Improving Reproductive and Economic Performance using Serum and Milk Based Pregnancy Tests

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CRI Annual Meeting, 26 March 2013, Minneapolis

Chemical pregnancy tests

Commercial available assays

Blood (serum or plasma)
ELISA for PSP-B

Blood (serum or plasma)
ELISA for PAG

Milk
ELISA for PAG

Blood (serum or plasma)
ELISA for PAG

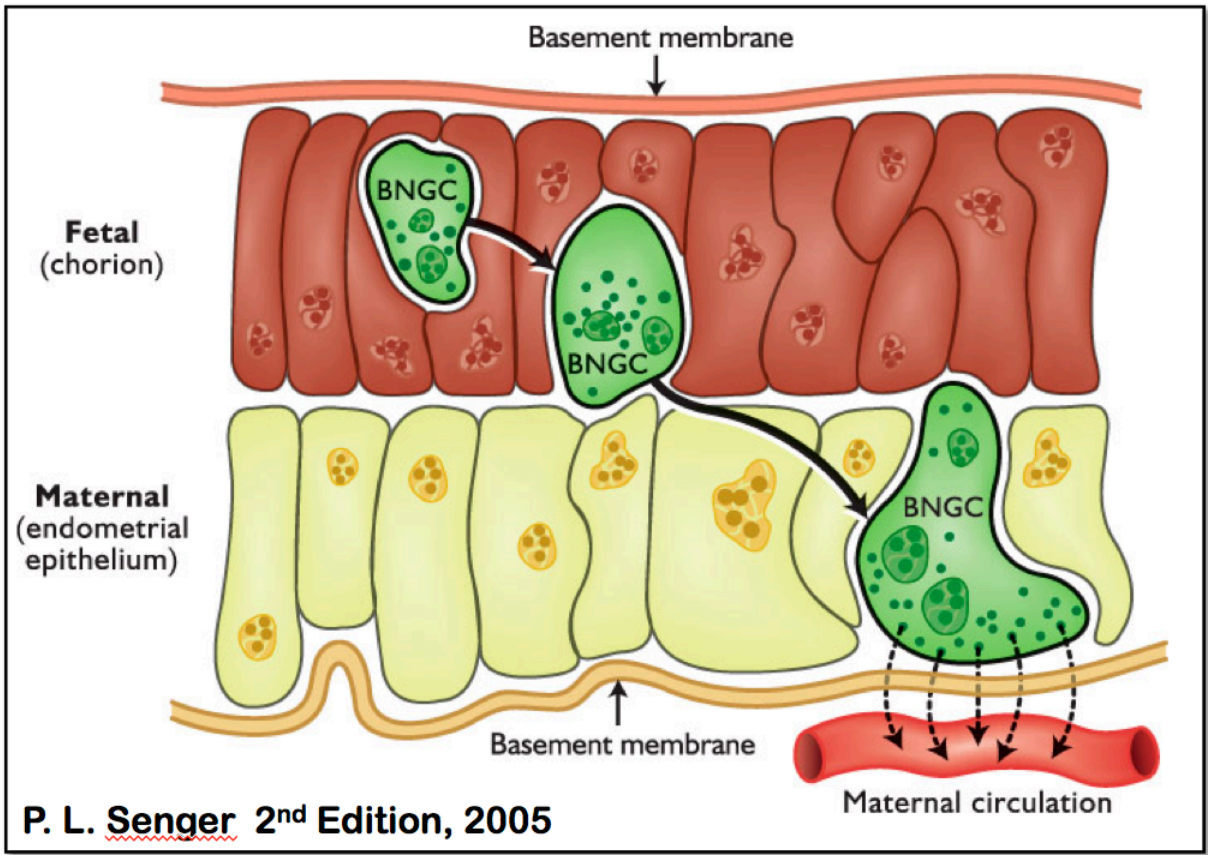
ELISA = Enzyme-Linked Immunosorbent Assay

PSP-B = Pregnancy Specific Protein B (***Sasser et al., 1998***)

PAG = Pregnancy Associated Glycoproteins (***Green et al., 2005***)

Chemical pregnancy tests

How they work?



Courtesy of P. M. Fricke

BNGC = Binucleate giant cell

Pregnancy tests

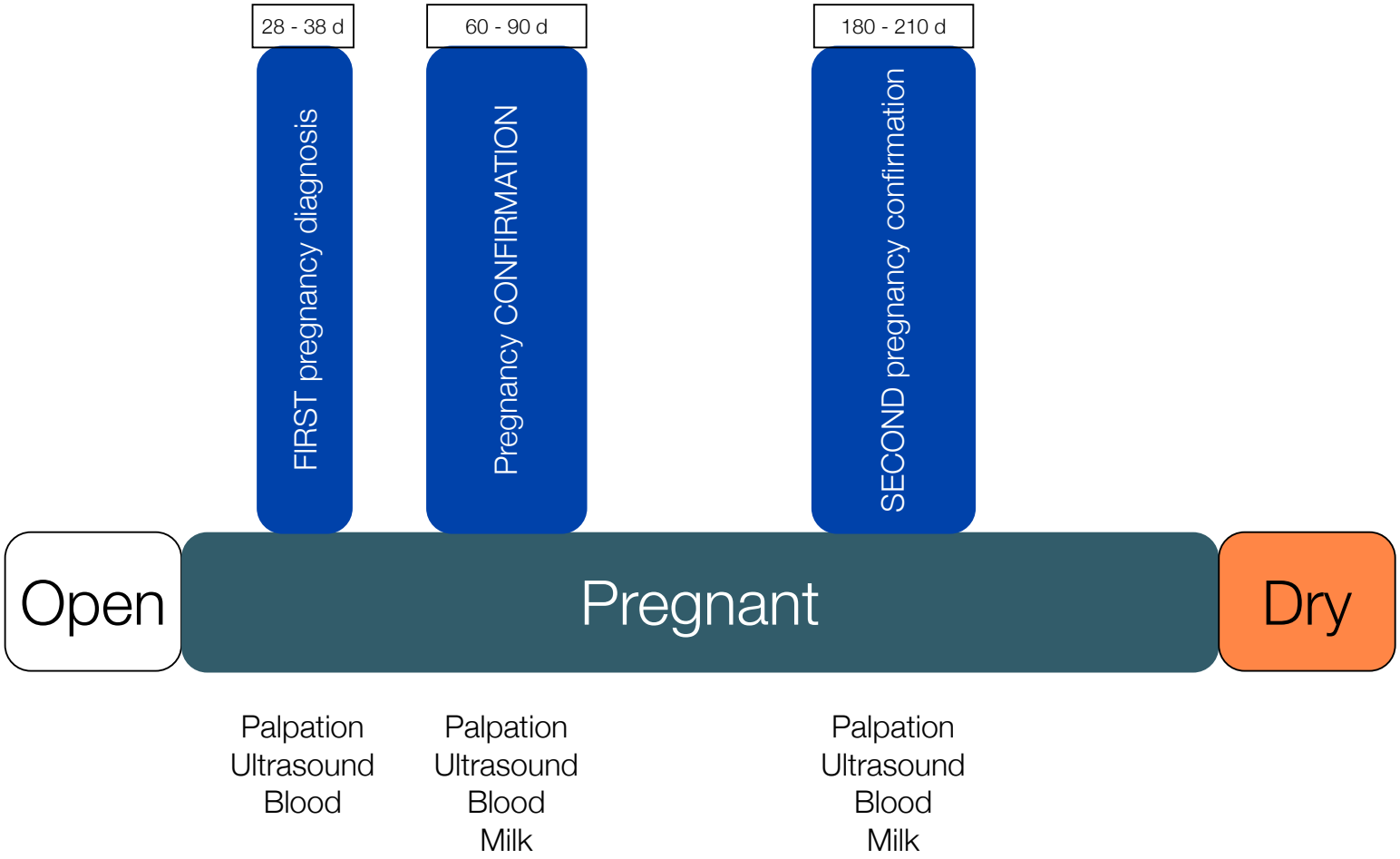
A comparison

	Earliest post breeding d	Gender	Age/Size	Heifers	Less handling	Abortion risks	More available tests
Palpation	32		✓	✓			
Ultrasound	28	✓	✓	✓		✓	
bioPRYN	28			✓		✓	✓
DG29	29			✓		✓	✓
IDDEXX blood	28			✓		✓	✓
IDDEXX milk	35				✓	✓	✓

Chemical tests to be performed at least 60 d after calving

Pregnancy diagnosis

The timeline

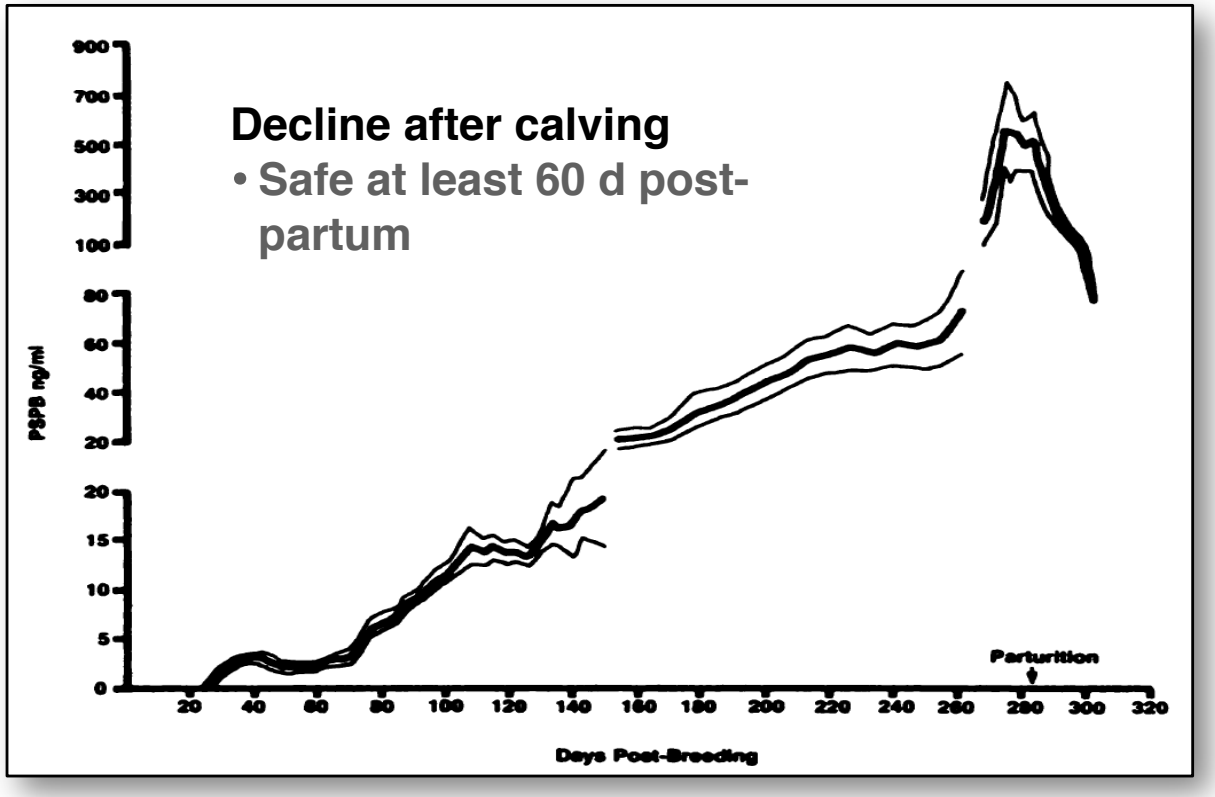


Chemical pregnancy tests facts

Earliest post-calving

Earliest post-calving

- **Carryover concentrations**
  - **PSP-B**
  - **PAG**



Sasser et al., 1986

Chemical pregnancy tests facts

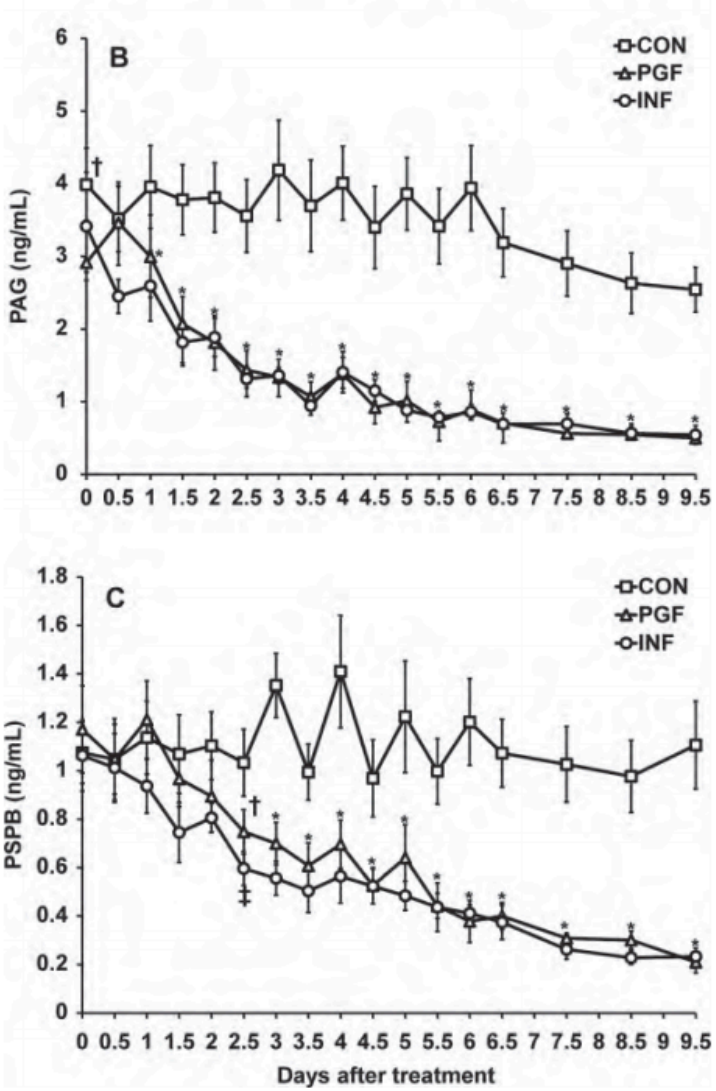
Earliest post-abortion

Earliest post-abortion

- Carryover concentrations
  - PAG
  - PSP-B

Decline below detectable thresholds

- PAG and PSP-B concentrations were similar to non-pregnant cows at 9.5 d after treatment



Giordano et al., 2012

PGF=25 mg of PGF2a (36 h stop heart beat)
INF=Intrauterine infusion of hypertonic saline (0.3 h stop heart beat)

Chemical pregnancy tests facts

Accuracy

Sensitivity: True pregnant

- **Actual pregnant cow with positive ELISA**

Blood				Milk
27 d PAG	28 d PSP-B	30 d PSP-B	35 d PSP-B	> 60 d PAG
95.4%	**93.9%**	**96.0%**	**97.2%**	**99.2**
Silva et al., 2007	*Romano and Larson, 2010*			*LeBlanc, 2013*

Sensitivity: False non-pregnant

- **Induced abortion!**

Chemical pregnancy tests facts

Accuracy

Specificity: True non-pregnant

- **Actual non-pregnant cow with negative ELISA**

Blood				Milk
27 d PAG	28 d PSP-B	30 d PSP-B	35 PSP-B	> 60 d PAG
94.2%	**95.5%**	**93.9%**	**93.6%**	**95.5%**
Silva et al., 2007	*Romano and Larson, 2010*			*LeBlanc, 2013*

Specificity: False pregnant

- **Lost time to re-enrollment**

Chemical pregnancy tests facts

Accuracy

Questionable diagnosis

- **Not conclusive answer**

Blood		Milk
Lower	Higher	> 60 d PAG
3.3%	**8.5%**	**3.8%**
Giordano et al., 2013		*LeBlanc, 2013*

Questionable diagnosis

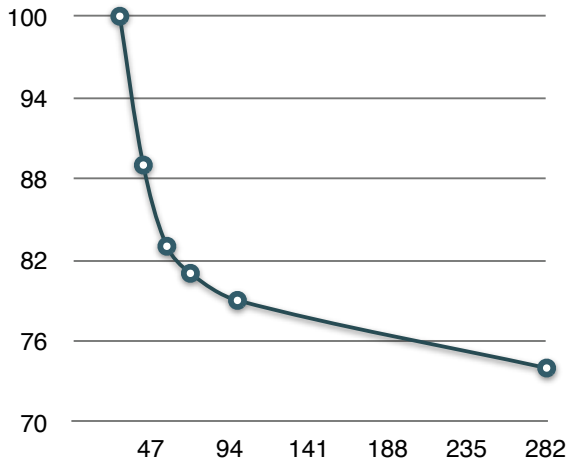
- **Re-check required**
- **Lost time to re-enrollment**

Chemical pregnancy tests facts

Early embryonic loss

Pregnancy loss

- **More in early stages**



Vasconcelos et al., 1997

24-28 d	28-42 d	42-56d	56-70 d
-Pregnancy losses per day-			
0.9%	**0.78%**	**0.42%**	**0.14%**
Giordano et al., 2013	*Vasconcelos et al., 1997*		

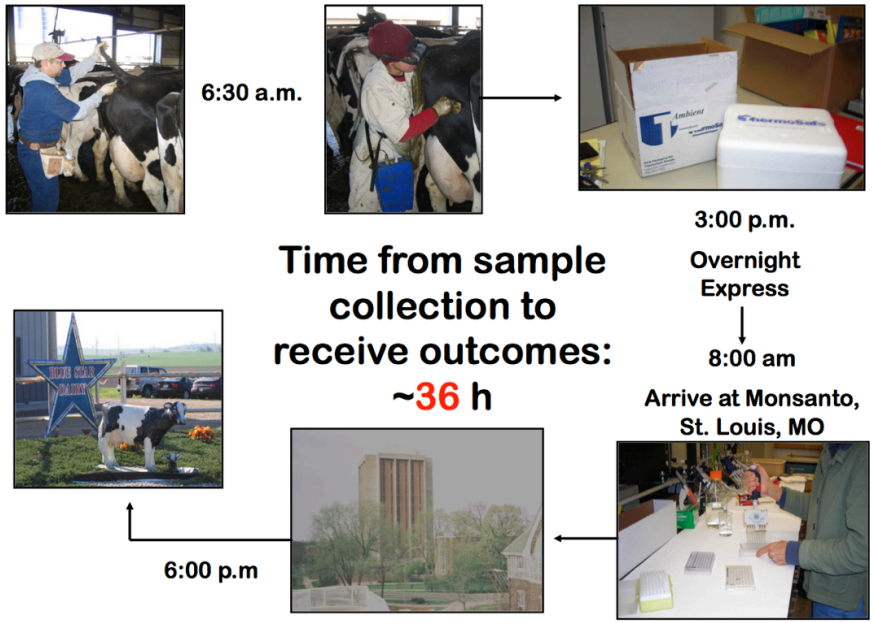
Pregnancy loss

- **Similar to lower specificity**
- **Appear as false pregnant**
- **Lost time to re-enrollment**

Chemical pregnancy tests facts

Lab test time cycle

Blood PAG tests (Silva et al., 2007)



Courtesy of P. M. Fricke

Blood PAG tests (Giordano et al., 2013)

- Assumed 4 effective days from sample collection to next reproductive action

Milk PAG AgSource Easy Preg-Check

- Results within 2 d from sample arrival at laboratory

J. Dairy Sci. 96:949–961
http://dx.doi.org/10.3168/jds.2012-5704
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Economics of resynchronization strategies including chemical tests to identify nonpregnant cows

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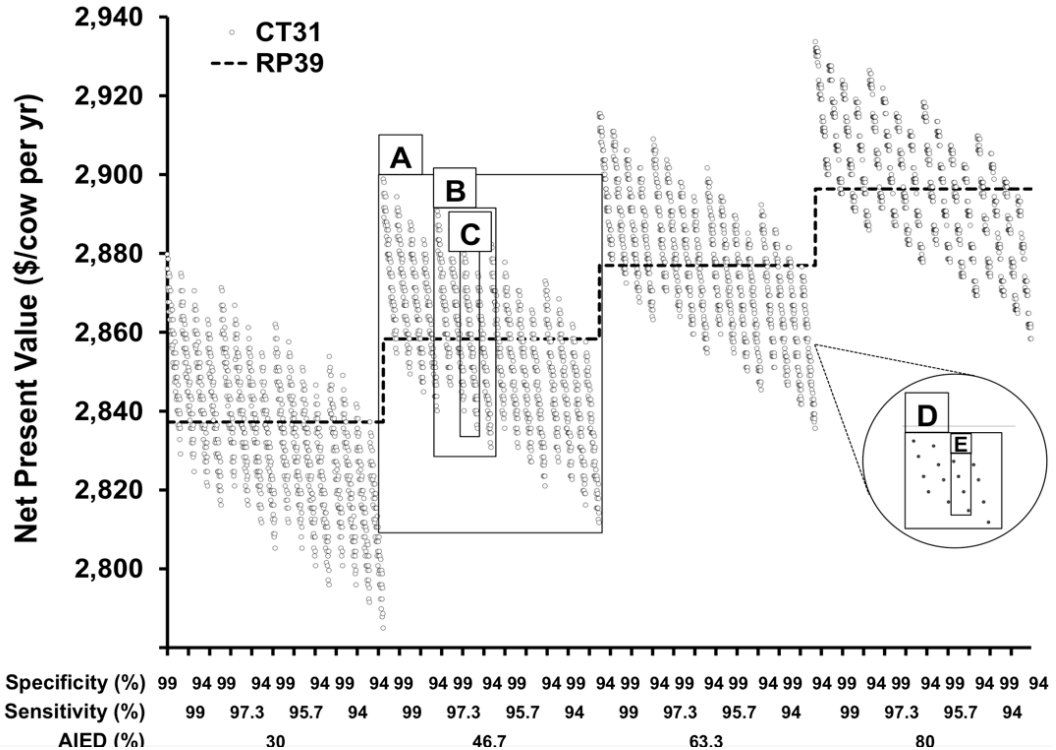

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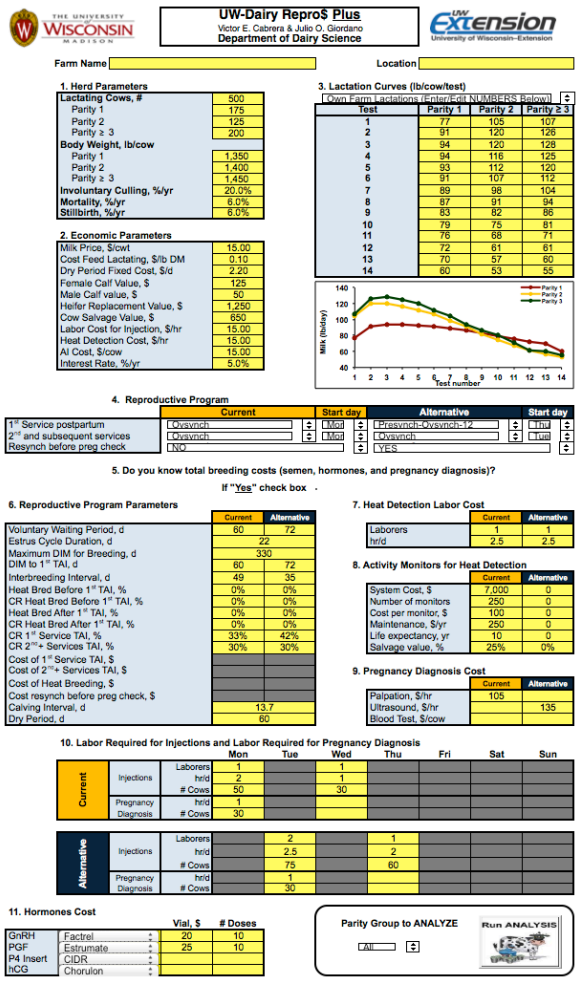
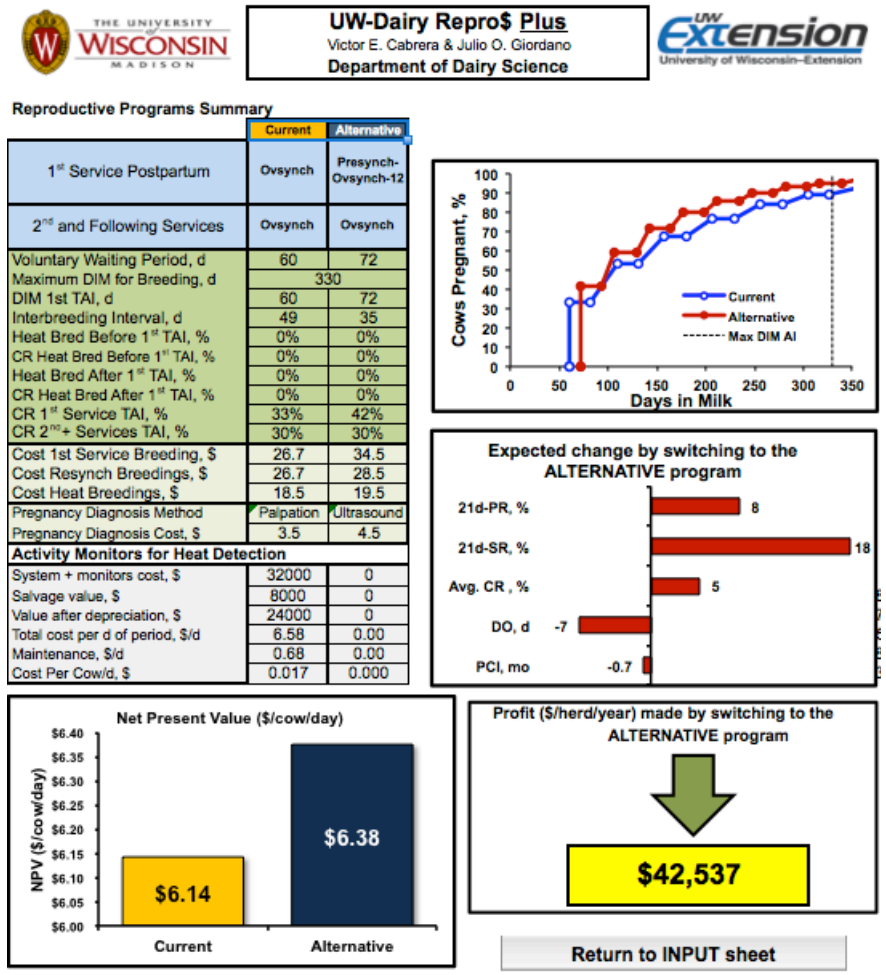
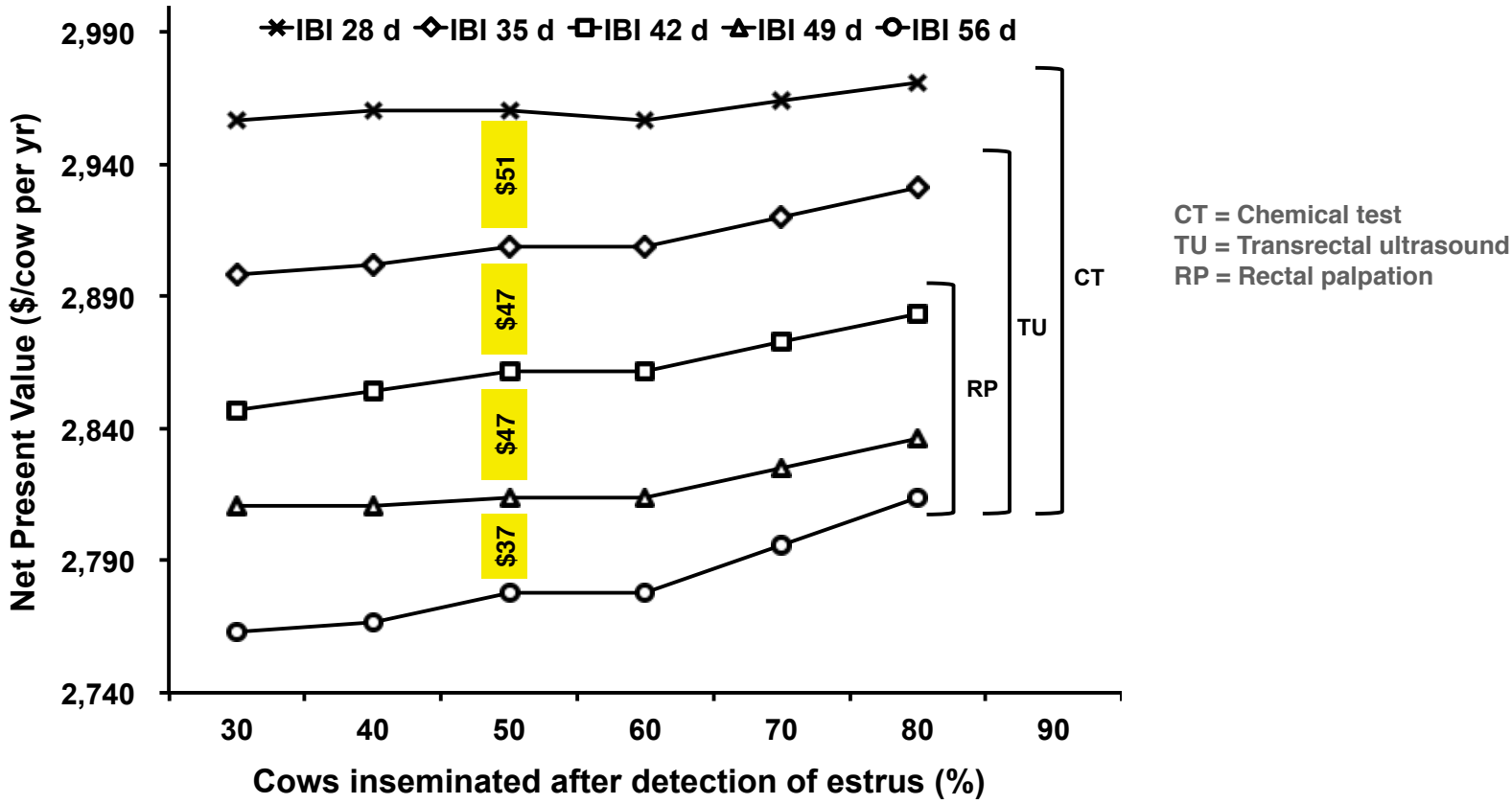
A decision support tool





Experiment 1

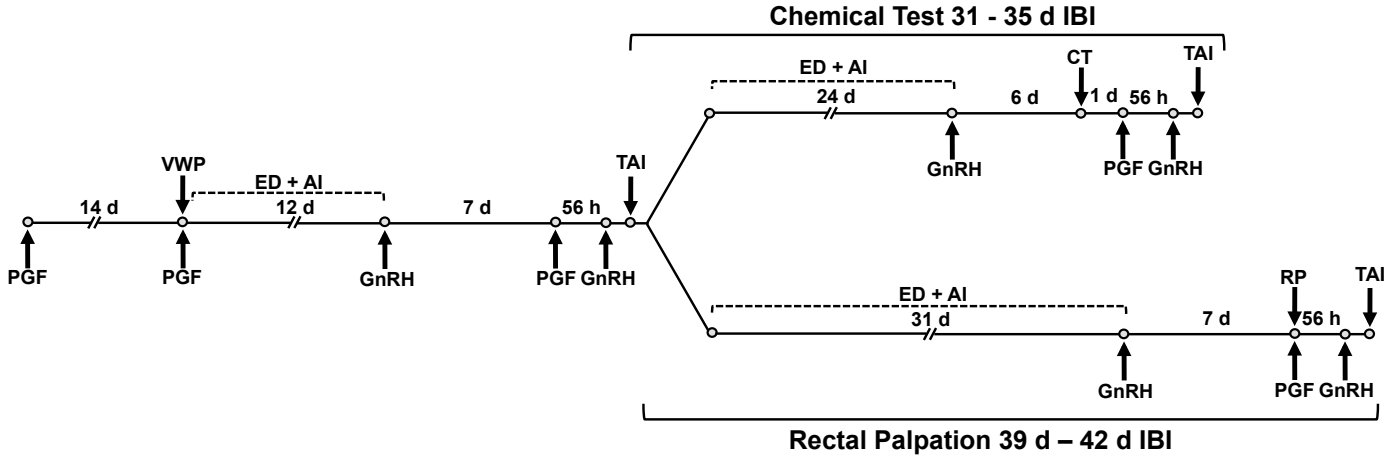
Effect of shorter interbreeding intervals (IBI)



Experiment 2

Economic impact of using chemical tests for early pregnancy diagnosis

A



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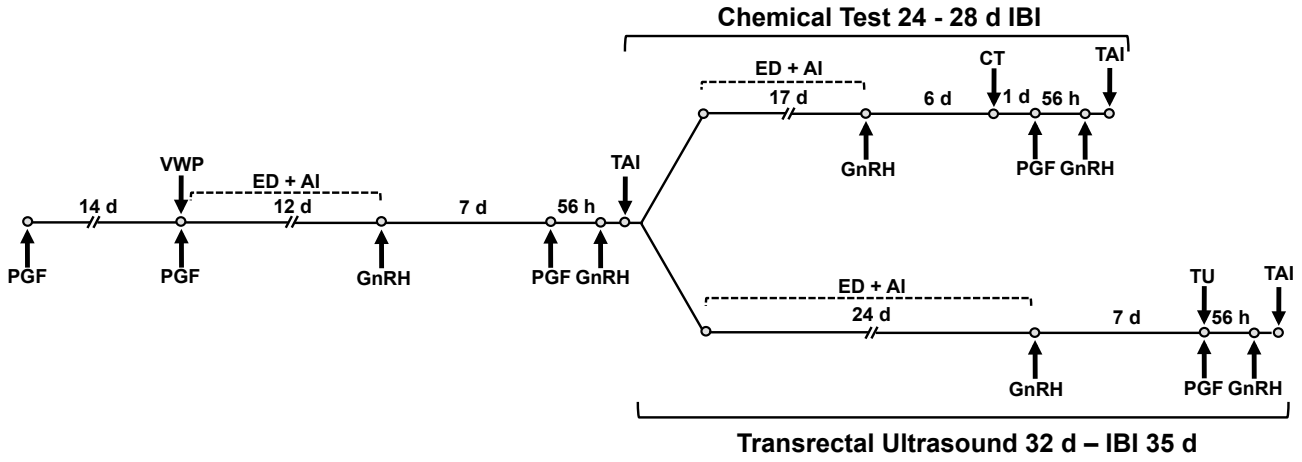
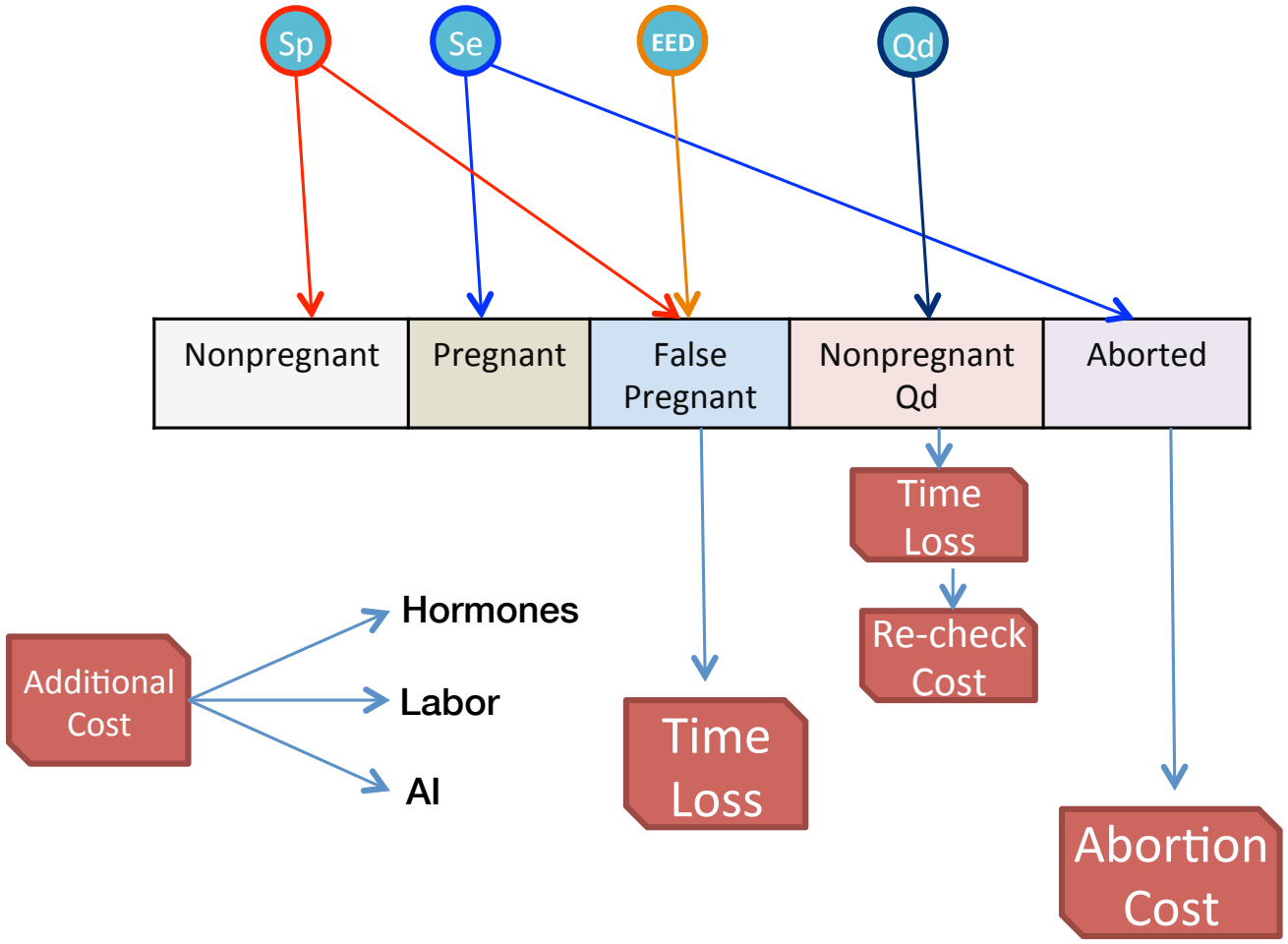


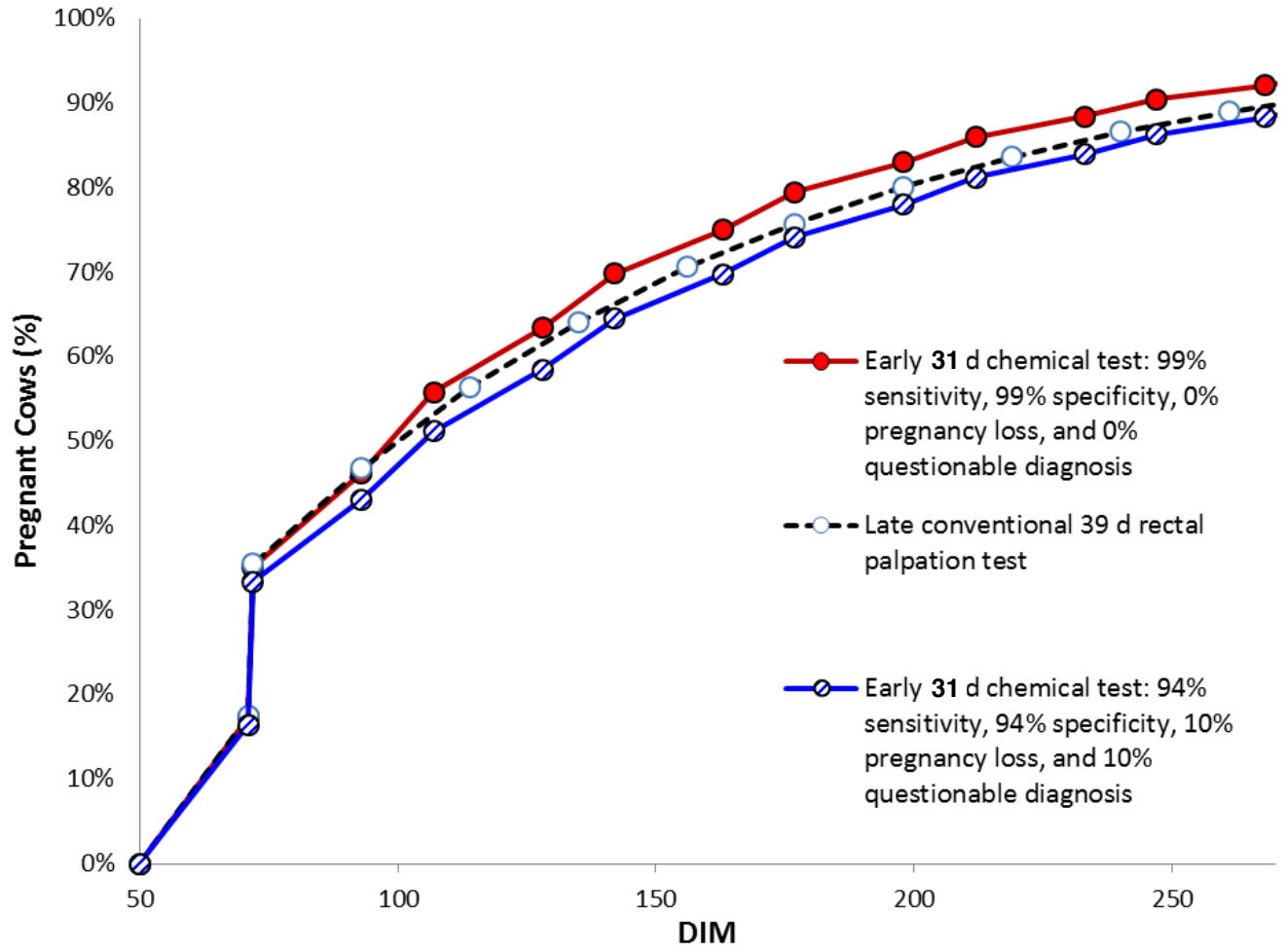
Experiment 2

Design



Experiment 2

Reproductive performance



Experiment 2

Economic performance, value of chemical test (CT)

			$ per 1% or $0.1	
	Base	Range	CT31 vs RP39	CT24 vs TU32
% Sensitivity	98/97	94-99	**+5.3**	**+4.5**
% Specificity	98/97	94-99	**+3.1**	**+2.5**
% Pregnancy loss	6/6.6	0-10	**-3.1**	**-2.5**
% Questionable	3.3/8.5	0-10	**-0.4**	**-0.3**
% Estrous detection	50	30-80	**0.097**	**-0.220**
$ CT cost	2.4	0.5-5	**-0.0175**	**-0.0192**

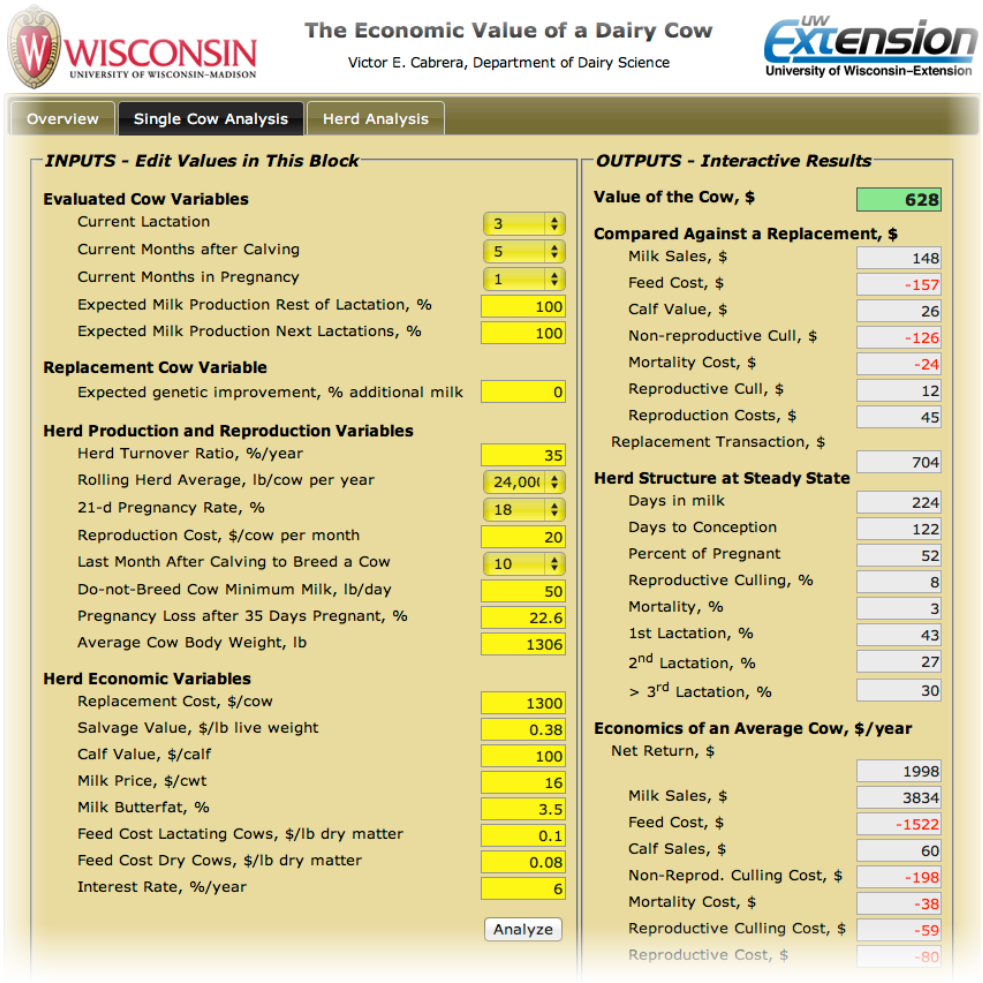
Experiment 2

Economic performance, breakeven of chemical test (CT)

	Break even	
	CT31 vs RP39	CT24 vs TU32
% Sensitivity	**96.4**	**94.9**
% Specificity	**95.1**	**93.2**
% Pregnancy loss	**8.9**	**10.5**

Economic value of a dairy cow

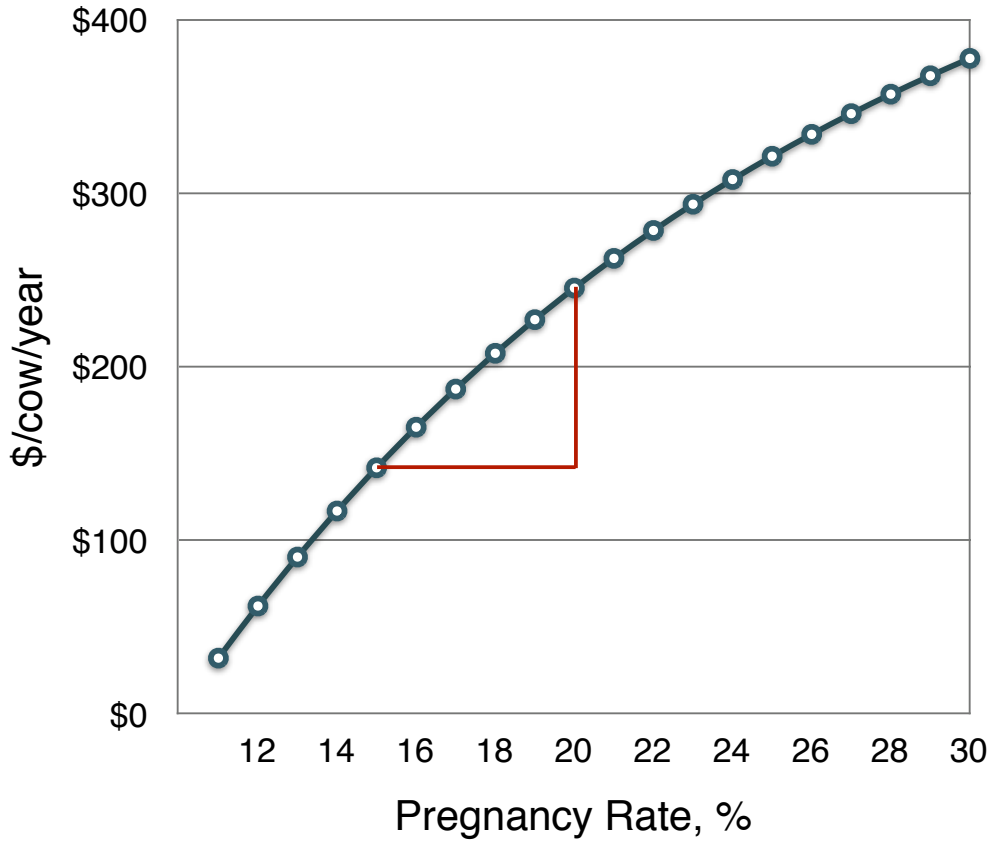
A decision support tool



DairyMGT.info

Value of improved reproductive performance

Law of diminishing returns



How much is the gain

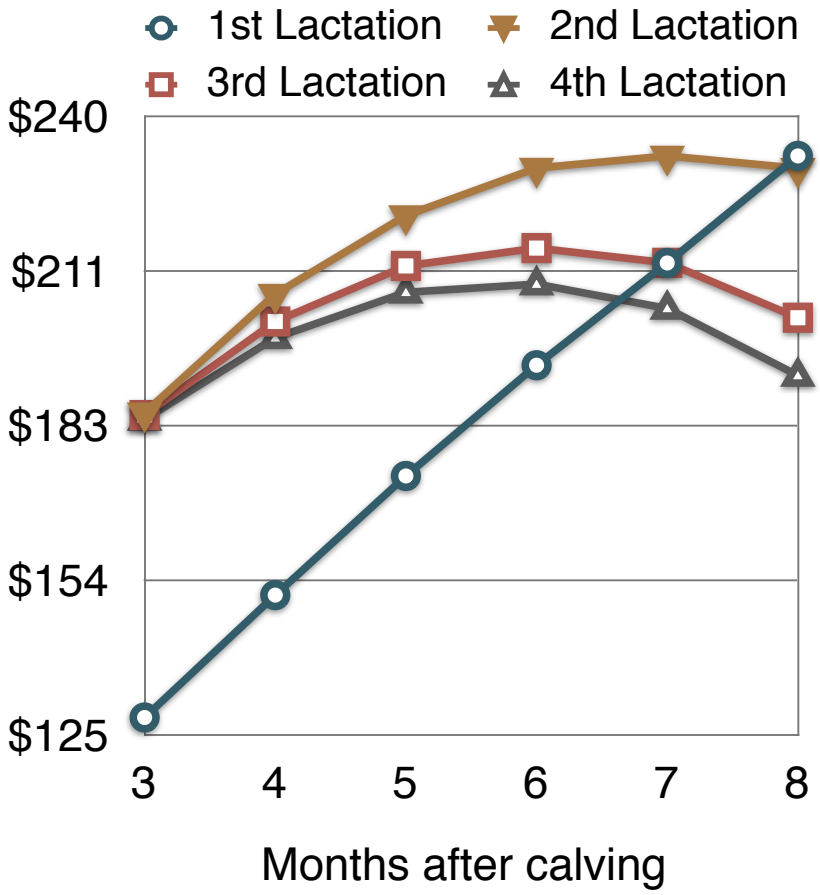
•Between $32 and $11 per cow per year

Net profit when increasing preg. rate from 15 to 20%

•$103 per cow per year

Value of a new pregnancy

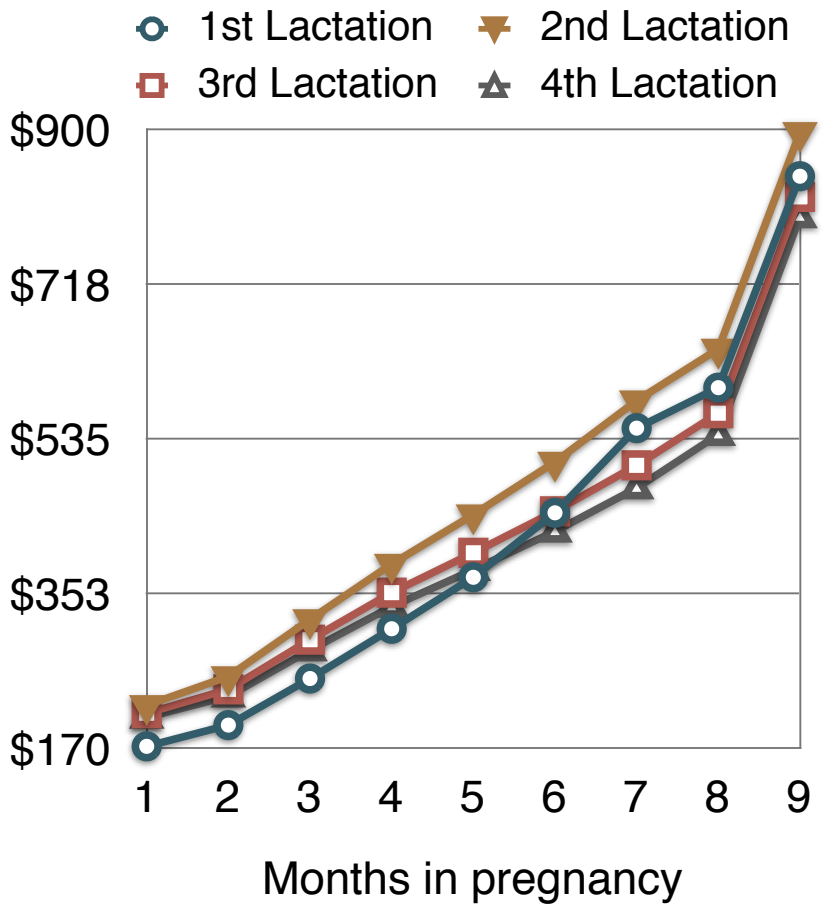
Important to have cows pregnant



Cabrera, 2012

Cost of a pregnancy loss

Detect aborted cows as early as possible



Cabrera, 2012

Cost of a day open ($/d)

Critical to have pregnant cows and detect non-pregnant cows as early as possible

	Lactation			
MIM	1	2	3	4
1	**-0.58**	**2.41**	**2.01**	**1.75**
2	**1.30**	**4.03**	**4.17**	**3.96**
3	**2.88**	**5.16**	**5.55**	**5.41**
4	**3.07**	**4.75**	**5.12**	**5.00**
5	**3.08**	**4.27**	**4.53**	**4.40**
6	**3.02**	**3.77**	**3.92**	**3.80**
7	**2.94**	**3.26**	**3.28**	**3.17**
8	**2.92**	**2.73**	**2.60**	**2.49**
9	**2.98**	**2.19**	**1.86**	**1.74**
10	**3.14**	**1.63**	**1.05**	**0.91**

Cabrera, 2012

Acknowledgement

Project support

This project is supported by Agriculture and Food Research Initiative Competitive Grant No. 2010-85122-20612 from the USDA National Institute of Food and Agriculture

United States Department of Agriculture
National Institute of Food and Agriculture

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