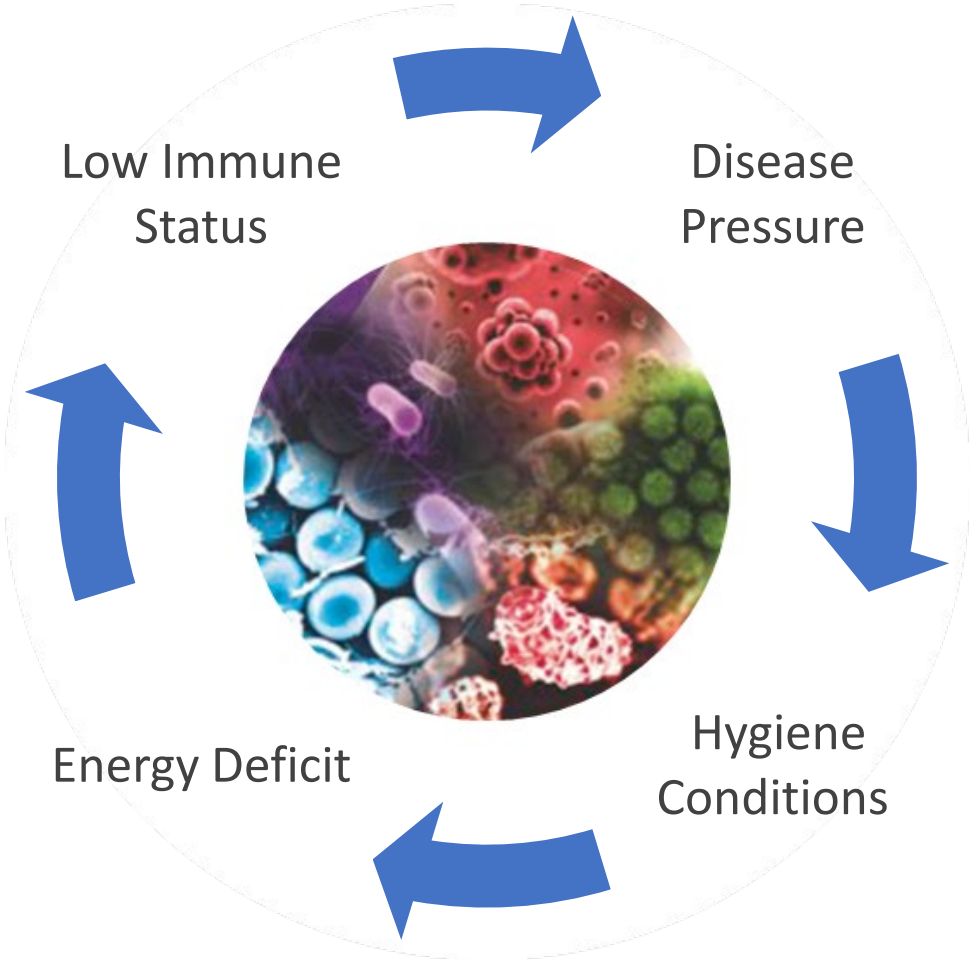
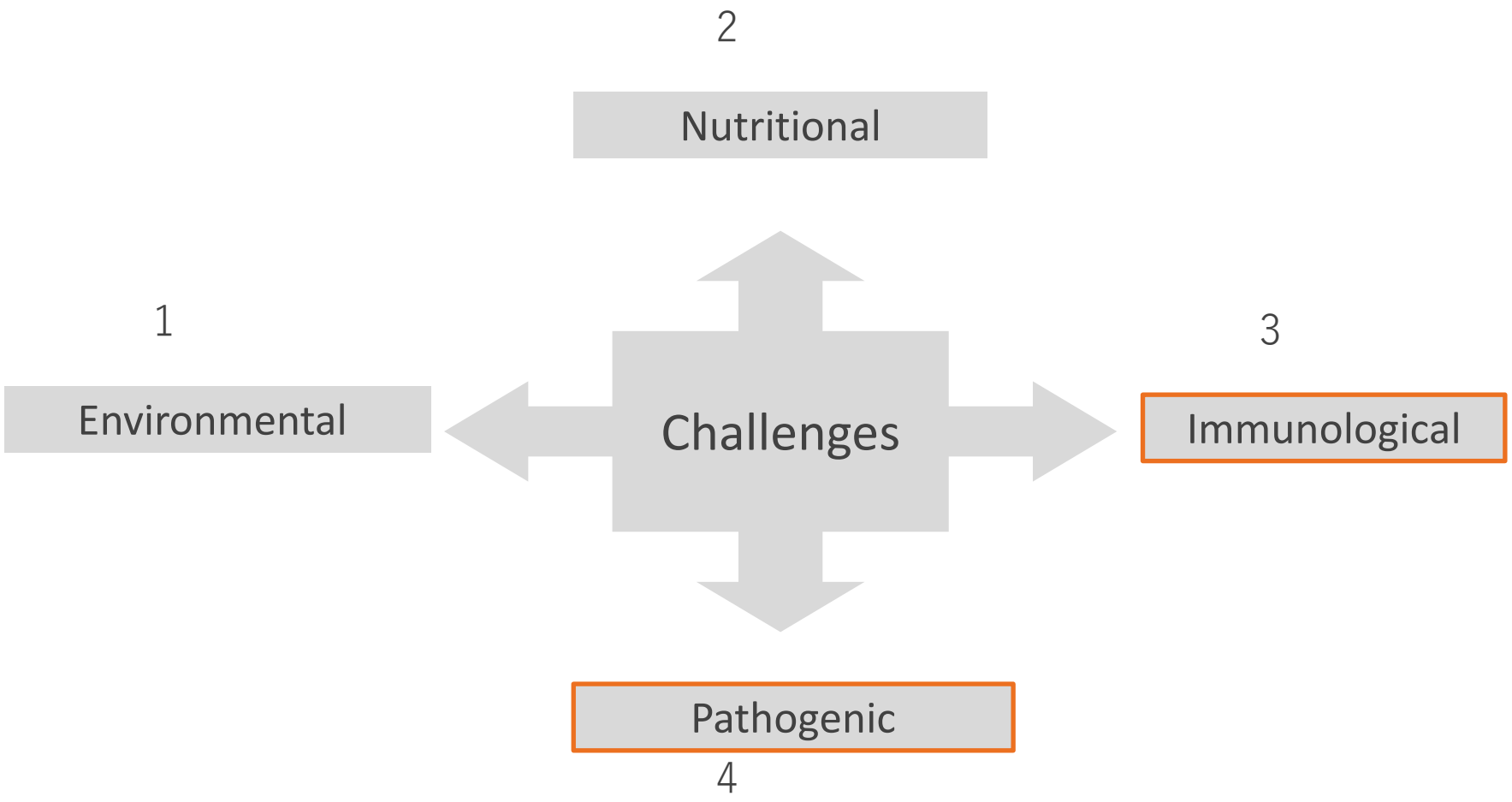
Challenges for Calves

Reasons for Mortality



Challenges for Calves



Potential Tools

Vaccines

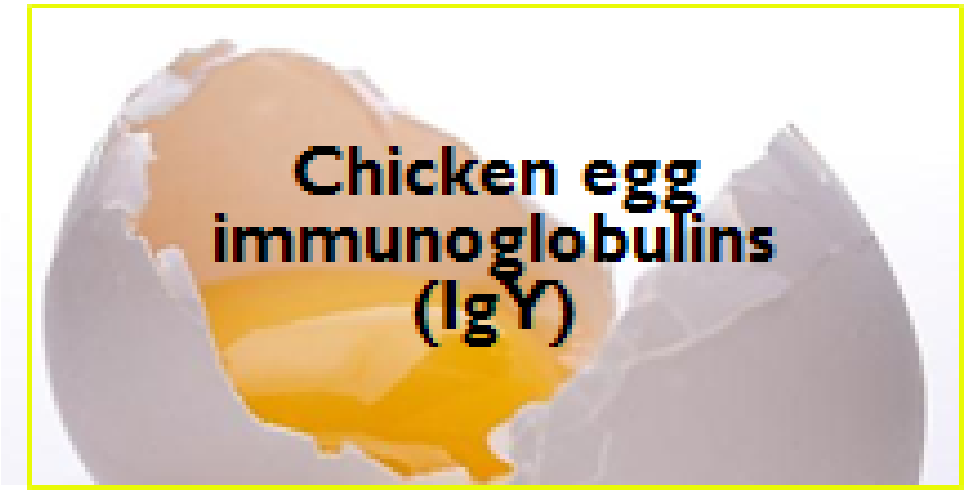
- Slow immune response
- Low effect against GI tract infections

Antibiotics

- Resistance
- Drug residues in food
- Not effective against viral infections
- Also harms good microbial flora in intestine

Blood plasma, colostrum, etc.

- Non specific antibodies
- Safety problems



Facts about Colostrum

- Calves are dependent on receiving maternal antibodies via colostrum
- Colostrum varies greatly in type and concentration of antibodies
- Animals receiving inadequate colostrum are extremely vulnerable to intestinal infection and subsequent scours

Environmental Challenges

- Hygienic conditions
  - in the calving stable
  - of the water
  - of the milk / feed
- Housing conditions
  - no fresh air
  - wrong temperature
- Management
  - during birt

Nutritional Challenges

- Insufficient colostrum and milk replacer (quality /quantity)
  - High yielding cows produce colostrum of less quality (limits of the genetic potential)
  - Inadequate temperature
- Wrong timing of first colostrum feeding
- An energy deficit causes a loss of body temperature
- Energy is also needed to build up the body’s own immune system

Immunological Challenges

- Calves are born without any immune protection and own immune system develops slowly
- Essential supply of immunoglobulins by the colostrum
- The immunoglobulin level in the cow’s colostrum rapidly decreases
- Absorption of immunoglobulins into blood mainly within 6 – 24 hours after birth

Role of Colostrum

Comparison between colostrum and normal milk

	Within 3 days of birth	After 3 days of birth
Immunoglobulin G (IgG)	50mg/mL	0.6mg/mL
Immunoglobulin A (IgA)	4mg/mL	0.15mg/mL
Immunoglobulin M (IgM)	4mg/mL	0.05mg/mL
Vitamin A	200～300 μg/dL	33 μg/dL
Solids	18～24%	13%
Fat	5～7%	4%
Protein	8～14%	3%

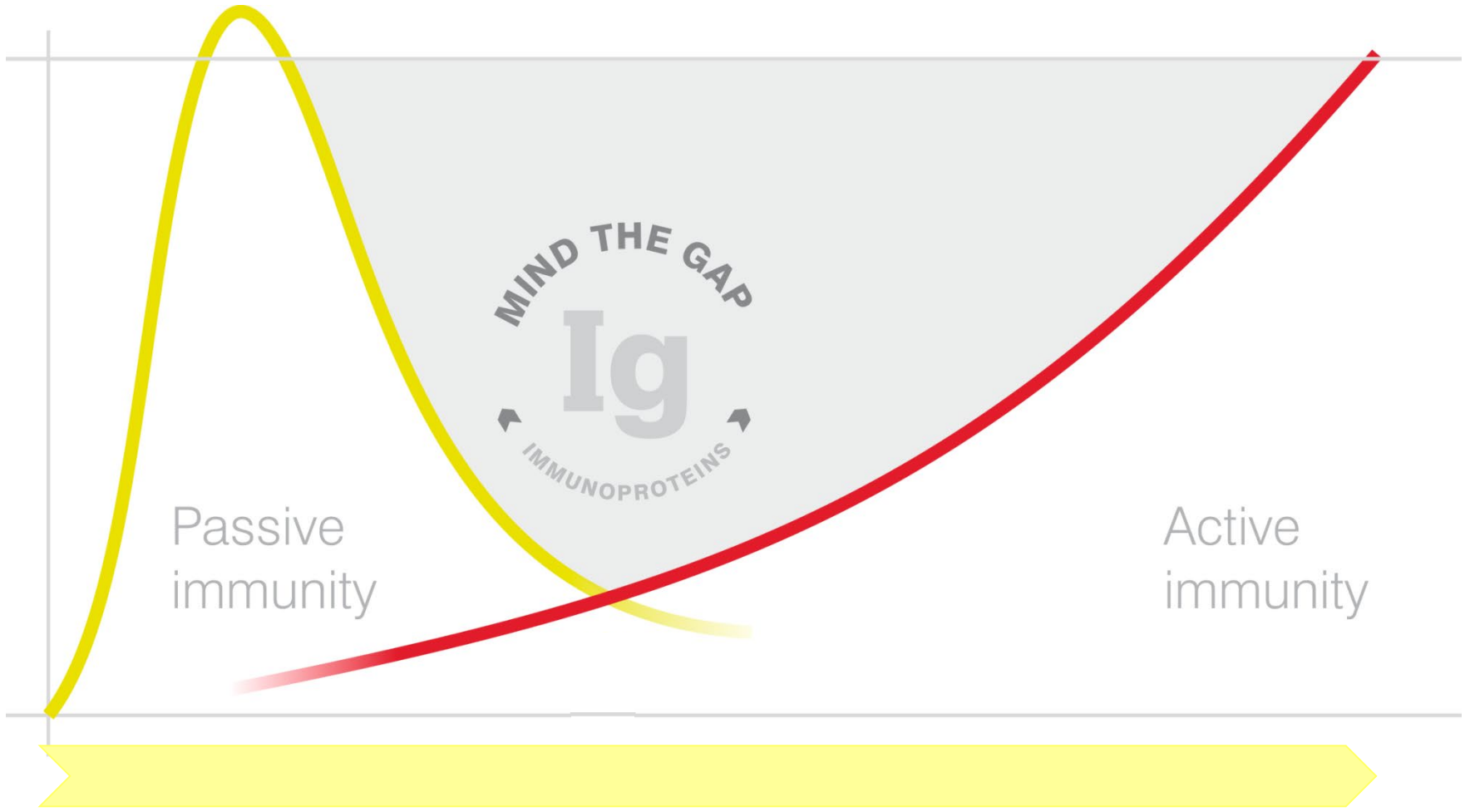
Immunological Status

Time of colostrum intake and total Ig absorption

Hrs after birth	Calf serum Ig [mg/ml]	% Absorption
6	52.7	66
12	37.5	47
24	9.2	12
36	5.4	7
48	4.8	6

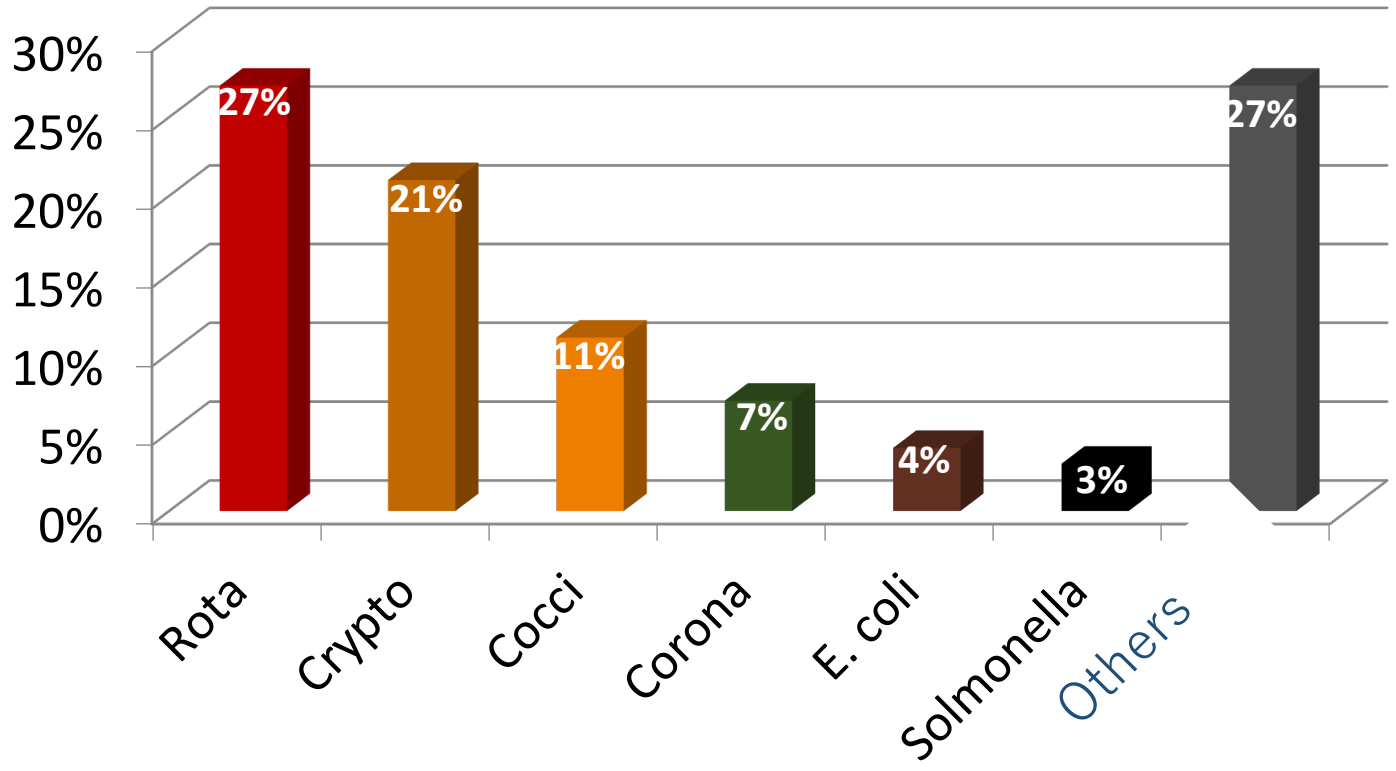
Reference: Vet. Rec. 114:157

Immunity gap in young animals

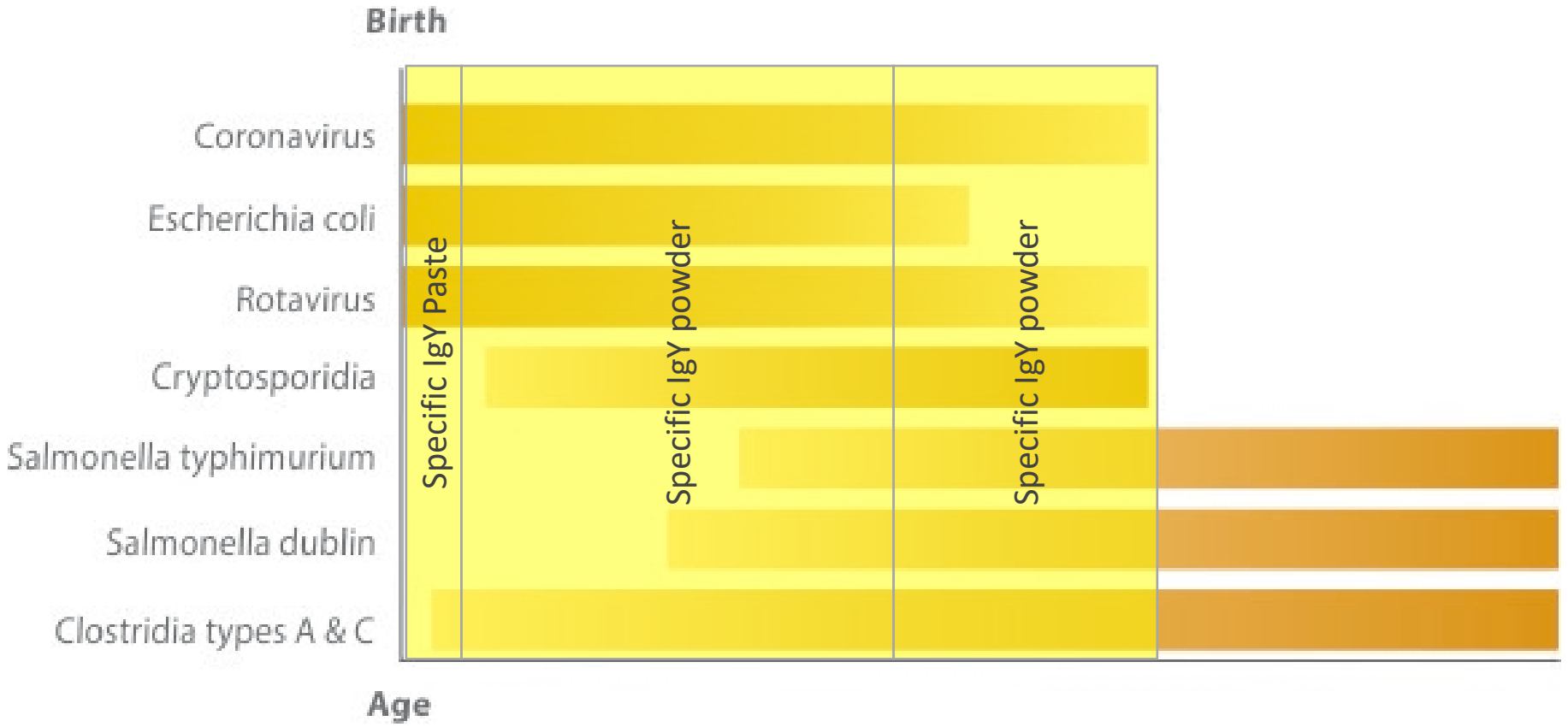


Disease pressure in neonatal calves

Main causal agents of diarrhea are pathogens:



Pathological Challenges of Calves



Specific IgY powder

Trials

In vivo study – Ig 0032

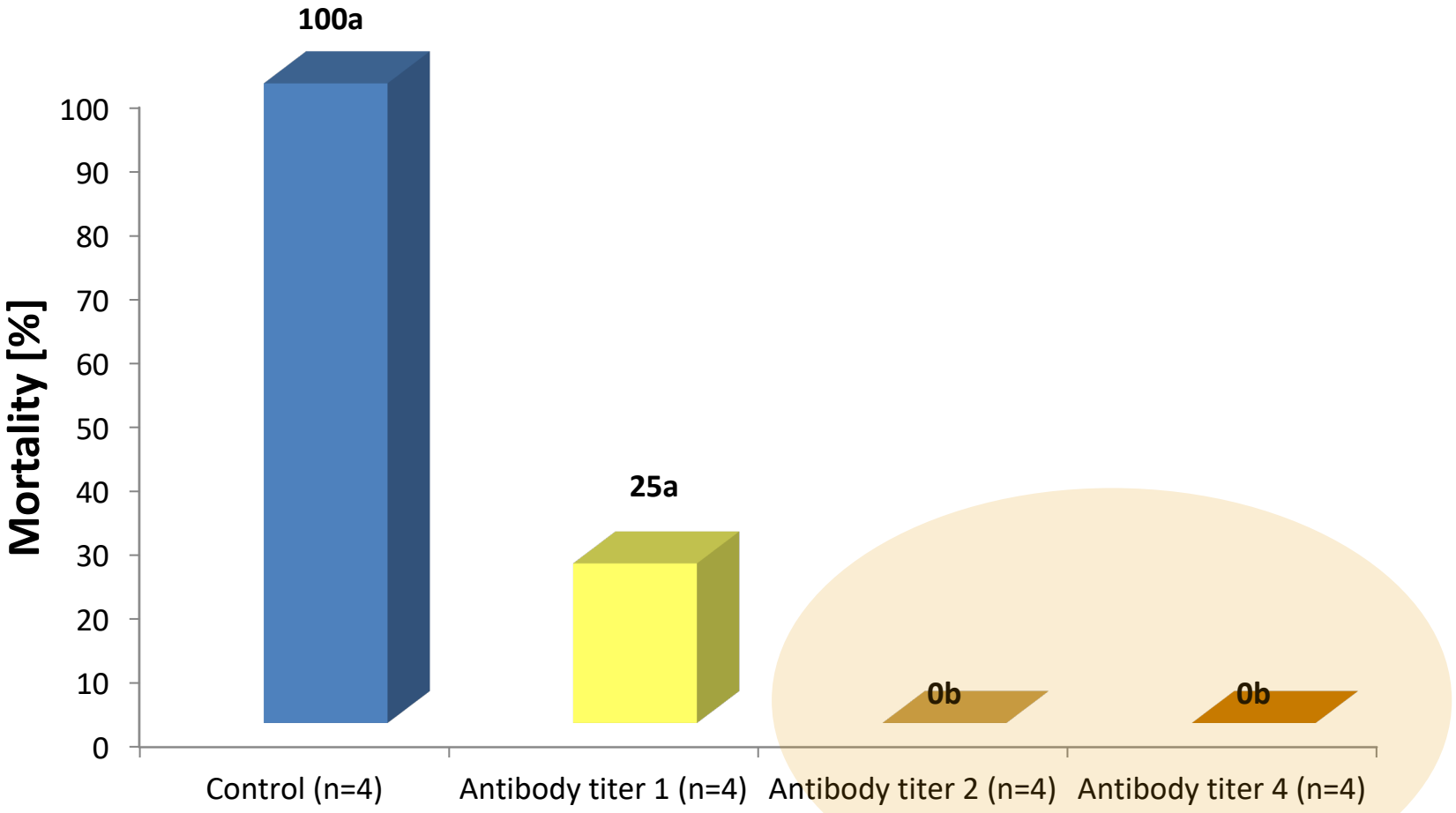
Protection of neonatal calves against fatal enteric colibacillosis by administration of specific IgY powder from hens immunized with K99-pilliated enterotoxigenic *E.coli*

Ikemori et al., 1992, Am J Vet Res 53: 2005-2008

In vivo study – Material and Methods

Animals	16 neonatal calves, 4 groups
Antibody	K99 fimbrial of Enterotoxigenic *Escherichia coli* (ETEC)
Groups	Control **IgY (3 different titers)**
Challenge	K99+ ETEC: 1.6×10^{11} CFU / calf
Test period	2 to 8 days of age
Observations	1. Clinical symptoms 2. Body weight

In vivo study: Results - Mortality



Results with different letters differ statistically (P<0,01)

In vivo study – Ig 0029

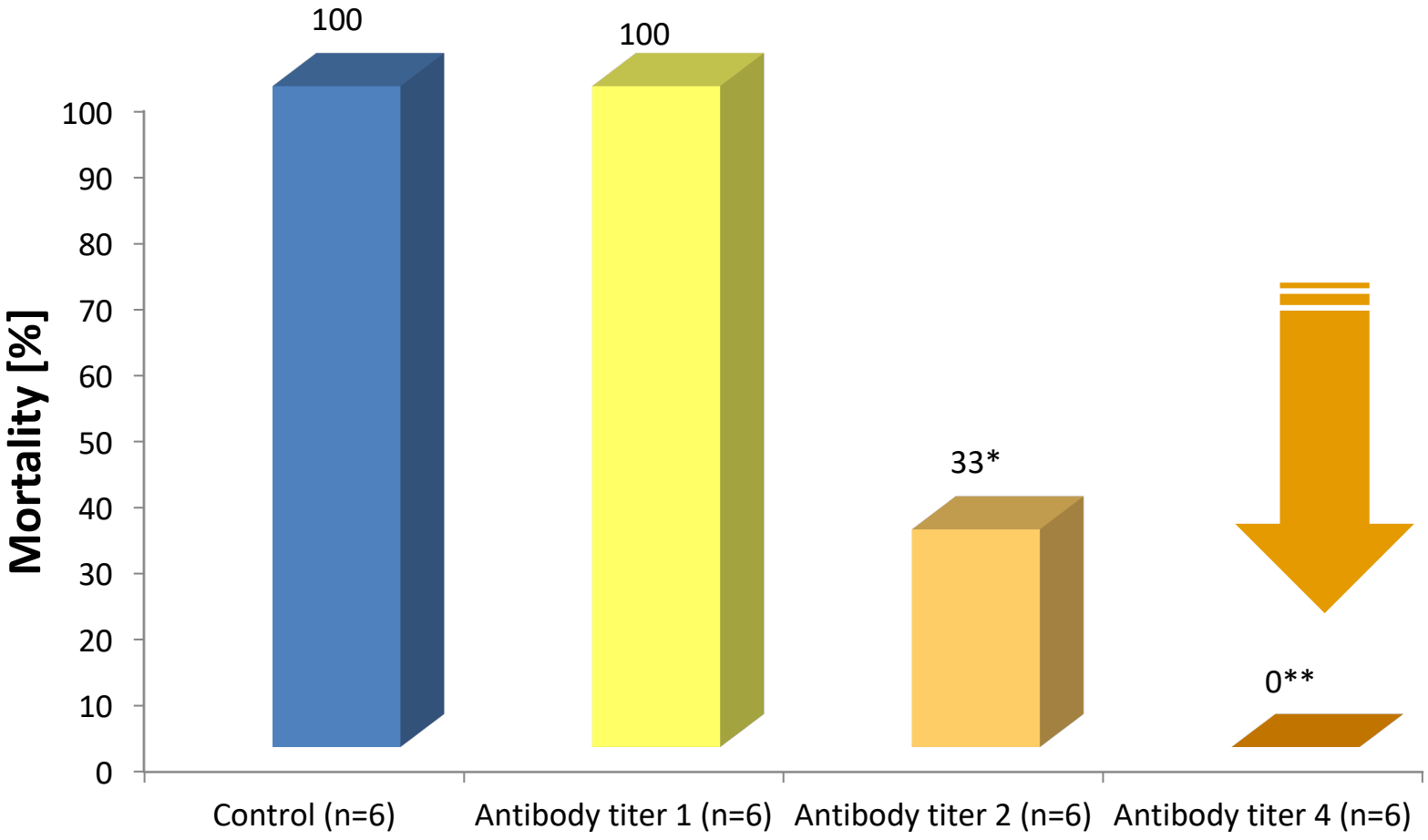
Prevention of fatal salmonellosis in neonatal calves, using orally administered IgY *Salmonella*-specific antibodies

Yokoyama et al., 1998, Am J Vet Res 59

In vivo study – Material and Methods

Animals	38 Neonatal Holstein calves from *Salmonella* free farms
Antibody	*Salmonella typhimurium* (ST) or *Salmonella dublin* (SD)
Groups	Control **anti ST-IgY (3 different titers)** **anti SD-IgY (2 different titers)**
Challenge	*S. typhimurium* 10^{11} CFU / calf *S. dublin* 10^{11} CFU / calf
Test period	1 to 14 days of age
Observations	1. Clinical symptoms 2. Body weight

In vivo study – Results (*Salmonella typhimurium*)



* P<0,05; ** P<0,01

In vivo study – Ig 0030

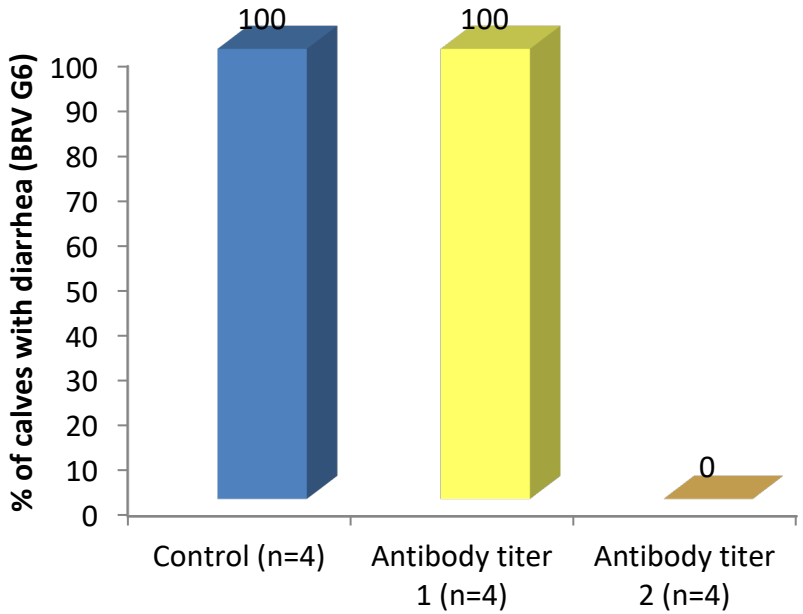
Passive protection against bovine rotavirus in calves by specific IgY

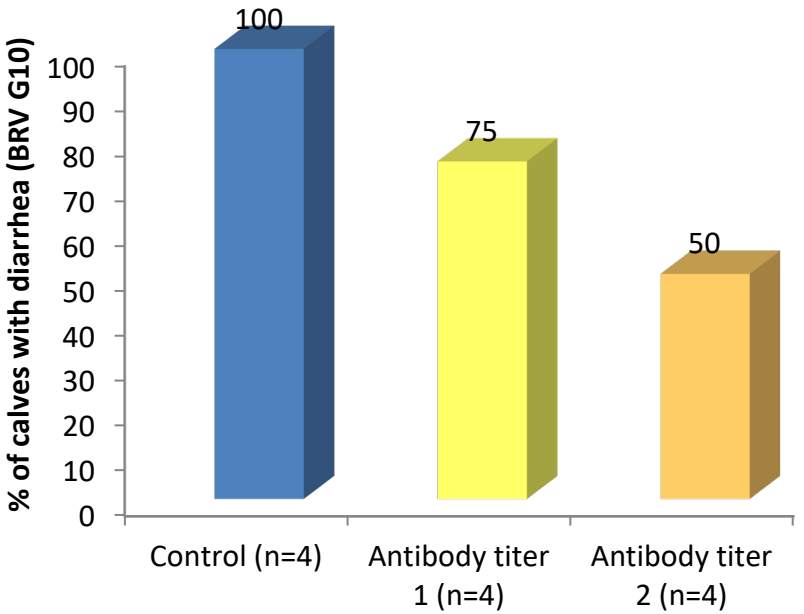
Kuroki et al., 1994, Arch Virol 138: 143-148

In vivo study – Material and Methods

Animals	24 neonatal calves
Antibody	against Bovine Rotavirus (BRV) serotypes G 6 or G 10
Groups	Control **Specific IgY (3 different titers)**
Challenge	BRV serotypes G6 $1x10^{10}$ TCID50/ calf BRV serotypes G10 $5x10^{9}$ TCID50/ calf
Test period	2 to 10 days of age
Observations	1. Clinical symptoms 2. Body weight

In vivo study – Results diarrhea incidence





In vivo study

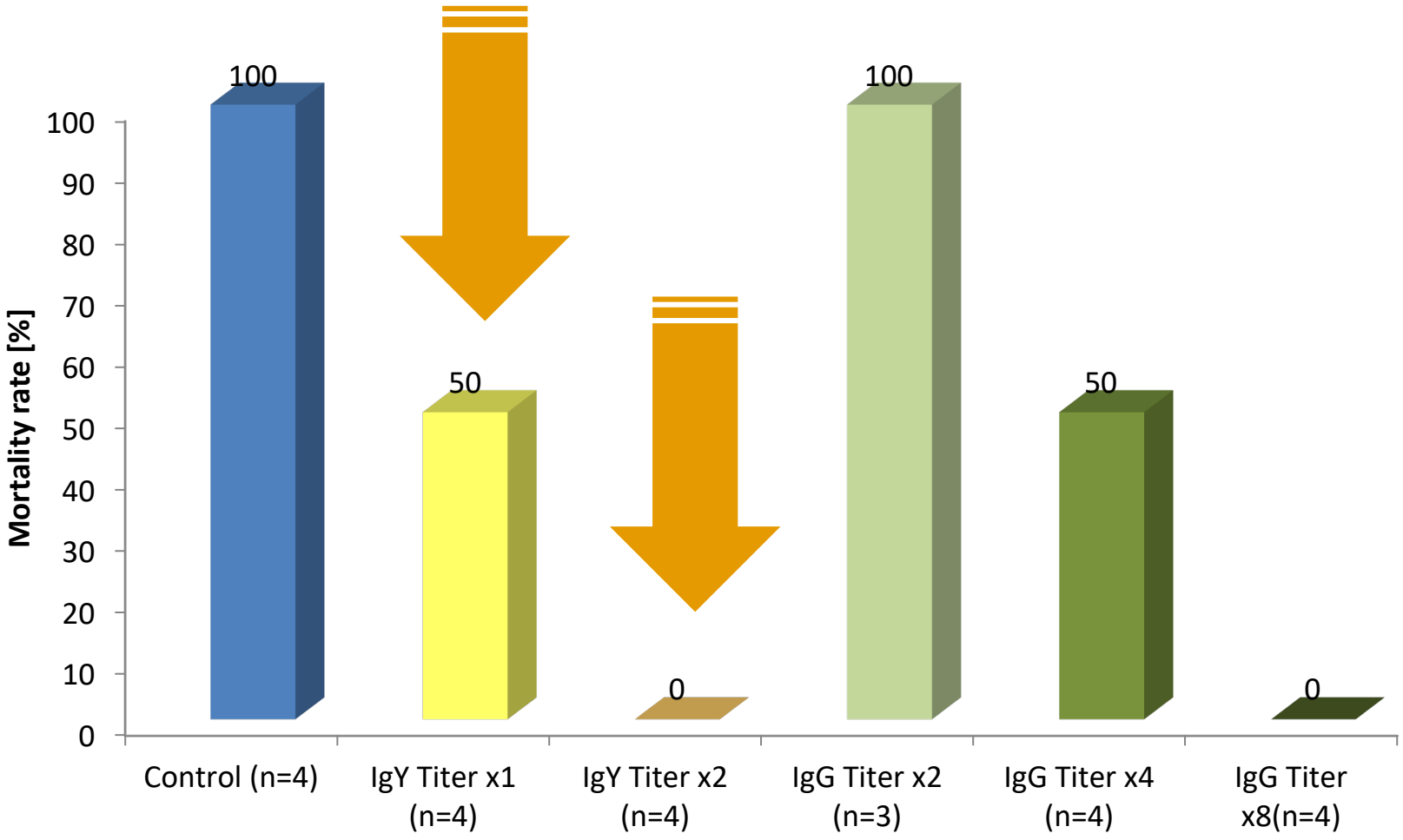
Passive protection of neonatal calves against Bovine Coronavirus (BCV) –induced diarrher by administration of specific IgY or colostrum antibody

Ikemori et al., 1997, Veterinary Microbiology 58: 105-111

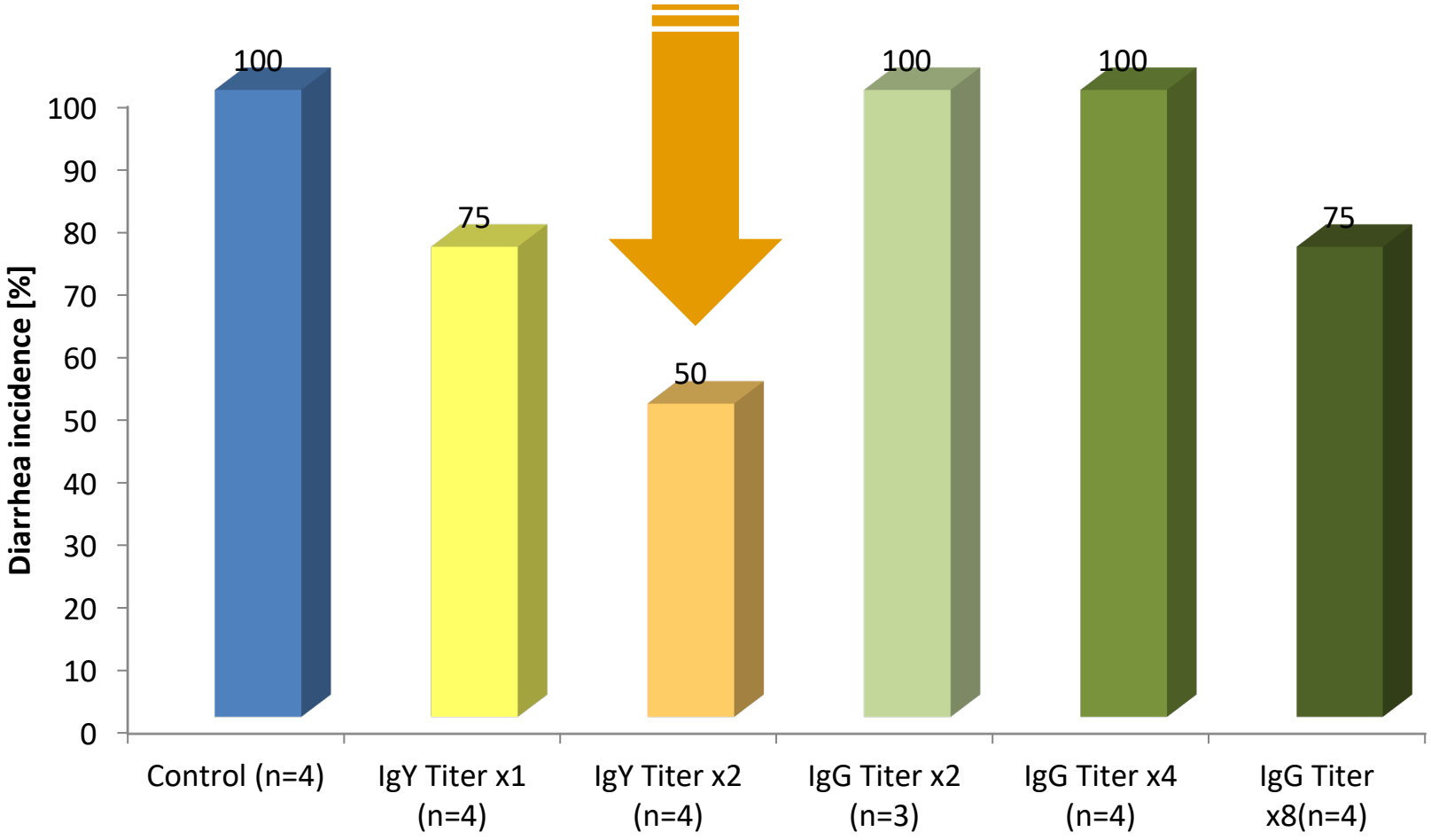
In vivo study: Materials and Methods

Animals	23 neonatal calves
Antibody	against Bovine Coronavirus (BCV)
Groups	Control Specific IgY: Group x1 titer, Group x2 titer Colostrum IgG: Group x2 titer, Group x4 titer, Group x8 titer
Challenge	BCV: 1×10^9 TCID50 / calf
Test period	2 to 8 days of age
Observations	1. Clinical symptoms 2. Fecal score 3. Body weight

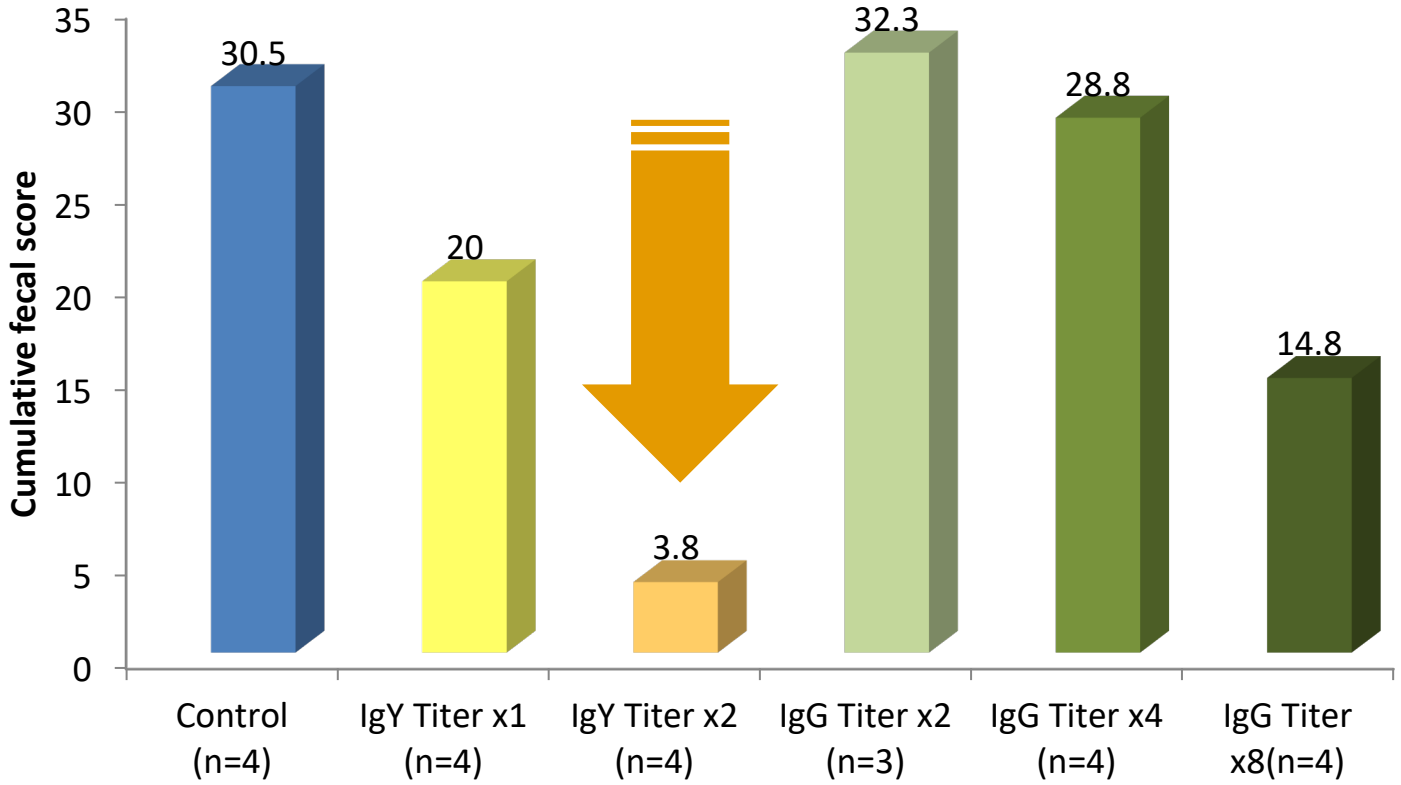
In vivo study: Results – Mortality rate



In vivo study: Results – Diarrhea incidence



In vivo study: Results – Cumulative fecal score



Specific IgY powder

Field Trials

Field trial – Specific IgY powder

Effect of Specific IgY powder added to milk replacer on calf growth performance

Institute trial at LVA Futterkamp, Germany, 1997

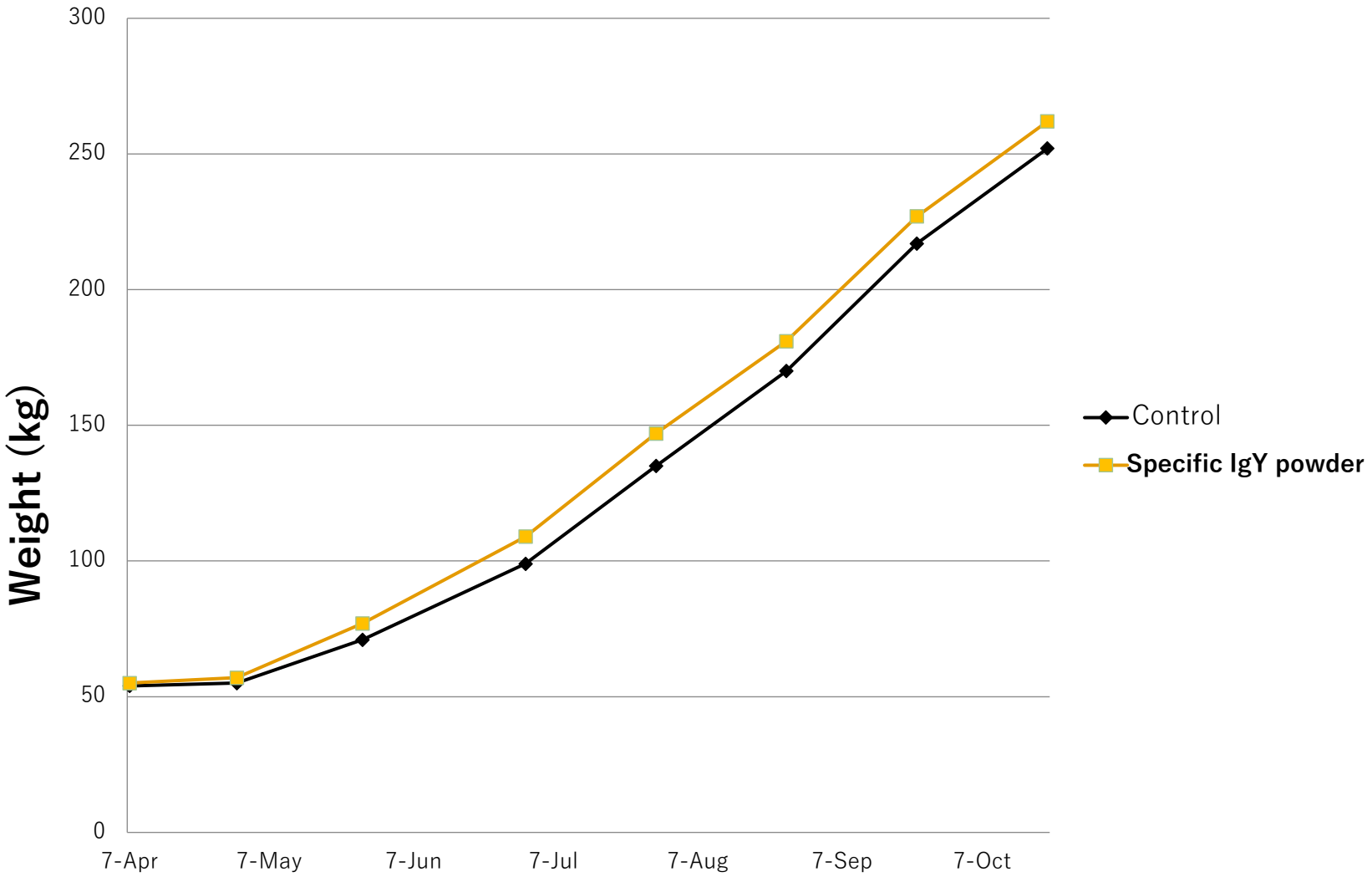
Field trial – Material and Methods

Animals	50 male Holstein Friesian calves Housed at 14 days of life
Groups	Control: 25 animals Specific IgY powder: 25 animals
Dosage	Day 1 – 14: 5 g/animal/day (mixed into the calf milk) Day 15 – end: no administration of Globigen®
Challenge	Field trial
Trial duration	07th of April until 21st of October
Observations	Body weight (every 4 weeks)

Field trial – Results

	Average weight per animal (kg)	
Date	Control	Specific IgY powder
07.04. (Start weight)	54	55
30.04.	55	57
27.05.	71	77
01.07.	99	109
29.07.	135	147
26.08.	170	181
23.09.	217	227
21.10. (End weight)	252	262

Field trial – Results



Start

Effects of Specific IgY powder on performance and meat parameters of veal calves

Field trial Holdorf region, Germany, 2010

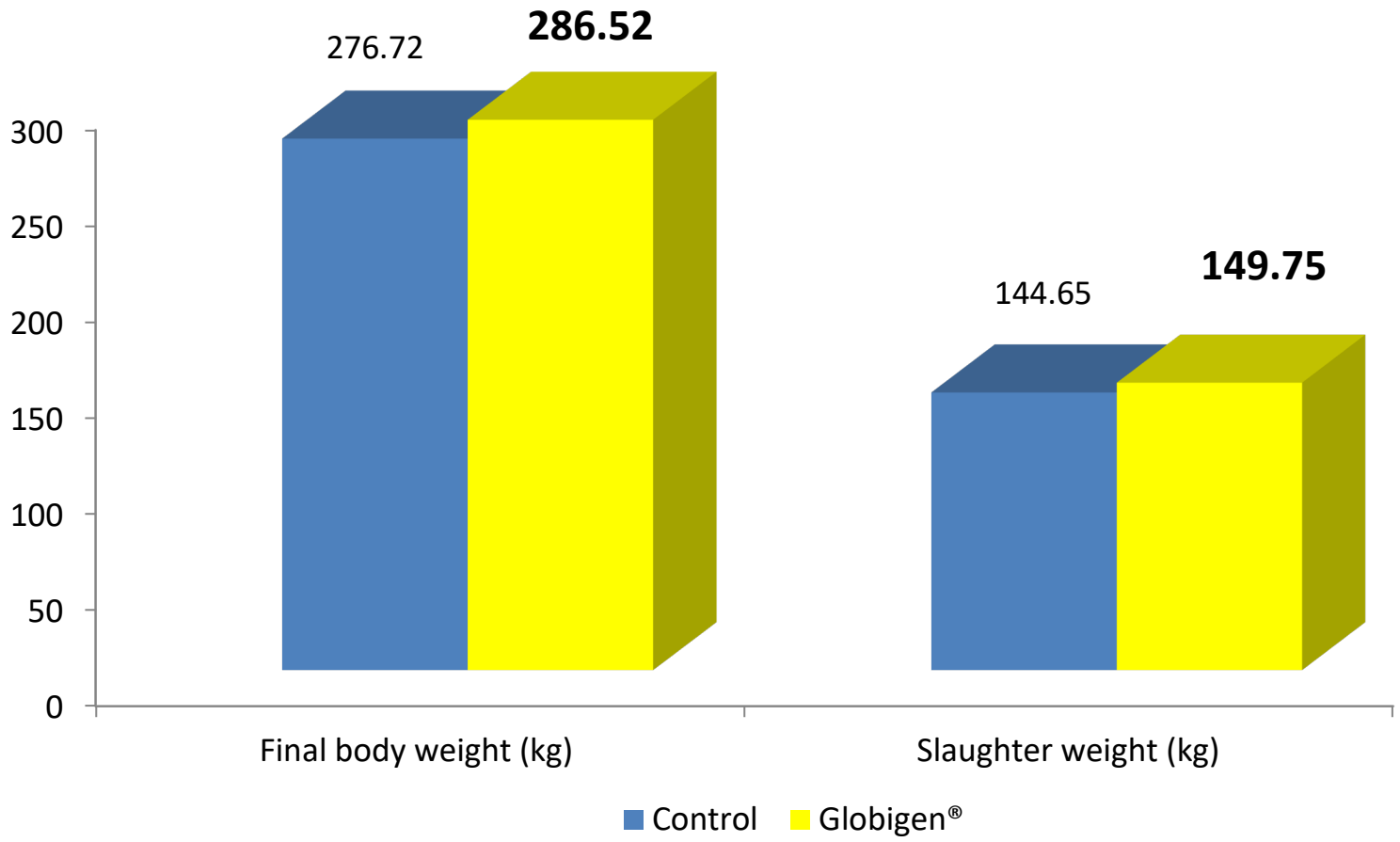
Field Trial: Specific IgY powder

Groups	Control: 360 calves (120 before, 238 after trial group) Specific IgY powder: 94 calves Comparison group (data from “Westfleisch”): 39,000 calves
Genetics	HF
Challenge	Field trial
Feeding system	Computer assisted
Trial duration	**From day 1 to week 26**
Observations	Growth performance Slaughter performance Medicine costs

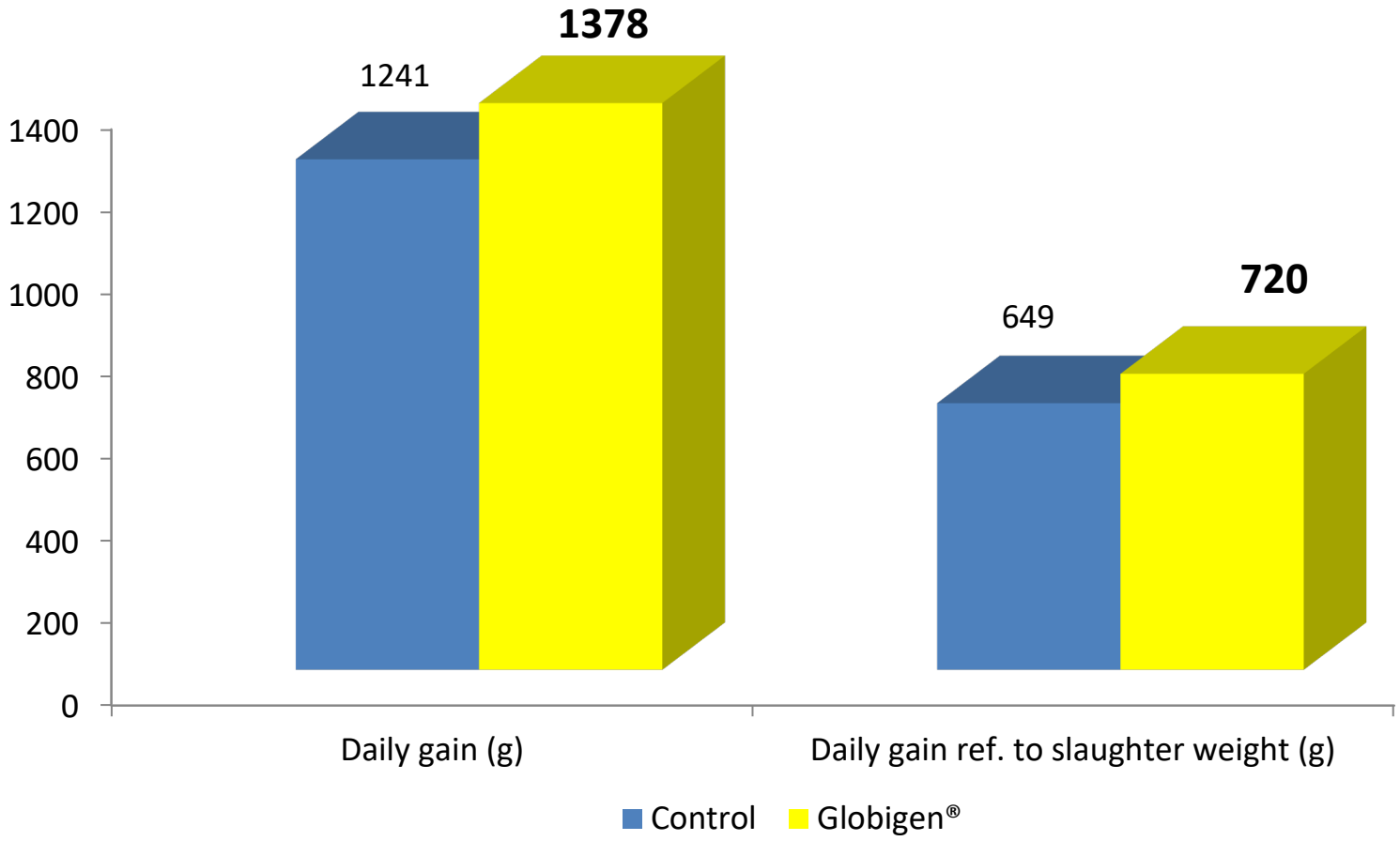
Field trial: Specific IgY powder

Application time	Specific IgY powder (g/animal & day)
day 1	20 g
day 2	15 g
day 3	10 g
day 4 to 14	6 g
week 3 to 26	1 g

Field trial: Specific IgY powder - RESULTS



Field trial: Specific IgY powder - RESULTS



Field trial: Specific IgY powder - RESULTS

Parameter	Comparison Westfleisch 2009 (39,000 calves)	Control group	**Specific IgY**
Final body weight (kg)		276,72	**286,52**
Slaughter weight (kg)	141,94	144,65	**149,75**
Daily gain (g)	Not specified	1241	**1378**
Daily gain ref. to slaughter weight (g)	690	649	**720**
FCR*	Not specified	1,57	**1,49**
Fattening period (days)	Not specified	223	**208**

*FCR only related to milk replacer consumption without inclusion of other feed (hay, corn, etc.)

Conclusion Specific IgY powder Trials

Over 80 trials in more than 10 years

Field trials, trial facilities, universities

95% positive outcome → zootechnical parameters improved

Specific IgY

Several (field) trials show:

- Improved general health status
- Less diarrhea
- Better daily gain
- Less medication costs
- Reduction in mortality