

Pregnancy testing in dairy cows using a PAG test in milk samples :

Different thresholds for different stages of the pregnancy

Jean Durocher, Robert K. Moore, Simon Dufour, Sebastien Buczinski, Shereen Hassan, Stephen LeBlanc, Daniel M. Lefebvre

IDEXX Milk Pregnancy Test



$(S-N) \geq 0.25$ = Pregnant Cow

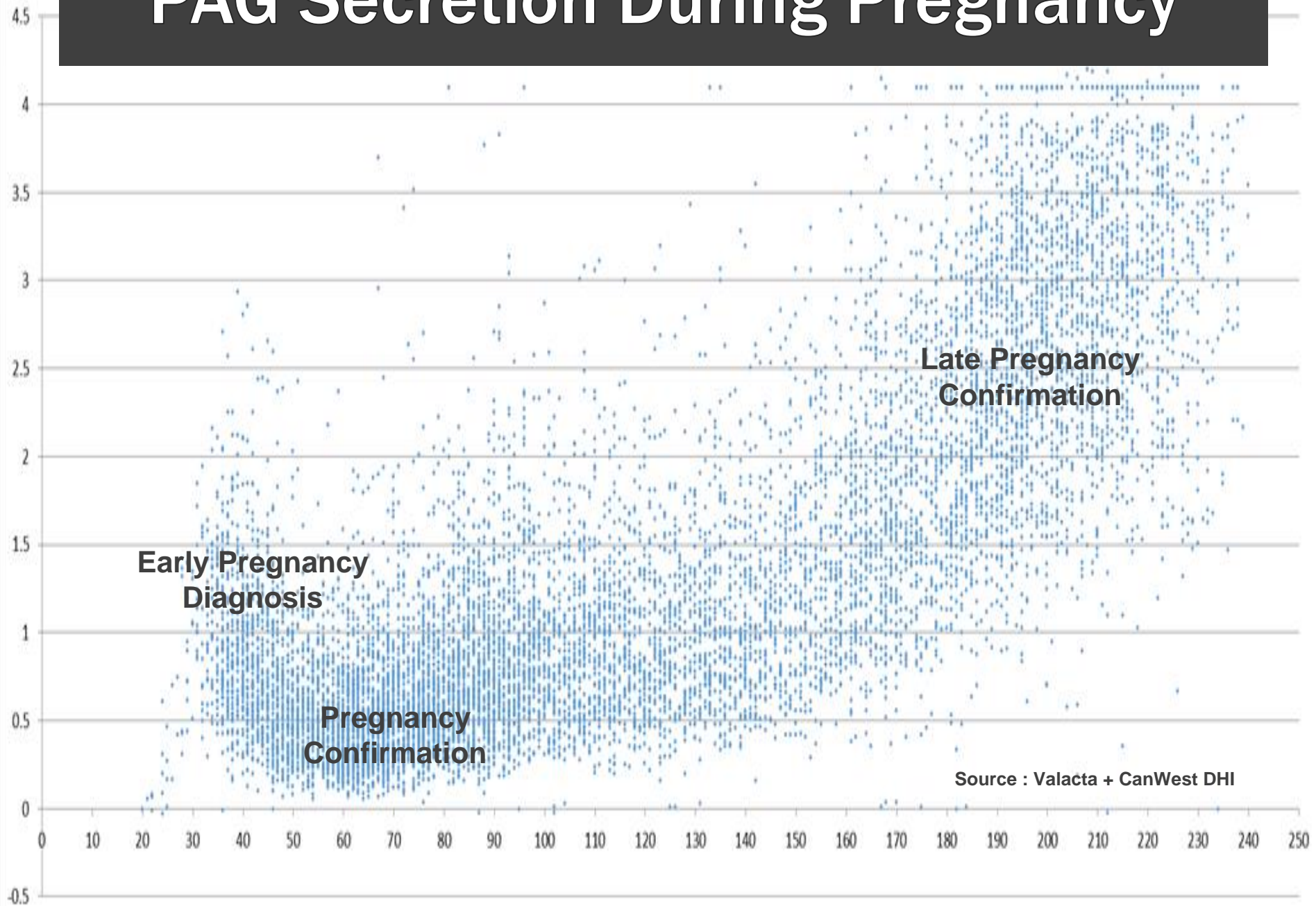


$(S-N) \geq 0.10$ to < 0.25 Inconclusive



$(S-N) < 0.10$ = Open Cow

PAG Secretion During Pregnancy



Early Pregnancy Diagnosis



At this stage of pregnancy...

The average PAG value of pregnant cows

... is considerably greater than the proposed threshold for identifying open cows ($S-N < 0.10$)

In theory, this should positively influence the test's **sensitivity**

... and limit the risk of declaring that a pregnant cow is « open »



Early Pregnancy Diagnosis



However, the average PAG value of pregnant cows

... is considerably greater than the proposed threshold for identifying pregnant cows ($S-N \geq 0.25$)

Given that:

- The embryo mortality rate is high at this stage of gestation
- The half-life of PAG after embryo loss is approximately 4 days



Early Pregnancy Diagnosis



The return of PAG levels to below the proposed threshold for identifying pregnant cows ($S-N \geq 0.25$)

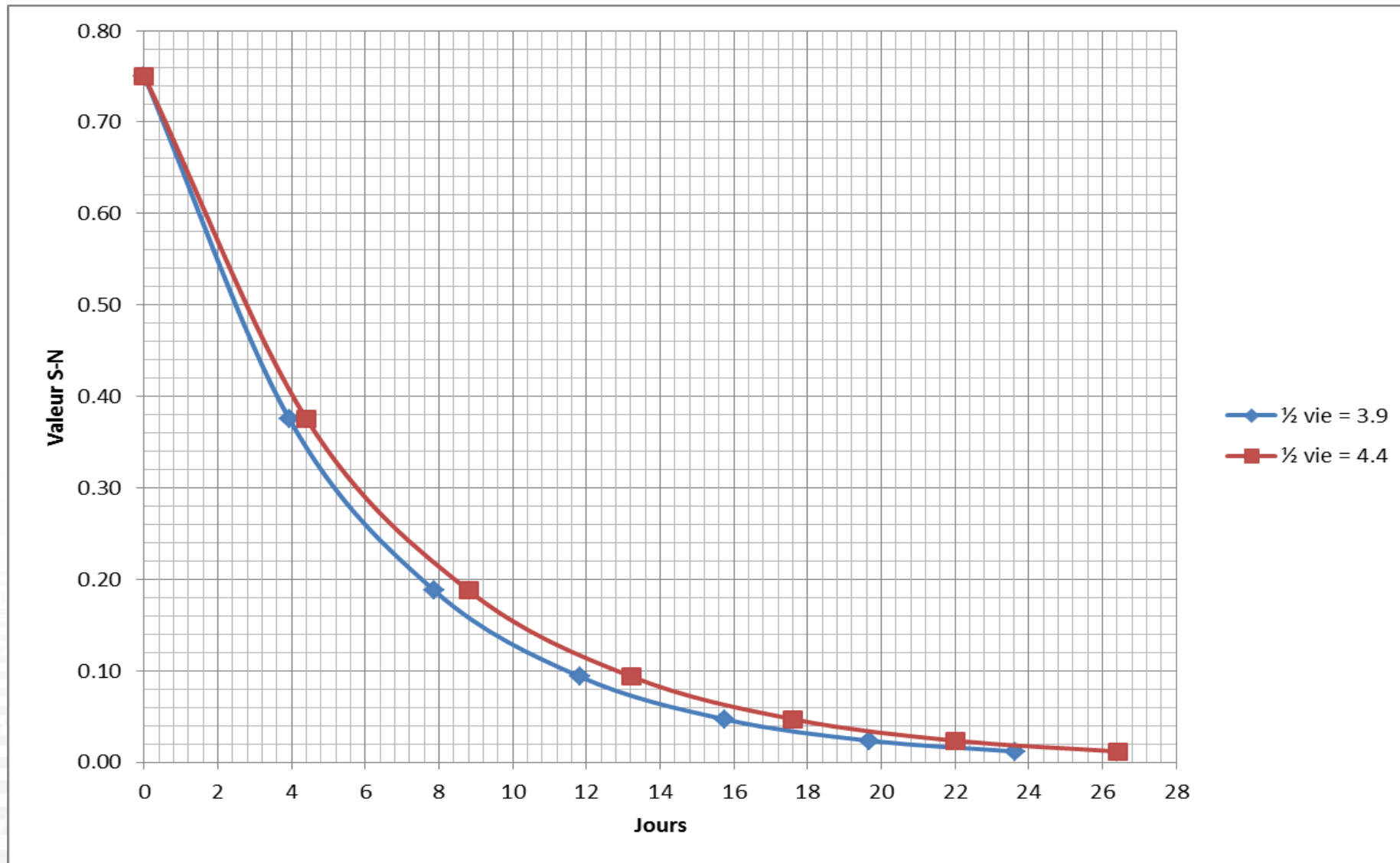
... may take several days following embryo loss

In theory, this should have a negative influence on test **specificity**

... and increase the risk of declaring that a cow that has recently lost an embryo is « pregnant »



PAG Decrease Following Embryonic Loss



Early Pregnancy Diagnosis

28 - 45 days post breeding



IDEXX LABORATORIES		Pregnant	Open	
	Pregnant	315	32	
	Open	3	290	
				640

Excluding Inconclusive Results (16 / 656 = 2.4%)

Sensitivity: 99.1%

Specificity: 90.1%

Source : Idexx (2014) Milk Pregnancy Validation Test Report



Pregnancy Confirmation



At this stage of pregnancy ...

The difference between the average PAG value of pregnant cows and the proposed threshold for identifying open cows ($S-N < 0.10$)

... is much smaller than in early pregnancy

In theory, this situation should negatively influence the **sensitivity** of the test

... and increase the risk of declaring that a pregnant cow is « open »



Pregnancy Confirmation

The rate of embryo loss is relatively low at this stage of pregnancy

And ...

The difference between the average PAG value of pregnant cows and the proposed threshold for identifying pregnant cows ($S-N \geq 0.25$)

... is much smaller than in the previous period



Pregnancy Confirmation

Consequently, with embryo loss...

The return of PAG levels to below the proposed threshold for identifying pregnant cows ($S-N \geq 0.25$)

... will on average take place more quickly than in the previous period

In theory, this situation should positively influence the **specificity** of the test


... and decrease the risk of declaring that a cow that has recently lost an embryo is « pregnant »



Pregnancy Confirmation

46 - 65 days pregnant



		Pregnant	Open	
	Pregnant	217	0	
	Open	8	26	
				251

Excluding Inconclusive Results (41 / 292 = 14.0%)

Sensitivity: 96.4%
Specificity: 100%

Source : Idexx (2014) Milk Pregnancy Validation Test Report



Early Pregnancy Diagnosis

Negative Predictive Value > 99%

The economic impact of declaring a pregnant cow « open » is highly significant

Positive Predictive Value > 95%

The economic impact of declaring a cow that has recently lost an embryo « pregnant » is less significant

... in a context where the strategy includes pregnancy confirmation

Our
Performance
OBJECTIVES



Early Pregnancy Diagnosis



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Bayesian estimation of sensitivity and specificity of a milk pregnancy-associated glycoprotein-based ELISA and of transrectal ultrasonographic exam for diagnosis of pregnancy at 28–45 days following breeding in dairy cows



Simon Dufour^{a,*}, Jean Durocher^b, Jocelyn Dubuc^c, Nandini Dendukuri^d,
Shereen Hassan^b, Sébastien Buczinski^c

^a Département de pathologie et microbiologie, Faculté de médecine vétérinaire, Université de Montréal, C. P. 5000, Saint-Hyacinthe, QC, J2S 7C6, Canada

^b Valacta, 555 boul. des Anciens-Combattants, Sainte-Anne-de Bellevue, QC, H9X 3R4, Canada

^c Département de sciences cliniques, Faculté de médecine vétérinaire, Université de Montréal, C.P. 5000, Saint-Hyacinthe, QC, J2S 7C6, Canada

^d Technology Assessment Unit, Royal Victoria Hospital, 687 Pine Avenue W, QC, H3A 1A1, Canada

PAG

Se 99%

SP 95%

TUS

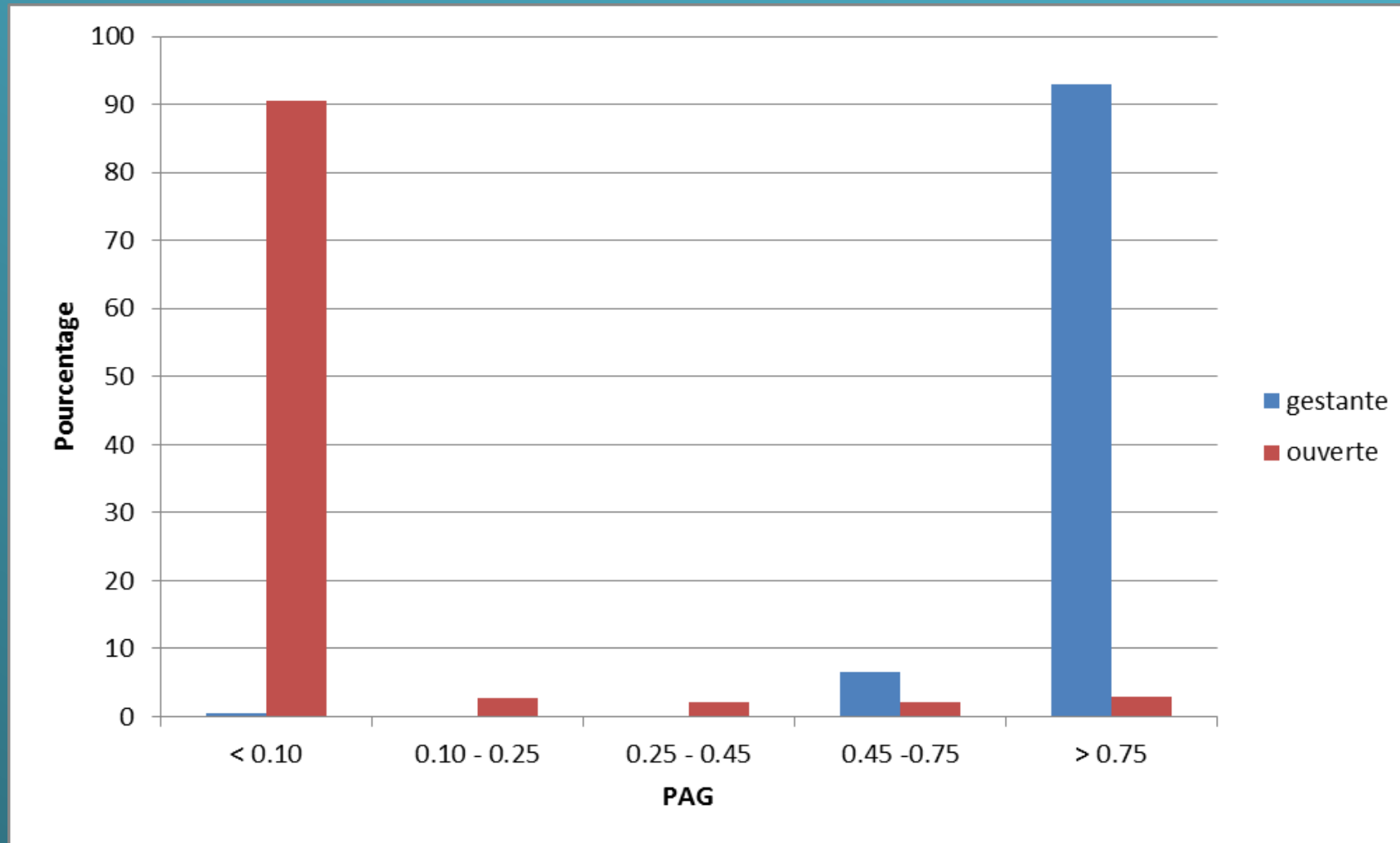
Se 96%

Sp 99%

Durocher (2015) Clinical Trial

GESTALAB in Early Pregnancy Diagnosis

28 - 37 days after breeding

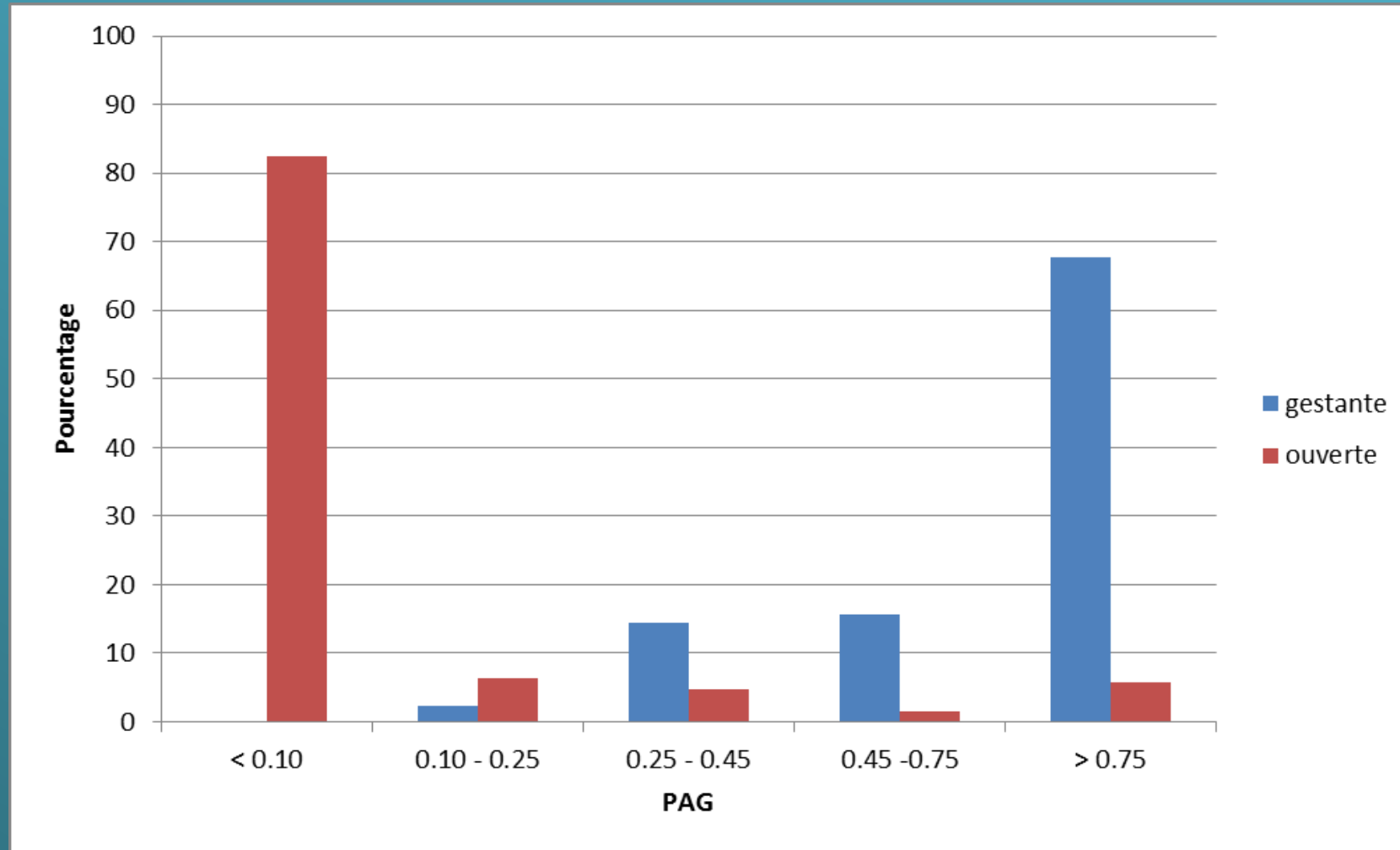


Source : Durocher (2015) Clinical Trial

Durocher (2015) Clinical Trial

GESTALAB in Early Pregnancy Diagnosis

38 - 45 days after breeding



Source : Durocher (2015) Clinical Trial

Validation of test performance according to the probability of calving

- by range of days after breeding**
- by range of PAG**

Analysis of the Canadian Milk Recording Data Bank

Date of Successful Breeding

Date of PAG test

Date of Subsequent Calving

Duration of Pregnancy: 275 - 285 days

Source : Valacta and CanWest DHI (2018)



GESTALAB

28 - 37 days after breeding



PAG < 0.15



Test
Interpretation
Open

TOTAL	Pregnant	Open
6,249	26	6,223

Negative Predictive Value: 99.6%

Source : Durocher (2018)



GESTALAB

28 - 37 days after breeding



PAG
 ≥ 0.15 and < 0.25



TOTAL
469

Pregnant
6

Open
468

Test
Interpretation
Probably
Open
(98%)

Negative Predictive Value: 98.7%

Source : Durocher (2018)



GESTALAB

28 - 37 days after breeding

PAG
 ≥ 0.25 and < 0.35



TOTAL
243

Pregnant
16

Open
227

Test
Interpretation
Recent
Embryo Loss
(90%)

Negative Predictive Value: 93.4%

Source : Durocher (2018)



GESTALAB

28 - 37 days after breeding

PAG
 ≥ 0.35 and < 0.50



TOTAL
304

Pregnant
88

Open
216

Test
Interpretation
Inconclusive

Negative Predictive Value: 71.1%

Source : Durocher (2018)



GESTALAB

28 - 37 days after breeding

PAG
 ≥ 0.50



TOTAL
15,302

Pregnant
13,595

Open
1,707

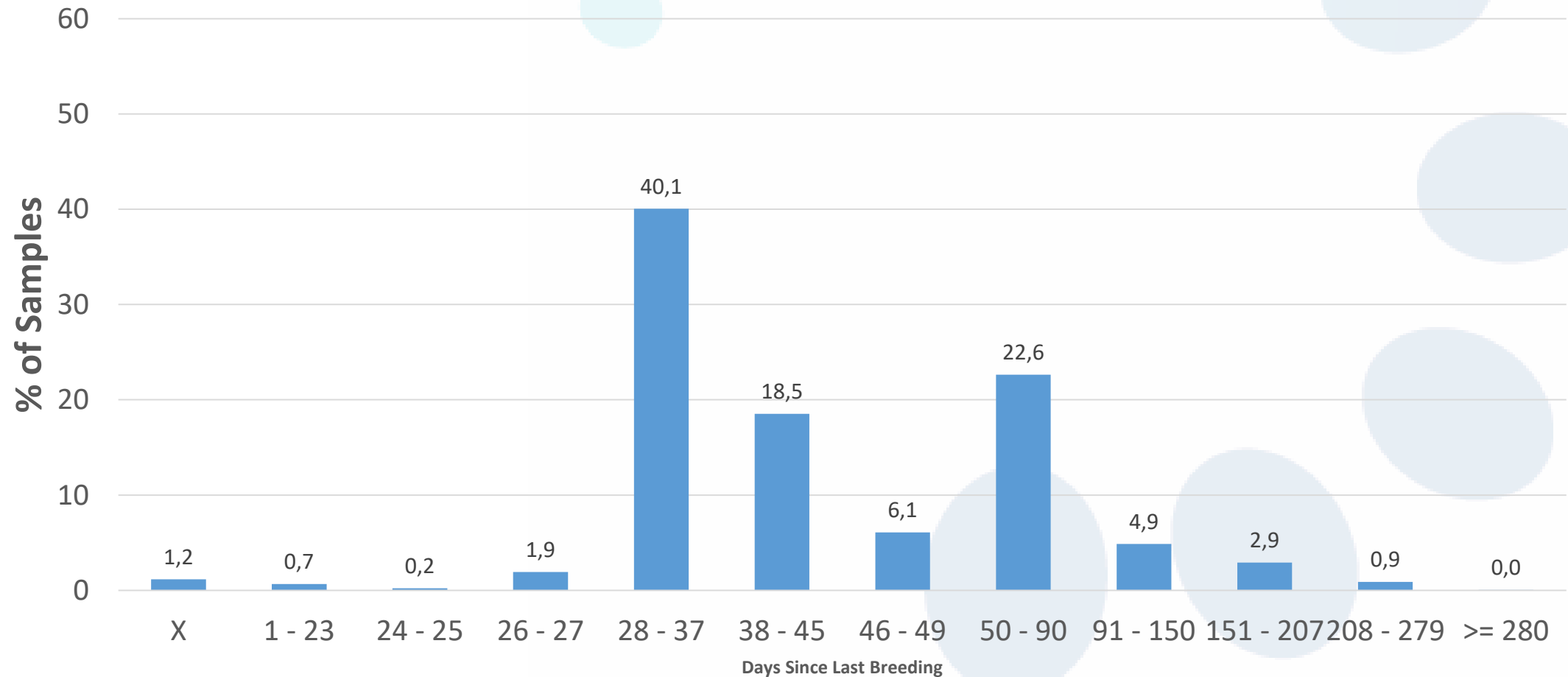
Test
Interpretation
Pregnant

Positive Predictive Value: 88.8%

Source : Durocher (2018)



Gestabalab Volume by DSB



Gestalab Interpretation Grid

Days Since Breeding	Thresholds
26-27	0.10, 0.40
28-37	0.15, 0.25, 0.35, 0.50
38-49	0.10, 0.15, 0.25, 0.45
50-90	0.00, 0.10, 0.15, 0.25
91-150	0.10, 0.25, 0.35
151-207	0.25, 0.35
208-279	0.25, 0.50

GESTALAB

Producer Report

GestaLab

Pregnancy Milk Test

NAME

Crackholm Farms

David Crack

VETERINARIAN

HERD NUMBER

QC 7695

PAGE

1 of 1

LAST TEST DATE

03 May 2019

SERVICE
Supervised

SAMPLING DATE

30 May 2019



Consult www.valacta.com/GESTALAB/cautionary guide to using the Gestalab report.
Valacta is not responsible for losses or damages related to the improper use or interpretation of these results.

Chain #	Cow Name	Lact #	Days in Milk	Days Last Bred or Carried Calf	Sample type	ELISA Value	Test Results Interpretation	Recommendation	Information
71		2	166	26	M	0.06	Open		
44	265	2	313	29	M	0.06	Open		
47	Barbade	3	92	29	M	0.35	Inconclusive	See explanatory note	7
24	4768	1	266	30	M	0.00	Open		
58	Dasha	3	84	31	M	0.61	Pregnant		
11	5850	1	87	35	M	0.00	Open		
21	5843	1	121	66	M	0.63	Pregnant		
70		2	201	91	M	0.07	Probably open (98%)		30

- 7 An inconclusive result indicates that the ELISA value cannot confirm whether the cow is pregnant or open. This result may predict a normal pregnancy with a delayed increase in PAG (Pregnancy Associated Glycoprotein) or an embryo loss accompanied by a gradual decline in PAG. To confirm your cow's reproductive status, please consult your veterinarian. Please note that this GESTALAB test will not be charged.
- 30 The majority of the cows (98%) with a similar ELISA value at this stage of the pregnancy are open.

Take Home

- PAG physiology – single threshold not optimal
- Using DSB greatly increases the value of the interpretation
- Power of DHI database allows to optimize the value of PAG test
- Vet involvement in using PAG testing in a reproduction strategy

Thank you !

Dr Jean Durocher - jdurocher@lactanet.ca

