

# COLORADO



GAYLORD ROCKIES, AURORA

29th International Veterinary Emergency & Critical Care Symposium

**SEPTEMBER 7-11, 2023**



# Brahms PCT Direct analyser for infection detection in horses

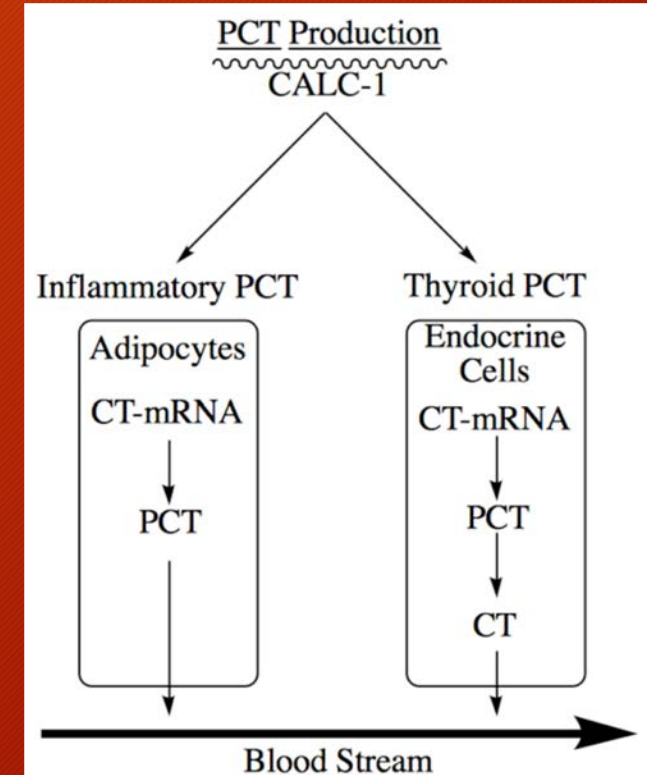
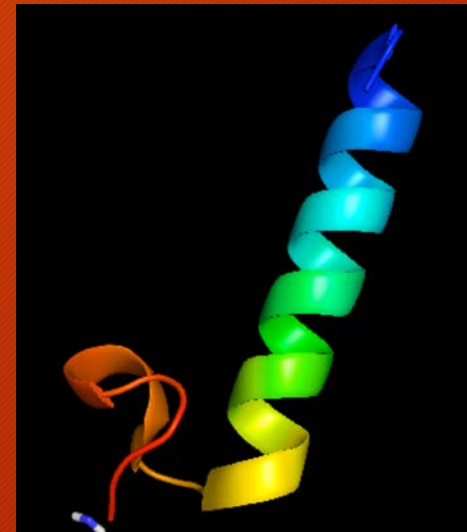


Claire Scicluna, DVM  
Clinique du Plessis  
Equ'Institut

# What is PCT ?



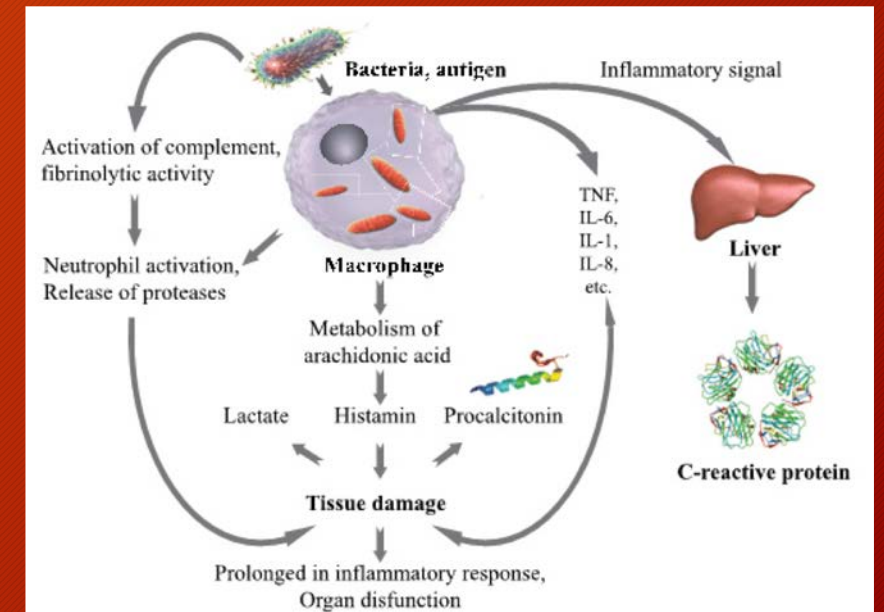
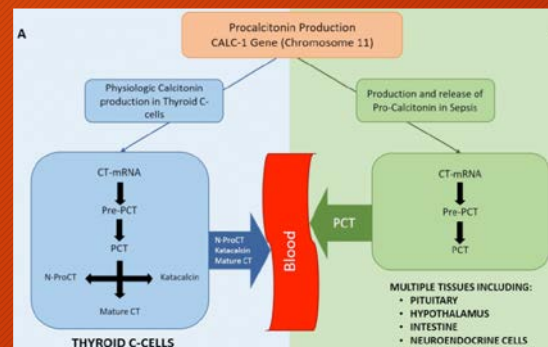
- PCT = procalcitonine
- Peptide precursor of calcitonin (hormone /  $\text{Ca}^{++}$ )
- 116 amino-acids
- Produced by
  - Parafollicular cells C cells of thyroid
  - Neuroendocrine cells of intestine and lung



# 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

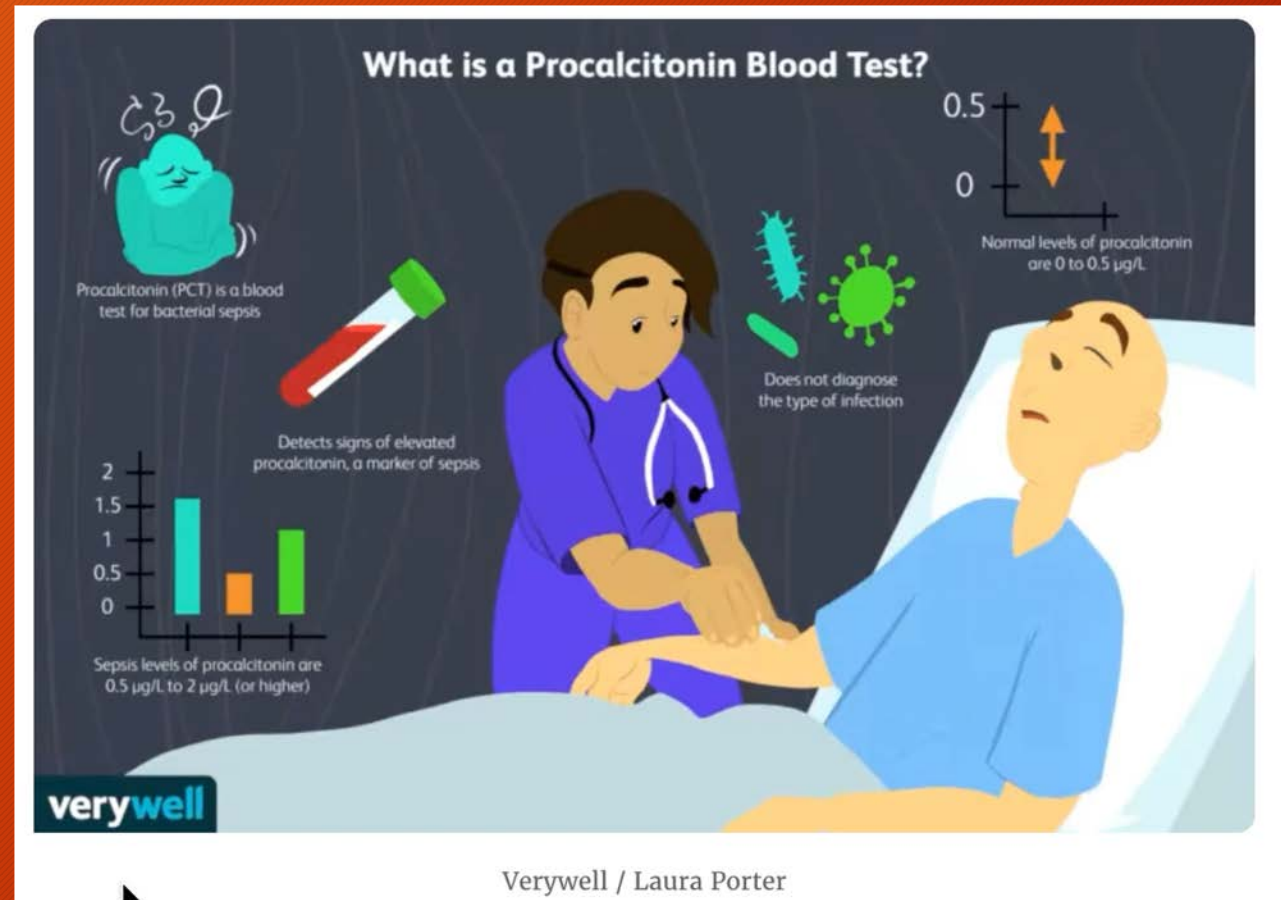


# PCT in veterinary medicine



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

### What is a Procalcitonin Blood Test?



Procalcitonin (PCT) is a blood test for bacterial sepsis

Does not diagnose the type of infection

Detects signs of elevated procalcitonin, a marker of sepsis

Normal levels of procalcitonin are 0 to 0.5 µg/L





Sepsis levels of procalcitonin are 0.5 µg/L to 2 µg/L (or higher)

verywell








Verywell / Laura Porter

# Infection & Inflammation in horses




## 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







## 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



# Brahms PCT direct & infection in horses

- 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

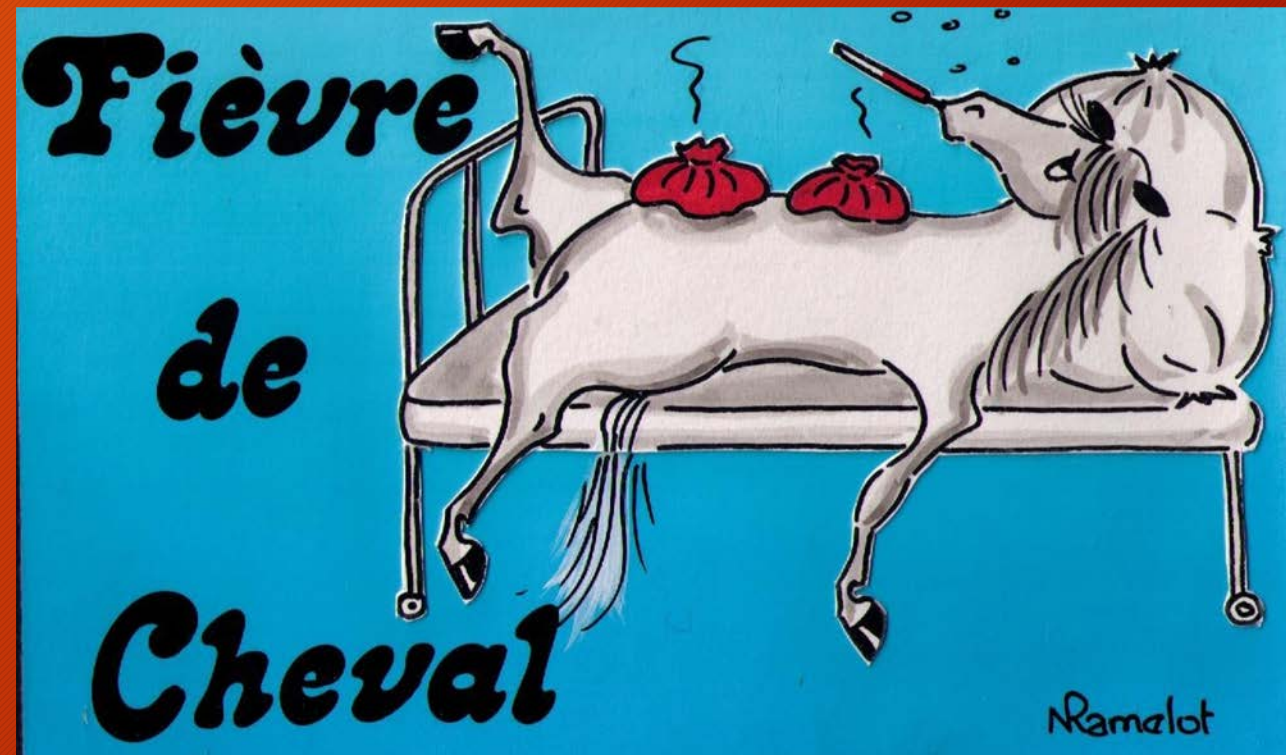


# Vet checks



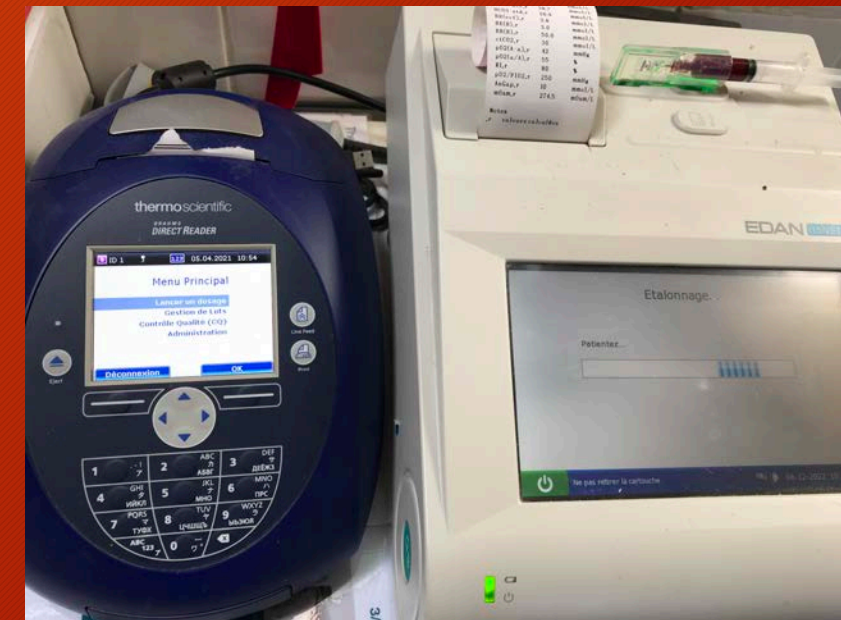
Mat & Meth

- 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

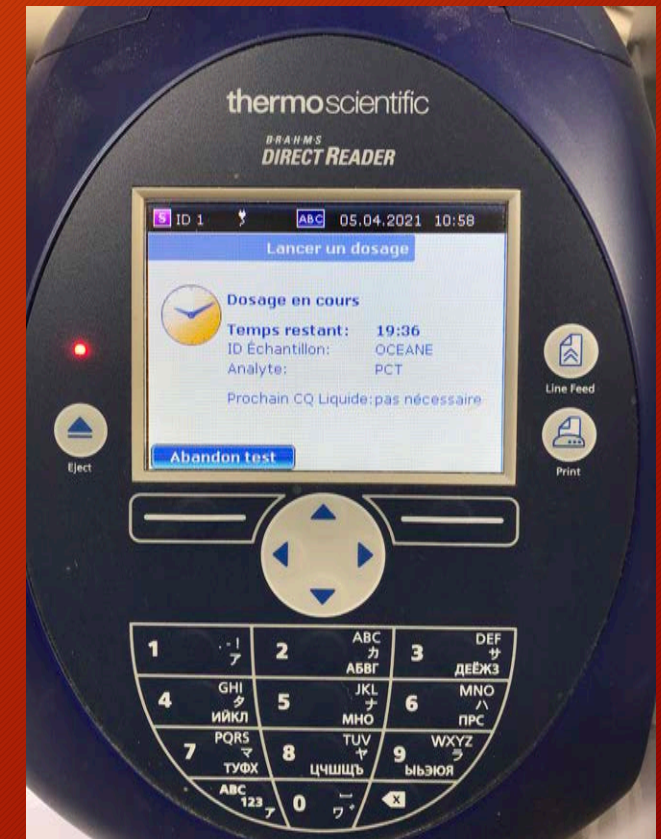


# Brahms PCT direct reader



Mat & Meth

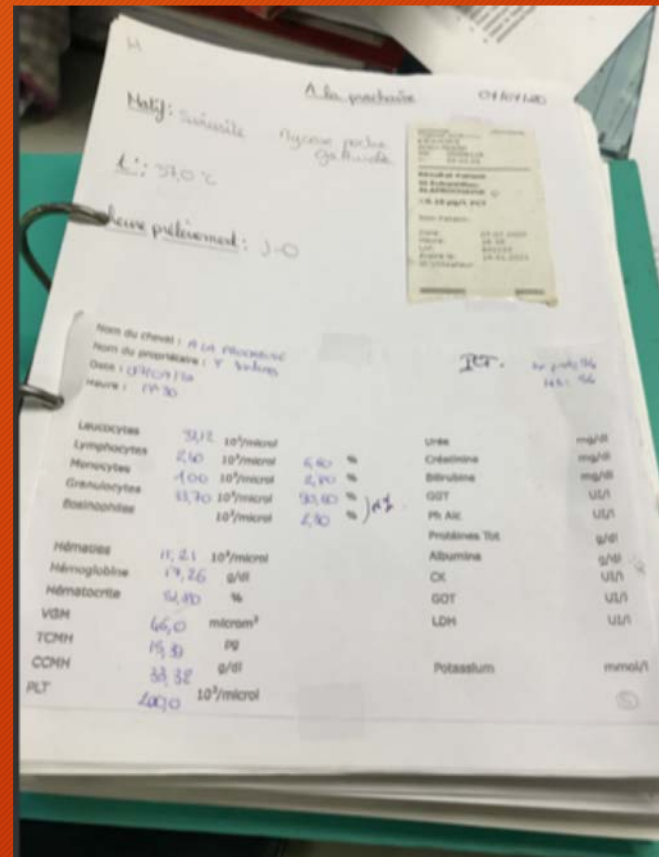
- POC machine from Thermofisher
- Immunochromatography
  - Rat and mouse antibodies
- 20 microl EDTA blood
- Cartridges (boxes of 25 /fridge)
- 20 mins test
- Dosage > 0.10 microg/l = positive
- Used a lot in human for COVID !!



# Data collection & analysis



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

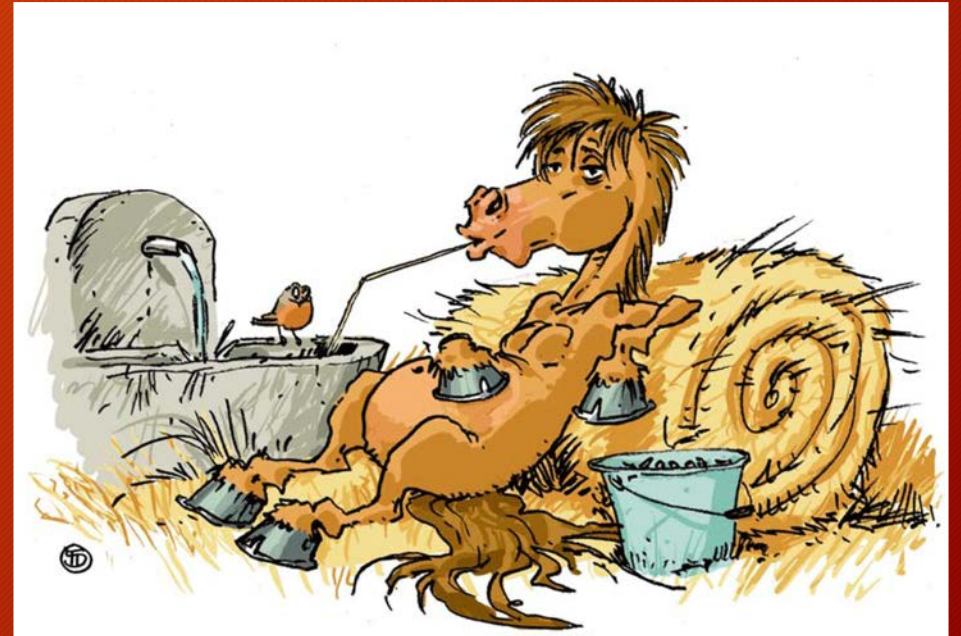


# Study protocol



Mat & Meth

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



# Final Protocol



- 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



# 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

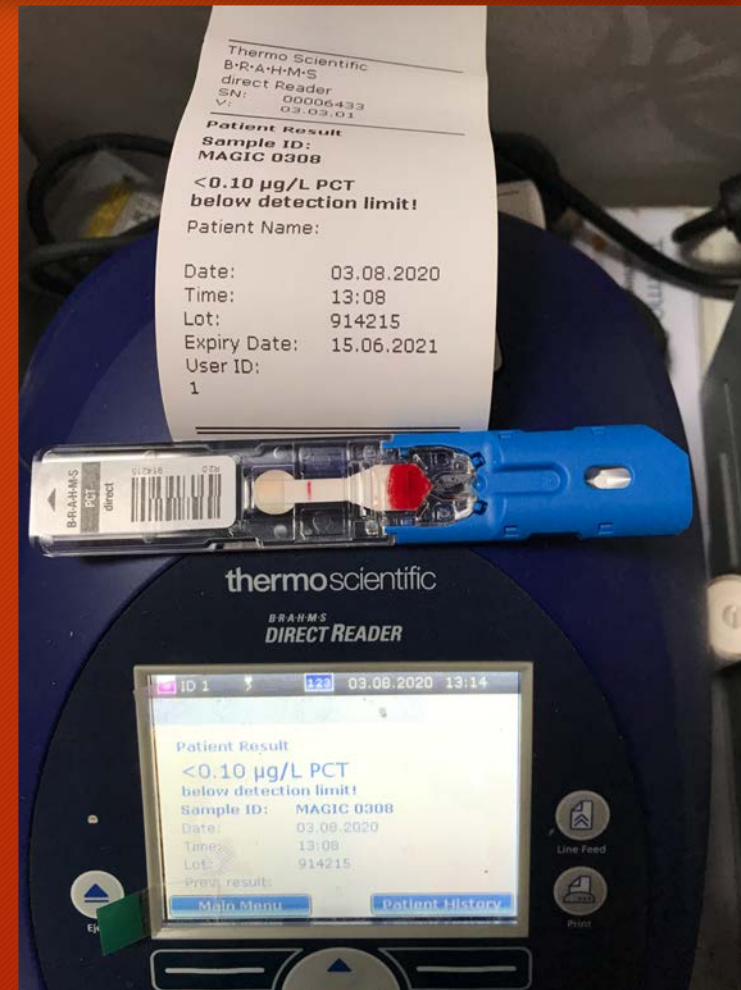


# Overall results



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	oesphagus	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

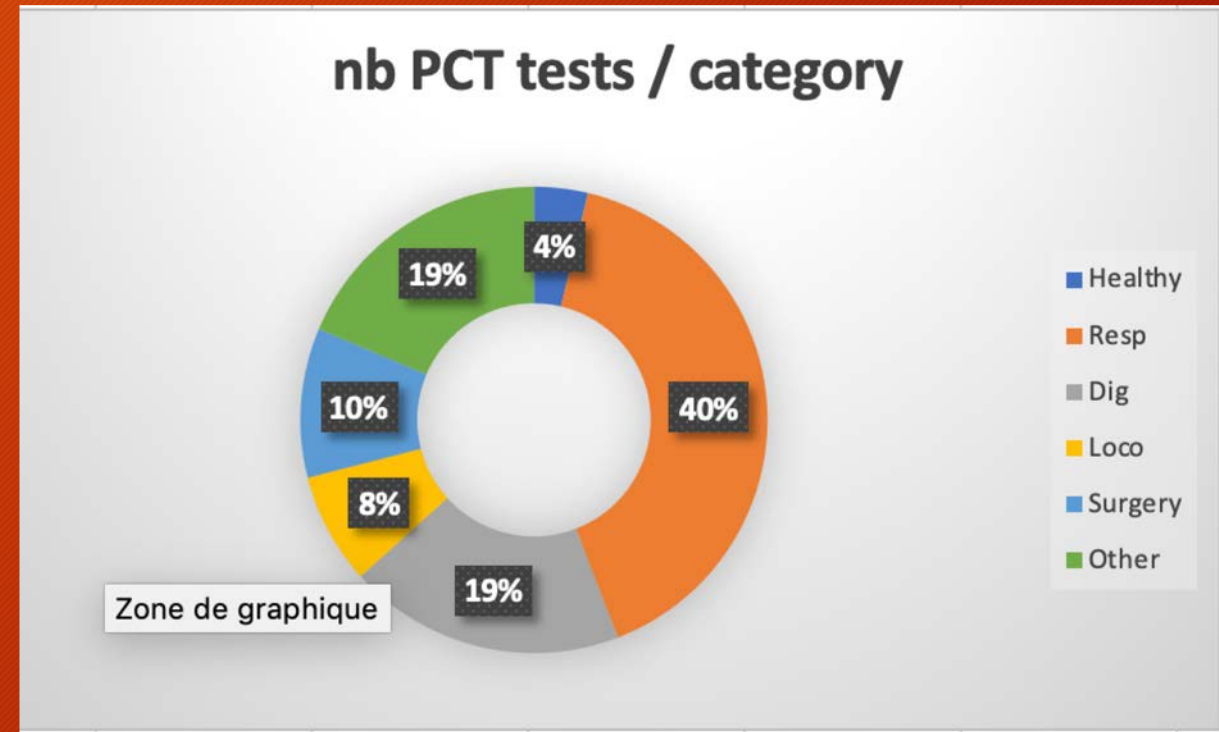


# Diseases categories



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



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

Zone de graphique

# Overall PCT values

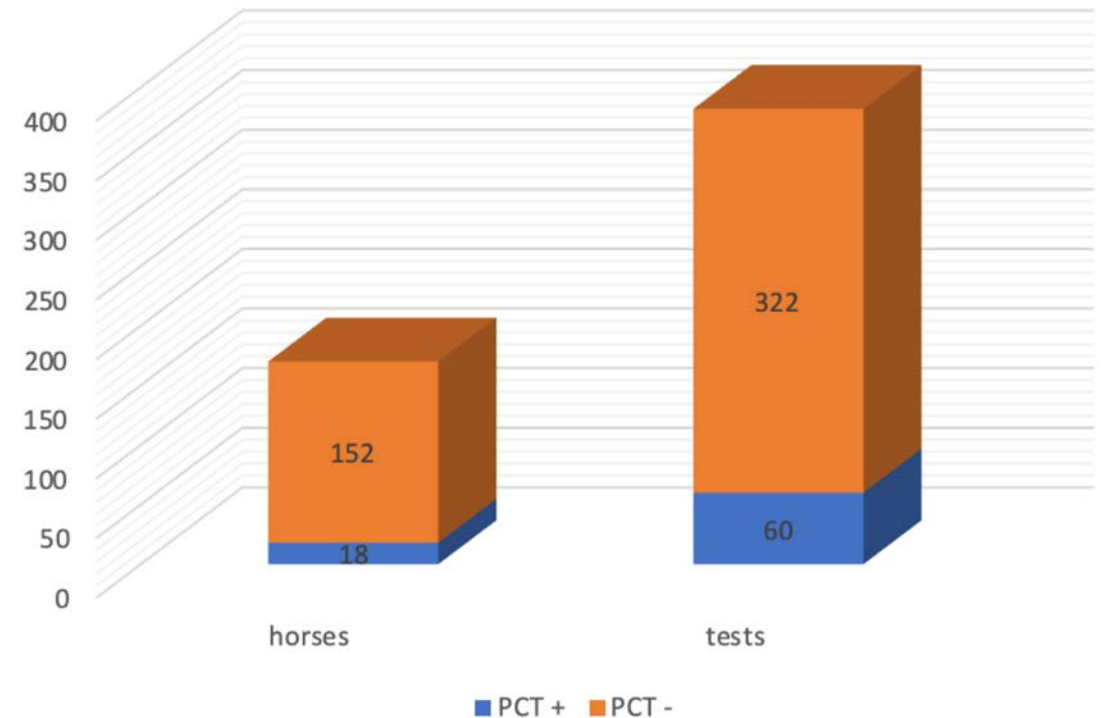


Results

- 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



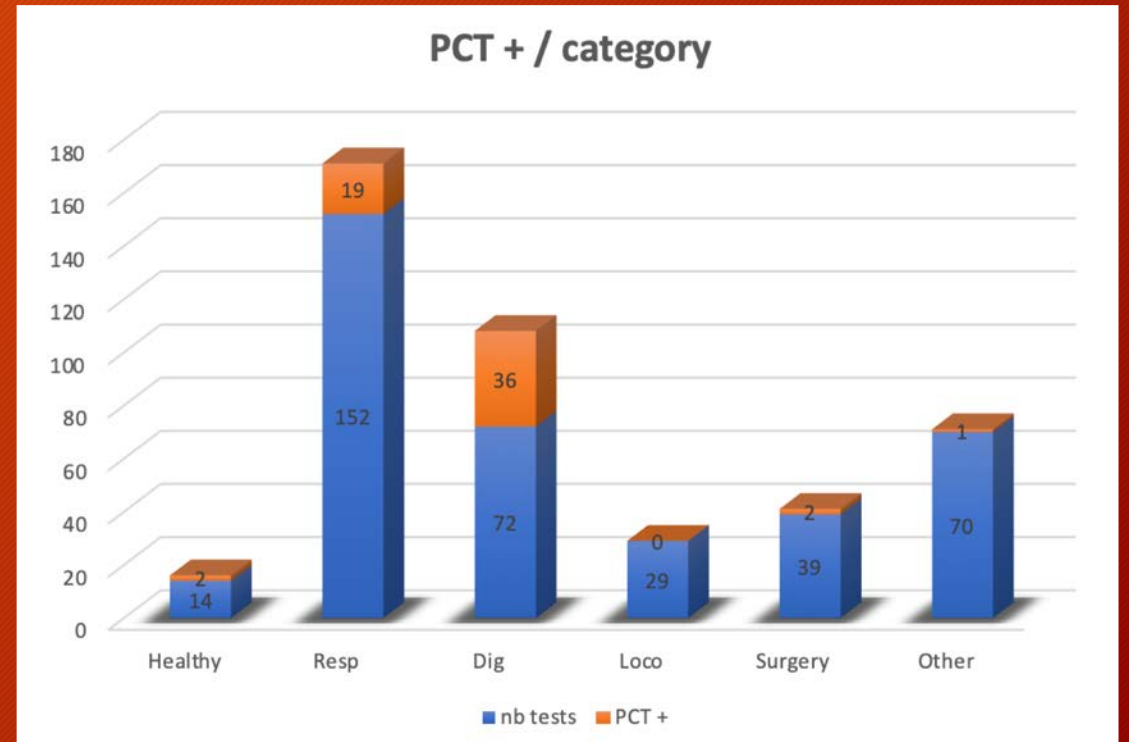
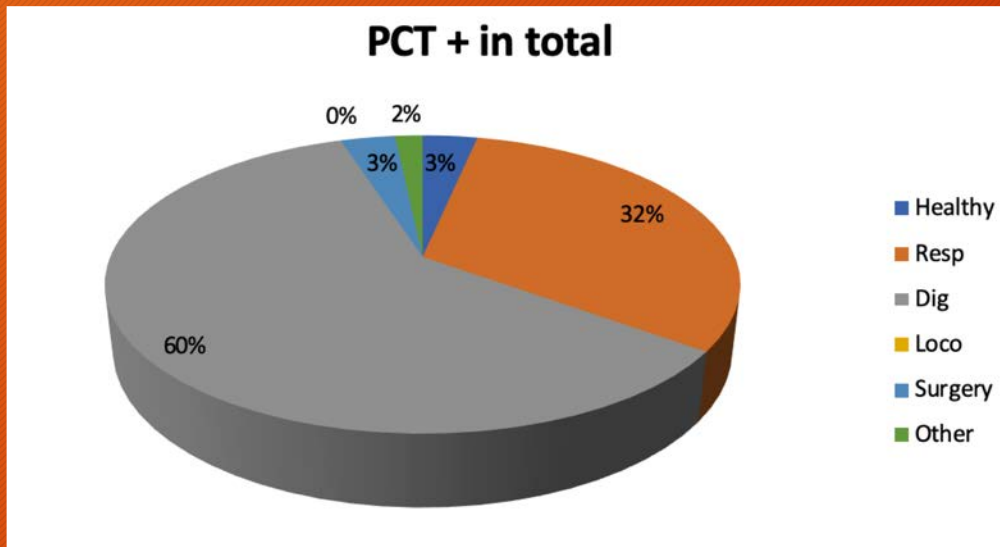


Results

# PCT & disease category

- 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





Results

# PCT & disease category



- 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

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

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



# PCT & fever



Results

## • Fever

- 28% PCT +
- 17 horses PCT+

## • Hyperthermia

- 100% PCT -
- 11 horses hyperthermia
- 6 pirolike detection



# PCT & blood analysis



Results

- 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

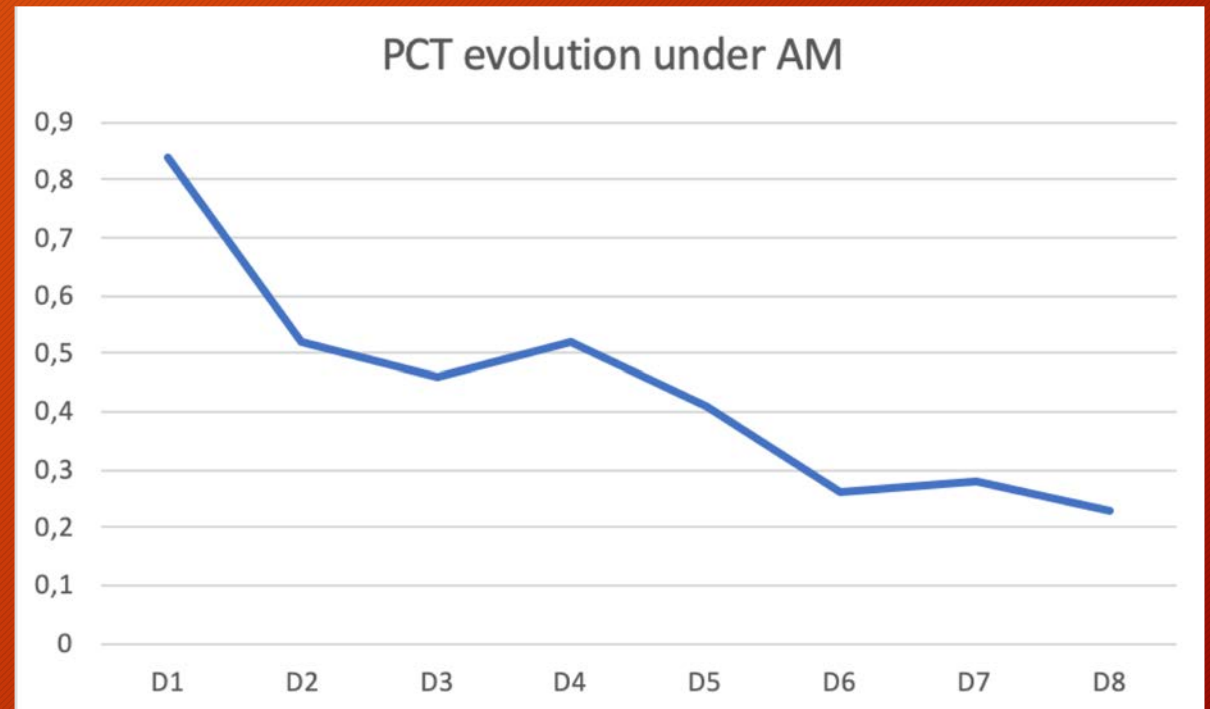


# PCT & AM management



Results

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



# PCT & horses' specials

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



Discussion

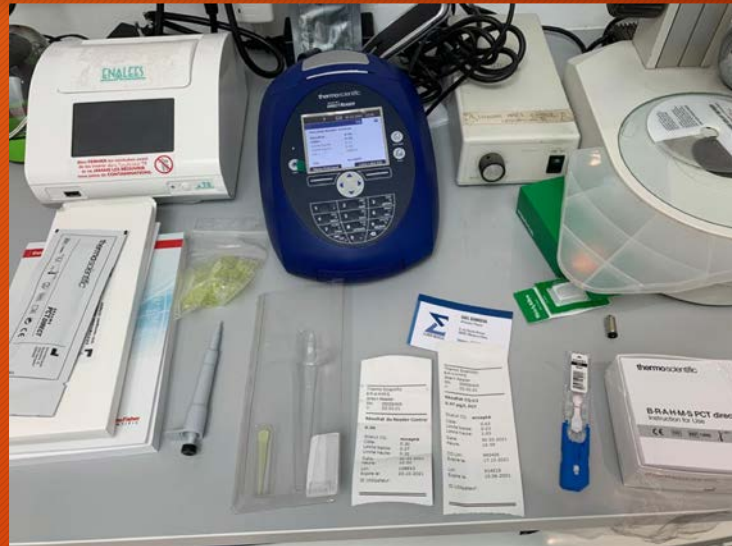


# Brahms PCT direct in horses



Discussion

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



# PCT difficulties



Discussion

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



# PCT future in horses ?



Discussion

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





THANK YOU !!

DGAL, France

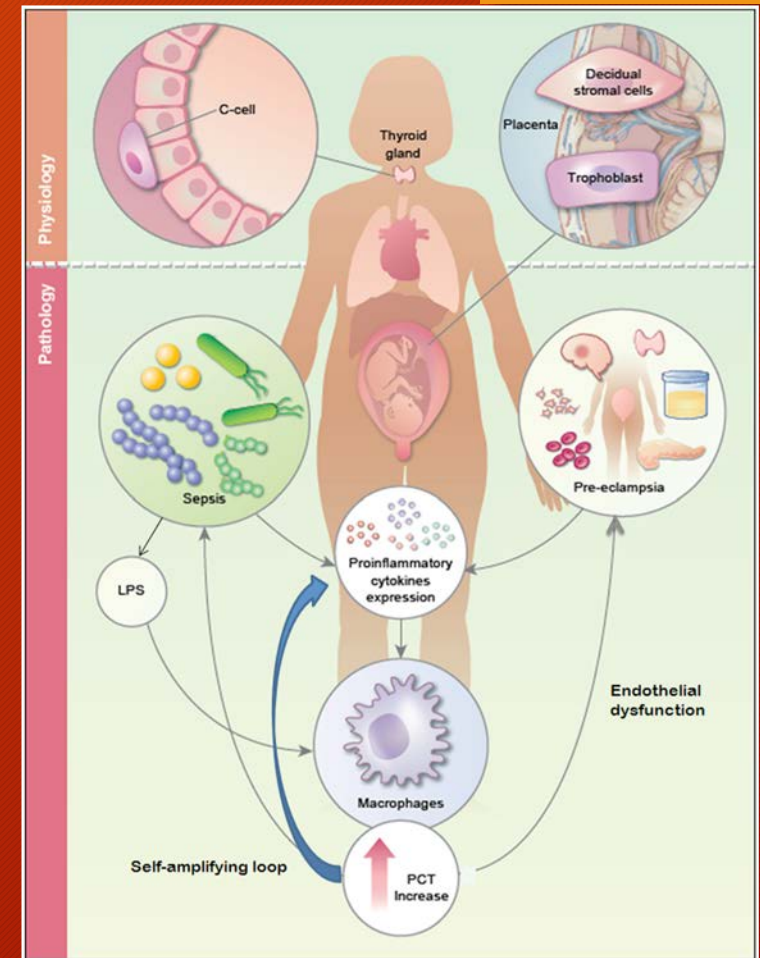
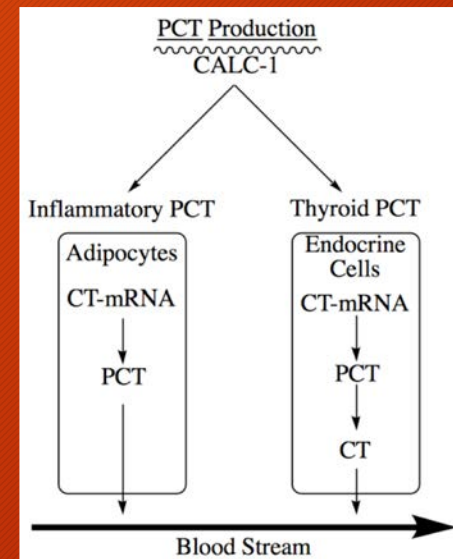
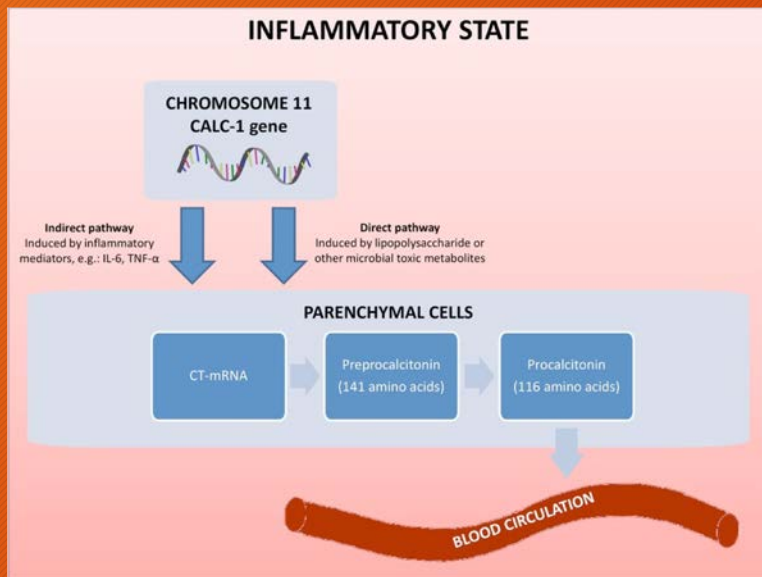
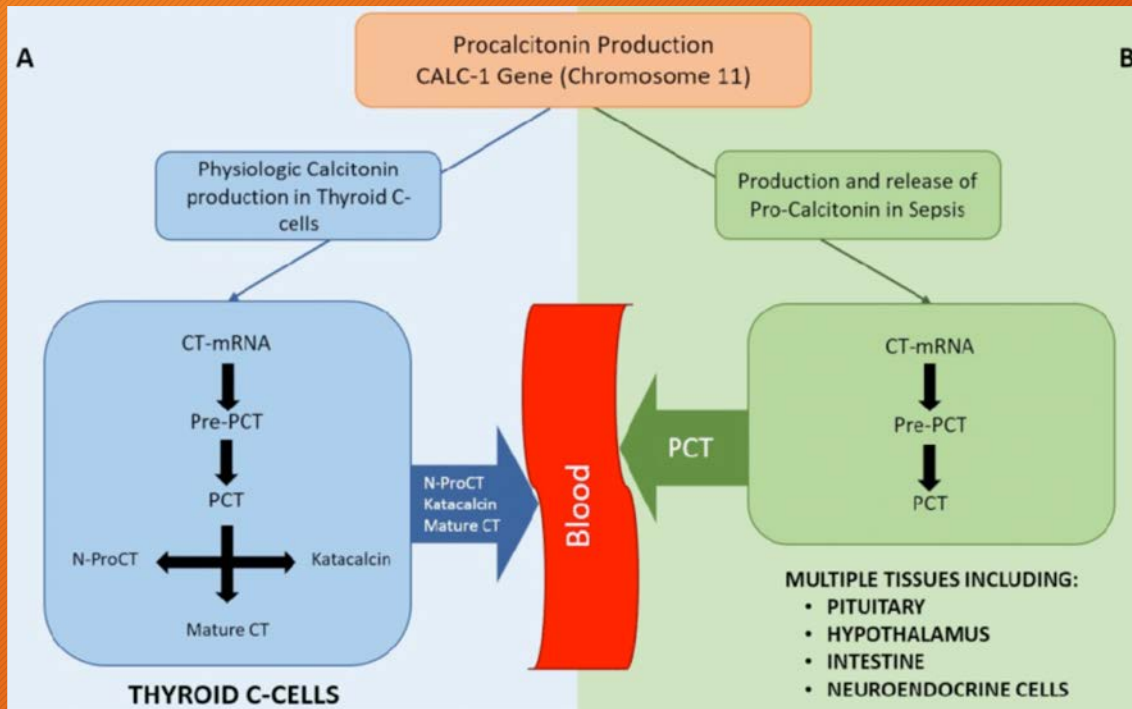
Clémentine Dubois, Laetitia Allio, Philippe Blaise

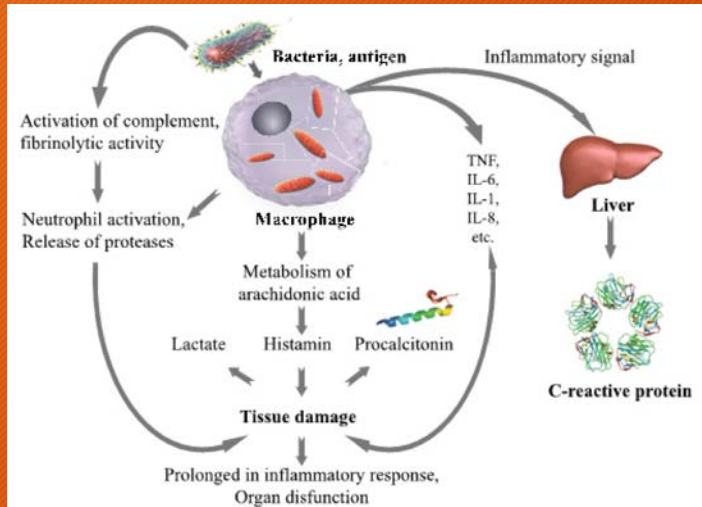
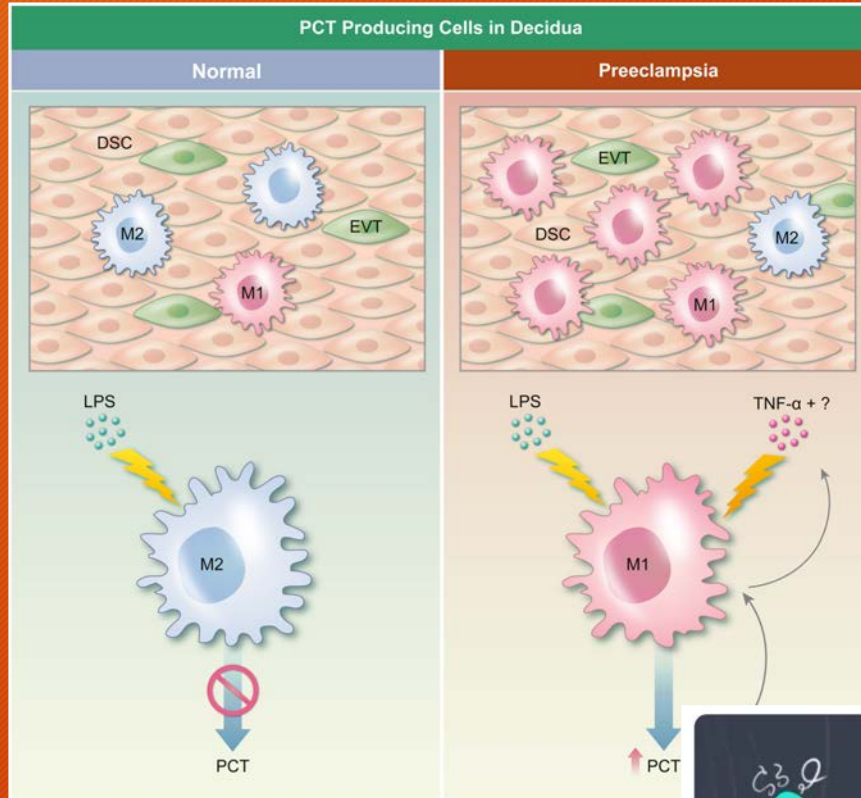
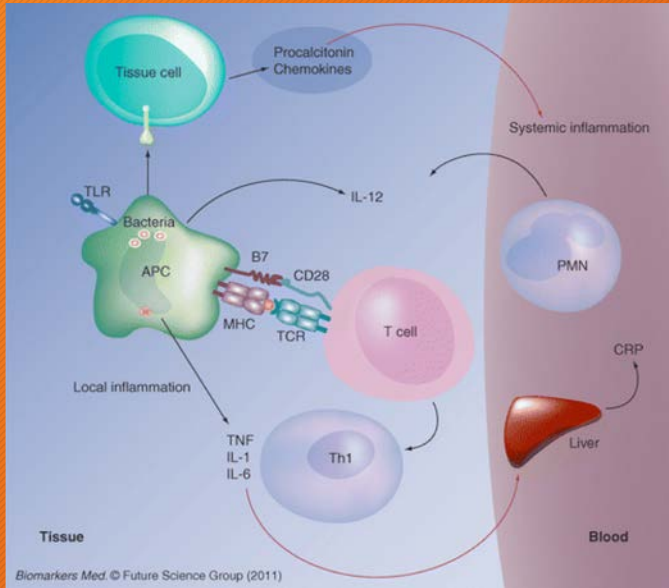




# EQU' Institut







### What is a Procalcitonin Blood Test?

Procalcitonin (PCT) is a blood test for bacterial sepsis.

Does not diagnose the type of infection.

Detects signs of elevated procalcitonin, a marker of sepsis.

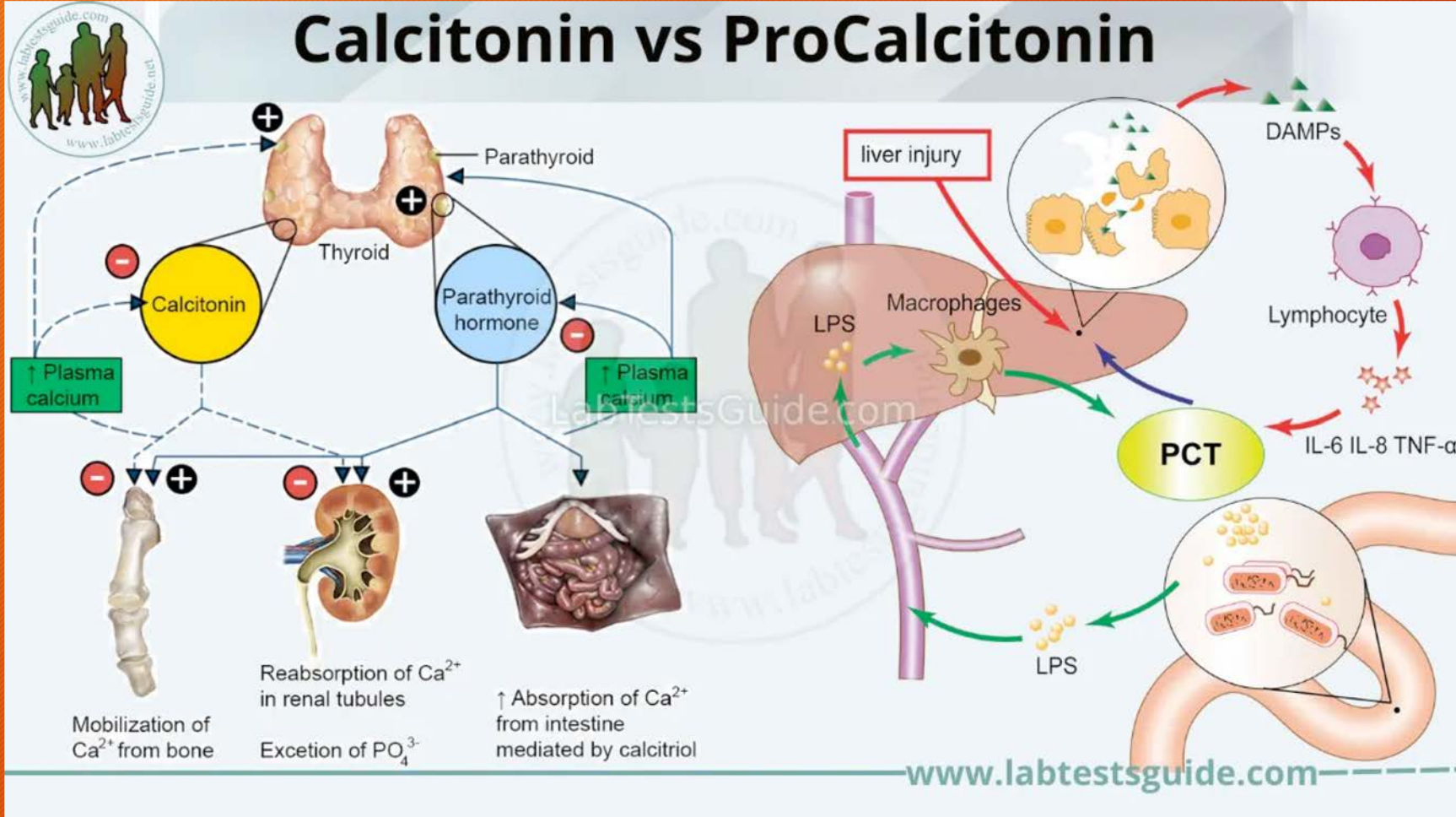
Normal levels of procalcitonin are 0 to 0.5 µg/L.

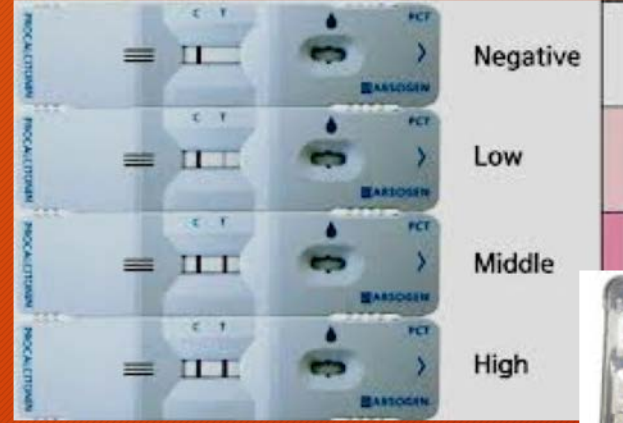
Sepsis levels of procalcitonin are 0.5 µg/L to 2 µg/L, (or higher).

**verywell**

Verywell / Laura Porter

# Calcitonin vs ProCalcitonin





Infection Type/Setting	Study Design	PCT Cut-Off (ug/L)	PCT Benefit	Conclusion	References
Abdominal Infections	observational	0.25	~	PCT may help exclude ischemia and necrosis in bowel blockage	[15][16][17][18]
Arthritis	observational	0.1-0.25	✓	PCT differentiates non-infectious (gout) arthritis from true infection	[19][20][21]
Bacteremic infections	observational	0.25	✓✓	Low PCT levels help rule out microbial infections	[22][23][24]
Blood stream infection (primary)	observational	0.1	✓✓	PCT differentiates contamination from true infection	[25]
Bronchitis	RCT	0.1-0.5	✓✓✓	PCT reduces antibiotic exposure without adverse outcomes in the ED	[26][27]
COPD exacerbation	RCT	0.1-0.5	✓✓✓	PCT reduces antibiotic exposure without adverse outcomes in the ED and hospital	[26][27][28]
Endocarditis	observational	2.3	✓	PCT is an independent predictor with high diagnostic accuracy for acute endocarditis	[29][30]
Meningitis	before-after	0.5	✓	PCT reduces exposure of viral meningitis	[31][32]
Neutropenia	observational	0.1-0.5	✓	PCT is helpful in patients with systemic infections	[33][34]
Pancreatitis	observational	0.25-0.5	~	PCT correlates with severity of infected pancreatic necrosis	[35][36]
Pneumonia	RCT	0.1-0.5; 80-90% ↓	✓✓✓	PCT reduces antibiotic exposure without adverse outcomes in the ICU	[37][38]

Pneumonia	RCT	0.1-0.5; 80-90% ↓	✓✓✓	PCT reduces antibiotic exposure without adverse outcomes in the hospital	[26][27][39][40][41][42]
Postoperative fever	observational	0.1-0.5	✓	PCT differentiates non-infectious fever from post-operative infections	[43]
Postoperative infections	RCT	0.5-1.0; 75-85% ↓	✓✓	PCT reduces antibiotic exposure without adverse outcomes in the surgical ICU	[44][45]
Severe sepsis/Shock	RCT	0.25-0.5; 80-90% ↓	✓✓✓	PCT reduces antibiotic exposure without adverse outcomes in the ICU	[46][47]
Upper respiratory tract infections	RCT	0.1-0.25	✓✓	PCT reduces antibiotic exposure without adverse outcomes in primary care	[48]
Urinary tract infections	observational	0.25	✓	PCT correlates with severity of urinary tract infections	[23][49]
Ventilator-associated pneumonia	RCT	0.1-0.25	✓✓	PCT reduces antibiotic exposure without adverse outcomes	[47][50]