





**Brahms PCT Direct analyser for
infection detection in horses**




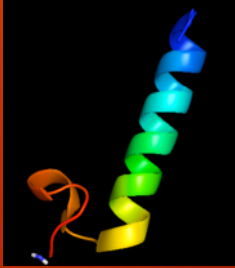
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What is PCT ?

- PCT = procalcitonine
- Peptide precursor of calcitonin (hormone / Ca⁺⁺)
- 116 amino-acids
- Produced by
 - Parafollicular cells C cells of thyroid
 - Neuroendocrine cells of intestine and lung

PCT Production
CALC-1


Inflammatory PCT

Adipocytes
CT-mRNA
↓
PCT



Thyroid PCT

Endocrine Cells
CT-mRNA
↓
PCT
↓
CT

↓
Blood Stream



PCT in human medicine

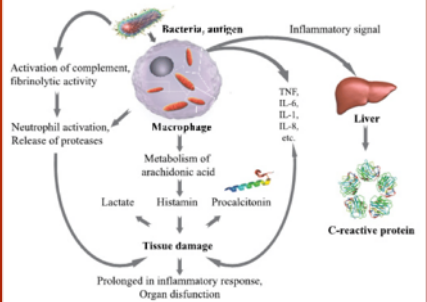
- Early, sensitive and specific of bacterial infections
- PCT increases in response to pro-inflammatory stimulus, esp bact
- No increased PCT in viral infection (PCT inhibition g.interferon/cells)
- Induction in 4-12h
- Half life 22-35h
- Normal values PCT < 0.10 microg/l
- SIRS, chronic resp

THYROID C-CELLS

CT-mRNA → PCT → Blood

Parafollicular Production
CALC-1 Gene (Chromosome 11)

MAJOR TISSUE INCLUDES:
• ADIPOCYTES
• INTTESTINE
• NEUROENDOCRINE CELLS



Bacteria, antigen → Inflammatory signal

Macrophage → Neutrophil activation, Release of proteases

Macrophage → Metabolism of arachidonic acid → Lactate, Histamin, Procalcitonin


Procalcitonin → Tissue damage → Prolonged in inflammatory response, Organ dysfunction

Liver → C-reactive protein

Macrophage → Activation of complement, fibrinolytic activity



PCT in veterinary medicine




- PCT in animals
 - Calves
 - Canine and feline
 - Pigs
- PCT in horses
 - SIRS
 - Colic

The infographic illustrates the use of Procalcitonin (PCT) as a blood test for bacterial sepsis. It shows a doctor performing a blood test on a patient. A bar chart indicates that sepsis levels of procalcitonin are 0.5 µg/L or higher, while normal levels are 0 to 0.5 µg/L. The infographic also notes that PCT does not diagnose the type of infection.

verywell
Verywell / Laura Porter



Infection & Inflammation in horses



Context

Infection /Inflammation


- 📄 heat
- 📄 pain
- 📄 effusion
- 📄 edema
- 📄 vascularisation
- 📄 local // general
- 📄 fever
- 📄 weakness
- 📄 decrease appetite

Fever in horses

- 👤 transient
- 👤 continuously
- 👤 fluctuating
- 👤 high // very high
- 👤 clinical signs // no signs
- 👤 no appetite // appetite
- 👤 epidemiologic context

Infection Treatments

- 📄 anti-inflammatory drugs
- 📄 anti-pyretic drugs
- 📄 antimicrobials





Antimicrobial resistance



Context

One Health issue

-  worldwide
-  humans
-  animals
-  environment

AM Responsible use

-  AM preservation
-  no routine decision
-  AM choice
-  start fast
-  check dosages
-  don't be afraid to stop

POC tests interest

-  diagnostic tools
-  rapid / immediate
-  on demand
-  easy to do
-  easy to repeat
-  start and stop decisions





EcoAntibio 2 for vets, by DGAL - France



Context

-  Decrease the use of AM in vet practice
-  EcoAntibio plans // call for projects
-  EcoAntibio 1
 -  AVEF consensus
 -  Guidelines for AM responsible use in horses
-  EcoAntibio 2
 -  educational video spots
 -  PCT clinical study - 49000 €



MINISTÈRE
DE L'AGRICULTURE
ET DE
L'ALIMENTATION








Brahms PCT direct & infection in horses



Objectives

- Evaluate Brahms PCT direct in measuring PCT in horses
- Check PCT interest as biomarker for infection detection in horses
- Learn about PCT values in healthy and sick horses
- Look at correlations between PCT + and clinical signs / lab tests
- Observe PCT evolution after antibiotics administration
- Evaluate use of PCT for antibiotics stewardship in horses
- Situations : healthy, SIRS, pneumonia in horses




Vets & Horses




Mat & Meth

- 3 equine clinics in France
 - 1 in Normandy (foals)
 - 1 east of France
 - 1 near Paris
- All type of horses examined
 - Sick horses
 - Healthy horses
 - All ages
 - Clinical cases +- hospitalization



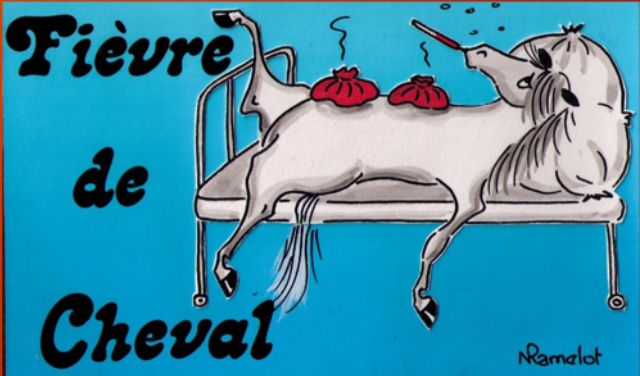



Vet checks




- Clinical examinations
 - Reason and History : infection, AM
 - General status, HR, RR, Mmb, CRT
 - Rectal temp °C
 - Resp endoscopy, Xrays, US if needed

- Time for exams
 - 1st exam / daily if hospitalization
 - On evolution
 - 1 or more exams / 1 horse




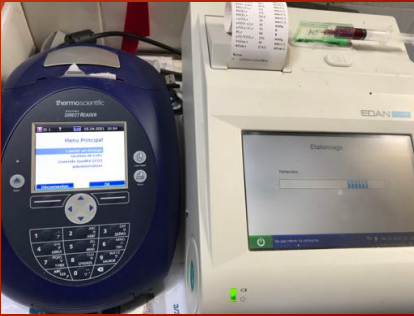


Lab tests



- Types of lab tests
 - Blood cell count - ABC Vet Scil
 - Blood gases - iVet Edan
 - PCT - Brahms PCT direct
 - +- tracheal wash when needed

- Time for lab tests
 - Every 1st exam / daily if hospitalization
 - Every clinical evolution (sp until PCT -)
 - 1 or more test / 1 horse

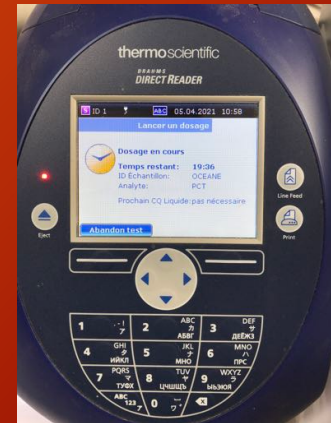





Brahms PCT direct reader



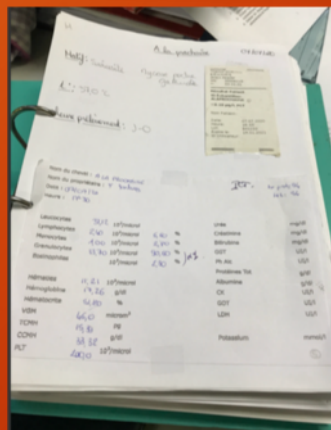
- POC machine from Thermofisher
- Immunochromatography
 - Rat and mouse antibodies
- 20 microl EDTA blood
- Cartridges (boxes of 25 /fridge)
- 20 mins test
- Dosage > 0.10 microg/l = positive
- Used a lot in human for COVID !!



Data collection & analysis



- Clinical reports
 - Exam + Hospitalization files
 - AM administrations
- Lab tests reports
 - From machines
 - Special report / horse
- PCT specials
 - Paper + excel file



IVECCS 2023

Study protocol

Mat & Meth



MINISTÈRE DE L'AGRICULTURE ET DE L'ALIMENTATION




- Prospective study
- 2019 DGAL AAP
- Designed
 - Multicentric
 - 60 horses (10 healthy, 25 pneumonia, 25 foals)
 - To start 2019



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Final Protocol

Results




- Prospective study
 - June 2020 - 2023 (COVID !)
 - Monocentric for 99%
- Horses inclusion
 - SIRS or resp infection suspicion
 - Healthy horses (+ locomotor)
 - + Pre-op screening
 - + all types of fever
 - + Other infection suspicion


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AURORA

Overall results

Results





- 152 Horses
 - 53 F, 24 M, 55 G
 - Th, Std, SH, leisure & ponies
 - Age from 1 day to 24 yo
 - Mean 6 yo, med 3 yo





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AURORA

Overall results


Results




- 322 tests
- 103 horses with unique tests
- 49 horses with multiple tests
 - 2 to 23 tests / 1 horse
 - 15 horses to check PCT +
 - 30 horses / check PCT -


Diseases categories





Results




- 376 Reasons for 152 horses exams
 - 1 unique category
 - multiple categories (several signs)
- Categories
 - 13 Main categories
 - Resp, dig, foals, repro, loco, abcess
 - Wounds, pre-op, post-op, hyperth
 - Ophtalmo, screening, pirolike
 - 17 Sub-categories
 - In resp, dig, foals, loco




Diseases categories



Results





- 13 Categories


category	Hyperth	Resp	Dig	Repro	Foals	Abcess	Wound	Loco	Pre-op	Post-op	Pirolike det	Ophtalm	Screening	
nb tests		11	152	72	7	20	15	9	29	23	16	6	2	14

- 17 sub categories


category	RESP				DIG				FOALS				LOCO					
sub category	resp exam	asthma	sinusitis	foal	colic	diarrhea	gastroscopy	foals	oesophagus	diarhea	resp	septic arth	septicemia	loco exam	tensyn	edema	laminitis	
nb tests	62		70	4	16	62	3	3	1	3	1	15	0	4	16	2	9	2

Diseases categories

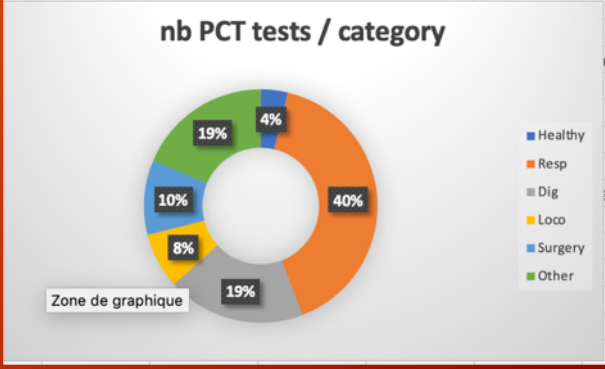


Results





- 376 Reasons for 152 horses exams
 - 1 unique category
 - multiple categories (several signs)
- Categories
 - 13 Main categories => 6 Big cat
 - Resp, dig, foals, repro, loco, abcess
 - Wounds, pre-op, post-op, hyperth
 - Ophtalmo, screening, pirolike
 - 17 Sub-categories
 - In resp, dig, foals, loco


nb PCT tests / category




category	Healthy	Resp	Dig	Loco	Surgery	Other	70
nb horses		14	152	72	29	39	

Overall PCT values

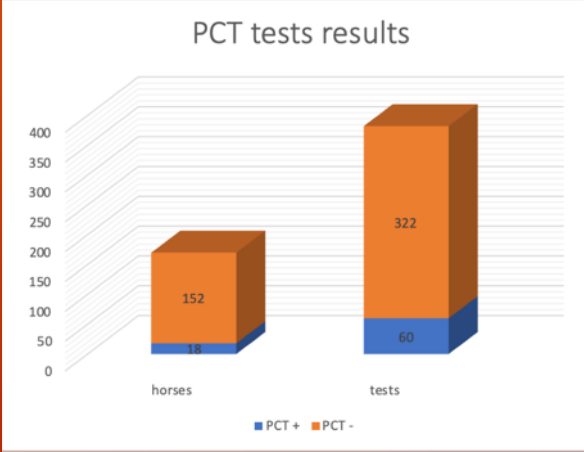




Results




- PCT > 0.1 microg/l = positive
- 60 PCT +
 - 322 tests = 19 % PCT +
 - 18 horses = 12% PCT +
- PCT + values
 - mean = 0.290 +- 0.202 microg/l
 - mini = 0.1 microg/l
 - maxi = 1.0 microg/l
 - med = 0.215 microg/l

PCT tests results




PCT & disease category



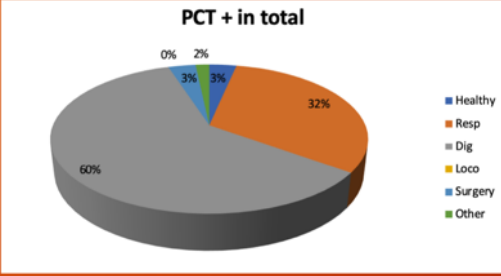
Results



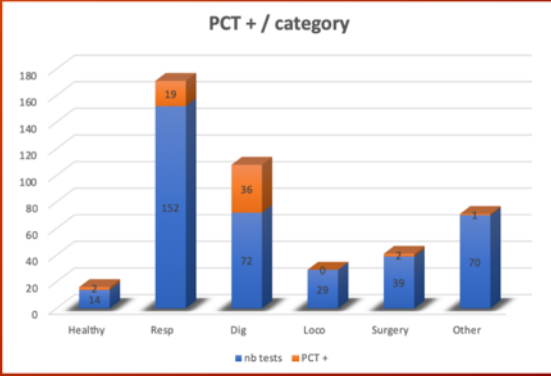
- 60 PCT +
 - 60% Dig
 - 32% Resp
 - 6% healthy or pre-op



category	Healthy	Resp	Dig	Loco	Surgery	Other	
nb tests	14	152	72	29	39	70	
PCT +	2	19	36	0	2	1	

PCT + in total




PCT + / category




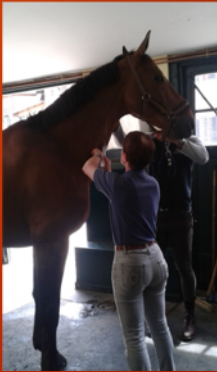

PCT & disease category





Results



- Digestive
 - Colic = 58% total PCT +, 100% dig group
 - mean PCT = 0,38 microg/l
- Respiratory
 - Cough = 13% total PCT +, 42% resp group
 - Asthma = 13% total PCT +, 42% resp group
 - Foals = 19% total PCT+, 16% resp group
 - Mean PCT = 0,34 microg/l

category	RESP					DIG				
	resp exam	asthma	sinusitis	foal	colic	diarrhea	gastroscopy	foals	oesophagus	
nb tests	62	70	4	16	62	3	3	1	3	
PCT +	8	8	0	3	36	0	0	0	0	

PCT & disease category






Results





- Other PCT +
 - 2 pre-op without signs
 - 2 healthy, coughing 2 days after
 - 1 uterus wound
 - mean PCT = 0.15 microg/l
- PCT -
 - Abscess
 - Resp (esp sinusitis)
 - Diarrhea
 - Loco

category	Healthy	Resp	Dig	Loco	Surgery	Other	
nb tests	14	152	72	29	39	70	
PCT +	2	19	36	0	2	1	






PCT & fever






Results




- Fever
 - 28% PCT +
 - 17 horses PCT+
- Hyperthermia
 - 100% PCT -
 - 11 horses hyperthermia
 - 6 pirolike detection










PCT & blood analysis





- Leucocytosis > 9000 WBC
 - 10 horses PCT+
 - 16% PCT + correlation
- Neutropenia < 60% WBC
 - 6 horses PCT+
 - 10% PCT + correlation
- Neutrophily > 67% WBC
 - 8 horses PCT+
 - 13% PCT + correlation




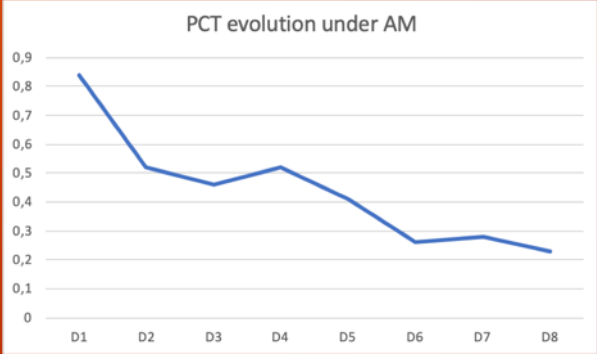
Results

PCT & AM management





- PCT + decrease
 - 5 horses with AM
- PCT -
 - Vet influence for no AM
 - 80% of 'wait and see' attitude



PCT evolution under AM

Day	PCT Value
D1	0.85
D2	0.50
D3	0.45
D4	0.50
D5	0.40
D6	0.25
D7	0.28
D8	0.22





Results


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PCT & horses' specials

Discussion




- PCT remaining +
 - Renal failure without origin
 - Abdominal pb without origin





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Brahms PCT direct in horses

Discussion



- PCT +
 - Colic
 - Respiratory pbs
- PCT -
 - AM needed ?
 - Infection diagnostic
- PCT reader
 - Easy
 - In the 8h






PCT difficulties



- Lack of SIRS cases
 - Pneumonia
 - Septicemic foals
- PCT & SAA
- Brahms PCT reader
 - No availability during COVID
 - Not anymore on the market !!




Discussion







PCT future in horses ?



- ELISA PCT tests
- Bact / virus in horses
- Peritoneal fluid
- AM stewardship
 - AM therapy on ?
 - Molecules
 - Dosages
 - AM treatment duration
 - Stop treatment








Discussion









THANK YOU !!
DGAL, France
Dr vet Laurent Mangold, Clémentine Dubois, Laetitia Allio, Philippe Blaise

