5.11 FENAMIDONE (264)

TOXICOLOGY

Fenamidone was evaluated by JMPR in 2013, when an ADI of 0–0.03 mg/kg bw and an ARfD of 1 mg/kg bw were established. The 2013 Meeting also evaluated toxicological data on the metabolites RPA 412636, RPA 410193 and RPA 412708, which are found in crops. Metabolites RPA 412636 and RPA 412708 are also present in rat urine and bile, respectively, whereas metabolite RPA 410193 is a novel plant metabolite. The 2013 Meeting concluded that these three metabolites are toxicologically significant but made no explicit statement about their respective potencies relative to fenamidone or the applicability of the ADI and ARfD for fenamidone to these metabolites.

Toxicological data on metabolites and/or degradates

Table 1 summarizes the toxicological data on fenamidone and the metabolites evaluated by the 2013 JMPR.

Table 1 Toxicological profile of fenamidone and its metabolites

Metabolite	Description	Toxicological profile
RPA 412636	Rat urine metabolite (< 1% of an administered dose)	Oral LD_{50} = 1 520 mg/kg bw (rat)
		Unlikely to be genotoxic
		14-day study of toxicity: NOAEL = 90 mg/kg bw per day (rat)
		90-day study of toxicity: NOAEL = 6.4 mg/kg bw per day (rat)
RPA 410193	Novel plant metabolite	Oral LD_{50} > 2 000 mg/kg bw (rat)
		Unlikely to be genotoxic
		14-day study of toxicity: NOAEL = 30 mg/kg bw per day (rat)
		90-day study of toxicity: NOAEL = 93.3 mg/kg bw per day (rat)
RPA 412708	Rat bile metabolite (> 10% of an administered dose)	Oral LD_{50} = 100–200 mg/kg bw (rat)
		Unlikely to be genotoxic
		14-day study of toxicity: NOAEL = 147.3 mg/kg bw per day (rat)
Fenamidone	Parent compound	Oral LD_{50} > 2 000 mg/kg bw (rat)
		30-day study of toxicity: NOAEL = 30 mg/kg bw per day (rat)
		90-day study of toxicity: NOAEL = 73.5 mg/kg bw per day (rat)
		2-year study of toxicity: NOAEL = 2.8 mg/kg bw per day (rat)

Toxicological evaluation

The current Meeting concluded that RPA 412636 is an order of magnitude more toxic than fenamidone over 90 days of dietary exposure in rats and that RPA 412708 is an order of magnitude more acutely toxic than fenamidone based on differences in LD_{50} values. The analytical method used converts RPA 412708 to RPA 412636, and both compounds are measured together as RPA 412636. On this basis, it was concluded that a 10-fold potency factor should be applied to both the acute and chronic dietary intake estimates for RPA 412636 and that these acute and chronic dietary intake estimates should be added to the acute and chronic dietary intakes of fenamidone and compared with the ARfD and ADI for fenamidone, respectively. The novel plant metabolite, RPA 410193, was concluded to have similar potency to fenamidone and would be covered by the reference doses for fenamidone.

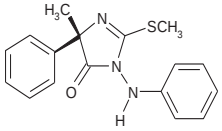
An addendum to the toxicological monograph was not prepared.

RESIDUE AND ANALYTICAL ASPECTS

Fenamidone is a broad-spectrum fungicide belonging to the imidazolinone group. The compound was evaluated the first time by the 2013 JMPR for toxicology where an ADI of 0–0.03 mg/kg bw and an ARfD of 1 mg/kg bw was allocated. The evaluation for residues was scheduled for the 2014 JMPR.

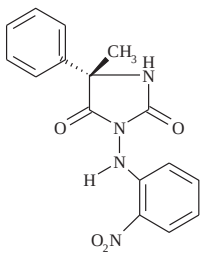
The current Meeting received information on physical and chemical properties, metabolism studies on animals and plants, environmental fate including rotational crops data, analytical methods, use pattern, supervised trials data, processing and feeding studies.

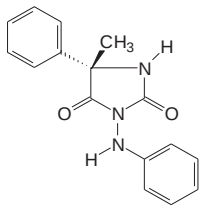
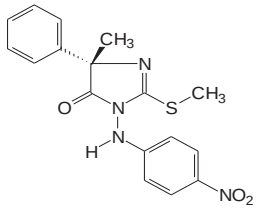
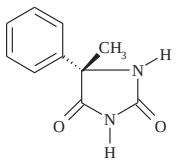
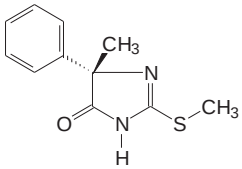
The active substance fenamidone is the S-enantiomer of a stereoisomeric molecule with the chiral centre in the 5-position of the dihydro-imidazolone ring. This S-enantiomer has been shown to be the biologically (fungicidally) active enantiomer.

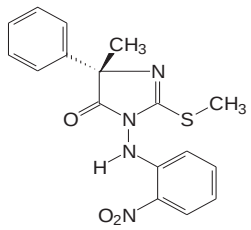
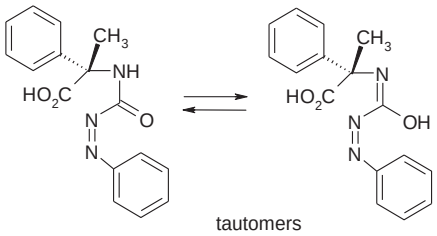


The chiral carbon atom on the 5-position of the dihydro-imidazolone ring is substituted by 4 non-hydrogen substituents, namely substituted by an amino, carbonyl, methyl and phenyl group. Prerequisite for isomerisation/racemisation of this type of centre of chirality is the presence of a hydrogen atom as a substituent that can be split off easily. In fenamidone, no hydrogen is linked to the chirality centre. Therefore, racemisation is chemically not possible and the configuration and the optical purity, respectively, established by synthesis does not change afterwards. There was also no evidence of enantiomerization or racemization of the parent substance and its metabolites during metabolic conversions in plants and animals or physical-chemical degradation in soil and water.

In this document, the code names of the S-enantiomers were used of the metabolites identified:

Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
RPA 221701  (5*S*)-5-methyl-3-[(2-nitrophenyl)amino]-5-phenyl- 2,4-imidazolidinedione (IUPAC)	$C_{16}H_{14}N_4O_4$ 326.3 g mol^{-1} <u>S-Enantiomer</u>: RPA 221701 AE 0591777 BCS-AX84897 2,4-imidazolidinedione, 5-methyl-3-[(2-nitrophenyl)-amino]-5-phenyl-, (5*S*)- <u>Racemate</u>: RPA 410995 AE 0591778	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard
RPA 410193	$C_{16}H_{15}N_3O_3$ 281.3 g mol^{-1} <u>S-Enantiomer</u>: RPA 410193 AE 0540049 BCS-AX71129	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Vine grapes, Lettuce,

Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
 (*S*)-5-Methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (IUPAC)	Diketo-fenamidone (DK-Fen) Racemate: RPA 405862 AE C650488	Tomato, Potato, Carrot Hen
RPA 411639  (5*S*)-5-methyl-2-(methylthio)-3-(4-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC)	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 411639 AE 0540054 BCS-AX71134 Racemate: RPA 406012 AE 0540056	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard Rat (postulated intermediate)
RPA 412636  (*S*)-5-methyl-5-phenyl-2,4-imidazolidine-dione (IUPAC) 2,4-imidazolidinedione, 5-methyl-5-phenyl-, (5*S*) (CAS)	$C_{10}H_{10}N_2O_2$ 190.2 g mol^{-1} S-Enantiomer: RPA 412636 AE 0540051 BCS-AX71131 " fenamidone-hydantoin" Desanilino-diketo-fenamidone (DADK-Fen) Racemate: RPA 717879 AE C415557	Soil, aerobic Soil, photolysis Water / sediment Lettuce, Potato, Rotational crops: Wheat, Turnip, Swiss chard Rat, Goat, Hen
RPA 412708  (5*S*)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (IUPAC)	$C_{11}H_{12}N_2OS$ 220.9 g mol^{-1} S-Enantiomer: RPA 412708 AE 0540050 BCS-AX71130 Desanilino-fenamidone (DA-Fen) Racemate: RPA 408056 AE 0540057	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Photolysis, nat. water Water / sediment Lettuce, Potato Rat, Goat, Hen
RPA 413255	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 413255	Soil, aerobic Soil, photolysis

Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
 (5S)-5-methyl-2-(methylthio)-3-(2-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC)	AE 0540053 BCS-AX71133 Racemate: RPA 410914 AE 0540055	Carrot Rotational crops: Turnip, Swiss chard
RPA 413350  tautomers 2-phenyl-N-{[(E)-phenyldiazenyl]carbonyl}-D-alanine (IUPAC)	$C_{16}H_{15}N3O_3$ 297.3 g mol^{-1} S-Enantiomer: RPA 413350 AE 0540052 BCS-AX71132 Racemate: RPA 409344 AE 0841910	Hydrolysis, abiotic

Animal metabolism

Metabolism studies on rats reviewed by the 2013 JMPR show that fenamidone undergoes extensive metabolism in the rat by phase I (oxidation, reduction and hydrolysis) and phase II reactions (conjugation). The plasma elimination half-life was at least 60 hours. More than 20 metabolites were detected in rat excreta, with the majority of radioactivity excreted in the faeces (up to approximately 90% of the administered dose) and the remainder in urine. Mass balance data indicated that the majority of radioactivity (> 80%) was eliminated within 48 hours of dosing. The metabolites RPA 412636 and RPA 412708 were present in rat urine and rat bile, respectively.

Metabolism studies have been conducted in lactating goats. Two dose levels were used for each label position: 1 ppm and 10.4 ppm in the diet for [C-phenyl-U-^{14}C]-fenamidone and 1.5 ppm and 11.5 ppm in the diet for [N-phenyl-U-^{14}C]-fenamidone. Dosing was performed twice daily by capsule during seven consecutive days. The total administered radioactivity (TAR) was quickly and almost completely eliminated in the excreta. In case of the C-phenyl label, the total excreted residues were 99–102% of TAR (75–80% via faeces, 17–26% via urine, 0.1% via milk). In case of the N-phenyl label, the total excreted residues were ca. 90% of TAR (45–52% via faeces, 36–40% via urine, 0.1–0.2% via milk). Neither fenamidone nor any of its metabolites accumulated in milk fat or milk proteins. At sacrifice, small amounts of radioactivity (totally 0.6 to 1.0% of TAR) were detected in edible organs/tissues and blood.

Residues in milk and edible tissues of goats were low. RPA 412708 and RPA 412636 were found, as well as hydroxylated fenamidone and hydroxylated RPA 412708. RPA 412636 was the most abundant residue in the goat, reaching after high dose administration 0.055 mg/kg (5.9% TRR) in liver, 0.018 mg/kg (15% TRR) in kidney and 0.002 mg/kg in milk (11% TRR). Fenamidone was identified in fat with 0.013 mg/kg (53% TRR), but was a minor component in milk (0.001 mg/kg, 0.7% TRR), liver (0.003 mg/kg, 0.3% TRR) and kidney (0.001 mg/kg, 0.6% TRR).

Metabolism studies have been conducted in laying hens. Two dose levels were used for each label position: 1.3 ppm and 13.8 ppm in the diet for [C-phenyl-U-^{14}C]-fenamidone and 1.0 ppm and

9.8 ppm in the diet for [N-phenyl-U-^{14}C]-fenamidone. Dosing was performed by administration of one capsule per day during fourteen consecutive days. The TAR was quickly and almost completely eliminated in excreta. The recovery of radioactivity was > 91% of the TAR. The majority of the radioactivity was in excreta (approximately 90% TAR). All of the eggs together contained 0.1% of the dose administered, most of which was retained in the yolk. At sacrifice, at both dose levels and in both labels, very minor amounts of radioactivity (0.1% of TAR) were detected in edible organs/tissues and blood.

Residues in eggs and edible tissues of hens were low. RPA 412636 was a major component in the hen, found at 0.011 mg/kg (74% TRR) in egg white, 0.014 mg/kg in egg yolk (11% TRR), 0.023 mg/kg (15% TRR) in liver and 0.002 mg/kg (16% TRR) in skin after high dose administration. RPA 412708 was the highest residue in the hen, reaching 0.028 mg/kg (25% TRR) in egg yolk but only 0.002 mg/kg (1.3% TRR) in liver. Fenamidone was identified, but was a minor component (egg yolk 0.014 mg/kg, 11% TRR; liver 0.003 mg/kg, 1.7% TRR; fat < 0.001 mg/kg, 4.6% TRR and skin 0.002 mg/kg, 14% TRR).

The Meeting concluded that, in all species investigated, the TAR was quickly and almost completely eliminated in excreta. The metabolic profiles differ quantitatively between the species, but qualitatively there are no major differences; the routes and products of metabolism in animals were consistent across the studies. Fenamidone, RPA 412708 (desanilino-fenamidone) and RPA 412636 (desanilino-diketo-fenamidone) were the components identified.

Plant metabolism

The metabolism of fenamidone has been studied in grapes, tomatoes, lettuce, carrots and potatoes.

Grapes

Following four foliar treatments of [C-phenyl-U-^{14}C]-fenamidone to a total nominal rate of the equivalent of 1.65 kg ai/ha (0.5, 0.49, 0.5 and 0.16 kg ai/ha) to field grown grape vines during the grape berry development period, the terminal residue in the mature harvest grape bunches (1.2 mg eq/kg) was shown to comprise mainly parent compound (56% TRR) and RPA 410193 (17% TRR). The interval between the last application and harvest was 24 days. The major part of the radioactivity associated with the grape bunches could be extracted by methanol/water and represented 89% of the TRR. The non-extracted radioactivity was confined mainly to the stem, skin and pips. Further extraction procedures were made including enzyme treatment followed by acid and alkali hydrolysis (100% TRR).

The metabolism of fenamidone in grapes was characterised by the formation of RPA 410193, i.e. loss of the thiomethyl group and formation of an imidazolidinedione. Some evidence was obtained to suggest that hydroxylation of parent compound (3.4% TRR) as well of RPA 410193 (4.2% TRR) also occurred. A number of other metabolites were detected, albeit polar and at very low levels.

Tomatoes

The metabolism was investigated following three foliar applications of [^{14}C]-fenamidone, each of 0.5 kg ai/ha giving a total nominal application rate of 1.5 kg ai/ha on glasshouse grown tomatoes. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 7 days after the last treatment, the TRR in tomato fruits was less than 0.2 mg eq/kg for both labels. About 90% of the TRR was extracted and more than 75% identified.

The major component of the extracted radioactivity in both treatment regimes was unchanged parent accounting for 66–76% TRR. The next largest component was RPA 410193 accounting for 9.3–9.4% TRR. No metabolites were formed at significant levels as a result of cleavage of the two phenyl-rings.

Lettuce

The metabolism was investigated following four foliar applications of [^{14}C]-fenamidone, each of a nominal rate of 0.4 kg ai/ha on outdoor grown iceberg lettuce. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 7 days after the last treatment, a total of 93% and 92% of the TRR for the C-phenyl-label and N-phenyl-label treated final harvest lettuces respectively, was identified. The TRR found in the lettuce wrapper leaves (12 mg eq/kg) were significantly higher than that present in the lettuce heads (0.2–0.3 mg eq/kg).

Analysis of the extracted radioactive residues showed the major components of both labels to be parent fenamidone (about 92% TRR in whole lettuce). The remaining extracted radioactivity was comprised of RPA 410193 (0.59–0.66% TRR) and multiple unidentified polar components, which comprised less than 3% TRR in total in whole lettuce. In addition, low levels of RPA 412636 (2.7% TRR) were present in the C-phenyl-label treated lettuce head leaves extracts only.

Potatoes

The metabolism was investigated following three foliar applications of [^{14}C]-fenamidone, each of nominal 0.5 kg ai/ha on outdoor grown potatoes. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 14 days after the last treatment, the TRR in the tubers (0.038–0.087 mg eq/kg) was significantly lower than the levels detected in the leafy part of the plant (5.9–6.6 mg eq/kg) with 1.3% of the whole plant TRR being present in the root/tuber. A total of 73% TRR of the intact potato tubers and 77% TRR of the potato haulm could be extracted for C-phenyl-fenamidone treated plants at final harvest. The corresponding values for N-phenyl-fenamidone treated potatoes were 46% and 78% for intact potato tubers and potato haulm respectively.

In potato tubers, parent fenamidone accounted for 2.3 to 6% of TRR (0.002 mg/kg) and two further metabolites were formed: RPA 412708 (desanilino-fenamidone) and RPA 412636 (desanilino-diketo-fenamidone), each accounting for ca. 6% of TRR with low absolute concentrations (0.005–0.006 mg eq/kg). A large portion of the residue was polar in nature and reported to be composed by acid labile conjugates.

Carrots

The metabolism was investigated following three applications of [N-phenyl-U-^{14}C]-fenamidone, each of nominal 0.3 kg ai/ha on outdoor grown carrots. The first application was made pre-emergence followed by two foliar applications. At final harvest, 14 days after the last treatment, the TRR in leaves and roots amounted to 30.5 and 0.04 mg eq/kg, respectively. Therefore, basispetal transport of residues from the treated leaves to the roots was very limited. In leaves, 81% of the radioactivity could be extracted with acetonitrile/water using a high-speed blender and the rest by water/dichloromethane partition. In roots, 93% of the radioactivity was extracted with acetonitrile/water.

Fenamidone accounted in leaves for 89% of the TRR and in roots for 29% of the TRR. Six minor metabolites were identified. No metabolite in the roots exceeded a level of 0.01 mg/kg. Two parallel metabolic reactions were found and a combination thereof. The first reaction was an oxidative hydrolysis of the thiomethyl group at the dihydro imidazole ring to a keto substituent resulting in RPA 410193 (diketo-fenamidone). Another reaction was the nitration of the N-phenyl ring. All metabolites contained the intact basic structure with the two phenyl rings and the imidazole ring. No cleavage product, such as aniline, aminophenols or nitroanilines was detected. In addition, radiolabelled glucose was found in the leaves resulting from complete mineralization of the fenamidone in the soil and photosynthetic uptake of the formed $^{14}CO_2$ in the plant. Small amounts of a dimer of fenamidone (0.17% of TRR, 0.05 mg/kg) were also detected in leaves.

In summary, the metabolism of fenamidone in plants after foliar application was investigated in three crop categories: fruits and fruiting vegetables, leafy vegetables, root and tuber vegetables.

The metabolic pattern was shown to be similar in all these crop groups with the unchanged parent compound being the main compound of the final residue at harvest. The Meeting concluded that after foliar treatment the only significant metabolite in plants was RPA 410193 (diketo-fenamidone), formed by oxidative hydrolysis of the thiomethyl side chain of fenamidone.

Environmental fate

For fenamidone, data were received for foliar spray on permanent crops and on annual crops. A further application is on cotton seed as in furrow treatment. Therefore, according to the FAO manual, studies on the aerobic degradation in soil, photolysis, hydrolysis, rotational crops (confined, field) and field dissipation were evaluated. The fate and behaviour of fenamidone in soils was investigated using fenamidone radio-labelled in two different positions, [C-phenyl-U-^{14}C]- and [N-phenyl-U-^{14}C]-fenamidone.

Degradation in soil, photolysis and hydrolysis

Degradation of fenamidone in soil primarily proceeds by the action of aerobic soil microorganisms. In the first major pathway there is loss of the N-phenyl aniline ring to form RPA 412708, followed by loss of the S-methyl moiety and hydrolysis to form RPA 412636. Two further pathways are the concurrent formation of 2- and 4-nitro compounds by addition to parent to form RPA 413255 and RPA 411639. A further route of degradation results in the formation of numerous minor non-polar components. The rate of degradation tested in silty clay loam, sandy loam and in clay loam, is similar in both C-phenyl and N-phenyl rings with DT50s ranging from 0.9 to 9.6 days in all tested soils at 20 °C. The Meeting concluded that fenamidone was rapidly degraded in soil under aerobic conditions leading to the formation of two major metabolites RPA 412708 and RPA 412636.

Field dissipation studies undertaken at four European sites showed that the average half-lives were 5 days for fenamidone, 12 days for RPA 412708, 21 days for RPA 411639, 43 days for RPA 413255 and 47 days for RPA 412636. It can be concluded that the dissipation of fenamidone was rapid in the field.

The photolytic degradation of fenamidone was investigated on a sandy loam soil for 30 days. Artificial sunlight was provided using an artificial xenon light source for 13 hours each day. The Meeting recognized that photolytic processes do not contribute significantly to the degradation of fenamidone applied to the soil surface.

The hydrolytic degradation of fenamidone was examined in aqueous buffered solutions at pH values of 4, 5, 7 and 9 under sterile conditions at 25 °C. The Meeting recognized that fenamidone was stable at pH 5 and pH 7, but was hydrolysed at pH 4 and pH 9.

Rotational crops

One confined radiolabelled succeeding crop study was conducted in 2001 with [C-phenyl-U-^{14}C]-fenamidone. Following application to the soil at an application rate of 1.6–2.0 kg ai/ha, lettuce, turnip and barley were cultivated after three plant back intervals (30, 120/150 and 365 days). The residues in rotated plants comprised the following major metabolites: RPA 412636 and RPA 412708 and a conjugate thereof. The parent substance could not be detected. Residues of RPA 412636 were in lettuce ca. 20% of TRR at each plant back intervals, in turnip tops 3.5–11% of TRR, in turnip roots 5–8% of TRR and in barley grain 2–6% of TRR. The highest residues of RPA 412636 were found in barley straw with 2.04 mg/kg (29% TRR). RPA 412708 was found in lettuce at a maximum of 5.7% of TRR (0.04 mg/kg).

Two additional confined radiolabelled succeeding crop studies were carried out in 2013. Following application of 0.96 kg ai/ha [N-phenyl-U-^{14}C]-fenamidone and 0.97 kg ai/ha [C-phenyl-U-^{14}C]-fenamidone to the soil, wheat, turnip and Swiss chard were sown and cultivated at three plant back intervals (30, 191 and 324 days after soil treatment). Both labelled forms of fenamidone were

rapidly degraded in soil with extensive uptake of the metabolites into the plants. The parent compound was only detected in Swiss chard at 30 days plant back interval, however at a low level amounting to a maximum of 0.002 mg/kg (0.2% of TRR). It was not detected in other crops. The pathway is proposed as follows: Electrophilic nitration of the aniline ring formed fenamidone-2-nitro and fenamidone-4-nitro, most probably in the soil, with RPA 413255 (fenamidone-2-nitro) being further converted to RPA 221701 (fenamidone-desthiomethyl-2-nitro) following nucleophilic substitution and the addition of water. Conjugation with hexose and malonic acid and hydroxylation lead to the formation of fenamidone-hydroxy-nitro-malonyl-glycoside. Further conjugation with glutathione and nucleophilic substitution of methyl mercaptan also lead to the formation of fenamidone-nitro-GSH. In addition to these metabolites, the C-phenyl-labelled compound underwent further degradation of the aniline moiety of fenamidone-desthiomethyl-2-nitro to RPA 412636, again, most likely in the soil. Conjugation of RPA 412636 with glucose, hexose plus malonic acid and serine formed fenamidone-hydantoin-glucoside and fenamidone-hydantoin-serine.

The Meeting concluded that parent fenamidone is quickly degraded in soil or in the follow-on crops, not resulting in residues detected at harvest. Residues of RPA 412636, RPA 412708 and conjugates thereof were the major metabolites in commodities used as animal feed and can also occur in the edible parts of rotational crops.

Seven field succeeding crop studies were conducted, one in Europe and six in the USA. Spray applications near GAP were made to bare soil to simulate a treatment of target crops like potatoes, leafy vegetables or fruiting vegetables. Rotational crops were cereals (wheat, maize), fruiting vegetables (sweet corn) root and tuber vegetables (turnip, radish), leafy vegetables (lettuce, spinach), pulses (soya bean, dry) and strawberries.

After application of 0.9–1.2 kg ai/ha per annum to the bare soil, in the follow-on crops no parent fenamidone or its plant metabolite RPA 410193 was found at or above the LOQ of 0.02 mg/kg.

In plant parts used as human food, RPA 412636 occurred up to maximum single values of 0.04 mg/kg in radish roots, 0.04 mg/kg in radish tops and 0.12 mg/kg in spinach. Residues of RPA 412636 in wheat grain were in 22 field trials < 0.02 mg/kg and in only one trial 0.061 mg/kg.

RPA 412708 and RPA 412636 occurred in commodities that may be used as animal feeds. The sum of RPA 412708 and RPA 412636 reached up to 0.14 mg/kg in soya bean hay, 0.29 mg/kg in sweet corn stover and 0.21 mg/kg in field corn forage; RPA 412636 occurred up to 0.07 mg/kg in wheat forage, 0.27 mg/kg in wheat straw and 0.45 mg/kg in wheat hay.

In conclusion, no residues of fenamidone and RPA 410193 above the LOQ of 0.02 mg/kg would be expected in follow-on crops but residues of the metabolites RPA 412708 and RPA 412636 taken up from the soil occurred in commodities that may be used as human food and animal feed.

Methods of analysis

The Meeting received descriptions and validation data for analytical methods for residues of fenamidone and its relevant metabolites RPA 410193, RPA 412708 and RPA 412636 in plant commodities and for fenamidone, RPA 412708 and RPA 412636 in animal commodities. Residue analytical methods rely on GC with NP-detection, GC-MS or LC-MS/MS. Typical LOQs achieved for plant commodities fall in the range of 0.01–0.02 mg/kg for each analyte. The LOQ for milk was 0.01 mg/kg and for animal products (liver, kidney, muscle, eggs) 0.05 mg/kg for each analyte. Methods have been subjected to independent laboratory validation.

Fenamidone and RPA 410193 were analysed in plant material by the multi method S 19 with an LOQ of 0.01 mg/kg by GC-MS. The QuEChERS multi residue method was used for fenamidone and RPA 410193 in plant matrices as well as for fenamidone and RPA 412708 and RPA 412636 in animal matrices with LOQs of 0.01 mg/kg by LC-MS/MS for each analyte.

Stability of residues in stored analytical samples

The Meeting received storage stability studies under freezer conditions at -20 °C for fenamidone, RPA 412636, RPA 412708 and RPA 410193 for the duration of the storage of 12 months in a wide range of raw and processed crop matrices, including examples of high-water and high-starch crops and for duration of 6 months for cotton products. Furthermore, studies were conducted for fenamidone and RPA 410193 in high-water content commodities for duration of 14 months and in strawberries of 18 months.

The Meeting concluded that residues of fenamidone and RPA 410193 are stable in commodities of high-water content for at least 14 months and in strawberries for at least 18 months. Residues of fenamidone, RPA 412636, RPA 412708 and RPA 410193 are also stable for at least 6 months in high-oil content products.

Because milk and tissue samples of the ruminant feeding study were analysed within 29 days of collection, no storage stability data were submitted.

Definition of the residue

Animal metabolism studies were performed in rats, lactating goats and laying hens. The metabolic behaviour of fenamidone in the rat is summarised by the 2013 JMPR and shows pathways and major components similar to those found in ruminants and poultry. RPA 412636 and RPA 412708 are found in the rat metabolism. RPA 410193, which is a plant metabolite, was not identified in the rat ADME studies. The 2013 Meeting considered the named metabolites as toxicological relevant.

The 2014 JMPR agreed that RPA 410193 is covered by the ADI of the parent fenamidone. The toxicological relevance of RPA 412636 and its precursor RPA 412708, both detected as RPA 412636, were confirmed. RPA 412636 was considered as 10 times more toxic than the parent.

Livestock metabolism studies in goat and hen showed no major differences; the routes and products of metabolism in animals are consistent across the studies. The residues in animal products were low. Fenamidone was identified, reaching 0.013 mg/kg in ruminant fat (53% TRR) and 0.014 mg/kg in egg yolk (11% TRR). RPA 412636 was the most abundant residue in the ruminant, reaching 0.055 mg/kg in liver (5.9% TRR) and 11% TRR in milk (0.002 mg/kg). RPA 412636 was also found in the hen, at 0.011 mg/kg (74% TRR) in egg white and 0.014 mg/kg in egg yolk (11% TRR). RPA 412708 was the most abundant residue in the hen, reaching 0.028 mg/kg in egg yolk and 0.002 mg/kg in liver (25 and 1.3% TRR, respectively).

The Meeting concluded that the residue definition for MRL-setting for animal products should be parent fenamidone. For dietary intake, the residue should be defined as the sum of fenamidone, RPA 412636 and RPA 412708, expressed as fenamidone. Due to the 10-fold higher toxicity, a factor of 10 should be applied.

Fenamidone has a log P_{OW} of 2.8. No residues of fenamidone, RPA 412636 and RPA 412708 could be determined in animal products from the cattle feeding study with the exception of one milk fat sample with 0.011 mg/kg of RPA 412708. In the high dose group of the goat metabolism study, the TRR in muscle were low (0.02 mg eq/kg) and could not further identified. Fenamidone was detected in the fat (53% TRR, 0.013 mg eq/kg). In the high dose group of the egg metabolism study, fenamidone was detected in the yolk (11% TRR, 0.014 mg/kg), but not in the egg white (< 0.001 mg/kg). The Meeting decided that the residue is fat-soluble.

Plant metabolism studies for foliar spray application to the plant provide a clear understanding of the fate of the fenamidone molecule, both the C-phenyl and N-phenyl portions. The overall metabolic pathway is consistent between the different crop groups. Fenamidone forms the largest part of the residue and the only significant metabolite is RPA 410193, which reached a maximum of 17% TRR in grape. RPA 412636 and RPA 412708 reached a maximum of 6.3% TRR (0.005 mg/kg) and 6.4% TRR (0.006 mg/kg) in potato tubers. No other metabolite exceeded 5% TRR in any plant commodity.

The Meeting took into account the possibility of residues of the metabolites RPA 412708 and RPA 412636 in follow-on crops used as human food and/or animal feed. The Meeting concluded to include both metabolites in the residue definition for estimation of the dietary intake of plant commodities. Because of the10-fold higher toxicity, a factor of 10 should be applied.

The Meeting agreed the following residue definitions:

- Definition of the residue for compliance with the MRL for plant and animal commodities: *Fenamidone.*
- Definition of the residue for estimation of dietary intake for plant commodities: Sum of fenamidone, (S)-5-methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (RPA 410193**)** plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.
- Residue concentration $C_{total}=C_{fenamidone} + C_{RPA\ 410193} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$
- Definition of the residue for estimation of dietary intake for animal commodities: *Fenamidone plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.*
- Residue concentration $C_{total}=C_{fenamidone} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$
- The residue is fat-soluble.

Results of supervised residue trials on crops

The Meeting received supervised residue trials data for grapes, strawberries, leek, bulb onion, spring onion, cabbage, flowerhead brassica, melons, watermelons, cucumber, summer squash, peppers, tomato, lettuce, mustard greens, spinach, carrots, potato, ginseng, Witloof chicory, celery, cotton seed, sunflower seed, common bean forage and cotton fodder. If two field samples were taken or results of two replicate plots were submitted, the mean value was calculated for estimation of maximum residue levels. For HR estimation, the highest single value of the trials according to GAP was used. From two or more trials carried out side-by-side the higher residue was chosen.

Residues are reported separately for fenamidone and RPA 410193 only because the soil metabolites RPA 412636 and RPA 412708 are not relevant for foliar treated crops. For HR and STMR estimation, the sum of fenamidone (MW 311.4 g/mol) and RPA 410193 (MW 281.3 g/mol), expressed as fenamidone (conversion factor 1.11), is needed. When residues are undetectable in a commodity, the sum of the LOQs of both components is not appropriate for all plant commodities because the days after the last treatment (DALT) differ from 2 days (e.g., lettuce) to 35 days (strawberry). The residues of RPA 410193 are found in the same order of magnitude as the parent in berries harvested 4 to 5 weeks after treatment. In other plant commodities harvested at shorter PHIs (2–21 days), the level of the metabolite is much lower than the parent in most cases. The method for calculation of the total residues of the sum of fenamidone and RPA 410193 is illustrated as follows:

- Plant commodities except grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.02
0.05	< 0.02	0.05
0.42	0.08	0.51[a]

[a] 0.42 + (0.08 × 1.11)=0.5088

- Grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.04
0.05	< 0.02	0.07
0.42	0.08	0.51

Trials from the USA or Canada on carrots, potatoes, fruiting—brassica, leafy and legume—as well as stalk and stem vegetables were performed with four instead of three applications and trials on bulb vegetables as well as cucurbits were performed with six instead of four applications. The Meeting accepted the trials as matching the GAP in the USA and Canada since comparative residue trials on grapes and tomatoes as well as decline studies on vegetables indicated that the contribution of two earlier applications to the terminal residue is negligible. The Meeting agreed to use the trials to estimate maximum residue levels.

Rotational crop maximum residue levels, STMRs and HRs

The Meeting noted that no residues of parent fenamidone above the LOQ of 0.02 mg/kg are expected in follow-on crops. It was concluded that the estimation of maximum residue levels is not necessary.

The Meeting recognized that, in commodities used as human food, RPA 412636 were found. The table below shows the highest and the mean residues of two plots found in follow crops as spinach, radish roots and leaves as well as wheat grain after treatment of vegetables with fenamidone at 1.2 kg ai/ha per annum. The Meeting agreed to use the proportionality approach and scaled the residues according to the US GAP of 0.9 kg ai/ha per annum for brassica vegetables, fruiting vegetables, leafy vegetables, root and tuber vegetables and celery. The values measured as RPA 412636 (MW 190.2 g/mol) were expressed as fenamidone (MW 311.4 g/mol) multiplying by 1.64.

		RPA 412636, highest residue, mg/kg			RPA 412636, mean residue, mg/kg		
Treatment, kg ai/ha	Commodity	Measured	Scaled	Calculated as fenamidone eq	Measured	Scaled	Calculated as fenamidone eq
6× 0.2	Spinach	0.12	0.09	0.15	0.096	0.072	0.12
	Radish tops	0.044	0.033	0.054	0.033	0.0275	0.045
	Radish roots	0.039	0.029	0.048	0.03	0.0225	0.037
	Wheat grain	0.061	0.046	0.075			
1× 0.2	Wheat grain				< 0.02		< 0.033 (n=22)

The Meeting concluded that the contribution of residues of RPA 412636 and RPA 412708 has to be considered for the STMR and HR estimation for annual crops like vegetables and cereals. A factor of 10 is used because of the 10-fold higher toxicity compared to parent.

For brassica vegetables, fruiting vegetables, leafy vegetables, fresh herbs as well as stalk and stem vegetables, the Meeting estimated a rotational crop STMR of 1.2 mg/kg and a rotational crop HR of 1.5 mg/kg, based on the residues analysed in spinach.

For bulb vegetables, root and tuber vegetables as well as their leaves/greens the Meeting estimated a rotational crop STMR of 0.4 mg/kg and an HR of 0.5 mg/kg, respectively.

For cereal grains, residues of RPA 412636 + RPA 412708 were in wheat of 22 field trials as well as of nine trials in maize < 0.033 mg eq/kg and in only one trial 0.075 mg eq/kg. The Meeting agreed to estimate an STMR of 0.33 mg/kg (10 times LOQ) for cereal grains except rice as follow-on crops.

No residues of RPA 412636 or RPA 412708 higher than the LOQ of 0.02 mg/kg occurred in strawberries, sweet corn kernels and soya bean seed grown as follow-on crops. The Meeting concluded that the uptake of substantial concentrations of RPA 412636 or RPA 412708 by strawberry, sweet corn, oil seeds and pulses is negligible. No STMR or HR was recommended.

Grapes

The GAP for fenamidone in Brazil on grapes is foliar spray treatment with 3× 0.13 kg ai/ha and a PHI of 7 days. Three Brazilian trials matching the GAP were submitted. The residues in grape bunches were for parent fenamidone 0.02, 0.03, 0.03 mg/kg and for the sum of fenamidone and RPA 410193 0.04, 0.05, 0.05 mg/kg.

Fenamidone is registered for foliar spray treatment on grapes in the Czech Republic with application at 3 × 0.13 kg ai/ha and a PHI of 28 days. Sixteen European trials according to GAP were conducted in 2009 and 2010 in Belgium, France, Germany, Italy, Portugal and Spain. The residues in grape bunches were for fenamidone (n=16) 0.04, 0.06, 0.08, 0.09, 0.09, 0.10, 0.13, 0.13, 0.17, 0.21, 0.22, 0.22, 0.26, 0.28, 0.30 and 0.33 mg/kg. The total residues (sum of fenamidone and RPA 410193) were 0.06, 0.09, 0.09, 0.11, 0.12, 0.13, 0.15, 0.16, 0.19, 0.25, 0.25, 0.25, 0.34, 0.34, 0.35 and 0.42 mg/kg.

Based on the European residue data, the Meeting estimated a maximum residue level of 0.6 mg/kg, an STMR of 0.175 mg/kg and an HR of 0.42 mg/kg for fenamidone residues in grapes.

Strawberry

The UK GAP for fenamidone in strawberries is one pre-transplantation treatment (0.18 kg ai/ha) followed by one post-transplantation drench or spray (0.27 kg ai/ha) and a PHI of 35 days.

Eight supervised residue trials were carried out in 2009 and 2012 in Europe in greenhouses. The plants were treated by a drip-irrigation with 0.16–0.18 kg ai/ha followed after 21/22 days by a foliar spray of 0.27 kg ai/ha. The residues were for parent fenamidone < 0.01, < 0.01, 0.01, 0.01, 0.01, 0.02, 0.02, 0.02 mg/kg and for the sum of fenamidone and RPA 410193 < 0.02, < 0.02, 0.02, 0.02, 0.02, 0.03, 0.03, 0.03 mg/kg.

Fenamidone is registered in Belgium in protected strawberries with two drench treatments of 0.45 kg ai/ha and a PHI of 35 days. Seven trials according to Belgium GAP were conducted in 2010/2011. The residues were for parent fenamidone < 0.01 (3), 0.01, 0.02 (3) mg/kg and for the sum of fenamidone and RPA 410193 < 0.02, < 0.02, 0.02, 0.02, 0.03, 0.03, 0.04 mg/kg.

The Meeting agreed to use the data set according to the Belgium GAP and estimated a maximum residue level of 0.04 mg/kg, an STMR of 0.02 mg/kg and an HR of 0.04 mg/kg for fenamidone residues in strawberries.

Bulb vegetables

Fenamidone is registered for bulb vegetables in the USA and Canada with foliar application at 4× 0.2 kg ai/ha and a PHI of 7 days. Field trials on bulb onion (8) and spring onion (4) were carried out in the USA. At each trial, six instead four spray applications of 0.2 kg ai/ha were made. The following residue data were received.

In bulb onion, the fenamidone residues as well as total residues (sum of fenamidone and RPA 410193) were < 0.02 (6), 0.02 and 0.10 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 0.13 mg/kg as HR for the short-term dietary intake assessment instead. The Meeting agreed to extrapolate the residue data from bulb onions to garlic and shallots. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.15 mg/kg, 0.42 mg/kg and 0.63 mg/kg, respectively, for bulb onion, garlic and shallots.

In spring onion, the fenamidone residues were 0.24, 0.36, 0.94 and 0.94 mg/kg. The corresponding total residues were 0.24, 0.36, 0.94 and 1.1 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to

use this value of 1.2 mg/kg as HR for the short-term dietary intake assessment instead. The Meeting agreed to extrapolate the residue data from spring onion to welsh onion. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 3 mg/kg, 1.05 mg/kg and 1.7 mg/kg, respectively, for spring onion and Welsh onion.

The GAP for leek in Switzerland is 3 × 0.15 kg ai/ha and a PHI of 14 days. Four supervised residue trials (France 1, Germany 2 and the Netherlands 1) with 4 × 0.15 kg ai/ha were submitted. At a PHI of 14 days, the residues of fenamidone as well as of the sum of fenamidone and RPA 410193 were 0.02, 0.05, 0.07 and 0.13 mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting considered four trials on leek as sufficient and estimated a maximum residue level, an STMR and an HR of 0.3 mg/kg, 0.46 mg/kg and 0.63 mg/kg, respectively.

Brassica vegetables

Head cabbage

Fenamidone is registered in Switzerland in head cabbages as foliar spray with 3 × 0.15 kg ai/ha and a PHI of 14 days. Seven European trials (France 2, Germany 4 and Portugal 1) according to the Swiss GAP were submitted. The residues of fenamidone as well as the sum of fenamidone and RPA 410193 were < 0.01 (4), 0.01, 0.02 and 0.06 mg/kg.

The GAP for Brassica vegetables in Canada and the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days. Six trials were conducted in 2003 in the USA with 4× 0.3 kg ai/ha and a PHI of 2 days. In all trials, heads with wrapper leaves were analysed. The residues were for parent fenamidone 0.10, 0.17, 0.22, 0.24, 0.35 and 0.52 mg/kg in cabbage heads with wrapper leaves. Residue data for heads without wrapper leaves were available from four of the six trials. The fenamidone residues as well as the total residues were < 0.02, < 0.02, 0.03 and 0.19 mg/kg.

The Meeting agreed to use the US residue data on cabbage heads with wrapper leaves for MRL estimation and without wrapper leaves for dietary intake purposes. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated a maximum residue level of 0.9 mg/kg, an STMR of 1.23 mg/kg and an HR of 1.69 mg/kg.

For livestock dietary burden calculation, the Meeting estimated a median residue of 0.22 mg/kg and a highest residues of 0.52 mg/kg based on the fenamidone data for head cabbage with wrapper leaves.

Flowerhead brassica

The GAP for Brassica vegetables in Canada and the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days. Six trials were conducted in 2003 on broccoli in the USA with 4 × 0.3 kg ai/ha and a PHI of 2 days. The mean residues of two separate field samples were for parent fenamidone as well as the total residues 0.31, 0.51, 0.68, 1.5, 1.6 and 2.2 mg/kg.

The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 2.7 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated for fenamidone residues in flowerhead brassica a maximum residue level, an STMR and HR of 4 mg/kg, 2.29 mg/kg and 4.2 mg/kg, respectively.

Fruiting vegetables, cucurbits

The GAP for cucurbits in Canada and the USA is 4 × 0.2 kg ai/ha and a PHI of 14 days. Field trials on cucumber (9), summer squash (9) and cantaloupe melons (8) were carried out during 1999 in the USA. At each trial, six spray applications in the range of 0.19–0.21 kg ai/ha were made at intervals of 3–6 days. The following residue data were received:

- In cucumber, the residues of fenamidone as well as the total residues were < 0.02 (7), 0.02 and 0.04 mg/kg.
- In summer squash, the residues of fenamidone as well as the total residues were < 0.02 (8) and 0.06 mg/kg.
- In cantaloupe melon, the residues for fenamidone as well as the total residues were in whole fruits < 0.02, 0.02, 0.04, 0.06, 0.07, 0.08, 0.08 and 0.09 mg/kg. No data were submitted for the edible part.

The Brazilian GAP for the use of fenamidone in watermelon is 3 × 0.15 kg ai/ha and a PHI of 7 days. Three trials on watermelons were conducted in 2004 in Brazil. The residues were in whole fruits for fenamidone as well as the sum of fenamidone and RPA 410193 were 0.03, 0.04 and 0.05 mg/kg. No residue data for pulp were submitted.

Fenamidone is registered in Switzerland for cucumbers, pumpkins, melons, courgettes, patisson and rondini with three foliar spray treatments of 0.15 kg ai/ha and a PHI of 3 days. Trials on cucumber (9 indoor) and on melons (8 indoor, 8 outdoor) carried out between 2002 and 2005 in European countries according to the GAP were submitted. The following residue data were received:

- In indoor grown cucumber, the residues of fenamidone as well as the total residues were < 0.01, < 0.02, 0.04, 0.04, 0.09, 0.10, 0.10, 0.12 and 0.13 mg/kg.
- In outdoor grown melons, the residues of fenamidone in whole fruits were < 0.02, 0.03, 0.03, 0.04, 0.04, 0.05, 0.08 and 0.12 mg/kg
- In indoor grown melons, the residues of fenamidone in whole fruits were < 0.02, < 0.02, < 0.02, 0.03, 0.04, 0.07, 0.07 and 0.09 mg/kg.
- The corresponding residues of the sum of fenamidone and RPA 410193 in melon pulp were < 0.01 (6) and < 0.02 (10).

The Meeting concluded that the maximum residue level should be based on the critical Swiss GAP. It was noted, that the median of the datasets for cucumber and melons (outdoor and indoor grown) differed by less than five times and agreed to consider a group maximum residue level. In deciding on the data set to use for estimating a group maximum residue level, as a Mann-Whitney U-test indicated that the residue populations for cucumber and melons were not different, it was agreed to combine the results to give a data set for fenamidone residues in whole melons and cucumbers of (n=25) < 0.01, < 0.02 (5), 0.03 (3), 0.04 (5), 0.05, 0.07, 0.07, 0.08, 0.09, 0.09, 0.10, 0.10, 0.12, 0.12 and 0.13 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated for fenamidone residues in fruiting vegetables, cucurbits a maximum residue level of 0.2 mg/kg. Based on the cucumber data, an STMR of 1.29 mg/kg and an HR of 1.63 mg/kg were estimated.

Fruiting vegetables other than cucurbits

The GAP for fruiting vegetables except cucurbits in the USA is 3× 0.3 kg ai/ha and a PHI of 14 days.

Field US trials on sweet pepper (6), chilli pepper (3) and tomatoes (17) according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The following residue data were received:

- In sweet pepper, the residues were for fenamidone as well as for the sum of fenamidone and RPA 410193 0.03, 0.05, 0.07, 0.08, 0.08 and 0.19 mg/kg.
- In chilli pepper, the fenamidone residues and the total residues were 0.07, 1.3 and 1.5 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 1.7 mg/kg as HR for the short-term dietary intake assessment instead.
- In tomatoes, the fenamidone residues were < 0.02, < 0.02, 0.07, 0.07, 0.09, 0.10, 0.11, 0.25, 0.33, 0.34, 0.38, 0.40, 0.42, 0.46, 0.47, 0.61 and 0.80 mg/kg. The total residues were (n=17) < 0.02, < 0.02, 0.07, 0.07, 0.09, 0.10, 0.11, 0.25, 0.33, 0.34, 0.38, 0.45, 0.46, 0.47, 0.40, 0.61 and 0.80 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 0.82 mg/kg as HR for the short-term dietary intake assessment instead.

The Meeting noted that the GAP in the USA was for fruiting vegetables other than cucurbits and considered a group maximum residue level. Furthermore, the Meeting noted that the median of the datasets for sweet pepper and tomatoes differed by less than 5-fold but the median for chilli was 17 times higher than for sweet pepper. The Meeting agreed to consider a group maximum residue level for fruiting vegetables other than cucurbits, except sweet corn, fungi and chilli pepper. In deciding on the data set to use for estimating a group maximum residue level, as a Mann-Whitney U-test indicated that the residue populations for sweet pepper and tomatoes belong to different populations with the highest residues in tomato. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

Based on the tomato residue data, the Meeting estimated a maximum residue level of 1.5 mg/kg, an STMR of 1.53 mg/kg and an HR of 2.32 mg/kg for fruiting vegetables other than cucurbits, except sweet corn, fungi and chilli pepper.

For chilli pepper, the Meeting estimated a maximum residue level of 4 mg/kg, an STMR of 2.5 mg/kg and an HR of 3.2 mg/kg.

The Meeting also decided to estimate a maximum residue for chilli pepper (dried) of 30 mg/kg following application of a default dehydration factor of 7 to the estimated maximum residue level of 4 mg/kg for chilli pepper (7 × 4=28 mg/kg). The STMR for residues of fenamidone in chilli peppers (dry) is estimated to be 18 mg/kg (7 × 2.5=17.5 mg/kg).

Leafy vegetables

The use of fenamidone in leafy vegetables in the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days and the Meeting looked at the possibility to establish a group MRL. However, the Meeting recognized that the ARfD of 1 mg/kg bw was exceeded for the single commodities, if the highest residue of 32.7 mg/kg (mustard greens) is used as HR and concluded that a group MRL cannot be recommended.

Nine outdoor US trials on head lettuce according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The fenamidone residues, as well as the total residues, were: 0.82, 2.3, 3.3, 3.3, 3.7, 3.9, 4.4, 8.0 and 11 mg/kg. The Meeting recognized that one single sample gave higher residues than the HR based on the mean and decided to use this value of 12 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 20 mg/kg, an STMR of 4.9 mg/kg and an HR of 13.5 mg/kg for fenamidone residues in head lettuce.

Nine outdoor US trials on leaf lettuce according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The fenamidone residues were

1.0, 2.6, 3.4, 3.4, 6.5, 7.9, 10, 12 and 16 mg/kg. The corresponding total residues were 1.0, 2.6, 3.4, 3.4, 6.5, 8.0, 10, 12 and 16 mg/kg (residue of one duplicate field sample 17.5 mg/kg).

The Meeting noted that the ARfD of 1 mg/kg bw is exceeded for leaf lettuce by the IESTI for children (110% of ARfD) using 17.5 mg/kg as HR and decided that the US dataset is not appropriate to estimate a maximum residue level for leaf lettuce.

Alternative GAP exist for outdoor use in Switzerland with 3 × 0.15 kg ai/ha with a PHI of 14 days. Nine trials on leaf lettuce conducted in Europe were submitted. The fenamidone residues in outdoor leaf lettuce at a PHI of 14 days were < 0.02 (3), 0.02, 0.04, 0.06, 0.07, 0.42 and 0.48 mg/kg. The corresponding total residues were < 0.02 (3), 0.02, 0.04, 0.06, 0.07, 0.43 and 0.48 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 0.9 mg/kg, an STMR of 1.24 mg/kg and an HR of 1.98 mg/kg for fenamidone residues in leaf lettuce.

Eight outdoor US trials on mustard greens and six on spinach according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied.

In mustard greens, the fenamidone residues were 11, 12, 13, 17, 24, 28, 28 and 29 mg/kg. The corresponding total residues were 11, 12, 13, 17, 24, 28, 29 and 29 mg/kg (residue of one duplicate field sample 32.7 mg/kg). In spinach, the fenamidone residues were 7.2, 7.3, 11, 21, 23 and 31 mg/kg. The corresponding total residues were 7.2, 7.4, 11, 21, 23 and 31 mg/kg (residue of one duplicate field sample 32.4 mg/kg).

The similar datasets of mustard greens and spinach were combined for mutual support. The rank order of the combined fenamidone residues in spinach and mustard greens were (n=14) 7.2, 7.3, 11, 11, 12, 13, 17, 21, 23, 24, 28, 28, 29 and 31 mg/kg. The corresponding total residues were 7.2, 7.4, 11, 11, 12, 13, 17, 21, 23, 24, 28, 29, 29 and 31 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 32.7 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

For spinach and mustard greens, the IESTI represented 150% and 170% for children, respectively of the ARfD of 1 mg/kg bw. The Meeting noted that an alternative GAP was not available.

The Meeting estimated a maximum residue level of 60 mg/kg, an STMR of 20 mg/kg and an HR of 34 mg/kg for fenamidone residues in spinach and mustard greens.

Legume vegetables

In the USA and in Canada, fenamidone may be used as foliar spray on succulent beans with 3 × 0.3 kg ai/ha and a PHI of 3 days. Field trials using 4×0.3 kg ai/ha were carried out in the USA for lima beans (8) and seven trials on common beans (7).

In mature succulent lima beans, the fenamidone residues as well as the total residues were in seeds without pods (n=8) < 0.02 (4), 0.03, 0.04, 0.08 and 0.08 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated for fenamidone residues in beans, shelled a maximum residue level, an STMR and an HR of 0.15 mg/kg, 1.2 mg/kg and 1.58 mg/kg, respectively.

In common beans, the fenamidone residues as well as the total residues were in pods with seeds (n=7) 0.10, 0.11, 0.16, 0.19, 0.23, 0.34 and 0.46 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated for fenamidone residues in beans, except broad bean and soya bean (green pods and immature seeds) a maximum residue level, an STMR and an HR of 0.8 mg/kg, 1.39 mg/kg and 1.96 mg/kg, respectively.

Root and tuber vegetables

Fenamidone is registered in the USA on the one hand for carrots, ginseng and potatoes and on the other hand for other root and tuber vegetables (garden beet, celeriac, horseradish, parsnips, parsley root, radish, salsify, swedes and turnips) except sugar beet with 3×0.3 kg ai/ha and a PHI of 14 days. Residue data were submitted for the use of fenamidone on carrots, potatoes and ginseng, dry.

Field trials (13) on carrots using approximately 4×0.3 kg ai/ha were carried out in the USA and in Canada. The fenamidone as well as the total residues were (n=13): 0.02, 0.03, 0.03, 0.03, 0.03, 0.04, 0.05, 0.05, 0.06, 0.06, 0.07, 0.09 and 0.11 mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to estimate the STMR and 0.5 mg/kg the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.2 mg/kg, 0.45 mg/kg and 0.61 mg/kg respectively, for carrots.

Field trials (19) on potatoes applying approximately 4 × 0.3 kg ai/ha were carried out in the USA and in Canada. The fenamidone as well as the total residues were < 0.02 (19) mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to estimate the STMR and 0.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 0.02* mg/kg for fenamidone residues in potatoes. Taking into account the uptake of RPA 412363 from the soil by rooting vegetables grown as follow-on crops, the Meeting estimated an STMR of 0.4 mg/kg and an HR of 0.5 mg/kg for fenamidone residues in potatoes.

Six supervised trials on ginseng were carried out in 2007 in the USA and Canada. Only one trial was carried according to GAP with 3 × 0.3–0.31 kg ai/ha. At five trials, nine applications with application rates in the range of 0.29–0.32 kg ai/ha were performed at intervals of 7–15 days between each foliar spray. Samples were prepared by washing the roots with water after harvest followed by drying on racks in drying chambers for 14 days at 18–46 °C. The following residue data were received:

- After a treatment with 3 × 0.3–0.31 kg ai/ha, the residue of fenamidone as well as the total residue was 0.06 mg/kg.
- After treatment with 9 × 0.29–0.32 kg ai/ha, the fenamidone residues were 0.03, 0.10, 0.17, 0.29 and 0.35 mg/kg. The corresponding total residues were 0.03, 0.10, 0.17, 0.31 and 0.37 mg/kg and the highest single value from a duplicate field sample was 0.55 mg/kg.

The Meeting noted that only one of the six trials matched the GAP and concluded that the data submitted are insufficient to estimate a separate maximum residue level for ginseng.

Stalk and stem vegetables

Fenamidone is registered in the USA for celery with 3 × 0.3 kg ai/ha and a PHI of 2 days. Six supervised trials on celery were carried out during 2003 in the USA. At each trial, fenamidone was applied by foliar spray at rates of about 0.3 kg ai/ha four times at intervals of 4–6 days. In untrimmed plants without roots, the residues of fenamidone as well as the total residues were at a 2-days PHI (n=6) 2.3, 4.4, 4.5, 8.8, 15 and 18 mg/kg. In trimmed stalks, the residues were (n=5) 0.06, 0.32, 1.1, 1.2 and 1.7 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 40 mg/kg, an STMR of 2.3 mg/kg and an HR of 3.2 mg/kg for fenamidone residues in celery.

The GAP for Witloof chicory in Belgium is one dip treatment of 0.006 kg ai/hL followed by an irrigation treatment with 0.6 g ai/hL and a PHI of 18 days.

All in all, nine European indoor residue trials were submitted. In 2004 four hydroponic residue trials were conducted in Belgium, France and the Netherlands consisting of one application through the irrigation water system at a maximum rate of 0.6 g ai/hL of fenamidone and a water volume of 40 L/m^2, at the commencement of forcing. The fenamidone residues as well as total residues in sprouts at PHIs of 20/21 days were < 0.01 mg/kg (4).

In 2008 and 2010 five residue trials were conducted in France, Germany and the Netherlands. These trials were treated twice, one dip application for two minutes in a solution containing 6.0 g ai/hL, immediately after field sampling of the roots. After storage of the roots in a cold room for 3–8 months, a second hydroponic application was made at the commencement of forcing in the irrigation water system at a maximum rate of 0.6 g ai/hL. Sprout samples were taken on day 20/21 after the second application. The fenamidone residues as well as total residues in sprouts at PHIs of 20/21 days were < 0.01 mg/kg (5).

The Meeting estimated a maximum residue level of 0.01* mg/kg, an STMR of 0.01 mg/kg and an HR of 0.01 mg/kg for fenamidone residues in Witloof chicory.

Oilseed

Fenamidone is registered in the USA for cotton as in-furrow treatment with 1 × 0.3 kg ai/ha.

Twelve trials were conducted on cotton in the USA during 2003. In each trial, cotton plants were treated at-planting with a single in-furrow over-the-seed application at a rate of 0.3 kg ai/ha. Samples of mature cotton seed were harvested 127–190 days post treatment. The residues of fenamidone as well as the total residues were in seed < 0.02 mg/kg (12).

The Meeting estimated a maximum residue level of 0.02* mg/kg and an STMR of 0.02 mg/kg for fenamidone residues in cotton seed.

The GAP for the use of fenamidone in the USA for sunflower is seed treatment with 0.19 kg/100 kg seed. Nine trials on sunflower were conducted in 2009 in the USA. In each trial, one plot was planted with sunflower seeds treated with fenamidone at a rate of 0.19 kg ai per 100 kg seed. Two trials included an additional plot planted with seed treated at an exaggerated rate of 0.95 kg ai per 100 kg seed. Samples of mature sunflower seed were harvested 104–146 days after sowing of the treated seed. The residues of fenamidone as well as the total residues were in seed < 0.02 mg/kg (9).

The Meeting estimated a maximum residue level of 0.02* mg/kg and an STMR of zero for fenamidone residues in sunflower seed.

Legume animal feed

In the USA and Canada, fenamidone may be used as foliar spray on succulent beans with 3 × 0.3 kg ai/ha and a PHI of 3 days. Seven field trials with 4 × 0.3 kg ai/ha were carried out in the USA on common beans. The fenamidone residues were in plants with pods at a PHI of 3 days 2.3, 4.1, 5.6, 7.6, 10, 11 and 16 mg/kg (fresh weight).

For the calculation of the livestock animal dietary burden, the Meeting estimated a median residue of 7.6 mg/kg and a highest residue of 16 mg/kg bean forage (green).

Cotton fodder, dry

Fenamidone is registered in the USA for cotton as in-furrow treatment with 1 × 0.3 kg ai/ha. Trials were conducted on cotton in the USA during 2003. In each trial, cotton plants were treated at-planting with a single in-furrow over-the-seed application at a rate of 0.3 kg ai/ha. The harvest was

127–178 days post treatment. The residues of fenamidone as well as the total residues were in cotton gin by-products < 0.02 mg/kg (6).

For the calculation of the livestock animal dietary burden, the Meeting estimated 0.02 mg/kg as median residue and highest residue for cotton fodder, dry.

Fate of residues during processing

Nature of residues

To estimate the degradation behaviour of [C-phenyl-U-^{14}C]-fenamidone during industrial processing or household preparation, the processes of pasteurization (90 °C, 20 min at pH 4), baking, boiling, brewing (100 °C, 60 min at pH 5) and sterilization (120 °C, 20 min at pH 6) were simulated.

Degradation of fenamidone was limited and appeared to be dependent on the conditions. The largest extent of degradation was ca. 12% TAR under pasteurisation conditions. RPA 410193 was the only degradate under these conditions. The amounts of RPA 410193 decreased with increasing pH, to 2.5% TAR at pH 6. There was additional degradation to RPA 412708 up to 3.6% TAR at higher temperature (120 °C) and pH (6). This degradation path was not seen at the lower temperatures.

The Meeting concluded that, in addition to the parent fenamidone, the only metabolite to consider for processed products is RPA 410193.

Level of residues

The Meeting received information on the fate of fenamidone residues during the processing of raw agricultural commodities (RAC) like grapes to juice, must, wine and pomace and tomatoes into juice, paste, ketchup and canned tomatoes. Because the residues of RPA 410193 are of the same order of magnitude as the parent concentrations in processed products of grapes and tomatoes, the sum of parent and RPA 410193 is calculated as follows:

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.04
< 0.02	0.076	0.10
0.05	< 0.02	0.07
0.53	0.13	0.67[a]

[a] 0.53 + (0.13 × 1.11) = 0.6743

Two processing studies were carried out on potatoes but were only of limited use because the residues in RAC were < LOQ. Five further studies conducted on cabbage, broccoli, peppers, mustard greens and spinach investigated the fate of fenamidone and RPA 410193 after washing and cooking. The processing factors were for washed vegetables 0.58 and for cooked vegetables 0.21.

The processing factors for the sum of fenamidone and RPA 410193 obtained in the processing studies and the estimated STMR-P values for dietary intake calculations are summarized below.

Raw agricultural commodity		Processed commodity (food)		
	STMR, mg/kg		Processing factor	STMR-P, mg/kg
Grapes	0.175	Juice	0.36 (median)	0.063
		Must	0.83 (median)	0.145
		Wine	0.71 (median)	0.124
Tomatoes	1.53	Juice	0.8 (median)	1.22
		Puree	2.1 (median)	3.21
		Ketchup	2.4 (single value)	3.67

Raw agricultural commodity		Processed commodity (food)		
	STMR, mg/kg		Processing factor	STMR-P, mg/kg
		Paste	3.65 (mean)	5.58
		Canned fruits	0.45 (median)	0.69

In some tomato processed commodities, the residues increased during processing. For parent fenamidone, the processing factors were 2.55 for paste, 1.7 for puree and 1.6 for ketchup. Based on the recommended MRL of 1.5 mg/kg in fruiting vegetables other than cucurbits, the Meeting estimated maximum residue levels of 4 mg/kg for tomato paste and of 3 mg/kg for tomato puree as well as for ketchup.

The processing factors for parent fenamidone obtained in the processing studies and the median values of fenamidone residues in the RAC (parent only) were used to calculate the residues in the feed items grape pomace, tomato pomace and potato wet peel for animal dietary burden purposes.

Raw agricultural commodity		Processed commodity (feed)		
	Median (mg/kg)		Processing factor	STMR-P (mg/kg)
Grapes	0.15	Pomace, wet	2.0 (median)	0.3
Tomatoes	0.33	Pomace, wet	4.5 (median)	1.49
Potatoes	0.02	Wet peel	> 2.3 (single value)	0.046

The Meeting noted that fenamidone concentrated during processing in grape wet pomace, tomato wet pomace and potato wet peel. Because wet pomace and wet peel are not commodities in the international trade, no maximum residue levels are estimated.

Residues in animal commodities

Farm animal feeding studies

The Meeting received information on the residue levels arising in tissues and milk when three groups of dairy cows were fed with a diet containing 0.8, 2.4 and 8 ppm fenamidone for 35 consecutive days. At the highest dose group, no residues of fenamidone or the two major metabolites RPA 412636 and RPA 412708 were found in any of the tissue or milk fat samples higher than the LOD of 0.003 mg/kg, with the exception that in one milk fat sample, RPA 412708 was detected (0.011 mg/kg).

No poultry feeding study was submitted. In two metabolism studies laying hens were dosed at 13.8 ppm (C-phenyl label) and 9.8 ppm (N-phenyl label) fenamidone in the diet. The maximum residues (sum of fenamidone, RPA 412636 and RPA 412708) were 0.012 mg/kg in egg white, 0.05 mg/kg in egg yolk, 0.028 mg/kg in liver, 0.004 mg/kg in skin and < 0.001 mg/kg in fat.

Estimated dietary burdens of farm animals

Maximum and mean dietary burden calculations for fenamidone are based on the feed items evaluated for cattle and poultry as presented in Annex 6. The calculations were made according to the livestock diets from Australia, the EU, Japan and US-Canada in the OECD feeding table. Furthermore, the Meeting estimated the maximum highest dietary burden for the main metabolites in follow-on crops.

Parent fenamidone in primary commodities

The foliar application of fenamidone to grapes, tomatoes, cabbage, root and tuber vegetables, cotton and sunflower resulted in residues of fenamidone in the following feed items: wet grape pomace, wet tomato pomace, head cabbage, carrot culls, potato culls, potato process waste, turnip roots, swede roots, cassava/tapioca roots, cotton undelinted seed, sunflower seed and cotton fodder, dry. Residue

data were also submitted for green bean forage (vines) what is listed as 60–70% of the Australian diet and for beef and dairy cattle and as 20% of the European diet for dairy cattle. Based on the named feed items, the calculated maximum animal dietary burden for dairy or beef cattle was in the USA and Canada 0.13 ppm, in the EU 10 ppm and in Australia 33 ppm. The Meeting noted that the estimated livestock dietary burden (AUS) was up to three times higher than the dose rate in the cow feeding study.

The Meeting recognized that green bean forage (vines) is not used as animal feed in the USA and in Canada but in the EU and in Australia. The Meeting was informed by an official communication of the government of Australia that no fodder crops are imported. Furthermore, the USDA Global Agricultural Trade System database indicates that no animal feed/fodder were exported from the USA to Australia and the EU in 2013. The Meeting concluded that green bean forage is not an exportable commodity and decided to make a refined calculation of the livestock dietary burden without the residues in bean vines (see Annex 6).

In the table below the estimated livestock dietary burden is presented for fenamidone after foliar treatment of plants.

	Livestock dietary burden, fenamidone, ppm of dry matter diet							
	US-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	0.15	0.15	1.0 [a]	0.52	1.0 [a]	0.97[b]	0	0
Dairy cattle	0.13	0.08	0.96	0.49	0.99	0.97	0	0
Poultry–broiler	0	0	0.09	0.04	0	0	0	0
Poultry–layer	0	0	0.27 [c]	0.12 [d]	0	0	0	0

[a] Suitable for MRL estimates for mammalian meat, fat, edible offal and milk.
[b] Suitable for STMR estimates for mammalian meat, edible offal and milk.
[c] Suitable for MRL estimates for eggs, meat, fat and edible offal of poultry.
[d] Suitable for STMR estimates for eggs, meat, fat and edible offal of poultry.

Metabolites in follow-on crops

Rotational crop studies showed that in the follow-on crops an uptake from the soil of the metabolites RPA 412708 and RPA 412636 occurred. Their highest concentrations found in follow-on crops as wheat, sweet corn, maize and soya beans after the treatment of bare soil with fenamidone at 1.2 kg ai/ha per annum were scaled according to the critical US GAP of 0.9 kg ai/ha per annum for brassica vegetables, fruiting vegetables, leafy vegetables, root and tuber vegetables and celery. These residues are extrapolated to similar feed items in the OECD feeding table.

The maximum livestock dietary burden for RPA 412708/RPA 412636 in follow-on crops in the USA and Canada was estimated as follows: Beef cattle 0.088 ppm (as RPA 41236), dairy cattle 0.36 ppm (as RPA 41236), poultry broiler 0 ppm and poultry layer 0 ppm. Expressed as fenamidone equivalents, the burden was for beef cattle 0.14 ppm and for dairy cattle 0.59 ppm.

The Meeting noted that RPA 412708 and RPA 412636 are not found in milk or tissues of dairy cows dosed at 8 ppm fenamidone through normal animal metabolism routes. Therefore, the two metabolites are unlikely to be present after direct administration of much lower levels (maximum livestock dietary burden 0.59 ppm).

The Meeting concluded that it is unlikely that residues of RPA 412708 and RPA 412636 in follow on crops of the uses considered by the JMPR result in residues in animal products.

Animal commodities, MRL estimation

The feeding study with fenamidone in dairy cows was performed at actual dose levels of 0.8, 2.4 and 8 ppm in the diet. At the highest dose group, no residues of fenamidone or of the two major

metabolites RPA 412636 and RPA 412708 were found in any of the tissue or milk fat samples (< 0.003 mg/kg, LOD; LOQ 0.01 mg/kg), with the exception that in one milk fat sample RPA 412708 was detected (0.011 mg/kg). The overdosing factor is calculated as about 8 (8 ppm ÷ 1 ppm). Therefore, residues of fenamidone, RPA 412636 and RPA 412708 in cattle tissues and milk arising from a burden of 1 ppm are not expected.

The Meeting estimated maximum residue levels of 0.01* mg/kg for milks, meat from mammals, other than marine mammals (fat), mammalian fat (except milk fat) and edible offal (mammalian). For milk fat, a maximum residue level of 0.02 mg/kg was estimated. The STMRs for milk and milk fat were 0.01 mg/kg and the STMR/HR values for muscle, fat and edible offal were zero.

No poultry feeding study was submitted. In two metabolism studies, laying hens were dosed at 13.8 ppm (C-phenyl label) and 9.8 ppm (N-phenyl label) fenamidone in the diet. The maximum residues (sum of fenamidone, RPA 412636 and RPA 412708) were 0.012 mg/kg in egg white, 0.05 mg/kg in egg yolk and 0.028 mg/kg in liver.

Allowing for the dose rates in the metabolism studies (overdosing factors about 40–50), it can be seen that at the maximum calculated dietary burden for poultry of 0.27 ppm, no residues of fenamidone or any of its metabolites will be found in poultry commodities at or above the LOQ of 0.01 mg/kg.

The Meeting estimated maximum residue levels of 0.01* mg/kg poultry meat, poultry fat, poultry edible offal and eggs. The STMR/HR values for poultry meat, poultry fat, poultry edible offal and eggs are zero.

RECOMMENDATIONS

On the basis of the data from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits and for IEDI and IESTI assessment.

Definition of the residue for compliance with the MRL for plant and animal commodities: *Fenamidone.*

Definition of the residue for estimation of dietary intake for plant commodities: *Sum of fenamidone, (S)-5-methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (RPA 410193) plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.*

Residue concentration $C_{total}=C_{fenamidone} + C_{RPA\ 410193} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$

Definition of the residue for estimation of dietary intake for animal commodities: *Fenamidone plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone*.

Residue concentration $C_{total}=C_{fenamidone} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$

The residue is fat-soluble.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Dietary Intakes (IEDIs) of fenamidone were calculated for the 17 GEMS/Food cluster diets using STMRs and STMR-Ps estimated by the current Meeting (Annex 3 to

the 2014 Report). The ADI is 0–0.03 mg/kg bw and the calculated IEDIs were 10–60% of the maximum ADI. The Meeting concluded that the long-term intake of residues of fenamidone resulting from the uses considered by the current JMPR is unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) for fenamidone was calculated for food commodities and their processed fractions for which maximum residue levels were estimated and for which consumption data were available. The results are shown in Annex 4 to the 2014 Report.

The Meeting recognized that for leaf lettuce the IESTI calculated according to the maximum GAP exceeded the ARfD of 1 mg/kg bw and used an alternative GAP. For spinach and mustard greens, the IESTI represented 150% and 170%, respectively of the ARfD of 1 mg/kg bw. The Meeting noted that an alternative GAP was not available. For the other commodities considered by the JMPR, the IESTI represented 0–30% of the ARfD. The Meeting concluded that the short-term intake of residues of fenamidone, when used in ways that have been considered by the JMPR, is unlikely to present a public health concern (except mustard greens and spinach).