

ADOPTED: 15 May 2019

doi: 10.2903/j.efsa.2019.5727

Safety and efficacy of VevoVital[®] (benzoic acid) as feed additive for pigs for fattening

EFSA Panel on Additives and Products or Substances used in Animal Feed (FEEDAP), Vasileios Bampidis, Giovanna Azimont, Maria de Lourdes Bastos, Henrik Christensen, Birgit Dusemund, Maryline Kouba, Mojca Kos Durjava, Marta López-Alonso, Secundino López Puente, Francesca Marcon, Baltasar Mayo, Alena Pechová, Mariana Petkova, Fernando Ramos, Yolanda Sanz, Roberto Edoardo Villa, Ruud Woutersen, Andrew Chesson, Jürgen Gropp, Giovanna Martelli, Derek Renshaw, Gloria López-Gálvez and Alberto Mantovani

Abstract

The Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) was asked to deliver a scientific opinion on the safety and efficacy of VevoVital[®] (benzoic acid) as a zootechnical feed additive for pigs for fattening. The additive is currently authorised for pigs for fattening with the effect of 'urinary pH decrease' at the minimum and maximum use of 5,000 and 10,000 mg/kg complete feed, respectively. The current application intends to support the use of the additive with the specific effect of 'improvement of performance parameters' at the minimum dose of 3,000 mg additive/kg complete feed, and keeping the same other conditions as for the use already authorised. The FEEDAP Panel assessed already the safety of the product when used in pigs for fattening in 2007 and 2017. The Panel confirms its former assessments that VevoVital[®] used as a feed additive in pigs for fattening at the maximum level of 10,000 mg/kg is considered as safe for pigs for fattening, consumers of food derived from pigs fed the additive and the environment. VevoVital[®] does not pose a risk by inhalation to users and is not a skin sensitiser but is a skin irritant and a severe eye irritant. Based on the results of three efficacy studies, the FEEDAP Panel concluded that VevoVital[®] has the potential to increase the performance in pigs for fattening at the level of 3,000 mg/kg complete feed.

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Keywords: zootechnical additive, other zootechnical additives, VevoVital[®], benzoic acid, pigs for fattening, performance improvement, efficacy

Requestor: European Commission

Question number: EFSA-Q-2017-000648

Correspondence: feedap@efsa.europa.eu

Panel members: Giovanna Azimonti, Vasileios Bampidis, Maria de Lourdes Bastos, Henrik Christensen, Birgit Dusemund, Maryline Kouba, Mojca Kos Durjava, Marta López-Alonso, Secundino López Puente, Francesca Marcon, Baltasar Mayo, Alena Pechová, Mariana Petkova, Fernando Ramos, Yolanda Sanz, Roberto Edoardo Villa and Ruud Woutersen.

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Acknowledgements: The FEEDAP Panel wishes to thank the following for the support provided to this scientific output (in alphabetical order of the last name): Montserrat Anguita, Roseella Brozzi, Jaume Galobart, Lucilla Gregoretti, Matteo L. Innocenti, Konstantinos Sofianidis, Jordi Tarrés-Call and Maria Vittoria Vettori.

Suggested citation: EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), Bampidis V, Azimont G, Bastos ML, Christensen H, Dusemund B, Kouba M, Kos Durjava M, López-Alonso M, López Puente S, Marcon F, Mayo B, Pechová A, Petkova M, Ramos F, Sanz Y, Villa RE, Woutersen R, Chesson A, Gropp J, Martelli G, Renshaw D, López-Gálvez G and Mantovani A, 2019. Scientific Opinion on the safety and efficacy of VevoVitall® (benzoic acid) as feed additive for pigs for fattening. *EFSA Journal* 2019;17(6):5727, 10 pp. <https://doi.org/10.2903/j.efsa.2019.5727>

ISSN: 1831-4732

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The EFSA Journal is a publication of the European Food Safety Authority, an agency of the European Union.



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1. Introduction

1.1. Background and Terms of Reference

Regulation (EC) No 1831/2003¹ establishes the rules governing the Community authorisation of additives for use in animal nutrition. In particular, Article 4(1) of that Regulation lays down that any person seeking authorisation for a feed additive or for a new use of a feed additive shall submit an application in accordance with Article 7.

The European Commission received a request from DSM Nutritional Products AG represented in the EU by DSM Nutritional Products Sp. Z.o.o. Poland² for authorisation of the product VevoVitall® (benzoic acid), when used as a feed additive for pigs for fattening (category: zootechnical additives; functional group: other zootechnical additives).

According to Article 7(1) of Regulation (EC) No 1831/2003, the Commission forwarded the application to the European Food Safety Authority (EFSA) as an application under Article 4(1) (authorisation of a feed additive or new use of a feed additive). EFSA received directly from the applicant the technical dossier in support of this application. The particulars and documents in support of the application were considered valid by EFSA as of 17 October 2017.

According to Article 8 of Regulation (EC) No 1831/2003, EFSA, after verifying the particulars and documents submitted by the applicant, shall undertake an assessment in order to determine whether the feed additive complies with the conditions laid down in Article 5. EFSA shall deliver an opinion on the safety for the target animals, consumer, user and the environment and on the efficacy of the product VevoVitall® (benzoic acid), when used under the proposed conditions of use (see Section 3.1.2).

1.2. Additional information

The additive VevoVitall® (benzoic acid) consists of 99.9% benzoic acid.

The Scientific Committee on Animal Nutrition (SCAN) issued an opinion on the efficacy of this additive, the impact on products of animal origin, and the safety for pigs for fattening, consumer and user and the environment (EC, 2002).

EFSA has issued five opinions on the safety and efficacy of VevoVitall® for weaned piglets (EFSA, 2005; EFSA FEEDAP Panel, 2011a), pigs for fattening (EFSA, 2007) pigs for reproduction (EFSA FEEDAP Panel, 2012a, 2015) and minor porcine species (EFSA FEEDAP Panel, 2017a). Furthermore, an opinion on VevoVitall® for the renewal of the authorisation for weaned piglets and pigs for fattening has also been issued (EFSA FEEDAP Panel, 2017b).

The product from the applicant, either as VevoVitall® or as benzoic acid, is authorised in the European Union as a zootechnical additive:

- for weaned piglets³ and minor porcine species for fattening and for reproduction⁴ at the maximum content of 5,000 mg/kg complete feedingstuffs, and
- for pigs for fattening³ and sows⁵ at the minimum and maximum content of 5,000 and 10,000 mg/kg complete feedingstuffs, respectively.

The safety and efficacy of VevoVitall® as a zootechnical additive for pigs for fattening has been assessed by the FEEDAP Panel (EFSA, 2007; EFSA FEEDAP Panel, 2017b); regarding efficacy, the claim of 'urinary pH decrease' was positively established at the minimum and maximum dose of 5,000 and 10,000 mg VevoVitall®/kg complete feed, respectively.

¹ Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition. OJ L 268, 18.10.2003, p. 29.

² DSM Nutritional Products Sp. z o.o., Tarczynska 113, 96-320 Mszczonow, Poland.

³ Commission Implementing Regulation (EU) 2018/1550 of 16 October 2018 concerning the renewal of the authorisation of benzoic acid as a feed additive for weaned piglets and pigs for fattening and repealing Regulations (EC) No 1730/2006 and (EC) No 1138/2007 (holder of authorisation DSM Nutritional Products Ltd). OJ L 260, 17.10.2018, p.3.

⁴ Commission Implementing Regulation (EU) 2018/983 of 11 July 2018 concerning the authorisation of benzoic acid as a feed additive for minor porcine species for fattening and for reproduction (holder of authorisation DSM Nutritional Products Sp. z o.o.). OJ L 176, 12.7.2018, p.17.

⁵ Commission Implementing Regulation (EU) 2016/900 of 8 June 2016 concerning the authorisation of benzoic acid as a feed additive for sows (holder of authorisation DSM Nutritional Product Sp. z o.o.). OJ L 152, 9.6.2016, p.18.

30.3 mg/kg additive and for the sum of biphenyls 64.7 mg/kg, while toluene was not detected.¹⁴ Thus, the product complied with the specifications provided by the applicant for impurities, which coincide with the limits foreseen in the product authorisation for phthalic acid (≤ 100 mg/kg) and biphenyls (≤ 100 mg/kg), and for toluene with the limits proposed by the VICH (Veterinary International Cooperation on Harmonisation of technical requirements for registration of medicinal products) on residual solvents in products for veterinary use.¹⁵

3.1.1. Stability and homogeneity

The stability and homogeneity of VevoVital[®] have been already evaluated in previous EFSA opinions. The applicant submitted copies of these studies in the new dossier.^{16,17} Only the studies that were updated are described below.

A continuation of two studies submitted in the dossier of 2011 was provided. A shelf-life of the additive of 24 months under controlled conditions at 25 or 30°C was confirmed.¹⁸ The stability of the additive in complete feed after pelleting (85°C) was demonstrated for 12 months.¹⁹

3.1.2. Conditions of use

VevoVital[®] is intended to be used in feed for pigs for fattening at a minimum and a maximum level of 3,000 and 10,000 mg/kg feed, respectively. The applicant also indicated that complementary feed containing benzoic acid may not be fed to animals as such and should be thoroughly mixed with other feed materials of the daily ration.

3.2. Safety

The recommended maximum dose (10,000 mg/kg feed) is the same as that authorised already for pigs for fattening. The applicant has submitted data to support the safety for the additive for target species, consumer, user/worker and the environment.

3.2.1. Safety for target animals

The safety of the additive from the same additive for pigs for fattening was first assessed by the FEEDAP Panel in 2007 based on a tolerance study, and subsequently confirmed with the renewal application in 2017 (EFSA, 2007; EFSA FEEDAP Panel, 2017b). The safety of VevoVital[®] for pigs for fattening was established at 10,000 mg/kg feed, with a margin of safety of less than 1.5.

3.2.2. Safety for the consumer

The safety for the consumer derived from the use of 10,000 mg VevoVital[®]/kg feed for pigs for fattening was first assessed by the FEEDAP Panel in 2007 and subsequently confirmed in 2017 (EFSA, 2007; EFSA FEEDAP Panel, 2017b).

The applicant made reference to a study not previously assessed by the FEEDAP Panel (Kristensen et al., 2009)²⁰ which showed that benzoic acid (at concentration 10,000 mg/kg feed) is rapidly absorbed and metabolised by the liver of pigs for fattening. Its conjugation with glycine is followed by efficient excretion as hippuric acid. These physiological mechanisms prevent accumulation of benzoic acid and hippuric acid in body fluids and tissues at the dietary level tested. These data support the previous conclusion of the FEEDAP Panel that the use of benzoic acid in pigs for fattening up to 10,000 mg/kg feed does not raise any concern for consumer safety.

3.2.3. Safety for the user

The safety of the additive for the user was first assessed in 2007 and subsequently reviewed in 2017. The FEEDAP Panel concluded that VevoVital[®] is a skin irritant and a severe eye irritant but is

¹⁴ Limit of detection of the analytical method: 2 mg/kg.

¹⁵ VICH GL18(R) (IMPURITIES SOLVENTS). June 2011. Available online: <http://www.vichsec.org/component/attachments/attachments/154.html?task=download>

¹⁶ Technical Dossier/Section II/Annex 2-12.

¹⁷ Technical Dossier/Section II/Annex 2-10.

¹⁸ Technical Dossier/Section II/Annex 2-9.

¹⁹ Technical Dossier/Section II/Annex 2-11.

²⁰ Technical Dossier/Section III/Annex 3-29.

not a skin sensitiser. The Panel also concluded that handling the additive does not pose a risk by inhalation to users considering the low dustiness of the additive and the minimal fraction of respirable and inhalable dust; thus inhalation exposure is considered as very low.

3.2.4. Safety for the environment

The safety of the additive for the environment was first assessed in 2007 and subsequently confirmed in 2017. No concerns for the environment resulting from the use of the additive at 10,000 mg/kg feed are expected.

The applicant provided the results of three literature searches, examining the databases Scopus and PubMed. The first search²¹ covered the period from January 2012 until August 2015 and the following keywords were used: 'benzoic', 'benzoate', 'hippuric', 'air', 'soil', 'water' and 'environment'. The second search²² covered the period from January 2012 until July 2016; the following keywords were used: 'benzoic', 'benzoate', 'hippuric', 'environmental toxicity' and 'ecotoxicity'. The third search²³ covered the period from June 2016 until July 2017; the following keywords were used: 'benzoate', 'benzoic', 'hippuric', 'environment', 'air', 'water', 'soil' and 'ecotoxicity'. These searches did not return any relevant hit, and thus the previous conclusion on the safety for the environment is retained.

3.3. Efficacy for pigs for fattening

In the current application, the applicant claims the specific effect of *improvement of performance parameters: weight gain or feed to gain ratio* in pigs for fattening at the minimum dose of 3,000 mg VevoVital[®]/kg complete feed.

To support efficacy of the additive, four efficacy studies with pigs for fattening were submitted; three of the studies were performed in two EU Member States and another one outside the EU. One of the studies could not be considered because of a failure in the feed delivery recording system during the trial which did not allow the measurement of the feed intake.²⁴

The design of the three assessed studies was very similar, with a control group given the basal diet compared to a treated group given the basal diet supplemented with VevoVital[®] at the minimum recommended level of 3,000 mg/kg complete feed. Pigs were initially fed a starter diet and, subsequently, a finisher diet, both offered on an *ad libitum* basis. The benzoic acid concentration in the diets was analytically confirmed. Details on the study designs are given in Table 1.

Table 1: Details of the designs of the three studies conducted with VevoVital[®] with pigs for fattening

Study	Total number of animals Replicates per treatment/Pigs per replicate	Average initial body weight (kg)	Genotype Sex	Basal diet composition	Study Duration (days)
1 ⁽⁵⁾	288 ⁽¹⁾ 16/6	36.1	PIC L1050 castrated ♂	Corn–soybean	70 ⁽²⁾
2 ⁽⁶⁾	480 12/20	32	Ratterow Landroc × PIC337 sire ♂♀	Wheat–barley– soybean–rapeseed	82 ⁽³⁾
3 ⁽⁷⁾	192 48/2	27.5	Topigs×Pietrain ♂♀	Wheat–barley– soybean–rapeseed	119 ⁽⁴⁾

(1): Besides control and treatment at 3,000 mg VevoVital[®]/kg complete feed, a treatment of 5,000 mg/kg complete feed was included in the study.

(2): The animals received a grower feed until day 35 and then a finisher feed until day 70.

(3): The animals received a grower feed until day 43 or 44, and then a finisher feed until day 82.

(4): The animals received a grower feed until day 42 and then a finisher feed until day 119.

(5): Technical Dossier/Section IV/Annex 4-2.

(6): Technical Dossier/Section IV/Annex 4-5 and Technical Dossier/Supplementary Information/Appendix 6,

(7): Technical Dossier/Supplementary Information/Appendix 7,

²¹ Technical Dossier/Section II/Annex 3-49.

²² Technical Dossier/Section II/Annex 3-50.

²³ Technical Dossier/Section II/Annex 3-51.

²⁴ Technical Dossier/Section IV/Annex 4-4.

Health status, mortality and culling were monitored throughout the studies. Body weight was measured individually at the beginning, at transfer from grower to finisher feed (day 35 for study 1, day 43 or 44 for study 2 and day 44 for study 3) and at the end of each study. Feed intake per pen was monitored. Average daily gain (ADG) and feed conversion rate (Feed:Gain) were calculated.

Regarding statistical analysis, for Study 1 an analysis of variance (ANOVA) was done with the data considering the effect of the diet and the block; mean groups were compared with Tukey test. For Study 2, an ANOVA was done with the data considering sex, treatment and block as fixed effects. For Study 3 an ANOVA was done with the data considering the effect of the diet, sex and the barn. In all cases, the experimental unit was the pen and the significance level was set at 0.05.

The summary of the performance data from the three efficacy studies conducted with VevoVital[®] are shown in Table 2. Mortality/culling was low in all studies and no related to treatments. The results showed that the addition of 3,000 mg VevoVital[®]/kg complete feed led to a significant improvement of average daily gain (in the three studies evaluated) and feed to gain ratio (in studies 1 and 2).

Table 2: Summary of the results of three efficacy studies performed with the additive VevoVital[®] in diets of pigs for fattening

Study No (Duration)	mg VevoVital [®] /kg feed	Average daily feed intake (kg)	Final body weight (kg)	Average daily gain (kg/d)	Feed: Gain	Mortality and culls (%)
1 (70 days)	0	2,787	109.0 ^a	1.048 ^a	2.66 ^a	2.1
	3,000	2,860	113.8 ^b	1.110 ^b	2.58 ^b	3.1
	5,000	2,844	113.5 ^b	1.103 ^b	2.58 ^b	0
2 (82 days)	0	2,200	103.8 ^a	0.872 ^a	2.53 ^a	1.7
	3,000	2,262	107.7 ^b	0.909 ^b	2.50 ^b	1.3
3 (119 days)	0	2,212	128.7	0.852 ^a	2.60	2.1
	3,000	2,275	132.7	0.884 ^b	2.57	2.1

a,b: Within a study and a given parameter, means with different superscripts are significantly different ($p < 0.05$).

3.3.1. Conclusions on efficacy for pigs for fattening

The FEEDAP Panel concludes that VevoVital[®] has the potential to increase the performance in pigs for fattening at the dose of 3,000 mg/kg complete feed.

3.4. Post-market monitoring

The FEEDAP Panel considers that there is no need for specific requirements for a post-market monitoring plan other than those established in the Feed Hygiene Regulation²⁵ and Good Manufacturing Practice.

4. Conclusions

The FEEDAP Panel confirms its former assessments that VevoVital[®] used as a feed additive in pigs for fattening at the maximum level of 10,000 mg/kg is considered as safe for pigs for fattening, consumers of food derived from pigs fed the additive and the environment.

VevoVital[®] does not pose a risk by inhalation to users and is not a skin sensitiser but is a skin irritant and a severe eye irritant.

VevoVital[®] has the potential to increase the performance in pigs for fattening at the level of 3,000 mg/kg complete feed.

²⁵ Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 laying down requirements for feed hygiene. OJ L 35, 8.2.2005, p. 1.

Documentation provided to EFSA/Chronology

Date	Event
31/08/2017	Reception mandate from the European Commission
05/09/2017	Dossier received by EFSA. VevoVital [®] (benzoic acid) for pigs for fattening. September 2017. Submitted by DSM Nutritional Products Ltd.
17/10/2017	Application validated by EFSA – Start of the scientific assessment
17/01/2018	Comments received from Member States
08/05/2018	Request of supplementary information to the applicant in line with Article 8(1)(2) of Regulation (EC) No 1831/2003 – Scientific assessment suspended. <i>Issues: characterisation and efficacy</i>
27/03/2019	Reception of supplementary information from the applicant - Scientific assessment re-started
15/05/2019	Opinion adopted by the FEEDAP Panel. End of the Scientific assessment

References

- EC (European Commission), 2002. Opinion of the Scientific Committee on Animal Nutrition on the use of benzoic acid in feedstuffs for pigs for fattening. Available online: https://ec.europa.eu/food/sites/food/files/safety/docs/animal-feed_additives_rules_scan-old_report_out100.pdf
- EFSA (European Food Safety Authority), 2005. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) on the safety and efficacy of the product VevoVital[®] as a feed additive for weaned piglets in accordance with Regulation (EC) No 1831/2003. EFSA Journal 2005;3(12):290, 13 pp. <https://doi.org/10.2903/j.efsa.2005.290>
- EFSA (European Food Safety Authority), 2007. Opinion of the Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) on the safety and efficacy of VevoVital[®] (benzoic acid) as feed additive for pigs for fattening. EFSA Journal 2007;5(3):457, 14 pp. <https://doi.org/10.2903/j.efsa.2007.457>
- EFSA (European Food Safety Authority), 2008. Technical Guidance of the Scientific Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) for assessing the safety of feed additives for the environment. EFSA Journal 2008;6(10):842, 28 pp. <https://doi.org/10.2903/j.efsa.2008.842>
- EFSA ANS Panel (EFSA Panel on Food Additives and Nutrient Sources Added to Food), 2016. Scientific Opinion on the re-evaluation of benzoic acid (E 210), sodium benzoate (E 211), potassium benzoate (E 212) and calcium benzoate (E 213) as food additives. EFSA Journal 2016;14(3):4433, 110 pp. <https://doi.org/10.2903/j.efsa.2016.4433>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2011a. Scientific Opinion on modification of the terms of authorisation of VevoVital[®] (benzoic acid) as a feed additive for weaned piglets. EFSA Journal 2011;9(9):2358, 9 pp. <https://doi.org/10.2903/j.efsa.2011.2358>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2011b. Technical guidance: Tolerance and efficacy studies in target animals. EFSA Journal 2011;9(5):2175, 15 pp. <https://doi.org/10.2903/j.efsa.2011.2175>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2012a. Scientific Opinion on the safety and efficacy of VevoVital[®] (benzoic acid) as feed additive for pigs for reproduction. EFSA Journal 2012;10(7):2775, 11 pp. <https://doi.org/10.2903/j.efsa.2012.2775>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2012b. Guidance for the preparation of dossiers for zootechnical additives. EFSA Journal 2012;10(1):2536, 19 pp. <https://doi.org/10.2903/j.efsa.2012.2536>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2012c. Guidance for establishing the safety of additives for the consumer. EFSA Journal 2012;10(1):2537, 12 pp. <https://doi.org/10.2903/j.efsa.2012.2537>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2012d. Guidance on studies concerning the safety of use of the additive for users/workers. EFSA Journal 2012;10(1):2539, 5 pp. <https://doi.org/10.2903/j.efsa.2012.2539>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), 2015. Scientific Opinion on the safety and efficacy of VevoVital[®] (benzoic acid) as a feed additive for pigs for reproduction (gestating and lactating sows, boars and gilts). EFSA Journal 2015;13(7):4157, 7 pp. <https://doi.org/10.2903/j.efsa.2015.4157>
- EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), Rycken G, Aquilina G, Azimonti G, Bampidis V, Bastos ML, Bories G, Chesson A, Cocconcelli PS, Flachowsky G, Gropp J, Kolar B, Kouba M, López-Alonso M, Mantovani A, Mayo B, Ramos F, Saarela M, Villa RE, Wallace RJ, Wester P, Martelli G, Renshaw D, López-Gálvez G and López Puente S, 2017a. Scientific Opinion on the safety and efficacy of VevoVital[®] (benzoic acid) as feed additive for minor porcine species. EFSA Journal 2017;15(10):5026, 7 pp. <https://doi.org/10.2903/j.efsa.2017.5026> ISS

EFSA FEEDAP Panel (EFSA Panel on Additives and Products or Substances used in Animal Feed), Rychen G, Aquilina G, Azimonti G, Bampidis V, Bastos ML, Bories G, Chesson A, Cocconcelli PS, Flachowsky G, Gropp J, Kolar B, Kouba M, López-Alonso M, Mantovani A, Mayo B, Ramos F, Saarela M, Villa RE, Wallace RJ, Wester P, Martelli G, Renshaw D, López-Gálvez G and López Puente S, 2017b. Scientific Opinion on the assessment of the application for renewal of authorisation of VevoVital[®] (benzoic acid) as feed additive for weaned piglets and pigs for fattening. EFSA Journal 2017;15(12):5093, 13 pp. <https://doi.org/10.2903/j.efsa.2017.5093>

Kristensen NB, Nørgaard JV, Wamberg S, Engbæk M, Fernández JA, Zacho HD and Poulsen HD, 2009. Absorption and metabolism of benzoic acid in growing pigs. Journal of Animal Science, 87, 2815–2822.

Abbreviations

ANOVA	analysis of variance
ADG	average daily gain
EURL	European Union Reference Laboratory
FEEDAP	EFSA Panel on Additives and Products or Substances used in Animal Feed
SCAN	Scientific Committee on Animal Nutrition
VICH	Veterinary International Cooperation on Harmonisation