

**" The shield effect,  
a revolution from  
the inside-out"**



**DEFINITIVE AUTHORIZATION  
PIGLET EUROPE E 1703**

**Levucell SB®**

**Live yeast for sows and piglets**



Summary

# Technical Dossier



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***An original shielding effect, documented in more than 145 international scientific publications***

- **NEUTRALIZATION** of bacterial toxins of *Clostridium sp*,
- **ADHERENCE** of flagellate pathogens (*E. coli*, *Salmonella sp*) to *S. c. boulardii* cell wall,
- **MATURITY** of intestinal mucosa.



***Validated nutritional benefits***

- . Sow and piglet program :
  - . Reduced weight loss in sows during lactation : **4 to 7 kg**
  - . Average feed increase in sows during lactation : **+ 8 kg**
  - . Heavier piglets at weaning : **+5 to 9 %**
  - . Better digestive integrity of piglets
- . Piglets :
  - . Increased daily weight gain for piglets in post-weaning : **+6 to 9 %**
  - . Improved feed conversion rate : **+4 to 6.5 %**





***Officially approved***

Efficacy, traceability and safety validated and approved under European (feed additive CE n°7, Dir. 70/524) and North American legislations, (US-FDA GRAS Status), Canada (CFIA 480419)...


## Programs and benefits: sows and piglets

### Sow and Piglet Program

	Gestation	Farrowing	Weaning	4 months	Benefits*
	1 to 2* .10 <sup>6</sup> cfu/g				<ul style="list-style-type: none"> <li>-Reduced weight loss in sows during lactation: 4 to 7kg</li> <li>-Average increased intake per sow during lactation: + 8kg</li> </ul>
		2* .10 <sup>6</sup> cfu/g			<ul style="list-style-type: none"> <li>-Heavier pigs at weaning: + 5 to 9%</li> <li>-Increased daily weight gain for piglets post weaning: + 6 à 9%</li> <li>-Better digestive integrity of piglets</li> </ul>

## 6 TO 1 ROI (RETURN ON INVESTMENT)

### Piglet Program

	Birth	Weaning	4 months	Benefits*
		2* .10 <sup>6</sup> cfu/g		<ul style="list-style-type: none"> <li>-Increased daily weight gain for piglets post weaning: + 6 to 9 %</li> <li>-Improved feed conversion rate: + 4 to 6.5 %</li> <li>-Better digestive integrity of piglets</li> </ul>

\* Trial results from the European registration file, directive 70/524/EC.

Levucell SB is compatible with antibiotics and acidifiers.

- \* Legal EU dose
- 2.10<sup>6</sup> ufc/g feed = 100g/ton Levucell SB 20 (eq to 200g Levucell SB 10ME)

The supplementation of sows and piglets improves productivity performance and body condition.

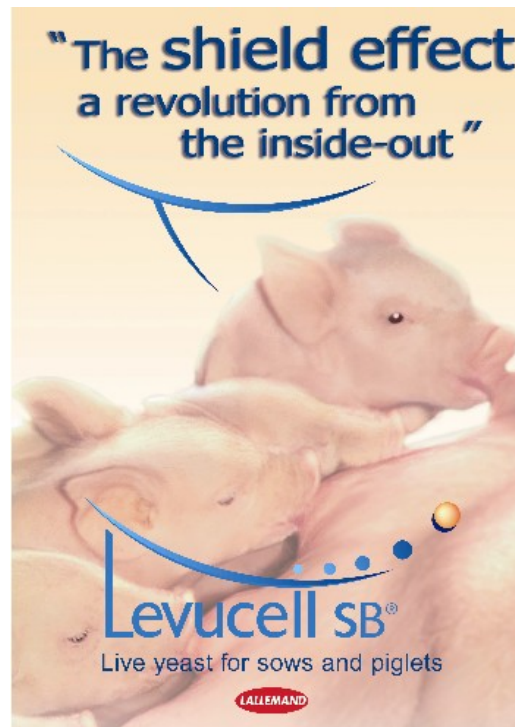
**The piglet's environment:**

via the sow's feces ...

- Less pathogens,
- Improved microbial balance.

**The Sow:**

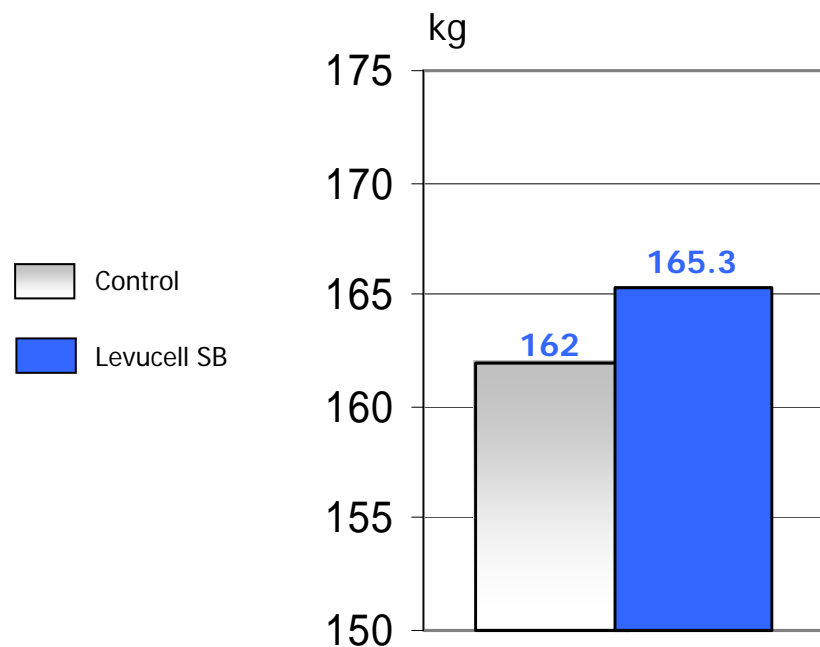
- Higher feed intake,
- Better body condition,
- Increased milk production.



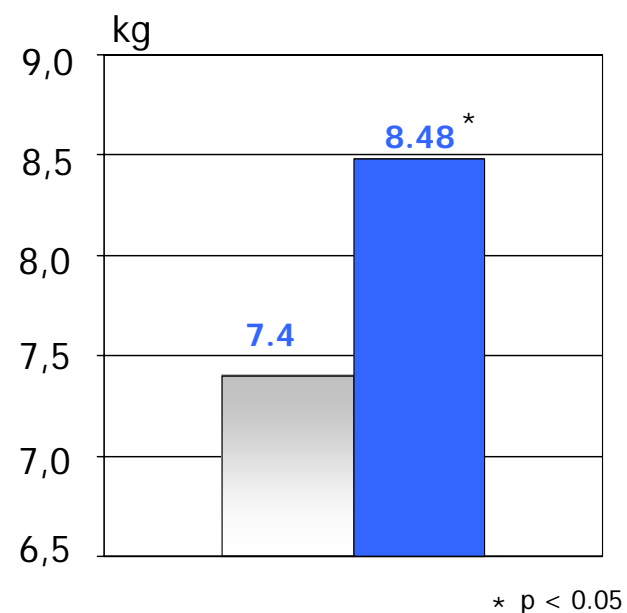
**The piglet:**

- Better growth,
- Increased immunity,
- Better viability,
- Increased weaning weight.

Levucell SB stimulates feed consumption during the entire lactation period.



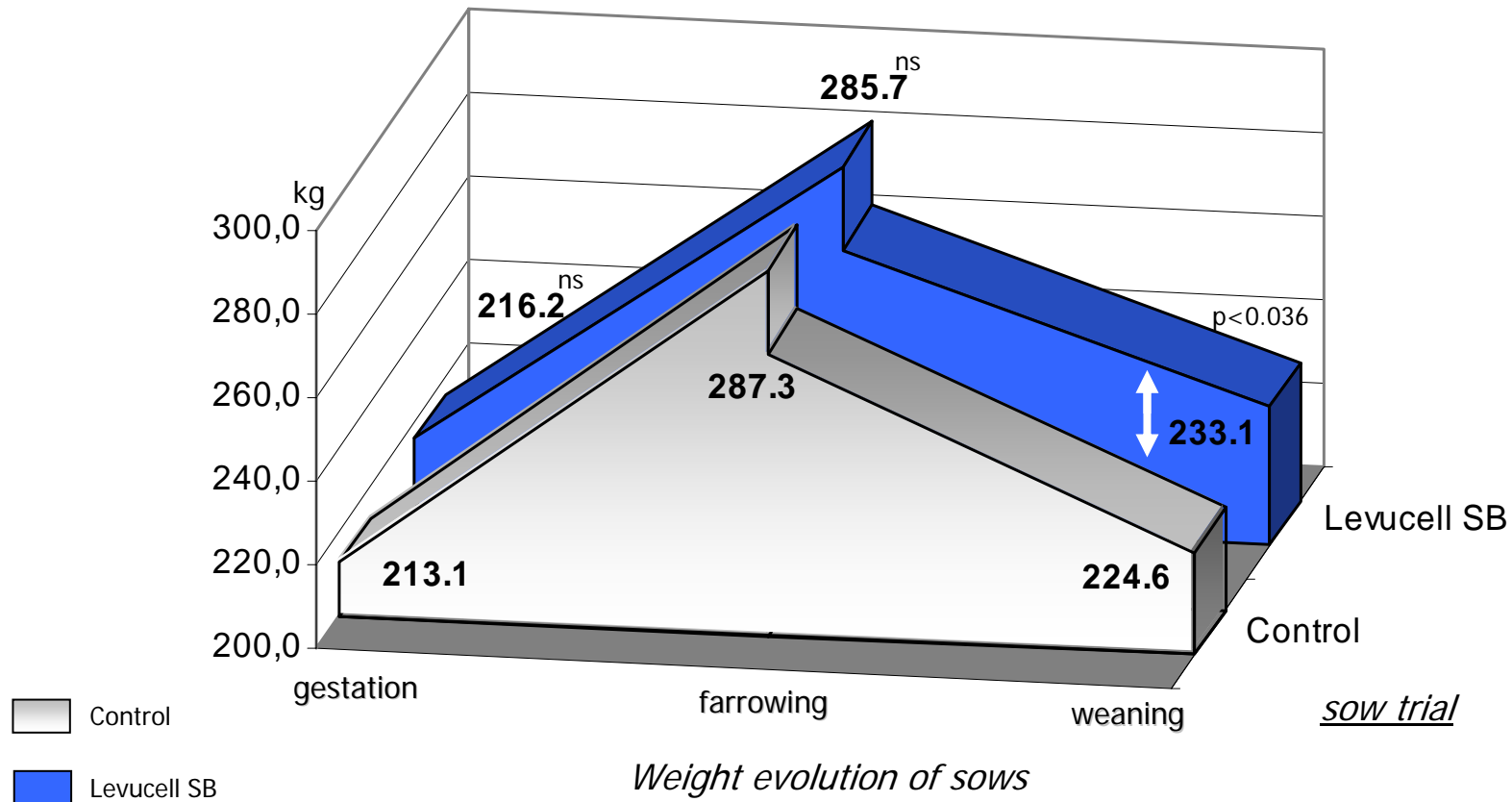
**La Gautellerie (1995):**  
+ 3kg / complete lactation



**INZO (2003):**  
+ 1kg / day /sow in lactation

*Feed consumption of sows during lactation*

Levucell SB improves sow body status. On average, treated sows lost less weight in a production cycle (5.4Kg).

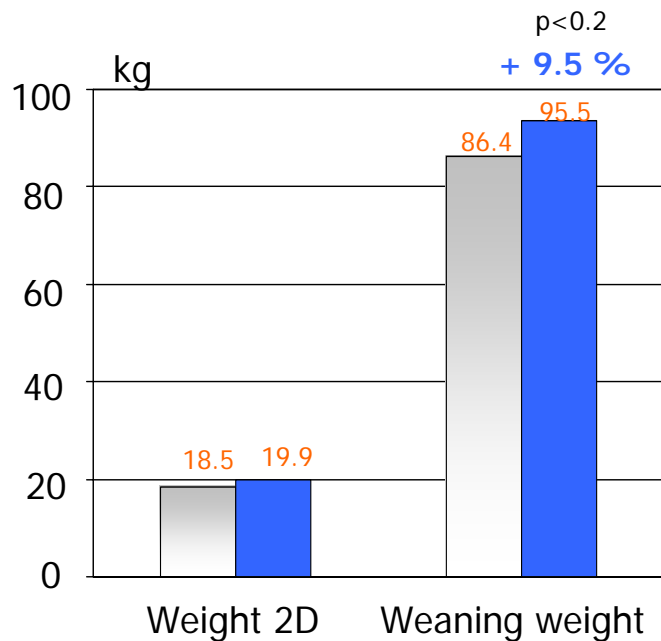


**Less weight loss in sows allows :**

- reduced days to first service,
- to reach target weight faster.

# Levucell SB benefits in sows are measured by:

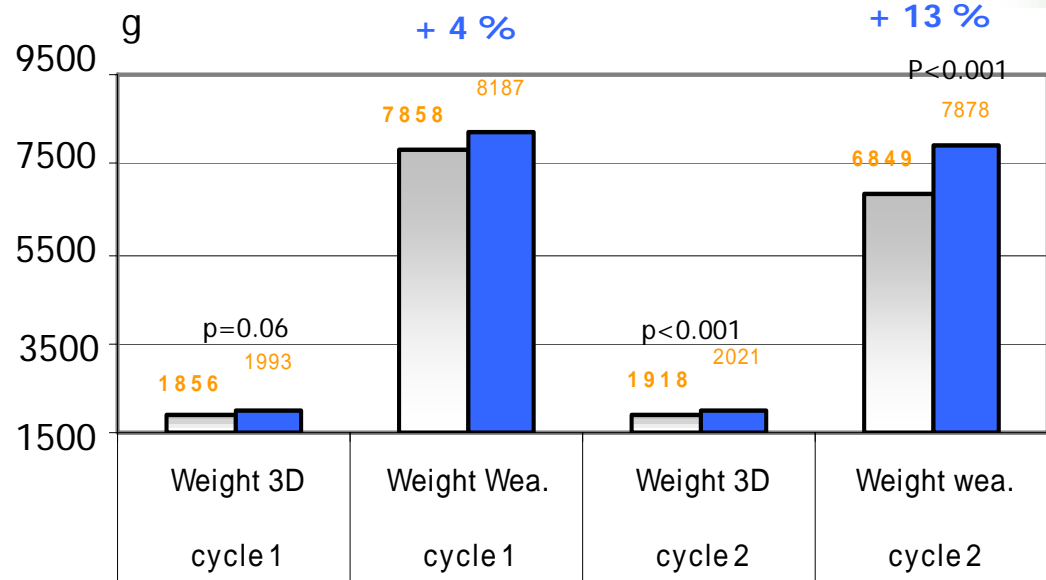
An improvement of piglet litter weight under the sow...



Effect of feed supplementation with Levucell SB in sows on litter performance

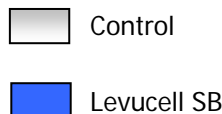
**INZO (2003)**

... with greater benefits if used in subsequent cycles



Effect of feed supplementation with Levucell SB in sows on piglet performance

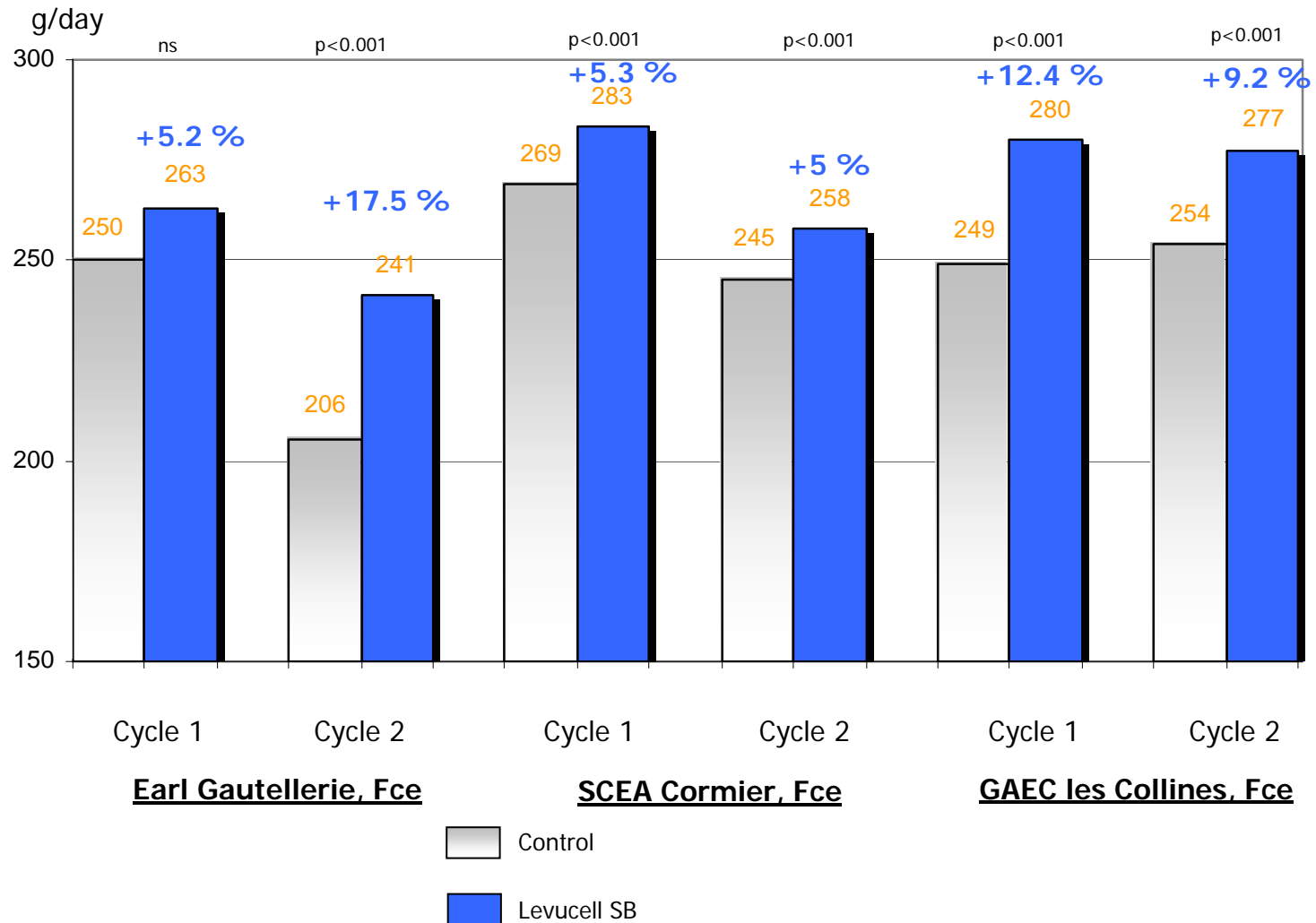
**La Gautellerie (1995)**





# Levucell SB improves piglet growth preweaning. (+ 8 % on 1759 piglets)

Effect of Levucell SB on **ADG of piglets before weaning**

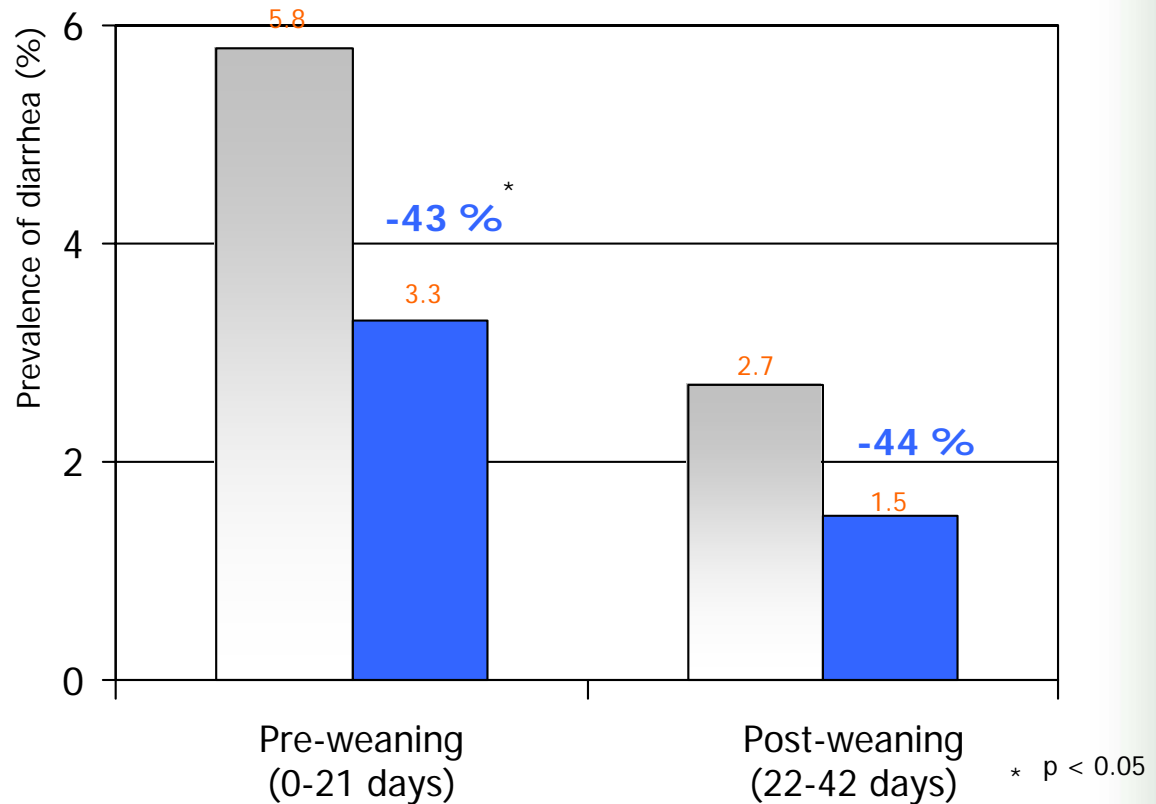
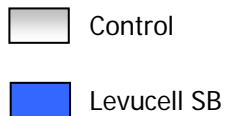


# Levucell SB decreases diarrhea in piglets pre- and postweaning (567 piglets).

High prevalence of *Clostridium difficile* on the farm

Distribution:

- . sow : from farrowing until weaning
- . Piglets: from 10 to 42 days of age.



*Impact of Levucell SB on piglet diarrhea in pre- and postweaning*

**Dr J.P. Alno and V. Normand, vet consultants in pig production, France**

## Return on investment for sow supplementation.

Parameters measured	Estimated performance impact	Estimated economic impact	Your situation
Increased litter weaning weight	+ 7.5%	+ 0.91 €	
Number of piglets weaned	+ 0.6	+18 €	
Decreased sow weight loss	- 5.4 kg	+ 4.6 €	
Feed intake per sow during lactation	+ 8kg	- 1.52 €	
Levucell SB cost in sow (gestation and lactation)	-	- 2.65 €	

$$= (0.075 \times 8^1) \times 1.52\text{€}^2$$

$$= 0.6 \times 30\text{€}^3$$

$$= (4.5^4 \times 5.4\text{kg}) \times 0.19\text{€}^5$$

$$= 8 \times 0.19\text{€}$$

$$= 500\text{kg}^6 \times 0.0053\text{€}$$

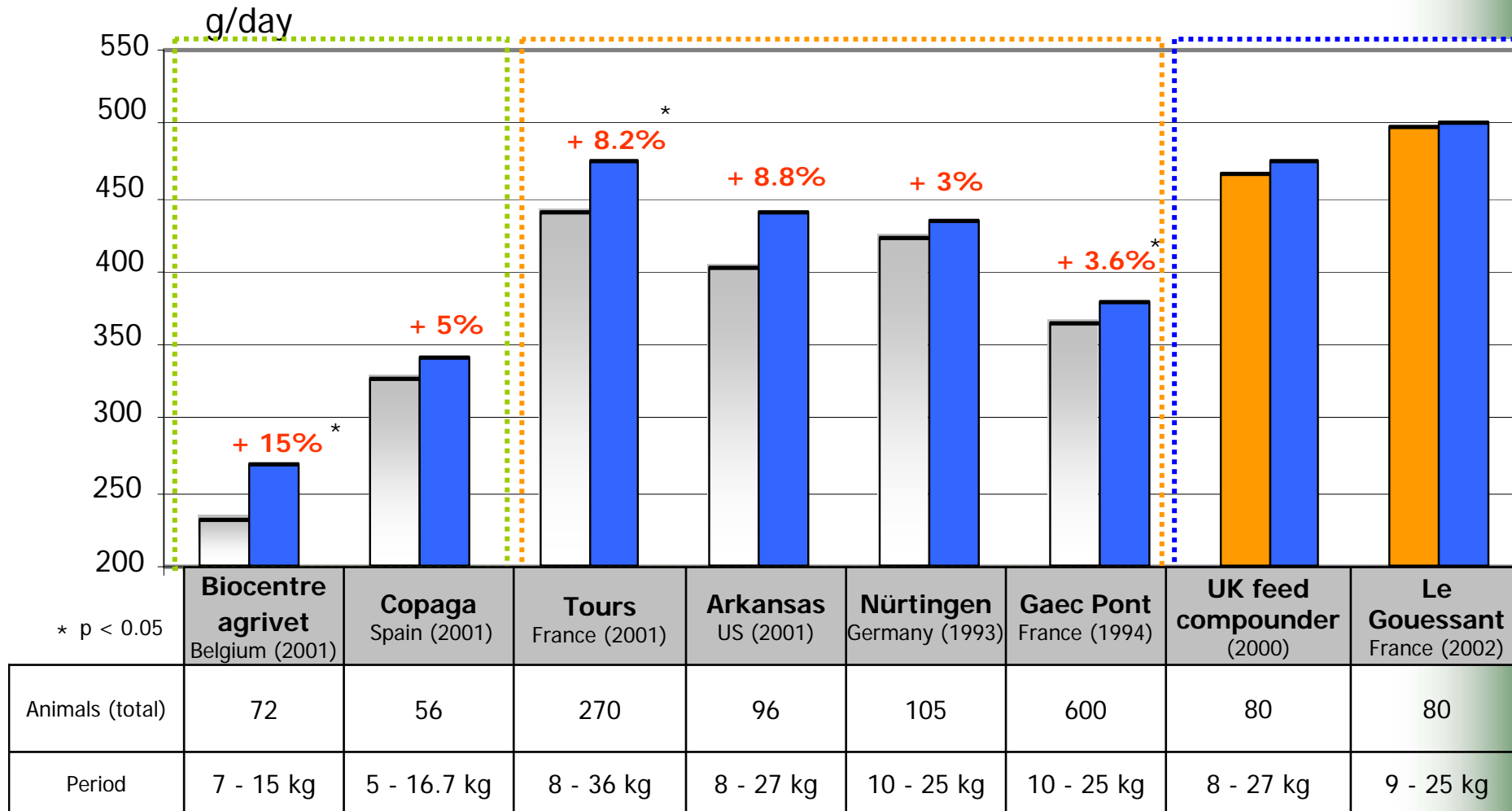
**ROI : 19.34€**

Database :

(1) Piglet weight at weaning: 8kg ; (2) + 1.52€/kg per piglet if weight sup. to 8kg at weaning ; (3) Piglet cost at weaning: 30€ ; (4) Sow FCR: 4.5 ; (5) lactation feed cost: 0.19€ ; (6) Average feed intake per sow on a cycle.

# Levucell SB improves piglet growth from 6 to 9 %.

Examples of trial ...



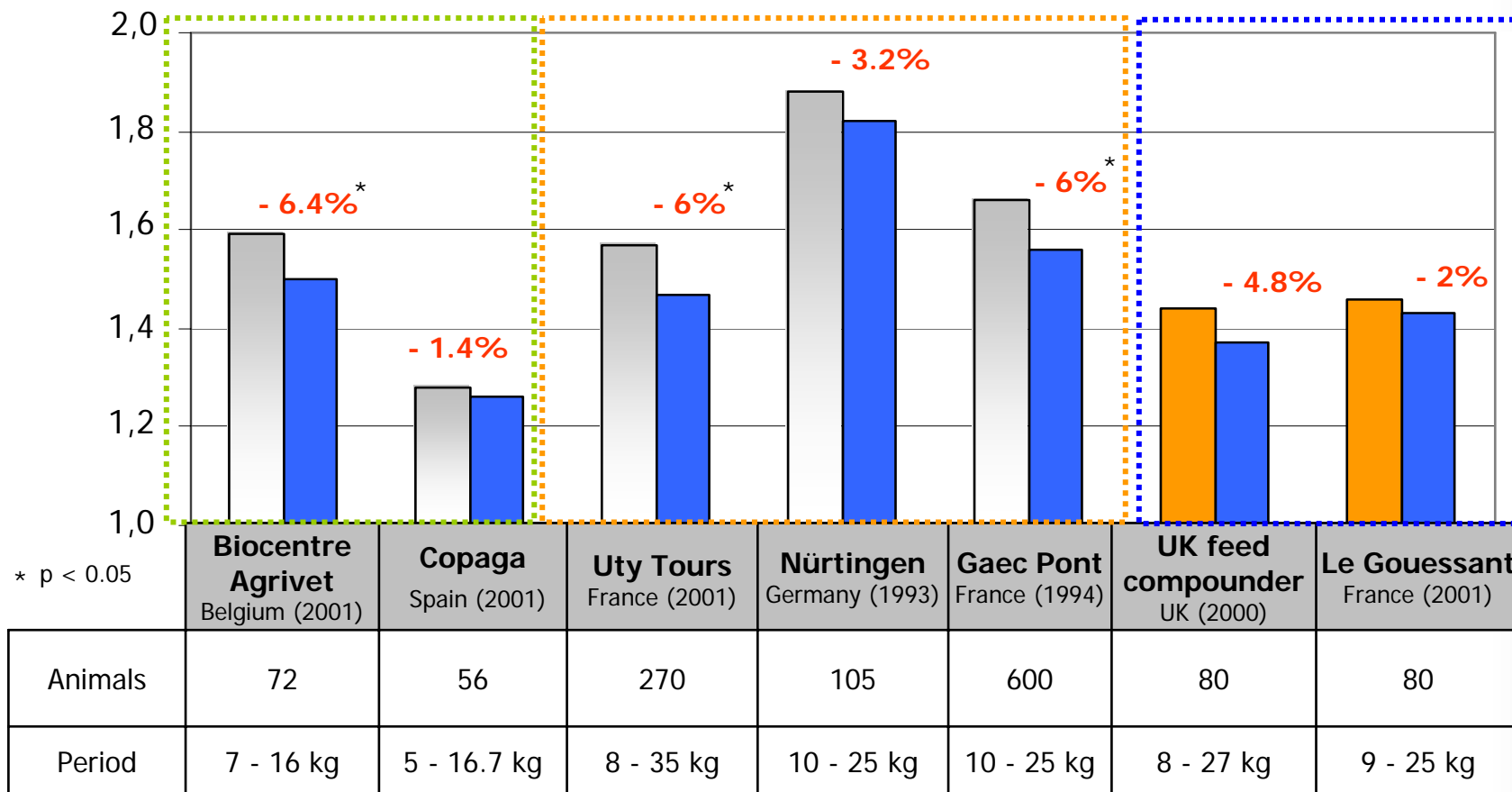
Control
  Levucell SB
  Antibiotic

UK FC : avilamycin 40 ppm : prestarter & colistin 40 ppm : starter

Le Gouessant : avilamycin 40 ppm

# Levucell SB improves feed conversion from 4.5 to 6%.

*Examples of trials...*



\* p < 0.05

Control
  Levucell SB
  Antibiotic

UK FC : avilamycin 40 ppm : prestarter & colistin 40 ppm : starter

Le Gouessant : avilamycin 40 ppm

## Return on investment for piglet supplementation.

Parameters measured	Estimated performance impact	Estimated economic impact	Your situation
ADG increase (g/d)	+ 7.5%	+ 0.76 €	
Improved feed conversion	- 4.5 %	-0.14 €	
Mortality	- 0.5%	+ 0.21 €	
Levucell SB cost in piglet	-	- 0.23 €	

**ROI : 0.60€**

Nb growth day      Carcass weight

$$= [(33g^1 \times 29) \times 0.8] \times 1\text{€}^2$$

Levucell SB

$$= (1.62 \times 13.65\text{kg} \times 0.27\text{€}) - (1.7^3 \times 12.7\text{kg} \times 0.27\text{€}^4)$$

Control

$$= 0.64^5 \times 0.326$$

$$= 22\text{kg}^6 \times 0.0106\text{€}$$

Database :

(1) ADG: 440 g/day from 28 to 57 live ; (2) Pig cost: 1€ ; (3) FCR: 1.70 from 28 to 57 live ; (4) Cost of prestarter feed: 0.54€ & cost of starter feed: 0.23€ ; (5) cost per pig/ sow / year: 0.64€ for a 100kg pig weight ; (6) average feed intake per piglet from 28 to 57 live.

Two formulations adapted to standard monogastric feeding practices:

***Hyper concentrated formula***

**LEVUCCELL SB20**

*Saccharomyces boulardii*  
( $20 \times 10^9$  CFU/g)

**Application :**

premix and meal feed

**Dose Rate :**

Sows : 50 g / ton of feed  
Piglets : 100 g / ton of feed

**Compatibility :**

Antibiotics and acidifiers

***Micro-Encapsulated formula***

**LEVUCCELL SB 10 ME**

*Saccharomyces boulardii*  
( $10 \times 10^9$  CFU/g)

**Application :**

premix and pelleted feed

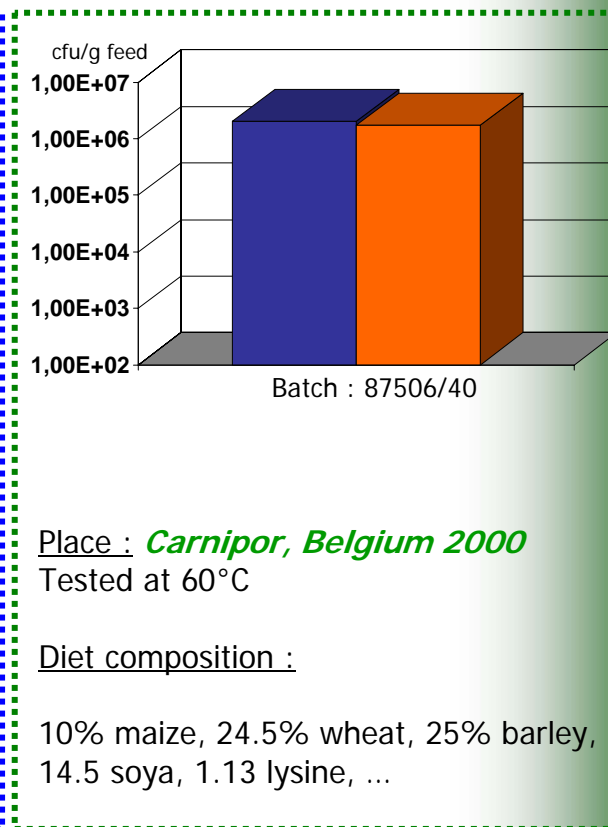
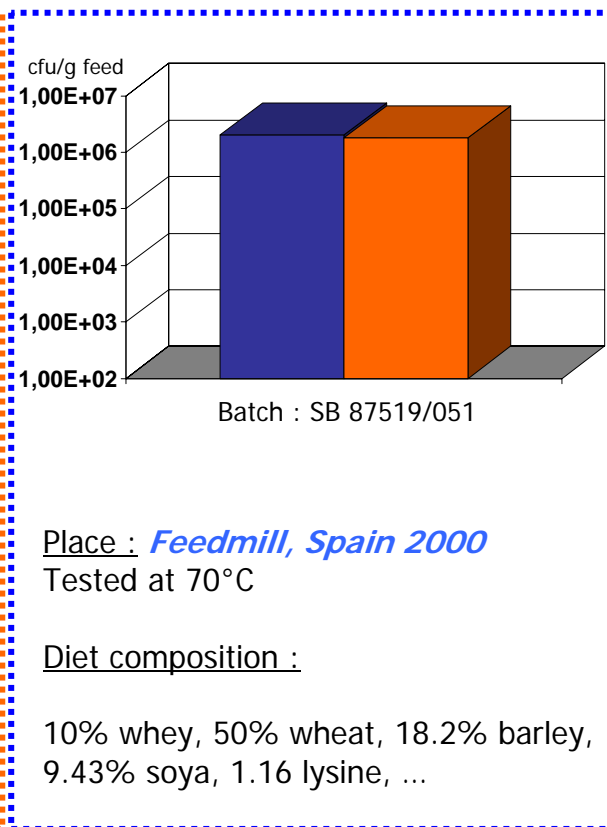
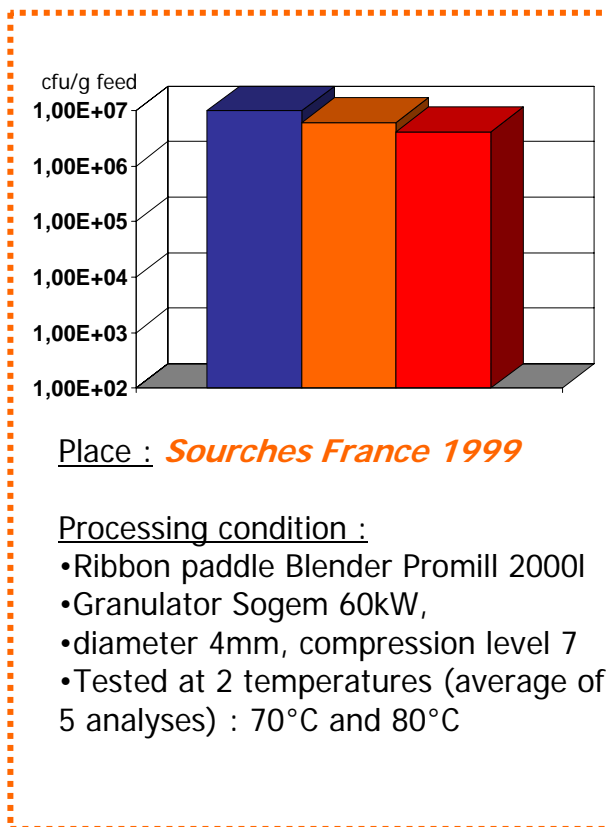
**Dose Rate**

Sows : 100 g / ton of feed  
Piglets : 200 g / ton of feed

**Compatibility :**

Antibiotics and acidifiers

Levucell SB10ME has been designed for pelleted feed.



Expected Measured



## Questions - Answers...



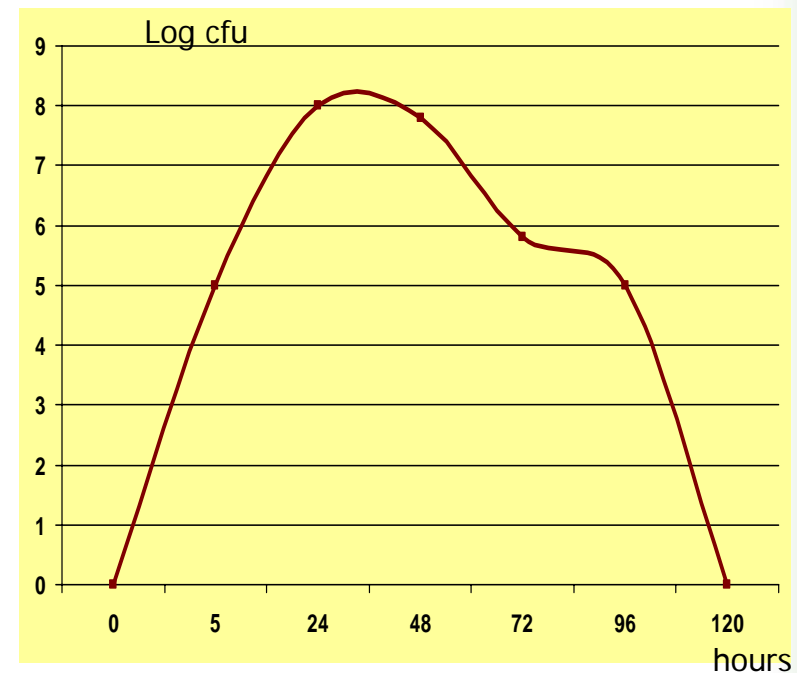
- ✓ How does Levucell SB transit the digestive tract ?
- ✓ Why *S. c. boulardii* must be alive ?
- ✓ Are effects fast ?
- ✓ Is Levucell SB compatible with acidifiers ?
- ✓ Is Levucell SB compatible with antibiotics ?

- **How does Levucell SB transit the digestive tract ?**

*Saccharomyces boulardii* must be ingested continuously to maintain high levels in the digestive tract.

Transits in a viable form,

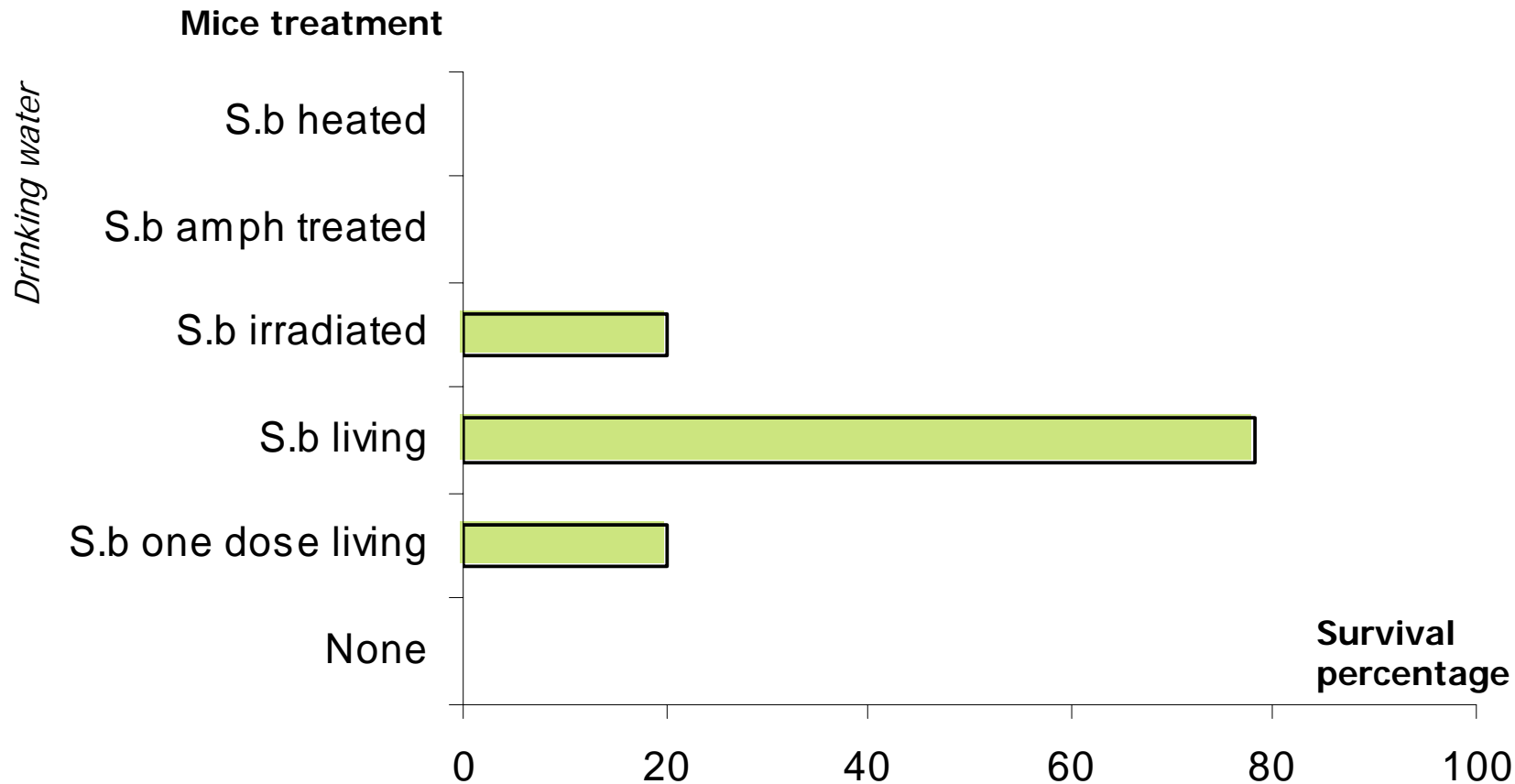
Does not permanently colonise the digestive tract



*Time of elimination of SB in human volunteers given a single dose of 1g (Bléhaut and al., 1989)*

- **Why *S. c. boulardii* must be alive ?**

*Saccharomyces c. boulardii* must be administrated alive and continuously to exert its action (example with *Clostridium difficile*).



Amph : amphotericin B

*Effet of the viability of *S. c. boulardii* on the capacity to protect gnotobiotic mice infected by *C. difficile**

- **Are effects fast ?**

- For a reinforcement of digestive mucosa, a continuous administration at least 10 days is necessary. To maintain this effect, the administration must be continued.

- The standard daily dose of *S. c. boulardii* ( $10^9$  cfu/kg feed minimum) can immediately prevent from the development of certain pathogens.

- **Is Levucell SB compatible with acidifiers ?**

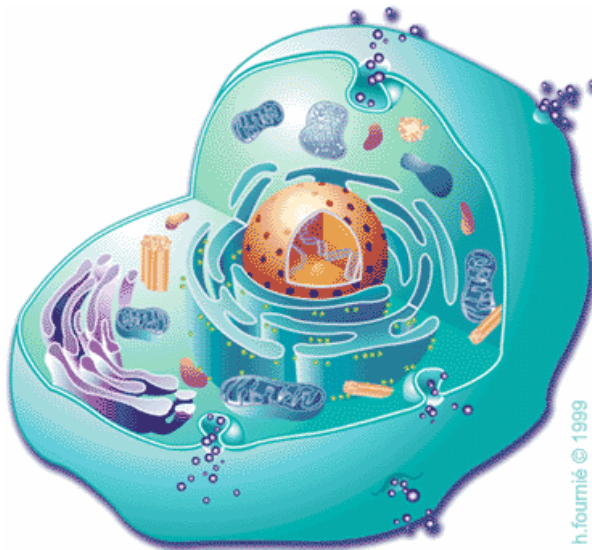
*Saccharomyces c. boulardii* is resistant to acidifiers commonly used in animal nutrition.

Acidifier	Concentration of active substance								
	0.1%	0.2%	0.3%	0.4%	0.5%	0.7%	1%	1.5%	2.5%
Formic acid	ND	100%	100%	100%	100%	ND	<b>100%</b>	ND	ND
Fumaric acid	ND	100%	100%	100%	100%	ND	<b>100%</b>	ND	ND
Citric acid	ND	ND	ND	ND	100%	ND	<b>80%</b>	ND	ND
Lactic acid	100%	ND	100%	ND	ND	100%	<b>100%</b>	100%	100%

ND : Not Determined

# • Is Levucell SB compatible with antibiotics ?

➤ Interaction : *Saccharomyces c. boulardii* cell walls are resistant to antibiotics commonly used in animal nutrition.



*Eucaryot cell (Saccharomyces sp)*

Antibiotics	LEVUCCELL SB (batch 00116)	Dose commonly used in swine nutrition	Compatibility
Flavomycin	➤1600 ppm	20 ppm	Compatible
Zinc Bacitracin	➤1200 ppm	20 ppm	Compatible
Tylosin tartrate	➤1000 ppm	200 ppm	Compatible
Stafac (40% Virginiamycin)	➤200 ppm	40 ppm	Compatible
Carbadox	➤1600 ppm	20 to 50 ppm	Compatible
Sodium sulfadimethoxine	➤1600 ppm	400 ppm	Compatible
Furazolidone	➤1200 ppm	300 ppm	Compatible
Chlortetracycline HCl	➤1000 ppm	500 ppm	Compatible
Procaine Penicillin G	➤1600 ppm	400 ppm	Compatible
Olaquinox	➤400 ppm	100 ppm	Compatible
Flubendazole	➤48 ppm	12 ppm	Compatible
Colistin	➤560 ppm	120 ppm	Compatible
Amoxicillin	➤800 ppm	400 ppm	Compatible
Oxolinic acid	➤800 ppm	400 ppm	Compatible
Oxytetracycline	➤1440ppm	720 ppm	Compatible
Tiamulin	➤200 ppm	100 ppm	Compatible
Tylosin	➤720 ppm	360 ppm	Compatible
Lincomycin	➤220 ppm	110 ppm	Compatible

*Compatibility of Levucell SB with antibiotics*

✓ Microbiology : Therapeutic antibiotics can reduce microbial pressure. The use of *Saccharomyces c. boulardii* contributes to enrich positively flora (lactic).