Lamb mortality : current knowledge

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Context: low numerical productivity

- **Numerical productivity** = number of weaned lambs/ewes

- **2010 results in France** :
  - **numerical productivity :** 27% to 262% (mean=120%)
  - 30% herds with a numerical productivity below 100%

- **The three components of** numerical productivity :
  - - Lambing rate
  - - Ewe prolificity rate
  - **- Lamb mortality rate**

Lamb mortality rate

- Variable according to studies :
  - often between 10 and 20%

Country	Number of herds	Maximum age of lambs taken into account	Global lamb mortality rate	reference
Australia	1	Unspecified	22.8	Dennis et *al.*, 1974
Scotland	10	Before weaning	14.2	Johnston et *al.*, 1980
Scotland	1	After weaning	25.8	Wiener et *al.*, 1983
France	8	60 days	13.2	Seegers et *al.*, 1984
USA	4	2 to 6 weeks	10.3	Rowland et *al.*, 1985
France	24	80 days	18.4	Lepeltier, 2010

Only limited information

- Limited records

Death age	Aborted	Stillborn	Birth to lamb tagging	lamb tagging to weaning
% of breeders who have recorded	73.4	87.5	92.4	94.1

Socle National ovin allaitant 2010, 353 farms

- Low identification of the causes of death

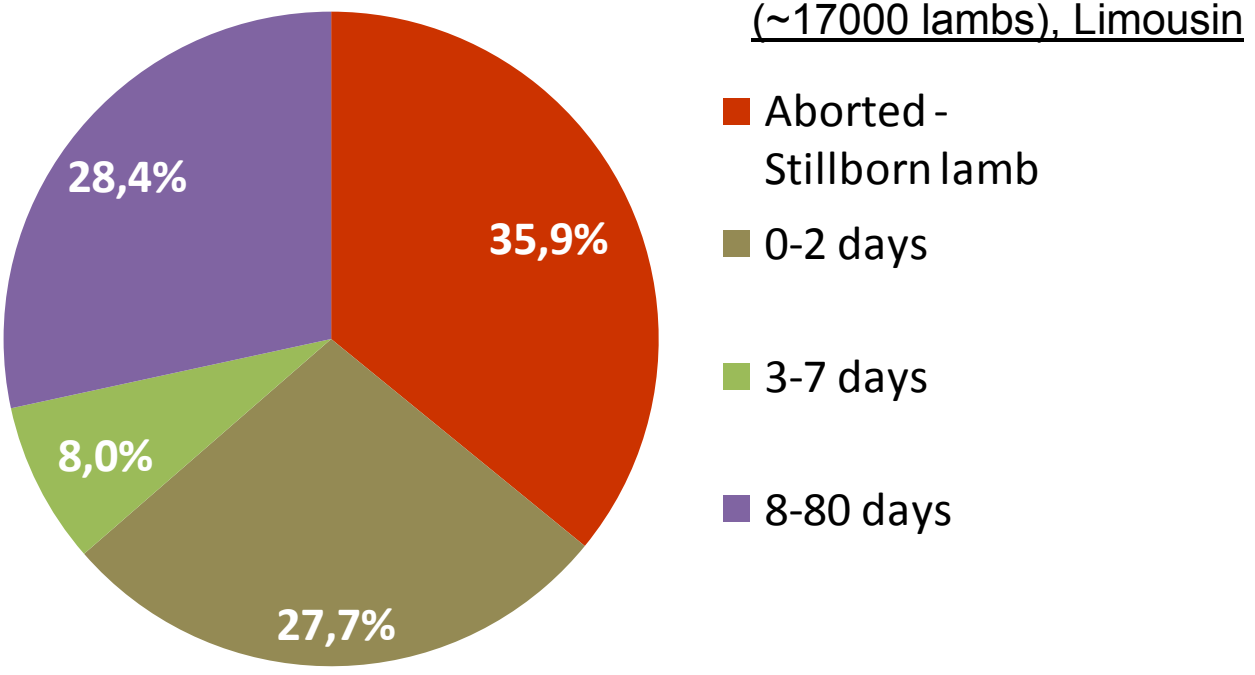
Death age	Aborted Stillborn	0-48h	3-10 days	> 10 days
% lamb with «unknown cause»	56.5	19.3	9.8	29.7

UMT SPR 2010, 24 farms, ~1300 dead lambs

  - Contribution of necropsy and additional tests

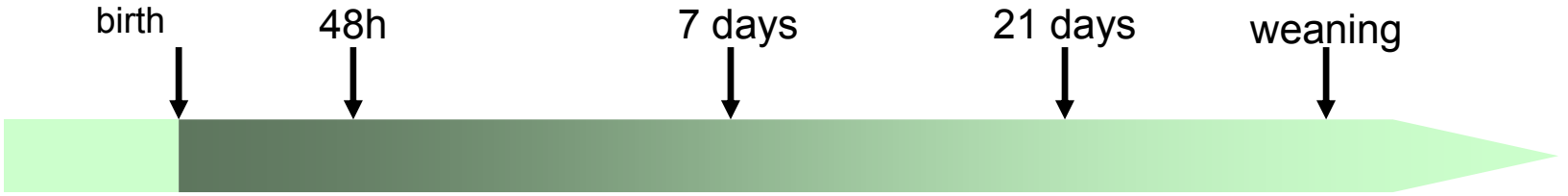
Lamb mortality

- Mortality distribution by age at death



Lepeltier, 2010

Mortality causes

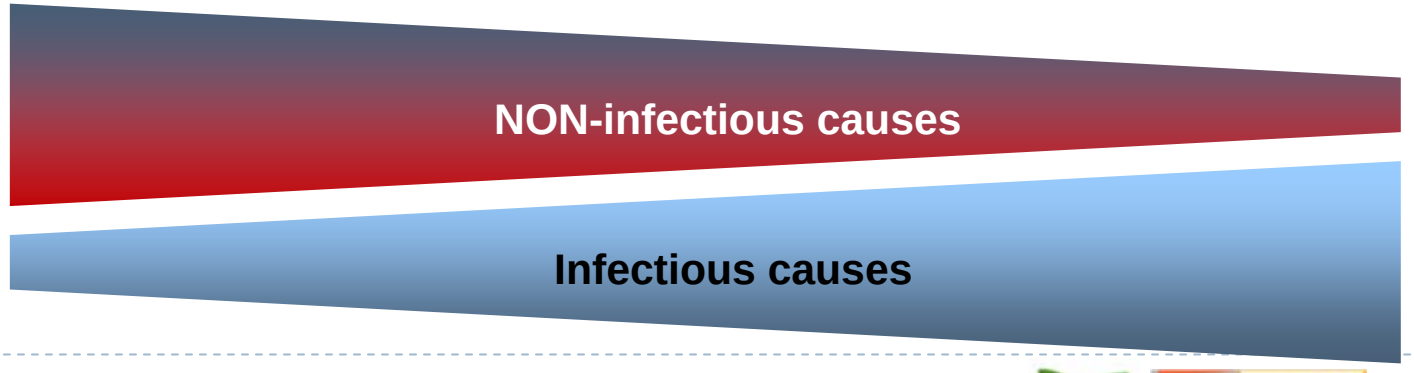


Gestation toxemia
Cu, Se, I… deficiency
Infectious diseases abortion
…

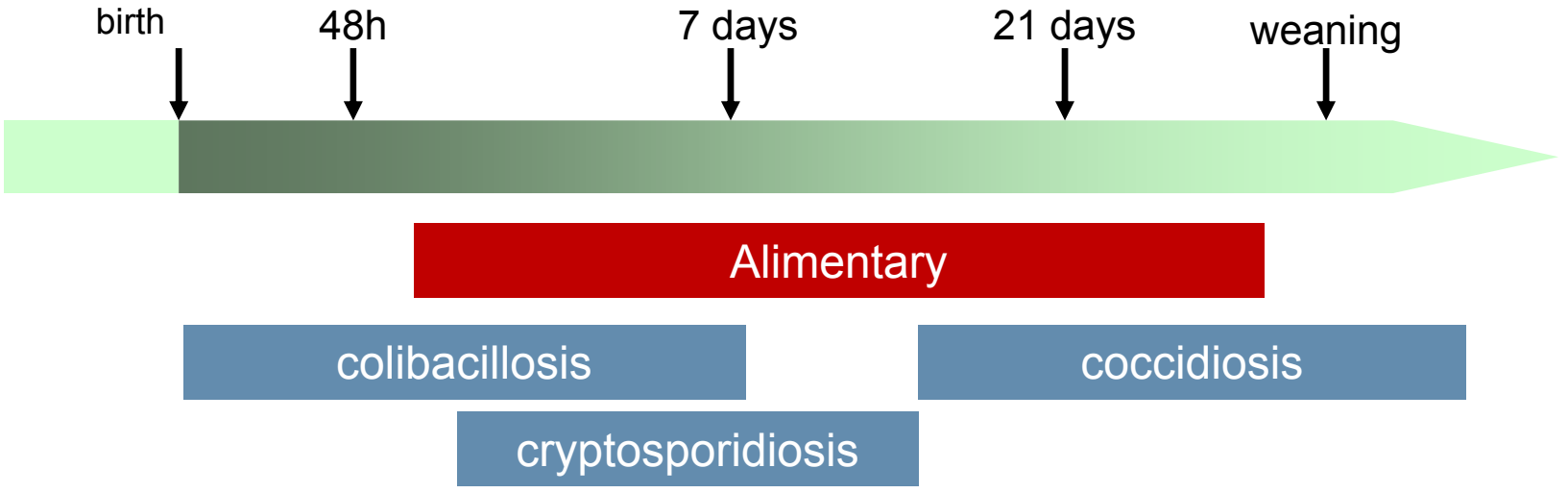
Dystocia
Starvation and hypothermia
Water mouth disease (*E.Coli*)
…

Enterotoxemia (*C. perfringens*)
Arthritis
…

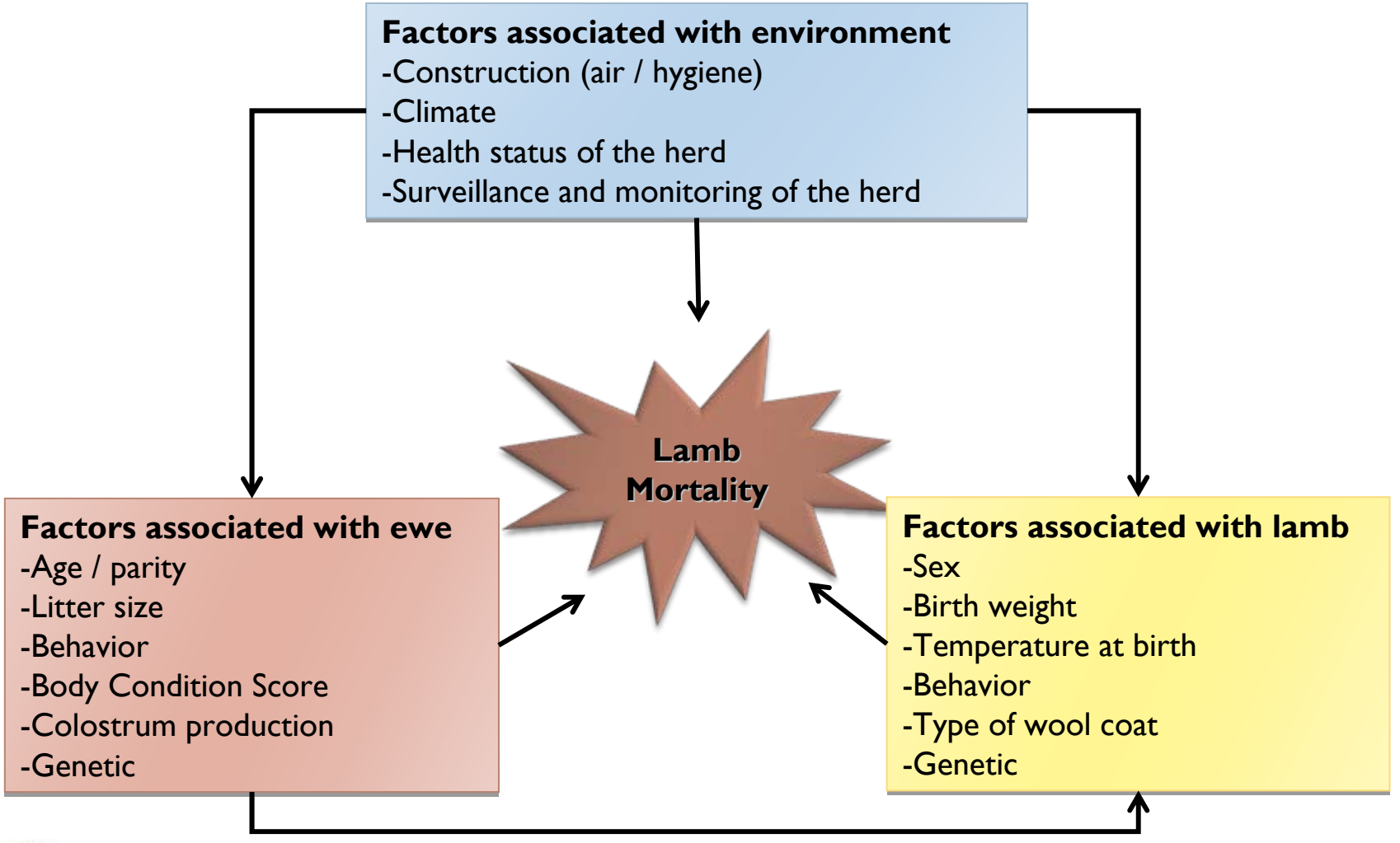
pulmonary pasteurellosis
…



Mortality causes related to diarrhea

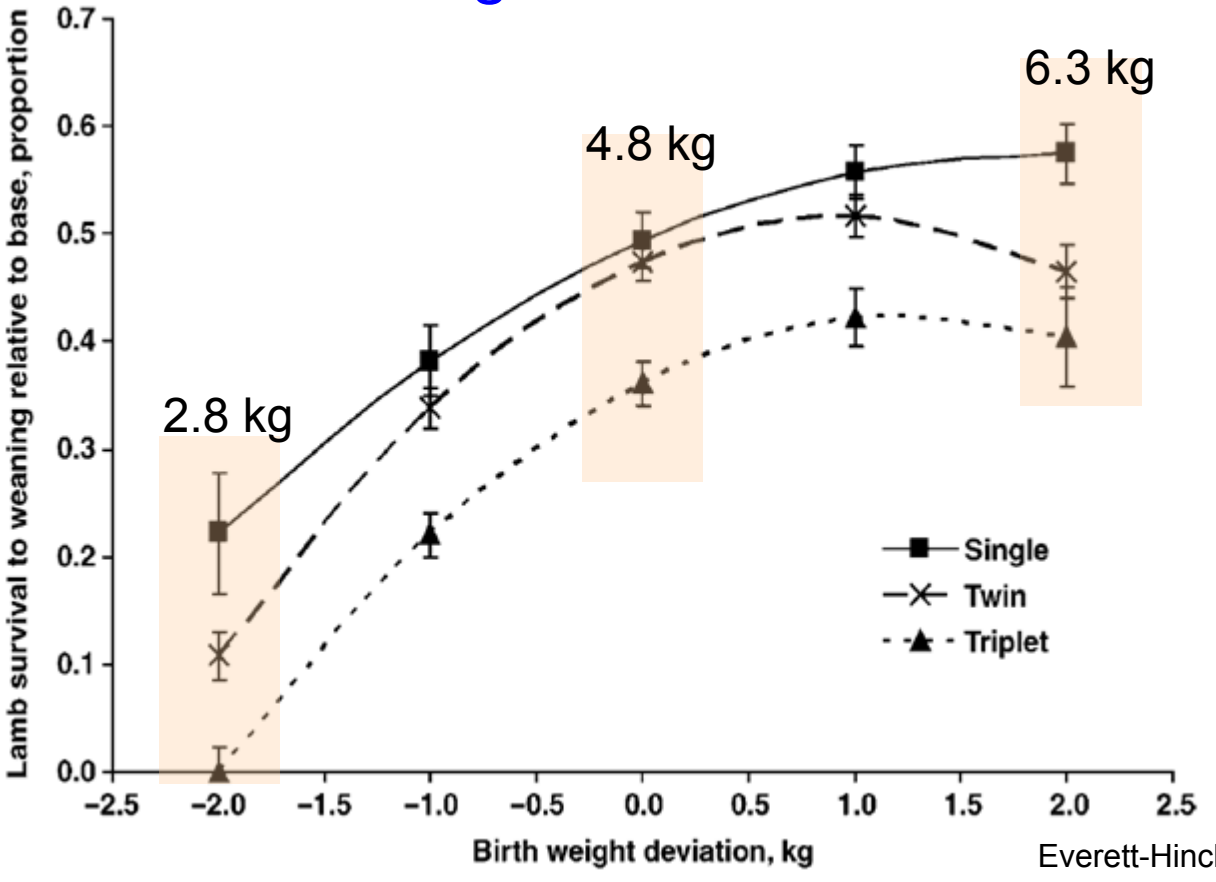


Risk factors ?



Risk factors related to lambs

- Influence of litter size and birth weight on lamb survival to weaning



Everett-Hincks and Dodds, 2007

Risk factors related to lambs (2)

- Data from :
  - 5 herds (INRA)
  - 44 000 lambs born between 2004 and 2010

UMT SPR ; 2011

		Aborted/Stillborn Odd's ratio	0 - 2 days Odd's ratio	3 - 7 days Odd's ratio	8 – 60 days Odd's ratio
Birth weight quartile	*1*	not studied	**6.93** [5.79 ; 8.29]	**3.11** [2.60 ; 3.72]	**1.79** [1.57 ; 2.04]
	2		**2.12** [1.75 ; 2.57]	**1.58** [1.31 ; 1.90]	**1.21** [1.06 ; 1.38]
	3		-	-	-
	4		**0.61** [0.47 ; 0.79]	0.85 [0.68 ; 1.07]	0.9 [0.77 ; 1.04]
Litter size	*1*	1.05 [0.93 ; 1.19]]	0.84 [0.67 ; 1.05]	0.56 [0.45 ; 0.70]	0.76 [0.66 ; 0.89]
	2	-	-	-	-
	3	**2.82** [2.58 ; 3.10]	**1.24** [1.07 ; 1.44]	0.97 [0.83 ; 1.14]	**1.23** [1.09 ; 1.38]
	4	**4.95** [4.38 ; 5.60]	**1.93** [1.59 ; 2.34]	**1.4** [1.12 ; 1.74]	1.08 [0.89 ; 1.32]
	5	**8.53** [7.13 ; 10.21]	**2.45** [1.84 ; 3.26]	**1.57** [1.11 ; 2.23]	**1.56** [1.14 ; 2.15]
	6 et +	**16.78** [13.16 ; 21.41]	**2.12** [1.38 ; 3.26]	**1.57** [0.93 ; 2.65]	0.99 [0.54 ; 1.82]

Risk factors related to ewe

- Feeding during gestation

Nutritional intake (% of requirements) between 50 d of gestation and lambing				
	60% n=28	100% n=28	140% n=28	p
Weight gain (kg)	-4.0	6.2	17.3	0.01
Lamb birth weight (kg)	4.01	4.64	4.21	<0.01
Udder weight (g)	670.1	838.9	815.3	0.03
Colostrum first milking				
volume (ml)	325.9	575.1	364.0	<0.01
IgG concentration (g/l)	127.7	82.1	99.9	<0.01
total IgG (g)	31.5	43.2	33.6	0.06

Swanson et al, 2008

Risk factors related to environment

- Exposure of lambs (0-3 days age) to cold temperatures
  - Winter 2010-2011; 16 farms

	<10°C during 24H	<5°C during 12H
Farms affected by cold temperatures	50%	31%
% lambs (0-3 days age) exposed to cold temperatures in these farms	2 to 66%	1 to 44%

- Quality of litter?

UMT SPR, 2011

Survival genetic effects

Estimations of heritability following different periods, different scales, different genetic models (direct, d + maternal)…

breed	number of lambs	period	scale	direct heritability	maternal heritability	reference
US MARC crossbreds	16 881	At birth	binary	0.02±0.03	-	Gama *et al.* (1991)
Romney	55 146	At birth	binary	0.03±0.01	0.01±0.01	Morris *et al.* (2000)
Scottish Blackface	4 459	At birth At 8wk	Normal	0.09±0.03 0.07±0.03	-	Riggio *et al.* (2008)
Scottish Blackface	15 652	At birth 15-120d	Normal Weibull	0.05±0.02 0.18±0.04	0.09±0.02 -	Sawalha *et al.* (2007)
Romane Romanov	22 428 4 215	At birth 1-60d At birth 1-60d	Normal « « «	0.09±0.01 0.07±0.02 0.05±0.03 0.06±0.03	0.01±0.01 0.02±0.01 0.05±0.03 0.07±0.04	François *et al.* *(in progress)*

Low estimates →

– high environment effects (key for improvement)

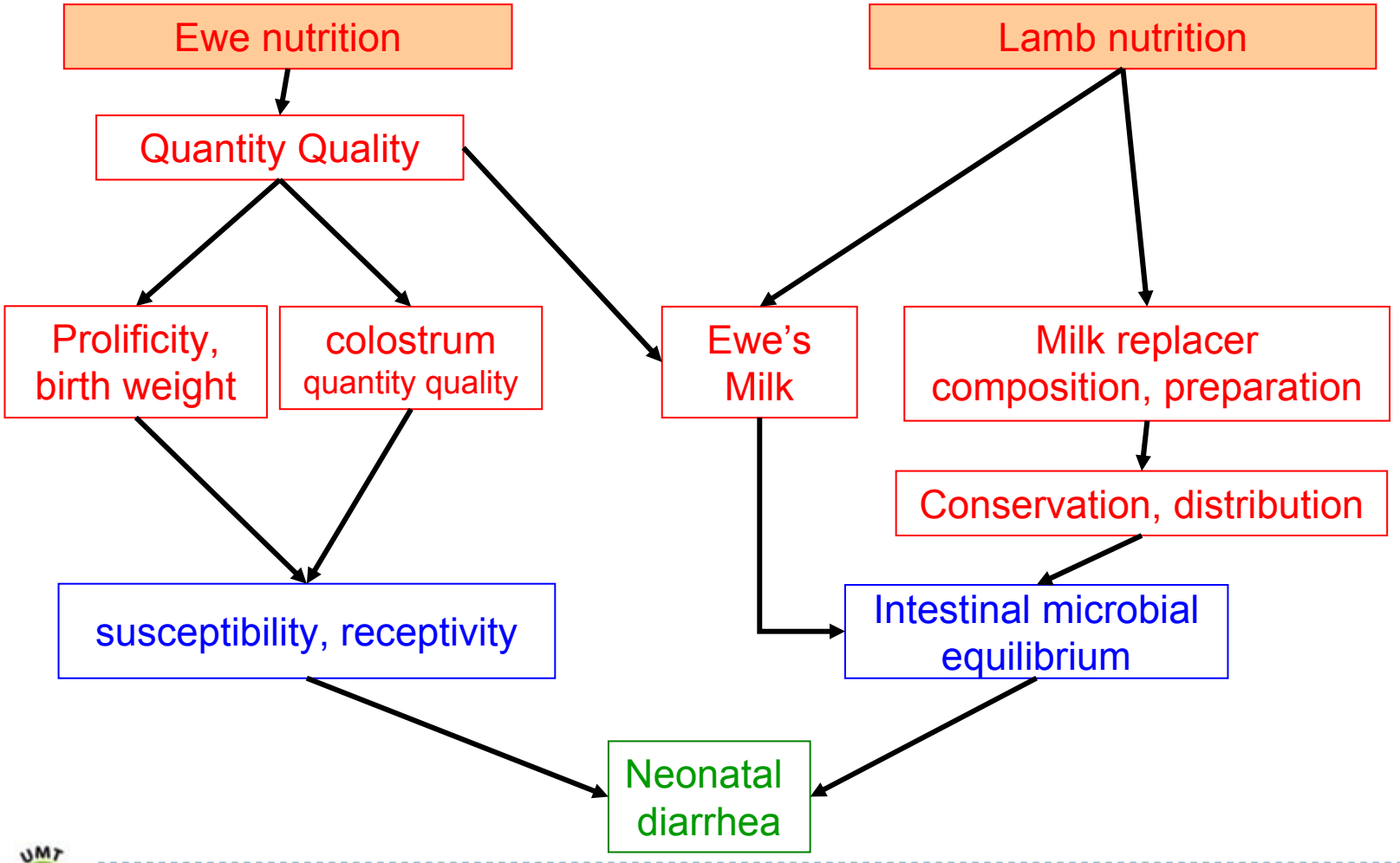
– can be improved by appropriate selection design (← progeny test)

French maternal Estimation of Breeding Value (Poivey *et al.*,1995) includes survival breeding value

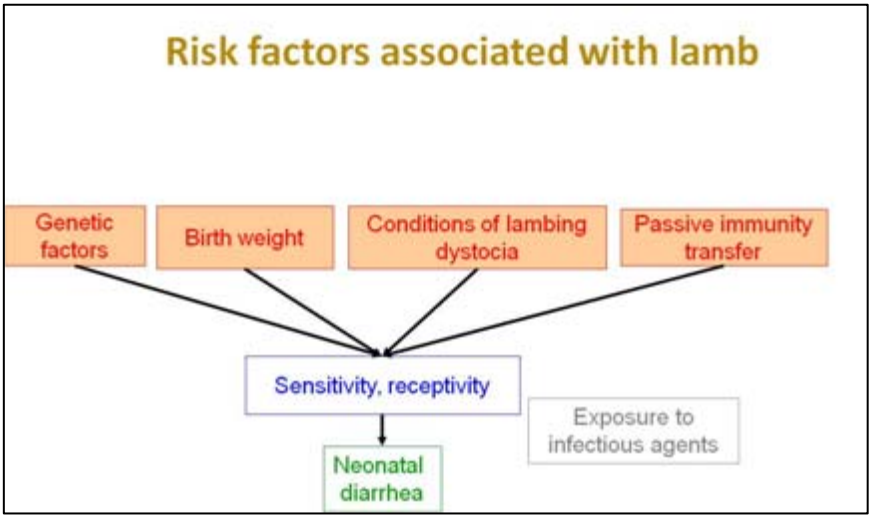
Exploration of risk factors

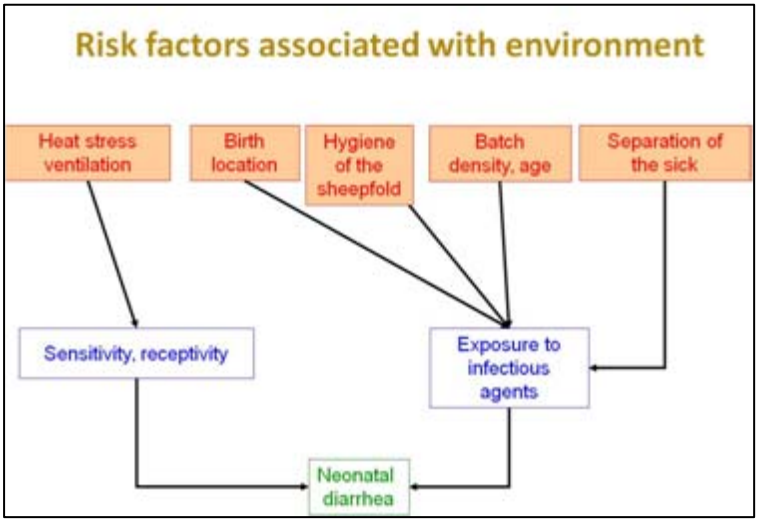
Example of neonatal diarrhea

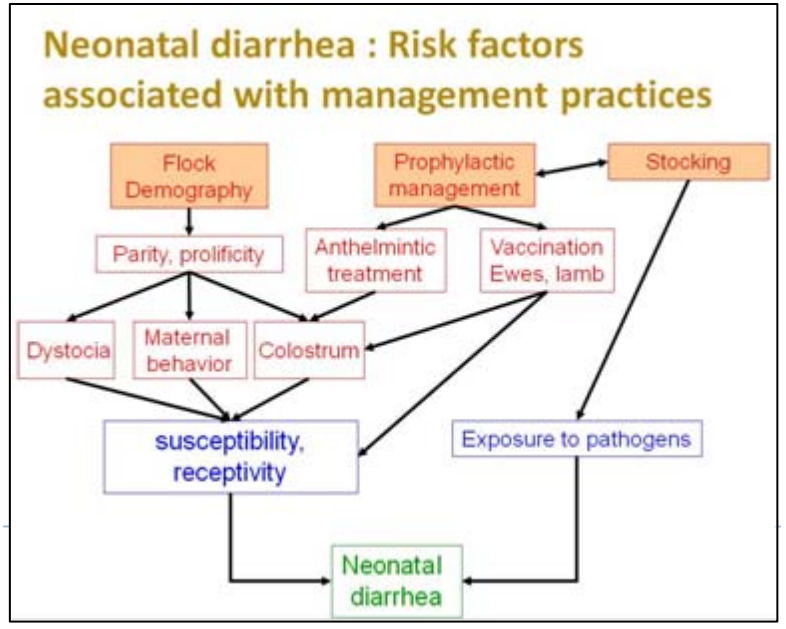
Neonatal diarrhea
Risk factors associated with food



Neanatal diarrhea
Other Risk factors







Description of health troubles

- **Who ?**
  - Lambs : [0 – 7 d] [7j – 15d] [15d – 1 month]…
  - Twins…
  - Primiparous…
- **What ?**
  - Definition cases / non cases: diarrhea vs. other diseases
  - Necropsy, further investigations
- **When? temporal evolution**
  - Causality: the cause precedes the effect
  - Pay attention to modification in management following health troubles!
- **Where ? : space**
  - barn, grazing, physical groups…

Conclusions

- Various causes and numerous risk factors
- Improvement at the farm level
- Improvement at the collective level
- Multiple perspectives ...

Thank you for your attention

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