Relationship between Keto-test results and health and reproduction variables: A retro-spective study using data from herd health visits in private practice

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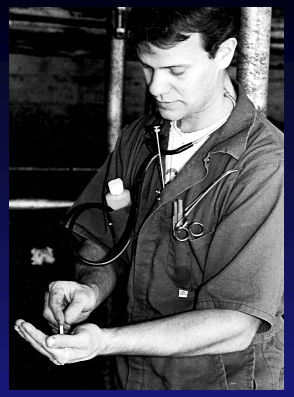
Keto-tests, my practice, the study



- Why I started using Keto-tests (KTST) in 2003
  - New, convenient way to quantify NEB
  - Data easily retrievable, cross-matched in cow lists and files…« teachable moment »
- Why do a study
  - « Motivation » #1 asset of practitioner !
  - All repro. + health events recorded: value
  - Database with KTST + repro. + health

Study population

- 22 herds, 95 % Holstein
  - Average herd size: 70 lactating cows
  - Range: 35 – 225 lactating cows
- Mature equivalent milk production: 9731 kg /305 d
- All herds on computerized herd health (DSA)
  - Monthly (n=18) or every other week (n=4)
- 10 herds are on some form of systematized repro. synchronization
- First breeding: all A.I.

Data collection

- During regular herd health visits (3-year period)
  - Keto-test on all cows (4 – 21 DIM)
- Production data were downloaded from DHI
- Repro., demographic and health events were entered in DSA
  - At the farm (on paper or in the computer)
  - At the clinic (by staff)
  - Or by automatic transfer from vet billing system

Some variables recorded

- HERD: identification of the herd (categorized)
- CS: calving season (categorized)
- LN: lactation number (categorized)
- DIMAI: days in milk at 1st AI (categorized)
- BS: season at 1st AI
- PREG: pregnancy result at 1st AI
- MF: milk fever
- RP: retained placenta
- ME: metritis
- CY: ovarian cyst
- MA: mastitis
- LA: lameness
- DA: displaced abomasum

Descriptive stats

- Cows tested:
  - n=1428
- Cows with Keto-test (+) (cut-off: 100 µM):
  - n=394 (27.6 %)
- Cows bred (1st A.I.):
  - n=1217 (85.2 %)
- Cows pregnant at 1st A.I.:
  - n=387 (conception rate: 31.8 %)

Binary logistic regression

- Complete model included:
  - KTST
  - Potentially confounders (Chi-square $P < 0.25$ between confounder and outcome)
  - Interactions KTST × confounders ($P < 0.25$)
- Reduced model included:
  - KTST
  - But only the confounders and the interactions that modify the odds ratio
- Odds ratio were converted to %

Characterization of cows diagnosed pregnant or non-pregnant after first breeding

	Pregnant	Non-pregnant
Number of cows	387	830
KTST (+)[1]	101 (26.1)[2]	224 (27.0)
Milk fever*	9 (2.3)	35 (4.2)
Retained placenta	28 (7.2)	81 (9.8)
Metritis**	31 (8.0)	113 (13.6)
Ovarian cyst**	14 (3.6)	87 (10.5)
Mastitis	75 (19.4)	164 (19.8)
Lameness	32 (8.3)	63 (7.6)
Displ. abomasum**	10 (2.6)	41 (4.9)

[1]KTST (+) if BHB ≥ 100 μM; [2] n (%)
*Chi-square $P < 0.10$
**Chi-square $P < 0.05$

Categorization of herds according to 1st A.I conception rate

	n	Conception rate (%)
HERD (conception rate)**		
< 25%	147	21.1
25 – 30 %	585	29.1
30 – 35 %	249	34.1
> 35 %	236	42.8
Lactation number**		
1	392	36.7
2 – 3	530	32.3
> 3	295	25.1

**Chi-square $P < 0.05$

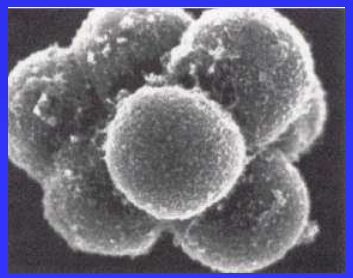
Effect of breeding season and days in milk at 1st A.I. on 1st A.I. conception rate

	n	Conception rate (%)
Breeding season		
winter	322	33.5
spring	276	29.0
summer	276	33.0
fall	343	31.5
DIM at A.I.		
< 70	280	28.9
70 – 100	630	32.7
> 100	307	32.6

Non significant Chi-square $P > 0.50$

Results, Conception rate

- Complete binary logistic moded included:
  - KTST
  - HERD, LN, MF, RP, ME, CY, DA
- Reduced model included KTST only
- Conception rate at 1st A.I. is not associated ($P = 0.74$; n=1217) with KTST result :
  - 32.1 % when KTST is (-)
  - 31.1 % when KTST is (+)



Results, Health events

	KTST (+)	KTST (-)
Number of cows	394	1034
Displ. abomasum**	31 (7.9)[1]	36 (3.5)
Metrits	40 (10.2)	124 (12.0)
Ovarian cyst	23 (5.8)	79 (7.6)
Retained placenta	32 (8.1)	105 (10.2)
Milk Fever	18 (4.6)	39 (3.8)
Mastitis**	98 (24.9)	182 (17.6)
Lameness	27 (6.9)	86 (8.3)

**Chi-square ($P < 0.01$); otherwise $P > 0.20$

[1]n (%)

Results, Mastitis

- Final model included KTST only
- Mastitis is associated with KTST result :
  - OR: 1.55 ($P = 0.002$)
  - 17.6 % (182/1034) when KTST is (-)
  - 24.9 % (98/394) when KTST is (+)

Results, Displ. abomasum

- Final model included KTST, HERD, KTST×HERD
  - HERD was categorized according to incidence of displ. abomasum: < 5%, 5 − 10%, > 10%
- Displ. abomasum is associated with KTST result but depends on herd incidence of displ. Abomasum
  - OR: 3.81 ($P = 0.001$)

Results, Displ. abomasum

	Herd incidence of displ. abomasum		
	Low < 5%	Medium 5 – 10%	High > 10%
n cases	20	26	21
KTST (-)	2.3%	5.9%	12.5%
KTST (+)	3.4%	8.3%	35.2%

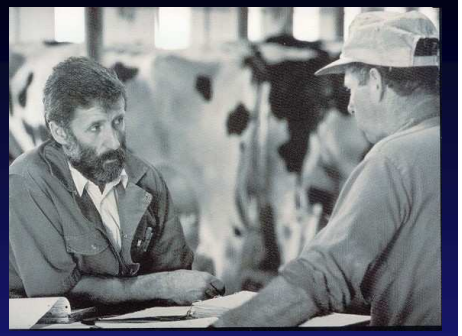
Discussion (reproduction)

- No effect on 1st A.I. conception rate ???
  - Observational retrospective study
  - Test on milk, not serum (sensitivity…)
  - One measure between 4 – 21 DIM (false negatives ?)
  - 1st A.I. conception rate is not the only important repro. variable

Discussion (diseases)

- Strong association between KTST and displ. abomasum
  - In herds with a high incidence of displ. abomasum
  - Cause or consequence
- Strong association between KTST and mastitis
  - Leukocyte function ? Immune failure ?
  - Duration of effect ?
- Underlines the importance of monitoring the transition period and NEB

Discussion (practice)



- Use of Keto-test in practice
  - Easy
  - Creates « teachable moment »
    - Transition / fresh cow nutrition
- Data analysis in private practice
  - Good way to « stay motivated »
  - Emphasizes the value of herd health data

Questions…