the components recited in claim 1 in the specified amounts) in order to comply with the requirement of sufficiency of disclosure. As set out by the respondent, claim 1 does not limit the pH of the antimicrobial compositions claimed which can comprise additional components due to the open formulation of the claim. Moreover, claim 1 does not require a limitation of the pH when the claimed antimicrobial compositions are applied. The compositions of claim 1 can be applied in an environment where additional components are present, which can also modify the pH value. What is more, the appellant also conceded that the strong dilution of an acid solution in an aqueous phase in the absence of an appropriate buffer can give rise to a solution having a pH of between 7.2 and 7.3, as was evidenced by O9. Claim 1 does not exclude the possibility that the claimed composition is effective in the presence of additional water (as in Study A) or that it comprises additional water.

Hence, even if the pH of the antimicrobial compositions were limited to a pH range of from 1 to 5, as argued by

the appellant, this does not mean that results of their use in an environment having a higher pH should be disregarded.

Therefore, the board takes the view that a skilled person has enough guidance in view of the technical disclosure of the patent to select suitable amounts of the acid components in the relative weight ratios recited in claim 1 in order to prepare antimicrobial compositions. As outlined by the respondent, such buffered compositions exhibiting antimicrobial properties have been prepared in the patent and are featured in Tables 6 and 8 of the patent. The relative amounts of the two acid components, short-chain acids and pelargonic acid cover the entire range recited in claim 1.

The appellant's observation that the relative concentration ranges of the acid components were not chosen on purpose does not give rise to an issue which could be subsumed under the ground of insufficiency of disclosure either.

Likewise, the issue of whether antimicrobial components were present in overkill amounts in the compositions has no bearing on sufficiency of disclosure, as no synergistic effect is expressed in claim 1 (*vide supra*).

Finally, the failure to yield antimicrobial compositions when using very low amounts of the acid components (an argument put forward by the appellant in the oral proceedings in view of the results disclosed in O2), in the opinion of the board, does not lead to insufficiency of disclosure of the subject-matter of claim 1. A skilled person would determine, by orienting

trials, which threshold concentrations would be needed for a given acid combination in order to still provide an antimicrobial effect. Those threshold concentrations appear to be dependent on the microbe species under scrutiny and can be determined by a skilled person. Claim 1 does not require antimicrobial activity against all kinds of bacteria either.

- 2.3 KOH as allegedly essential feature and enabling disclosure of extension of the shelf-life of feed or feed ingredients
 - 2.3.1 The appellant alleged in its statement setting out the grounds of appeal that KOH was needed for solubilising long-chain fatty acids, such as pelargonic acid, in water. Antimicrobial compositions claimed to be suitable for the treatment of feed comprised 2-20 wt. % of pelargonic acid and implicitly 2-20 wt. % of KOH. Hence, the fatty acid treated with KOH resulted in a pH of the aqueous solution above pH 14 (see points 14. and 15. of the statement of grounds of appeal). No enabling disclosure could be identified as to how this pH could be lowered to a pH range of 1 to 5, according to the appellant.
 - 2.3.2 The board, however, is convinced by the respondent's argument that pelargonic acid can be solubilised in water in the presence of acetic acid or propionic acid, as is demonstrated by Table 6 of Example 3 of the patent. Apparently, no KOH was added to the buffered acid compositions in this example. As outlined by the respondent, O3 also sets out in Example 1, paragraphs [0059] and [0060], that formic acid can be used for dissolving fatty acids. Therefore, the board concludes that KOH is not needed for solubilising pelargonic acid

in aqueous solutions comprising acetic or propionic acid. Consequently, no insufficiency of disclosure arises from said considerations by the appellant.

2.3.3 The appellant noted that the patent did not contain any experimental data for antimicrobial compositions comprising pelargonic acid concerning the extension of the shelf-life of feed or feed ingredients.

2.3.4 The board considers it plausible that the antimicrobial compositions of claim 1 are not only suitable for extending the shelf-life of water but can also reduce microbial growth on feed or feed ingredients as a substrate. Firstly, capric acid, myristic acid, and lauric acid as homologous fatty acids exhibit an antimicrobial effect in combination with propionic acid or acetic acid, as demonstrated in Studies 6-8 of the patent. Secondly, Study B of O9 corroborates that organic acid mixtures of propionic acid (95%) and pelargonic acid (5%) at pH 1.1 effectively inhibit the growth of *Salmonella typhimurium* on poultry feed. This pH value falls within the scope of claim 1. Although it is not disclosed in O9 that the acid composition used in Study B is buffered (cf. the corresponding remark on page 2 of the appellant's submission of 29 March 2021), in the opinion of the board it is thus plausible that the compositions of claim 1 are also suitable for extending the shelf-life of feed or feed ingredients.

2.4 It is for these reasons that the board holds that the subject-matter of claim 1 can be carried out by a skilled person, applying their common general knowledge, across the full scope of the claim without undue burden. The subject-matter of claim 1 is thus considered to be sufficiently disclosed. The ground for opposition of insufficiency of disclosure according to

Article 100(b) EPC thus does not prejudice the maintenance of the patent.

3. *Inventive step (Article 100(a) and Article 56 EPC)*

3.1 The closest prior art

3.1.1 The appellant and the respondent held document O3 as suitable closest prior art for the assessment of inventive step in the course of the opposition proceedings; see e.g. point 2.3.3.1 of the opposition division's decision. In the oral proceedings before the board, the appellant stated that document O6 should be regarded as the closest prior art for the combination of pelargonic acid and propionic acid.

3.1.2 The respondent requested that O6 not be admitted into the proceedings as the closest prior art since this objection had never been raised before, and it was thus taken by surprise by this new inventive-step attack.

3.1.3 The claims of the main request were already the subject of the opposition division's decision, and the appellant did not rely on O6 as the closest prior art in the statement setting out the grounds of appeal. The inventive-step attack based on O6 as the potential closest prior art was only submitted after the summons to oral proceedings had been notified and even after the board's communication pursuant to Article 15(1) RPBA 2020 had been issued. Therefore, its admission is subject to the provisions of Article 13(2) RBPA 2020.

3.1.4 The board takes the view that the discussion of O6 as the closest prior art in the oral proceedings before the board could potentially have led to an entirely different assessment of the question of inventive step,

since in the problem-solution approach the objective technical problem needs to be formulated in view of the distinguishing technical feature(s) relative to the closest prior art. The respondent's argument that it was taken by surprise by the new inventive-step attack is thus considered valid.

- 3.1.5 The appellant's representative stated in the oral proceedings that during the preparation for the oral hearing, the appellant had become aware that document O6 was a suitable springboard for the combination of pelargonic acid and propionic acid.
- 3.1.6 The board, however, sees no exceptional circumstances which had been justified with cogent reasons for the admission of the inventive-step attack based on O6 in this case. As the relevant evidence and arguments were already on file (the question of the closest prior art had already been discussed in the course of the proceedings before the department of first instance), the suitability of the cited documents for an inventive-step attack should have been analysed prior to filing the statement of grounds of appeal and the corresponding reply, respectively. Therefore, the board has not taken document O6 into account as the closest prior art for the assessment of inventive step (Article 13(2) RPBA 2020).

Consequently, the inventive merit of the main request is assessed based on document O3 as the closest prior art in the present decision.

- 3.2 The distinguishing features
- 3.2.1 The appellant did not object to the opposition division's conclusion made under point 2.3.3.2 of its

decision that O3 does not provide the specific combination of i) pelargonic acid with ii) propionic acid, acetic acid or a mixture of these.

3.2.2 The board also concurs with the finding of the department of first instance that consequently O3 also does not disclose that acetic and/or propionic acid are present in amounts of from 80 to 98 wt. % and pelargonic acid in a range of 2 to 20 wt. % of the total organic acid content in the organic acid aqueous solution.

3.3 Technical effect and the resulting objective technical problem

3.3.1 In the appellant's opinion, no unexpected technical effect which could be causally related to said differences can be observed for the subject-matter of claim 1. As there was no unexpected technical effect, the feature combination in claim 1 was just a mere juxtaposition of known antimicrobial agents. The compositions in Table 9 of the patent in suit, Study A of O9, and of Study C of O10 were not buffered to a pH of 1 to 5, according to the appellant. They thus did not fall within the scope of claim 1 of the patent in suit and thus could not support a synergistic effect.

Table 6 of the patent demonstrated that at a pH of 3, compositions comprising 80 wt. % of pelargonic acid and 20 wt. % of propionic acid or compositions comprising 20 wt. % of pelargonic acid and 80 wt.-% of propionic acid or 100 wt. % of pelargonic acid all exhibited 100% antimicrobial activity. These experiments thus could not support an unexpected antimicrobial effect either.

What is more, the antimicrobial activity of the acids showed no linear concentration dependence. In Table 6 of the patent, at a dilution of 0.1%, a reduction in microbial activity of 44% was reported for propionic acid, whereas a reduction of 11% would be expected at a concentration of 0.025%. This was not the case, and a reduction of 25% was observed instead. Therefore, in the absence of a linear relationship between concentration and antimicrobial activity, no reliable comparisons could be made with respect to observed versus expected reduction of microbial activity in the combinations of acids. The measurement values displayed in Table 9 (Study 5) of the patent did not show a linear correlation between acid concentration and observed reduction of microbial activity either. Even assuming a synergistic effect supported by the results featured in Study 5, a synergistic effect was absent at a dilution of 0.01 and 0.02.

Given that pelargonic acid showed much stronger antimicrobial activity than propionic acid or acetic acid, it was obvious that replacing 2 to 20 wt. % of acetic acid with pelargonic acid resulted in antimicrobial compositions with higher antimicrobial activity.

As regards the results in Table 10 of Study A of 09, the appellant argued that, even assuming a linear relationship of antimicrobial activity of the acids, the expected reduction in microbial activity of the composition comprising 95 wt. % acetic acid and 5 wt. % pelargonic acid against *Staphylococcus aureus* ranged from 32.8% to 48.9% in view of the indicated standard deviations for the measurement. This expected reduction was in line with the observed reduction of 46% to 54%, according to the appellant. Again, for the composition

comprising 95 wt. % acetic acid and 5 wt. % pelargonic acid, the expected reduction in microbial activity expressed in [%] against E. coli overlapped with the observed reduction when considering the corresponding standard deviations.

The improved antimicrobial effect of the compositions in O10 comprising acetic acid, propionic acid, and pelargonic acid was a pH-related effect and could not be ascribed to a synergy of components of these compositions. Whilst, at a concentration of 0.05%, the compositions only contained a small amount of acid and had a pH of about 7 due to the small amount of acid in the buffer, this was also the case for composition 2 at all concentrations, according to the appellant in the oral proceedings. According to Figure 1 of O4, pelargonic acid only exhibited antimicrobial activity at pH values of less than 6. At a pH of 5, which was observed at a concentration of 0.2% in O10 for the composition comprising 5% added pelargonic acid (composition 3), pelargonic acid became active and was, per se, the acid with the strongest antimicrobial activity according to Table 5 of the patent.

As regards the remark made in paragraph 77 of the respondent's letter of 6 September 2019, the appellant mentioned that if claim 1 had to be regarded as an intermediate product, it did not make it clear or did not enable it to be understood which product, which had not been defined further, rendered the intermediate product from claim 1 patentable. Such an interpretation of claim 1 whereby the pH of the claimed compositions could fall outside the range of from 1 to 5 was not in line with the application as filed. It referred to clause 8 of the application as filed in this context.

3.3.2 The board is of the opinion that claim 1 does not exclude the possibility that the claimed composition can be used in the presence of further ingredients which could change the pH of the antimicrobial compositions or of additional water or that it comprises such ingredients (cf. point 2.2.2 above).

With regard to the results relating to Study C of O10, the appellant's argument that the pH of the compositions was about 7 at a concentration of 0.05% is plausible in view of the high dilution of the acids in the buffer phase (sterile phosphate buffered saline). The respondent likewise mentioned that the supposed pH in Study C was about 7.

The board thus takes the view that a marked increase in antimicrobial action was supported at a concentration of 0.05% in Table 2 in O10 (11% for the propionic acid/ acetic acid mixture vs. 61% for the composition based on formulation 3, comprising 7 wt. % of pelargonic acid and propionic acid and acetic acid in a total amount of 93 wt. % based on the total organic acid content). The predicted reduction in microbial activity based on the incremental activities of the isolated components at said concentration was only 13% in O10. The composition of formulation 3 having the lowest concentration of 0.05% comprises all the components stipulated by claim 1 of the patent in suit, including a buffer. The relative amounts of the short-chain acids and pelargonic acid likewise meet the corresponding limitation of claim 1. Said formulation 3 at a concentration of 0.05% thus falls within the scope of claim 1 of the patent, as argued by the respondent.

Consequently, the synergistic effect of the compositions of claim 1 is considered plausible in view of the data provided in O10.

In the opinion of the board, the antimicrobial compositions in Study 5 of the patent demonstrate, at concentrations of the acids of 0.02, 0.04, and 0.05%, markedly greater reductions in microbial activity against *Salmonella typhimurium* than predicted when the mass fractions of the individual components are added (cf. points 71 and 86 of the reply to the statement setting out the grounds of appeal). The observed reduction is up to about five times higher than expected (e.g. 99% for the 95% acetic acid/5% pelargonic acid mixture vs. 22% predicted reduction in the table on page 11 of said reply by the respondent).

Even considering the appellant's argument that the values for the observed reduction of microbial activity are not linear in Table 9 of the patent, the observed antimicrobial activity, being up to 5 times higher than expected, is taken as a further pointer to synergy between pelargonic acid and acetic acid/propionic acid.

The respondent's argument that the presence of a buffer compound was not decisive for the synergistic action of the acids is convincing to the board; as stated by the respondent, the buffer is merely added for stabilising the pH of the compositions.

The board thus takes the view that Study 5 of the patent also supports synergistic activity of the acid mixtures in claim 1.

Finally, Study A in O9 contains an acid solution having a pH of 1-2 in diluted form. The pH of the final

compositions of said solution ranges from about 7.2 to 7.4. The appellant calculated the expected percentage reduction in microbial activity by adding the incremental contributions of the individual pure acid solutions according to their mass fractions in the acid mixtures (as outlined above). It did so by using the upper and lower limit of the value ranges established by the measurement error. For the mixture of acetic acid/pelargonic acid at 95:5, the value ranges for the predicted reduction in microbial activity obtained when considering the standard error of the measurements indeed overlap with the range of the observed percentage reduction as established around the mean value by the standard error; however, this is not the case for the mixture comprising propionic acid/pelargonic acid at 95:5 (cf. the entries in the table provided under item 74 of the respondent's reply to the statement of grounds of appeal).

The significant increase in the observed reduction in microbial activity is seen as further substantiation of a synergistic effect of the acid mixture compared with the individual acids. Although the error ranges for the observed and predicted reduction of microbial activity overlap for acetic acid/pelargonic acid at 95:5, the same tendency of a marked reduction over the predicted reduction is observed for the acid mixtures.

The pH of the acid mixtures used in Study A ranges from 1-2 and thus falls within the range of claim 1 (pH 1-5). Claim 1, as has been stated, does not limit the final pH of the compositions claimed or that of compositions in which the claimed antimicrobial compositions are used. In the opinion of the board, it is thus credible that the compositions in Study A render synergistic action of the acid mixture (compared

with the individual acids) credible, even when taking into account the possibility of some non-linear behaviour of the antimicrobial activity of the acids.

Consequently, the board is of the opinion that Study A, Study C, and Study 5 in the patent substantiate a synergistic effect of the antimicrobial compositions of claim 1.

The objective technical problem underlying the subject-matter of claim 1 thus has to be formulated as that of providing improved antimicrobial compositions for extending the shelf-life of water, feed or feed ingredients.

As regards the success of the solution proposed in claim 1, any potential failure to yield antimicrobial compositions when using very small amounts of the acid components (such as in Study 5 at a concentration of 0.01 for propionic acid/pelargonic acid at 95:5 or in O2) would, in the opinion of the board, not lead to the conclusion that the posed technical problem would not have been solved across the full scope of claim 1; a skilled person could determine, by orienting trials, which threshold concentrations would be required for a given acid combination in order to still provide an antimicrobial effect (which is required by the wording of claim 1).

Said threshold concentrations appear to be dependent on the microbe species under scrutiny (cf. the results described in O2) and can be determined by a skilled person. Claim 1 does not require antimicrobial activity against all kinds of bacteria either.

Moreover, as already outlined under point 2.3.4 above, the board considers it plausible that the antimicrobial compositions of claim 1 are not only suitable for extending the shelf-life of water, but can also reduce microbial growth on feed or feed ingredients as a substrate.

Therefore, the board takes the view that the objective technical problem is solved essentially across the full scope of claim 1.

3.4 Obviousness of the solution

3.4.1 Document O3 is primarily concerned with providing antimicrobial compositions for the treatment of hoof diseases (cf. paragraph [0002] of O3). Further fields of application for the acid compositions featured in O3 are, according to paragraph [0020], hand sanitisers, skin cleansers, surgical scrubs, wound care agents, disinfectants, bath/shower gels, and hard surface sanitisers. Said fields of application seem to primarily relate to the treatment of surfaces. The use of the compositions as preservatives for food or animal feed and water is not described in O3. Therefore, the question arises as to whether a skilled person would adopt the proposed solution in view of O3 either taken in isolation or in any combination with the prior-art documents O4 to O8 in order to arrive at improved antimicrobial compositions for extending the shelf-life of water, feed or feed ingredients.

3.4.2 O3 does not discuss this matter and does not mention any potential improvement when using different carboxylic acids in terms of antimicrobial activity. This improvement is neither explicitly nor implicitly derivable from O3. In the opinion of the board, the

document thus gives no incentive to a skilled person to consult further documents as secondary sources of information (such as O4-O8) in order to arrive at a composition falling within the scope of claim 1 of the patent. In particular, the concentration ranges disclosed in Examples 2 and 3 of O3 for the germicide agent (including in a list nonanoic acid = pelargonic acid) and the pH-adjusting agent (including acetic acid, *inter alia*) are generic, and the relative amounts of the acids relative to the total acid content are not disclosed in O3.

Consequently, the board takes the view that the subject-matter of claim 1 is not obvious to a skilled person from O3.

- 3.4.3 Even assuming that a skilled person would have consulted O6, the following considerations apply in the view of the board: the passage on page 9, lines 2-11 of said document cited by the appellant suggests using pelargonic acid in amounts of at least 30 mass/wt. % and preferably at least 50 wt. % of the total antimicrobial constituents in the mixtures. O6 proposes that these could be used in combination with other antimicrobials. O6 mentions that a synergistic effect could be obtained for pelargonic acid *possibly* in admixture with other antimicrobial agents. A list of useful antimicrobial agents then follows on page 9, lines 9-14 of O6, including sorbic acid and salts of this acid, propionic acid and salts of this acid, polyethylene glycol, polyphosphates, and metabisulfite. As argued by the respondent, the only specific synergistic behaviour of antimicrobial components described in O6 is mentioned on page 2, lines 12-15 in the context of animal feed preservation. At this point, no combination of pelargonic acid with propionic and/or acetic acid is featured, but the edible organic acid is

always present alongside a sugar (fructose) and an antimycotic, such as sorbic acid. These three constituents appear to provide the synergistic bactericidal action.

Hence, the board takes the view that a skilled person studying O6 in order to develop improved antimicrobial compositions for food and feed would realistically be directed to ingredient combinations which have already been proven to exhibit synergy, such as combinations of an organic acid with a sugar and sorbic acid described on page 2 of O6, and not to combinations of pelargonic acid with propionic acid.

Moreover, O6 points towards amounts of at least 30 wt. % of pelargonic acid of the antimicrobial constituents in the mixtures, whereas, in claim 1, the amount of pelargonic acid in the total acid content, typically making up the antimicrobial components of claim 1 of the patent, is limited to 20 wt. %. Hence, even when choosing the combination of pelargonic acid with propionic acid in O6 (based on the teaching on page 9, lines 2-14 of said document), a skilled person realistically would not arrive at the subject-matter of claim 1 of the patent.

O7 mentions (last paragraph on page 2) that organic acids have exhibited synergy when used in combination with other compounds. Pelargonic acid in combination with acetic acid and/or propionic acid, however, is not mentioned in O7 in the context of an improved antimicrobial effect.

The appellant also argued that O4 taught that pelargonic acid had no antimicrobial effect at pH 6 or higher, as was disclosed in figure 1 of O4.

In the opinion of the board, the demonstrated antimicrobial activity of the claimed compositions at a pH value of even around pH 7 is indeed surprising in view of 04. In the opinion of the board, this argument is instead in favour of inventive merit of the subject-matter of claim 1 and not against it.

The board concludes that the subject-matter of claim 1 is not obvious to a skilled person in view of the prior art and thus involves an inventive step.

It is for these reasons that the subject-matter of the main request meets the requirements of Article 56 EPC. Consequently, the ground for opposition of lack of inventive step (Article 100(a) EPC in combination with Article 56 EPC) does not prejudice the maintenance of the patent in suit.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



A. Nielsen-Hannerup

A. Haderlein

Decision electronically authenticated