

EVALUATION OF SENSOR-BASED HEALTH ALERTS

SUPPLEMENTARY MATERIAL

Table 1: Definition of diseases during the fresh cow period and individual treatments in the conventional and sensor-based groups.

Disease	Group	Severity	Definition of severity	Drug	Company	Route	Dose	Frequency	Meat/Milk Withholding (days)	Remarks
Fever of unknown ethology	CON	1	Fever ³ without other signs of disorders	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
	SEN	1	Fever ³ without other signs of disorders	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
Rumen dys-function	CON	1	RF ⁵ <3	Drench (Water, propylene glycol, dinatriumphosphate, yeast, whey powder)	Dechra Veterinary GmbH, Aulendorf, Germany	oral	30 L	1×	0	
	SEN	1	lowered intensity (soft noises) and contraction (con) (<2 con/3min) ⁶	Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	500 ml	1×	0	
		2	lowered intensity (soft noises) and contraction (con) (<2 con/3min) ⁶ and RF ⁵ <3	Drench (Water, propylene glycol, dinatriumphosphate, yeast, whey powder)	Dechra Veterinary GmbH, Aulendorf, Germany	oral	30 L	1×	0	
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	500 ml	1×	0	

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Ketosis	CON	1	Low grade loss of appetite ¹¹ + C4 ¹	1,2-Propandiol (Propylene Glycol)	Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1×	0	
		2	Medium grade loss of appetite ¹¹ + C4 ¹	1,2-Propandiol (Propylene Glycol)	Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1×	0	
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	500 ml	1×	0	
				Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
		3	High grade loss of appetite ¹¹ + C4 ¹	1,2-Propandiol (Propylene Glycol)	Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1×	0	
			Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0		
			Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	1000 ml	1×	0		
			Dexamethason dihydrogenphosphat-Dinatrium (Rapodexon)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	20 ml	1×	8/3		
	SEN	1	BHB ⁷ 1,8 ≥ 1,2 µmmol/l	1,2-Propandiol (Propylene Glycol)	Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1× per day for 3 days	0	Repeated BHB test after 3 days
		2	3,0 ≥ BHB ⁷ µmmol/l	1,2-Propandiol (Propylene Glycol)	Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1× per day for 3 days	0	Repeated BHB test after 3 days
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH,	i.v.	500 ml	1×	0	

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		3	BHB ⁷ ≥ 3,0 µmmol/l	1,2-Propandiol (Propylene Glycol)	Tuttlingen, Germany Spezialfutter Neuruppin GmbH & Co. Kg, Neuruppin, Germany	oral	300 ml	1× per day for 3 days	0	Repeated BHB test after 3 days
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	1000 ml	1×	0	
				Dexamethason-dihydr ogenphosphat- Dinatrium (Rapodexon)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	20 ml	1×	8/3	
Mastitis	CON	1	Intramammary infection with visible abnormalities in milk or udder	Cefalexin and Kanamycin (Ubrolexin)	Boehringer Ingelheim Vetmedica GmbH, Ingelheim am Rhein, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	10/5	In case of no improve- ment, continue treatment for 3 more days
				alpha- Tocopherolacetat, Retinolpalmitat, Chymotrypsin, Trypsin, Papain (Mastiveyxm)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	0	
				Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
		2	Intramammary infection with visible abnormalities in milk or udder and disturbed general condition	Cefalexin and Kanamycin (Ubrolexin)	Boehringer Ingelheim Vetmedica GmbH, Ingelheim am Rhein, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	10/5	In case of no improve- ment, continue treatment for 3 more days
				Alpha- Tocopherolacetat, Retinolpalmitat,	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	0	

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		3	Intramammary infection with Escherichia coli, with clear sings of inflammation ranging from mild to severe	Chymotrypsin, Trypsin, Papain (Mastiveyxm)						
				Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
				Penethamathydroiodid (Permacyl)	Vetoquinol GmbH, Ismaning, Germany	i.m.	18 ml	1× per day for 2 days	4/2.5	
				Natriumchlorid (NACL Hypertone)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	1000 ml	1×	0	In case of no improvement in 24 h, repeat infusion
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH,	i.v.	500 ml	1×	0	
				Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
				Sulfadoxin Trimethoprim (Sulfonamide)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.v.	60ml	1× per day for 4 days	6/4	
	SEN	1	Intramammary infection with visible abnormalities in milk or udder	Penethamathydroiodid (Permacyl)	Vetoquinol GmbH, Ismaning, Germany	i.m.	18 ml	1× per day for 2 days	4/2.5	
				Cefalexin and Kanamycin (Ubrolexin)	Boehringer Ingelheim Vetmedica GmbH, Ingelheim am Rhein, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	10/5	In case of no improvement, continue treatment for 3 more days
				Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
		2	Intramammary infection with visible abnormalities in milk or udder	Benzylpenicillin-Procaïn (ProcPen Injektor)	AniMedica GmbH, Senden, Germany	i.mam m. ⁹	1 INJ	1× per day for 3 days	5/6	
				Penethamathydroiodid (Permacyl)	Vetoquinol GmbH, Ismaning, Germany	i.m.	18 ml	1× per day for 2 days	4/2.5	

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			and disturbed general condition	Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
		3	Intramammary infection with Escherichia coli, with clear sings of inflammation ranging from mild to severe	Drench (Water, propylene glycol, dinatriumphosphate, yeast, whey powder)	Dechra Veterinary GmbH, Aulendorf, Germany	oral	30 L	2× in 24 h	0	
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	500 ml	1×	0	Repetition of infusion if no improvement in 24 h
				Natriumchlorid (NACL Hypertone)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	1000 ml	1×	0	
				Tolfenamic acid (Tolfedol)	Virbac GmbH, Bad Oldesloe, Germany	i.m.	60 ml	1×	4/1	
				Sulfadoxin Trimethoprim (Sulfonamide)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.v.	60ml	1× per day for 4 days	6/4	
				Natriumchlorid (NACL isotone)	B. Braun Vet Care GmbH, Tuttlingen, Germany	i.v.	500 ml	1×	0	Additional infusion if no improvement in 24 h
				Dexamethason Dihydrat Dinatrium (Rapodexon)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	20 ml	1×	8/3	
Metritis	CON	1	purulent uterine discharge ² detectable in the vagina	Tetracyclinhydrochlorid (Tetrabol)	CP-Pharma GmbH, Burgdorf, Germany	i.u. ¹⁰	5	1×	10/4	
				Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
				Cloprostenol (PGF 2α)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	2 ml	1×	2/0	Once at day 10 in lactation

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		2	purulent uterine discharge ² detectable in the vagina and fever ³	Tetracyclinhydrochlorid (Tetrabol)	CP-Pharma GmbH, Burgdorf, Germany	i.u. ¹⁰	5	1×	10/4	If fever persists, repeat the treatment 2 days later
				Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
				Cloprostenol (PGF 2α)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	2 ml	1×	2/0	Once at day 10 in lactation
				Benzylpenicillin-Procaïn (Proactive_Penicillin)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	25.ml	1× per day for 4 days	6/4	Apply, if fever persists for 4 days
	SEN	1	purulent uterine discharge ² detectable in the vagina	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
		2	purulent uterine discharge ² detectable in the vagina and fever ³	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
				Benzylpenicillin-Procaïn (Proactive_Penicillin)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	25.ml	1× per day for 4 days	6/4	Apply, if fever ≥ 40 C° for 2 days, or fever persists for 4 days
Hypocalc-aemia	CON	1	Cold ears and body surface	Calciumgluconat Magnesiumchlorid-Hexahydrat Boracid (Calcilift forte)	Dechra Veterinary GmbH, Aulendorf, Germany	s.c.	120 ml	1×	0	
		2	Ataxia	Calciumgluconat Magnesiumchlorid-Hexahydrat	Dechra Veterinary GmbH, Aulendorf, Germany	s.c.	250 ml	1×	0	

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				Boracid (Calcilift forte)							
				Calciumgluconat Magnesiumchlorid-Hexahydrat Boracid (Calcilift forte)	Dechra Veterinary GmbH, Aulendorf, Germany	i.v.	250 ml	1×	0		
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH,	i.v.	500 ml	1×	0		
		3	Downer cow	Calciumgluconat Magnesiumchlorid-Hexahydrat Boracid (Calcilift forte)	Dechra Veterinary GmbH, Aulendorf, Germany	i.v.	500 ml	1×	0		
				Glucose-Monohydrat (40% Glucose)	B. Braun Vet Care GmbH,	i.v.	500 ml	1×	0		
	SEN	1	Ca ⁸ < 1.97 mmol/l	Calciumchlorid, Calciumsulfat, Acetic acid ester (Bovikalc)	Boehringer Ingelheim Vetmedica GmbH, Ingelheim am Rhein, Germany	oral	Bolus	1× per day for 2 days	0		
		2	Downer cow + Ca ⁸ < 1.97 mmol/l	Calciumgluconat Magnesiumchlorid-Hexahydrat Boracid (Calcilift forte)	Dechra Veterinary GmbH, Aulendorf, Germany	i.v.	500 ml	1×	0		
				Glucose-Monohydrat (40% Glucose)	Glucose-Monohydrat (40% Glucose) B. Braun Vet Care GmbH,	i.v.	500 ml	1×	0		
	Retained Placenta (RP)	CON	1	visible foetal membranes on the vulva >24h after calving	Tetracyclinhydrochlorid (Tetrabol)	CP-Pharma GmbH, Burgdorf, Germany	i.u. ¹⁰	5	1×	10/4	For persistent RP, apply again on day 3, 5 in lactation
					Carbetocin (Depotocin)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	5 ml	1×	0	For persistent RP apply

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										on day 2 in lactation
				Cloprostenol (PGF 2 α)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	2 ml	1 $\times$	2/0	Once at day 10 in lactation
		2	visible foetal membranes on the vulva >24h after calving and disenabled general condition	Tetracyclinhydrochlorid (Tetrabiol)	CP-Pharma GmbH, Burgdorf, Germany	i.u. ¹⁰	5	1 $\times$	10/4	For persistent RP, apply again on day 3, 5 in lactation
				Carbetocin (Depotocin)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	5 ml	1 $\times$	0	For persistent RP apply on day 2 in lactation
				Cloprostenol (PGF 2 α)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	2 ml	1 $\times$	2/0	Once at day 10 in lactation
				Ketoprofen (Kelaprofen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1 $\times$	2/0	
	SEN	1	visible foetal membranes on the vulva >24h after calving	Oxytocin	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	2 ml	1 $\times$	3/0	within 24 h after calving
	Lame-ness	1	Abnormal gait or stance of an animal caused by dysfunction of the locomotor system. Score ⁴ $\geq$ 4	Ketoprofen (Kelaprofen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1 $\times$	2/0	
				Hoof trimming						
		2	Diffuse non-demarcated swelling in the	Ketoprofen (Kelaprofen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1 $\times$	2/0	Persistence of lameness

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			interdigital region combined with lameness.							LH $\geq$ 4, continue treatment
				Hoof trimming						Bandage for 3 days
				Benzympenicillin-Procaïn (Proactive Penicillin)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	25.ml	1× per day for 4 days	6/4	
	SEN	1	Abnormal gait or stance of an animal caused by dysfunction of the locomotor system. Score ⁴ $\geq$ 3	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	
				Hoof trimming						
		2	Diffuse non-demarcated swelling in the interdigital region combined with lameness.	Ketoprofen (Kelaprogen)	Veyx-Pharma GmbH, Schwarzenborn, Germany	i.m.	20 ml	1×	2/0	Persistence of lameness LH $\geq$ 4, continue treatment
				Hoof trimming						Bandage for 3 days
				Benzympenicillin-Procaïn (Proactive Penicillin)	Dechra Veterinary GmbH, Aulendorf, Germany	i.m.	25 ml	1× per day for 4 days	6/4	

¹Manure consistency score (Zaaijer et al., 2001)

²Order, viscosity, and modified color scales of vaginal discharge (Sannmann and Heuwieser, 2015)

³Fever: rectal temperature $\geq$ 39.5°

⁴Lameness Score (Sprecher et al., 1997)

⁵Rumen score (Zaaijer et al., 2001)

⁶Rumen auscultation, physiological two rumen contraction / 3min (Radostits et al., 2007)

⁷Beta-hydroxybutyrate (BHB) measurement in blood: Freestyle Precision β -Ketone, Abbott Diabetes Care Ltd, Oxon, United Kingdom.

⁸Calcium concentration (Ca) measurement in blood: VETSCAN[®] VS2 Chemistry Analyzer, Zoetis, New Jersey, USA.

⁹intramammary application (i.mamm.)

¹⁰intrauterine application (i.u.)

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¹¹normal-grade of appetite: Normal feed intake, constant feed intake during monitoring of fresh cows.

low-grade loss of appetite: hesitant feed intake during fresh cow monitoring

medium grade loss of appetite: low feed uptake at the cow monitoring

high-grade loss of appetite: no observed feed intake during fresh cow monitoring procedure

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