Higher risk of paratuberculosis when born in a dairy herd - A breed or herd type effect?

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Background & Objective

Mycobacterium avium **subsp.** ***paratuberculosis*** **(MAP) cause significant losses in intensive dairy production systems**

Prevalence in Denmark is high

- **20-30% of dairy cows are estimated MAP infected**
- **80-90% of dairy herds are estimated to house MAP infected animals**

Non-dairy herds in Denmark are often extensive production systems

- **Includes: professional and hobby farmers producing beef, ceased dairy herds etc.**
- **Lower animal density with animals potentially more frequent on pasture may result in different transmission dynamics**
- **Less intensive => less stress on the animals => lower risk of losing control of MAP infection (?)**

Objective: To compare differences in true prevalences (TP) for

- **different types of breeds**
- **different types of herd of birth**

Materials

Animals

- **Serum samples collected Oct. 2008-Jan.2009**
- **Every 6th animal from non-dairy herd**
- **Only animals > 24 month of age**
- **Total of 2361 samples**
- **21 breeds**
  - **3 Dairy breeds** (Danish Jersey, Danish Holstein, Danish Red Cattle)
  - **17 Pure beef breeds** (Blonde d'Aquitaine, Limousine, Angus, Hereford, Simmental, Charolais, Dexter, Galloway, Highland, Belgian Blue, Shorthorn, Grauvieh, Salers, Piemontese, Jysk, Pinzgauer, Hungarian)
  - **Crossbred** (of various breeds)

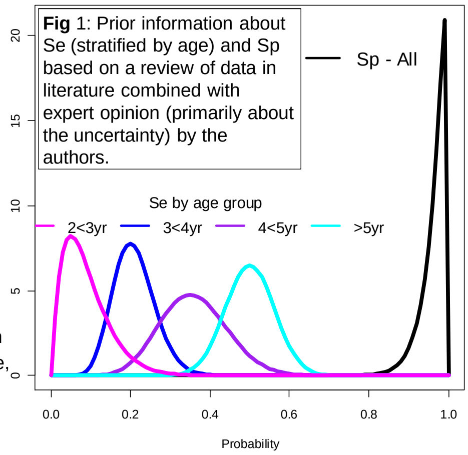

Fig 1: Prior information about Se (stratified by age) and Sp based on a review of data in literature combined with expert opinion (primarily about the uncertainty) by the authors.

Methods

Samples analysed for antibodies using IDScreen antibody ELISA (IDVet, Montpellier, France)

Animals divided in groups

- **Breed type:** Dairy (Jersey, Holstein or Danish Red), Crossbred, Other
- **Herd type at birth and later:** Beef herd all life; Dairy herd all life; Born dairy – moved to beef

Apparent prevalences estimated for each group

True prevalences estimated using OpenBUGS in a Bayesian model:

$$\mathbf{AP}_i = \mathbf{Se}[\mathbf{age}_i] \times \mathbf{TP}_{\mathbf{Strata}} + (1-\mathbf{Sp}) \times (1-\mathbf{TP}_{\mathbf{Strata}})$$

$$\mathbf{test}_i \sim \mathbf{Bern}(\mathbf{AP}_i)$$

$$\mathbf{TP}_{\mathbf{Strata}} \sim \mathbf{Beta}(1,1)$$

with the prior information as shown in Fig. 1.

Results

Breed

	Age group (#pos/#n)				
	2 < 3yr	3<4yr	4<5yr	>5yr	Total
Beef	0/266	4/144	0/108	6/469	10/987
Crossbred	4/227	3/127	1/69	1/295	9/718
Dairy	8/282	3/96	11/88	9/190	61/656

Data stratified by age and breed or type of herd at birth

Herd type

	Age group (#pos/#n)				
	2 < 3yr	3<4yr	4<5yr	>5yr	Total
Beef all life	4/468	7/261	2/175	7/746	20/1650
Dairy to beef	5/227	0/43	3/39	5/82	13/391
Dairy all life	3/80	3/63	7/51	4/126	17/320

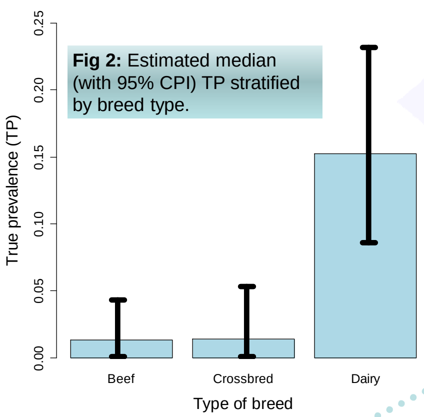

Fig 2: Estimated median (with 95% CPI) TP stratified by breed type.

The TPs of dairy breeds were app. 11 times higher than beef breeds and crossbreds breeds (Fig. 2).

The TPs of animals born in dairy herds was app. 15 times higher than animals born in beef herds, irrespective of where they ended their life (Fig. 3).

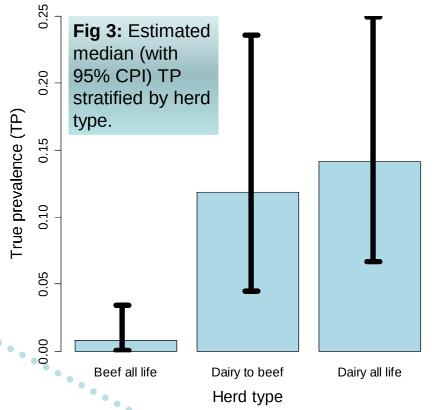

Fig 3: Estimated median (with 95% CPI) TP stratified by herd type.

Conclusion

Marked difference between

Dairy breeds | Beef breeds

Dairy herds | Beef herds

Dairy breeds and cows from dairy herds have significant higher TP than beef breeds and cows from beef herds

Not possible to determine if the cause is production system or genetic factors

ParaTBTools

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ParaTBTools