Overview of analytical methods available from the CRL for Residues

RIVM

Laboratory for Food and Residue Analysis

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Methods can be downloaded from www.rivm.nl/residues

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Proposed minimum list of substances and matrices for inclusion National Residue Monitoring Plans and recommended tested values.
Bovine, Sheep, Goats, Horses, Pigs, Rabbit, Game

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
A1	Diethylstilboestrol		Urine (1)	1 µg/l	387 - 479	SOP 479: Validated GC-MS method with with CCβ < 0.5 µg/l for diethylstilbestrol, dienestrol, and hexestrol
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
			Muscle (incl. fish)	1.0 µg/kg	490 530	SOP 490: Analysis of stilbenes in meat. Validated GC-MS method with CCβ < 0.5 µg/kg for diethylstilbestrol, dienestrol, hexestrol and benzestrol SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µ
	Dienoestrol		Urine (1)	1 µg/l	387 - 479	SOP 479: Validated GC-MS method with with CCβ < 0.5 µg/l for diethylstilbestrol, dienestrol, and hexestrol
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
			Muscle (incl. fish)	1.0 µg/kg	490 530	SOP 490: Analysis of stilbenes in meat. Validated GC-MS method with CCβ < 0.5 µg/kg

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
						for diethylstilbestrol, dienestrol, hexestrol and benzestrol SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Hexestrol		Urine (1)	1 µg/l	387 - 479	SOP 479: Validated GC-MS method with with CCβ < 0.5 µg/l for diethylstilbestrol, dienestrol, and hexestrol
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
			Muscle (incl. fish)	1.0 µg/kg	490 530	SOP 490: Analysis of stilbenes in meat. Validated GC-MS method with CCβ < 0.5 µg/kg for diethylstilbestrol, dienestrol, hexestrol and benzestrol SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
A2	Thiouracil		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = < 1 µg/kg
	Methylthiouracil		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = < 1 µg/kg
	Propylthiouracil		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = < 1

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
						µg/kg
	Mercaptobenzymidazole		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = < 1 µg/kg
	Benzylthiouracil		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = 1.1µg/kg
	Phenylthiouracil		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = 1.2 µg/kg
	Tapazole		Urine (Thyroid)	100 µg/l	552	Analysis of thyreostats in bovine urine by LC-MS. Validated LC-MS method with CCβ = 2.5 µg/kg
A3	Boldenone	17β-boldenone	Urine	1 µg/l	478 - 479	SOP 478: Analysis of free and conjugated boldenone in bovine urine by GC-MS. Validated method with CCβ < 0.5 for 17β-boldenone-glucuronide (expressed as free β-boldenone) < 0.5 µl SOP 479: Analysis of anabolic steroids in bovine urine with GC-MS. Validated analytical method with CCβ < 0.5 µg/l
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
			Muscle (incl fish)	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	17β-Nortestosterone	17α-Nortestosterone	Urine	1 µg/l	479	SOP 479: Analysis of anabolic steroids in bovine urine with GC-MS. Validated analytical method with CCβ < 1 µg/l
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
			Muscle (incl fish)	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Ethynyl estradiol		Urine	1 µg/l	479	SOP 479: Analysis of anabolic steroids in bovine urine with GC-MS. Validated analytical method with CCβ < 0.5 µg/l
			Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
			Muscle (incl fish)	1.0 µg/kg	113	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	17β-Oestradiol	17β-Oestradiol	Serum	0,1 µg/l	492	SOP 492: Analysis of α/β-oestradiol, α/β-testosterone and progesterone in serum by GC-MS. Validated analytical method with CCβ < 0.5 µg/l

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
			Muscle (incl fish)	0.1 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
			urine		479	SOP 479: Analysis of anabolic steroids in bovine urine with GC-MS. Validated analytical method with CCβ < 1 µg/l
	Methyltestosterone	17α-methyl-5β-androstaan-3α,17β-diol CAS 641-84-9 $C_{20}H_{34}O_2$	Urine	2 µg/lkg	479	SOP 479: Analysis of anabolic steroids in bovine urine with GC-MS. Validated analytical method with CCβ < 1 µg/l
		17α-methyl-5β-androstaan-3α,17β-diol CAS 641-84-9 $C_{20}H_{34}O_2$	Liver	2 µg/kg	113	ARO SOP 113, validated analytical method for single analyte confirmatory analysis based on off line LC isolation and GC-MS confirmation. Currently under revision
		Methyltestosterone	Muscle (incl. fish)	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	17β-Trenbolone	17α-Trenbolone	Urine	2 µg/kg	519	Residue analysis of 17α- and 17β-Trenbolone in bovine urine, meat, liver and Ffsh. LC-MSMS method based on IAC clean-up with CCβ < 1 µg/l
			Liver	2 µg/kg	519	Residue analysis of 17α- and 17β-Trenbolone in bovine urine, meat, liver and fish. LC-MSMS method based on IAC clean-up with CCβ < 1 µg/kg
			Muscle (incl fish)	1.0 µg/kg	519	Residue analysis of 17α- and 17β-Trenbolone in bovine urine, meat, liver and fish. LC-MSMS method based on IAC clean-up

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
						with CCβ < 1 µg/kg.
	Stanozolol	16β-Hydroxystanozolol	Urine	2 µg/l	446	SOP 446: Analysis of stanozlol and metabolites in urine, screening and quantification (LC-MSD) en confirmation (LC-MS^n)
			Liver	2 µg/kg		
			Muscle (incl fish)	1.0 µg/		Rapid method for the determination of stanozolol in meat with supercritical fluid extraction and liquid chromatography – mass spectrometry. *Anal. Chim. Acta 483 (2003) 1-9.*
	Dexamethasone		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Prednisolon		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Methylprednisolon		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Prednisone		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Betamethasone		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ <

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
						0.5 µg/l .
	Beclomethasone		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Flumethasone		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Triamcinolone acetonide		Urine (liver)	2 µg/l	517	Analysis of corticosteroids in bovine urine by LC-MSMS. Validated method with CCβ < 0.5 µg/l .
	Dexamethsaone		Liver			
			Muscle (incl fish)	0.5 µg/kg		
	Megestrol	Megestrol (acetate)	Kidneyfat	1 µg/kg	399	SOP 399: Analysis of samples of kidney fat with SPE LC-MS. CRL workshopbook 2001
			Muscle (incl. fish)	0.5 µg/kg	435 530	SOP 435: SFE GC-MS method with CC_β < 0.5 µg/kg. SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Melengestrol	Melengestrol (acetate)	Kidneyfat	1 µg/kg	399	SOP 399: Analysis of samples of kidney fat with SPE LC-MS. CRL workshopbook 2001.
			Muscle (incl. fish)	1.0 µg/kg	435 530	SOP 435: SFE GC-MS method with CC_β < 0.5 µg/kg. SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Chlormadinone	Chlormadinone(acetate)	Kidneyfat	1 µg/kg	399	SOP 399: Analysis of samples of

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
						kidney fat with SPE LC-MS. CRL workshopbook 2001
			Muscle (incl. fish)	0.5 µg/kg	435 530	SOP 435: SFE GC-MS method with CC_β < 0.5 µg/kg. SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Medroxyprogesterone	**Medroxyprogesterone (acetate)**	**Kidneyfat**	**1 µg/kg (MRPL)**	399	SOP 399: Analysis of samples of kidney fat with SPE LC-MS. CRL workshopbook 2001
			Muscle (incl. fish)	1.0 µg/kg	435 530	SOP 435: SFE GC-MS method with CC_β < 0.5 µg/kg SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
A4	Zeranol	Taleranol	Urine	2 µg/l	458	SOP 458: Analysis of Zeranol and metabolites in urine, bile, meat, liver and kidney by GC-MS. Validated analytical method with CCβ < 1 µg/l
			Liver	2 µg/kg	458	SOP 458: Analysis of Zeranol and metabolites in urine, bile, meat, liver and kidney by GC-MS. Validated analytical method with CCβ < 1 µg/kg
			Muscle (incl. fish)	1.0 µg/kg	458	SOP 458: Analysis of Zeranol and metabolites in urine, bile, meat, liver and kidney by GC-MS. Validated analytical method with CCβ < 1 µg/kg
A6	Chlorpromazine and other sedatives		Kidney	10 µg/kg	504	Determination of tranquilizers in kidney using LC-MSMS. Validated methods with CCβ < 1 µg/kg using LC-MSMS

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
	Xylazine Acepromazine Propiopromazine (note Azaperone/azaprol) MRL 100 ppb in pig liver, carazolol 25 ppb in pig liver)		Kidney	50 µg/kg	504	Determination of tranquilizers in kidney using LC-MSMS. Validated methods with CCβ < 5 µg/kg using LC-MSMS

Proposed additional substances for matrices for inclusion National Residue Monitoring Plans and recommended tested values.
Bovine, Sheep, Goats, Horses, Pigs, Rabbit, Game

Group	Substances to be included	Marker residue-metabolite (species dependant)	Best Matrix	Recommended concentration that should be screened and confirmed	Procedure	comments
	Norethandrolone	17α-ethyl-5β-norandrostaan-3α,17β-diol	Urine	2 µg/l		Standard for metabolite not available
		17α-ethyl-5β-norandrostaan-3α,17β-diol	Liver	2 µg/kg		Standard for metabolite not available
			muscle	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Normethandrolone	17α-methyl-5β-norandrostaan-3α,17β-diol	Urine	2 µg/l		Standard for metabolite not available
		17α-methyl-5β-norandrostaan-3α,17β-diol	Liver	2 µg/kg		Standard for metabolite not available
			muscle	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	Clostebol (Chlortestosterone)	**4-chloro-androst-4-ene-3,17-dione (CLAD)**	Urine	2 µg/l	479	SOP 479: Validated GC-MS method with with CCβ < 1 µg/l for for CLAD
			Liver	2 µg/kg		
			muscle	0.5 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.Currently under revision
	Norclostebol	**4-chloro-17α-hydroxy-**	Urine	2 µg/l	479	SOP 479: Validated GC-MS

		19-norandrostane-3-one				method with with CCβ < 1 µg/l for for CLAD **Available standard: 4-chloro-17β-hydroxy-19-norandrostane-3-one**
		4-chloro-17α-hydroxy-19-norandrostane-3-one	Liver	2 µg/kg		**Available standard 4-chloro-17β-hydroxy-19-norandrostane-3-one**
			muscle	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.
	methylboldenone	17α-methyl-4-androstene-3ζ,6ζ,17β-triol	Urine	2 µg/l		SOP 479: Validated GC-MS method with with CCβ < 0.5 µg/l for methylboldenone. Standard for metabolite not available
		17α-methyl-4-androstene-3ζ,6ζ,17β-triol	Liver	2 µg/kg		Standard for metabolite not available
			muscle	1.0 µg/kg	530	SOP 530: validated multi residue method based on GC-MSMS with CCα and CCβ < 0.5 µg/kg.