Current results from a German Rye pig feeding study on farm level in respect to Salmonella and boar taint reduction

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VV Walsrode eG and

Product Management International Feed

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KWS

Pig production – current challenges at least in Europe…

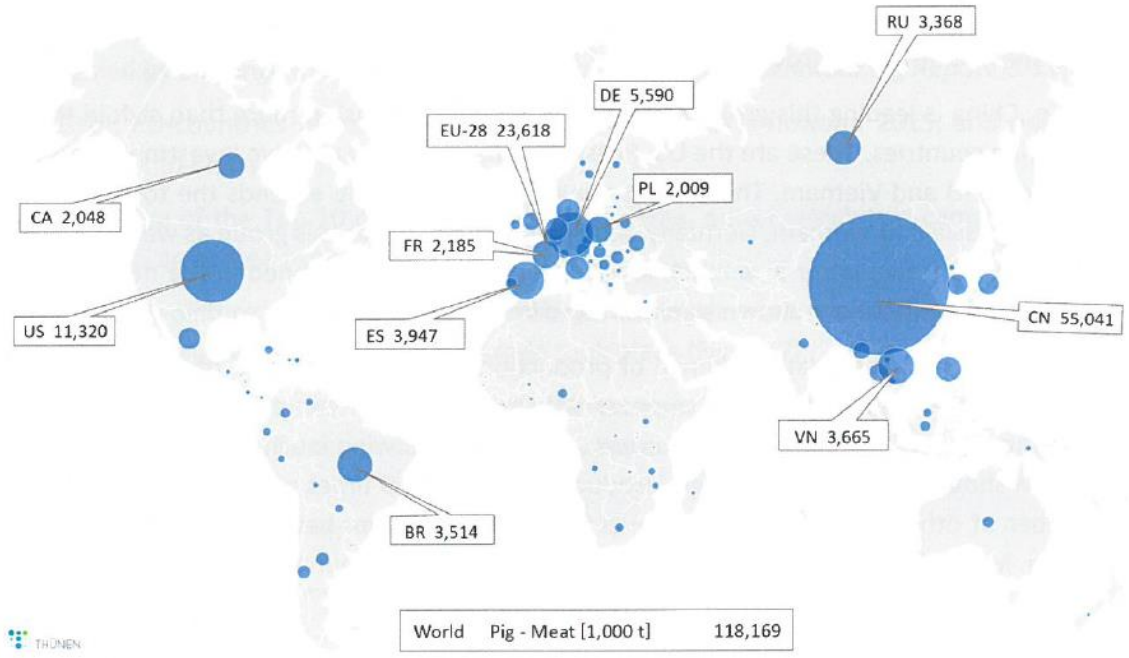
- Bureaucracy
- Future ban of castration without anesthesia
- New EU regulations regarding tail cutting by July 2019
- Future housing conditions for sows uncertain (group housing and pen structure)
- African swine fever threat
- Changing consumer behavior in Germany

Additionally: The long-term agricultural perspective

- Ban of chemical active ingredients
- New fertilizer regulations
- Animal welfare
- Restricted use of water
- New emissions regulation
- Bees/insects protection
- Bio diversity

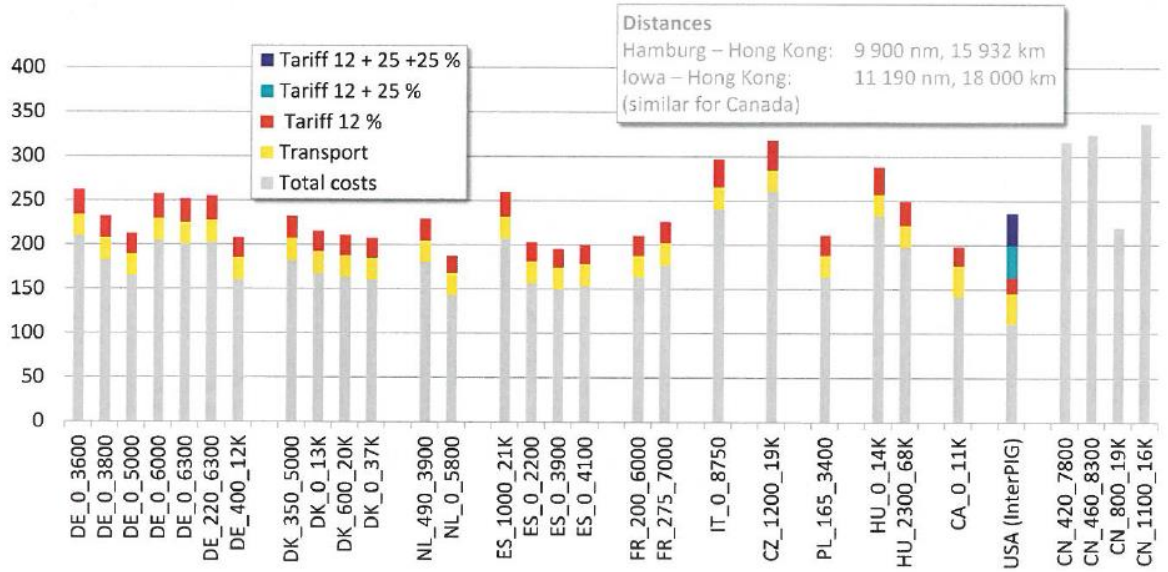
Pig meat production at a glance

Figure 2 **Global pig production 2016**



Source: FAOStat 08.18

Figure 13 Total cost of pig production (2017), transport costs and tariffs (2018)



Source: Own calculations based on *agri benchmark* data and Iowa State / Pork Industry Center Estimated Livestock Returns http://www2.econ.iastate.edu/estimated-returns/

Agribenchmark pig report 2018

Good reasons for the renaissance of rye

Lowest production costs compared to wheat, corn, barley and triticale in moderate and cold climates.

Highest efficiency regarding the utilization of water, nitrogen, phosphorus .

Less crude fiber but highest dietary fiber contents

Highest stimulating of butyrate production in the digestive tract

- nutrient for the gut mucous membrane
- reducing Salmonella prevalence
- lowering risk of boar taint
- enabling well being
- natural prebiotic function

Highest native phytase activity

Consumers expect solutions, that promote animal welfare also from the sector of animal nutrition. In this context, rye really deserves our academic interest.

Prof. Dr. Josef Kamphues, University of Veterinary Medicine Hanover

-partners and trial setup
-results field study I
-results field study II

Approach to improve animal welfare with POLLENPLUS® hybrid rye

Wilhelm Behrens, CEO Viehvermarktung Walsrode

Field Study – Story of Success

- Background information done by (University of Veterinary Medicine Hanover, Foundation)
- Cooperation together with Viehvermarktung Walsrode eG

Results based on different parameters

- Feed analysis
- Performance data
- Slaughter data
- Salmonella
- Boar taint

Core findings

Reduction of Salmonella and boar taint through high proportion of rye within the feed mixture

Trial description and results of the field study in Germany

Key parameters

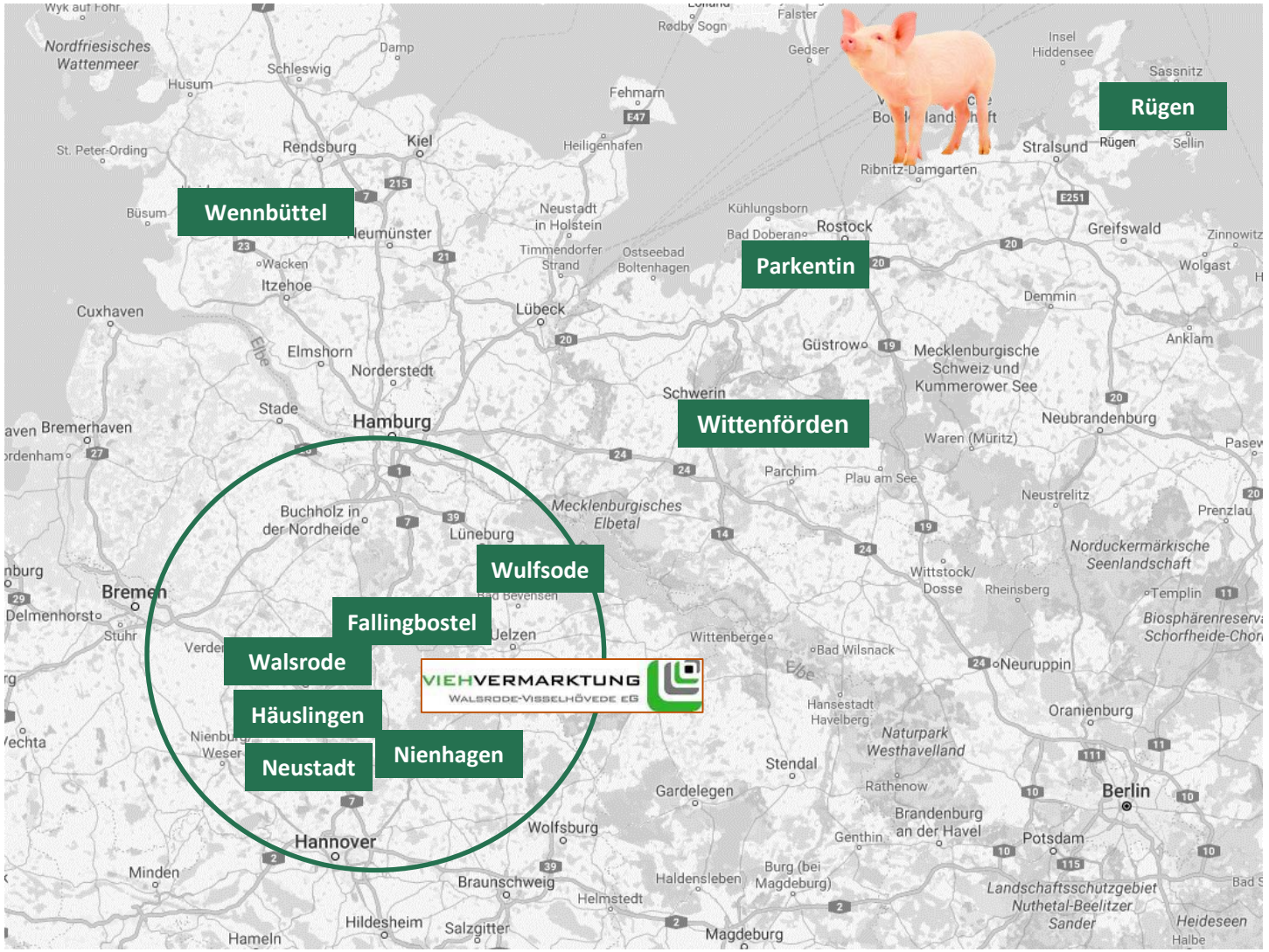
- 14 pig farmers of Viehvermarktung Walsrode e.G.
- 12,761 fattening places (67.119 pigs), 8 farms with boars (46,061 boars)
- Different feeding systems
- Boars, Sows und castrated male pigs
- PIC-, Victoria-, DAN- * PI
- Data: Performance data, feed data, carcass data

Feeding concept

- Coarse grinding (max. 20% < 0,25 mm)
- 40% Rye + 25% Barley in the finisher diet III > 80 kg life weight (5% I; 20% II)
- Relation of lysin/energy min. 0,75 in the finisher phase

Locations of slaughter houses during the test period

Origin of trial piglets



Feed analyses results of the Field Study

The fructan level of rye is twice as high as of other cereals

Cereals (88% DM)	Energy MJME (MJ/kg)	Protein (%)	Fructan* (%)	Crude Fiber (%)	Arabinoxylan, sol. (%)
Wheat	13,9	10,4	3,2	2,4	0,93
Barley	12,2	9,8	2,8	5	0,8
Rye	**13,6**	**8,2**	**7**	**2,4**	**2,18**
Triticale	13,6	9,8	3,8	2,2	0,8

Own results (KWS LOCHOW, 2017) n= 38 *HPLC measured on basis of chicoree, LKV Saxony

Fructan content of the already produced mixed fodder samples in specific fattening sections

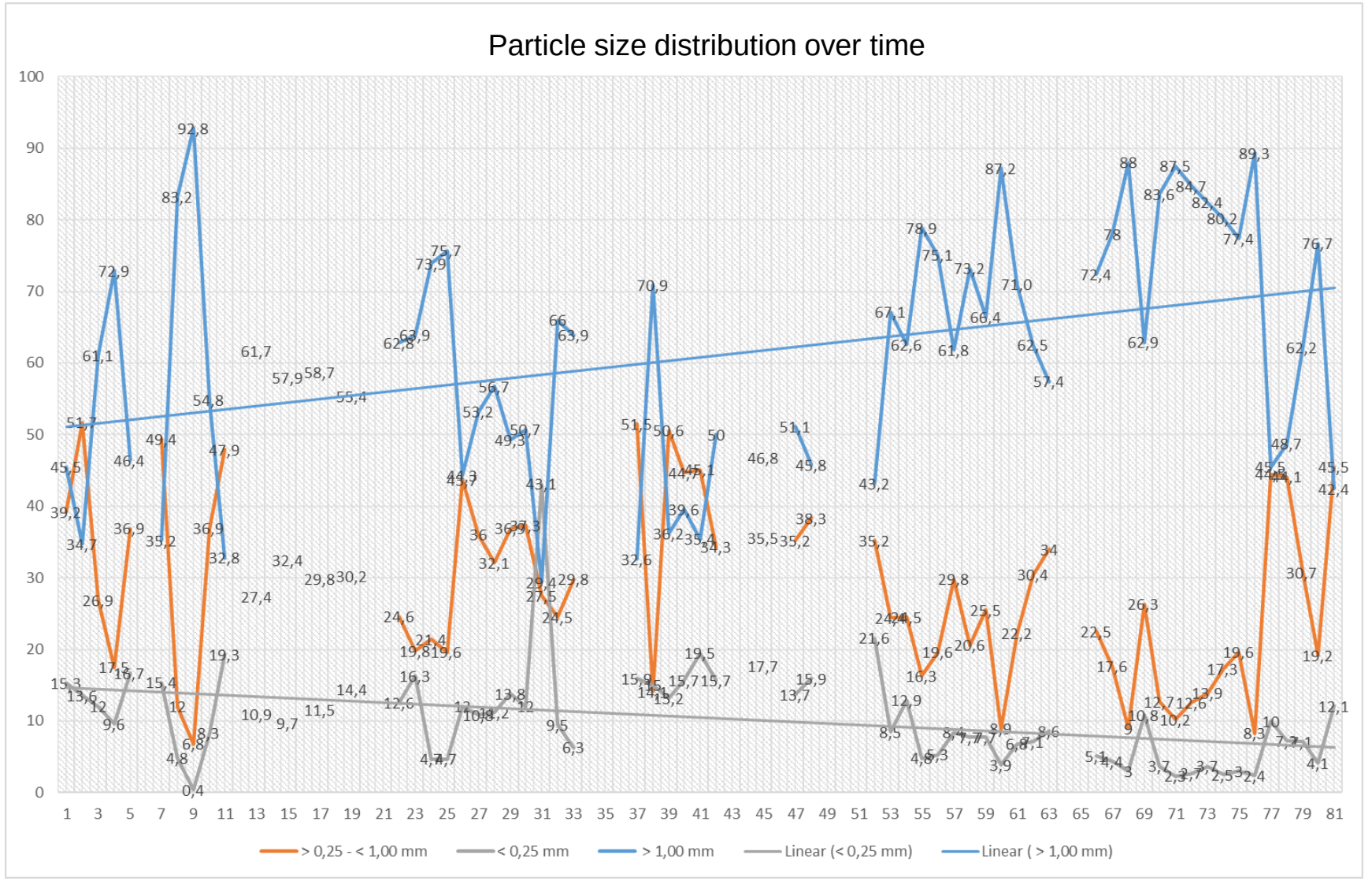
At the end of the testing period the fructan level of the mixed fodder samples was at approx. 6%.

% Fructan (88% DM)	PF 30-50 kg	MF 50-80 kg	F 80-120 kg	Remarks
Quarter I 2017	3,5	4,2	4,2	Wheat - triticale based mixtures
Quarter II 2017	5,4	5,9	6,2	Mixtures with increased rates of rye
Quarter III 2017	5,9	6,1	6,5	Rye based mixtures

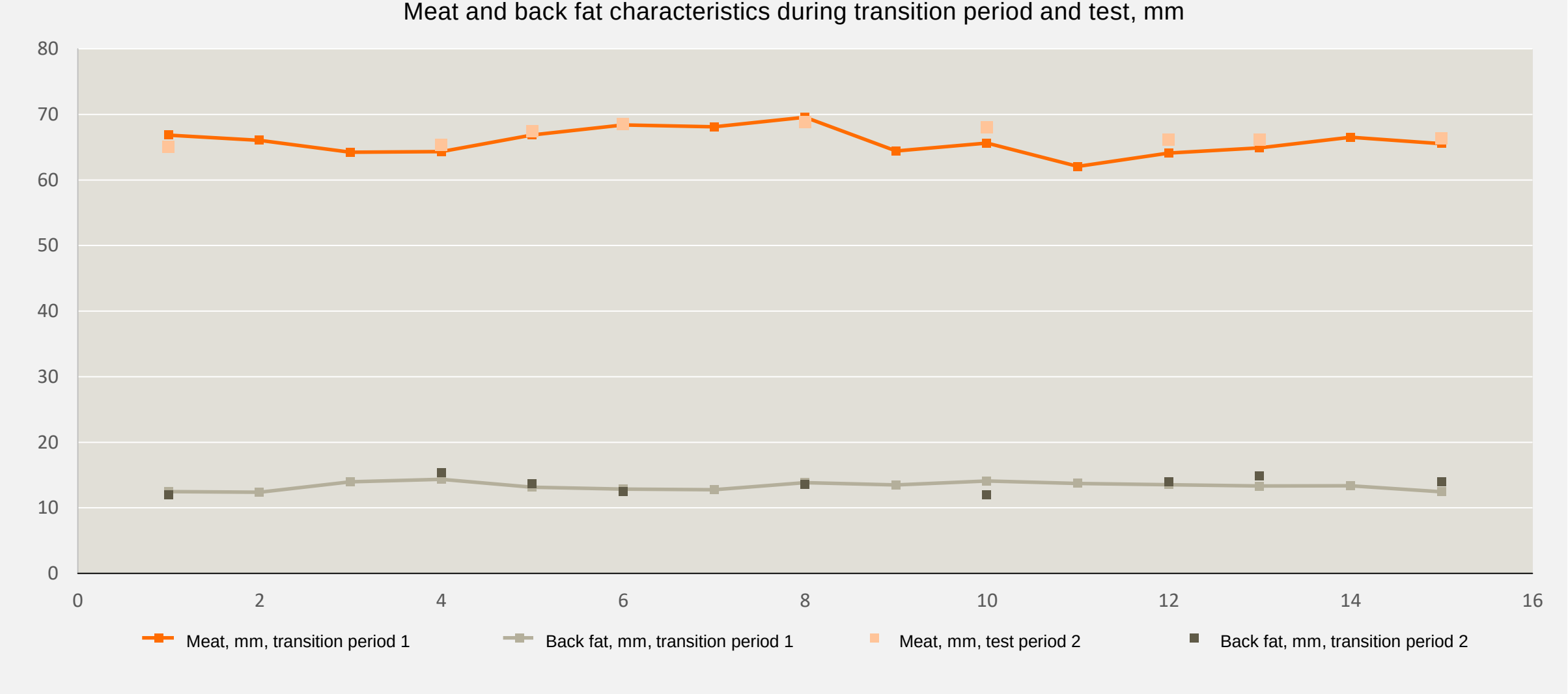
Feed concept	PF 30-50 kg	MF 50-80 kg	F 80-120 kg	Remarks
Energy MJME (MJ/kg)	13,6	13,4	13	Isocaloric for wheat - triticale and rye based mixtures
Protein (%)	16	15,5	14,5	Same for wheat - triticale and rye based mixtures

Own KWS LOCHOW data (2017) n= 45

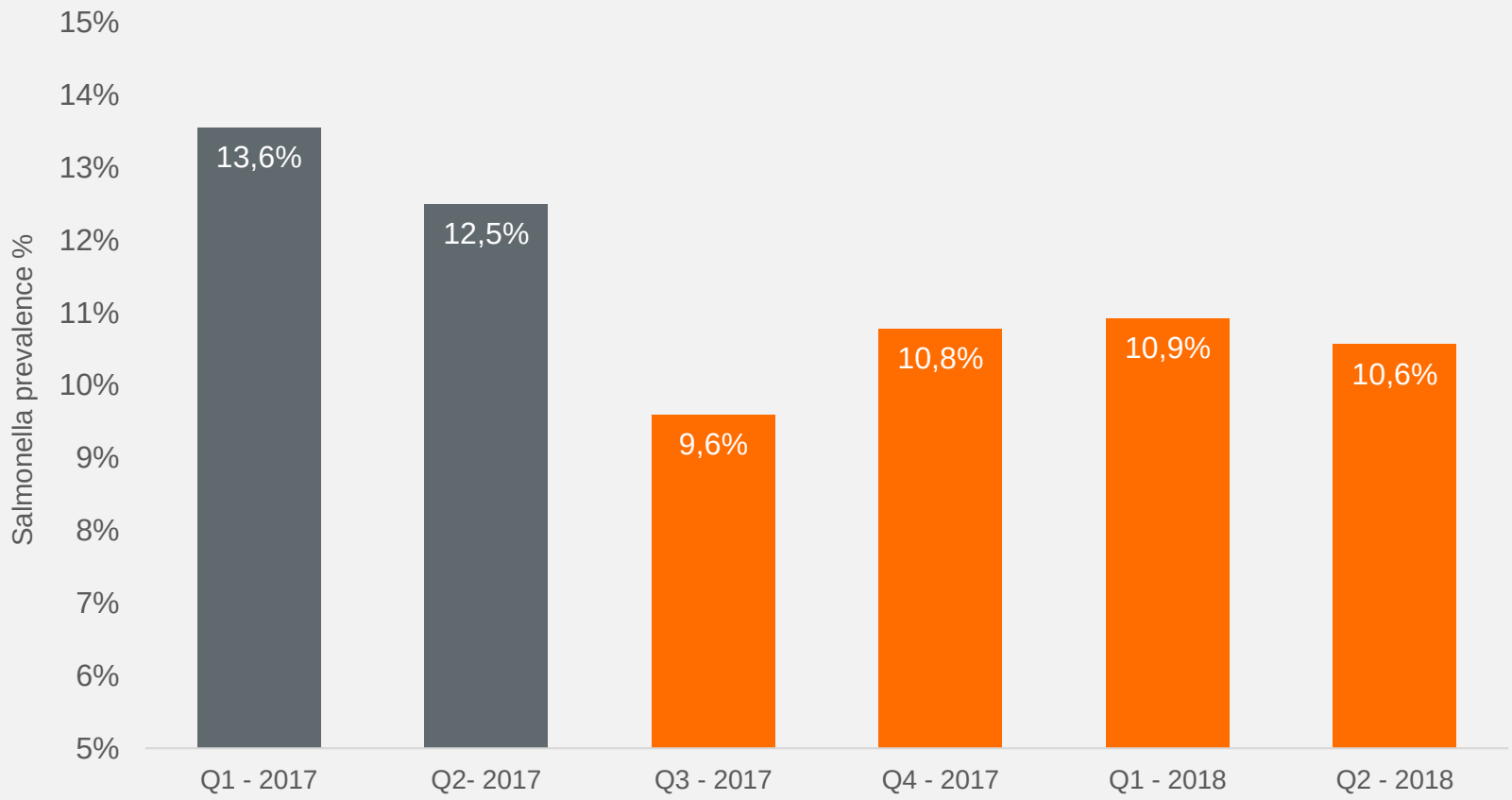
Development of the milling characteristics in the sample set over time



Carcase mass with good accordance and characteristics with other practice
(rel. average data, n=27,303)

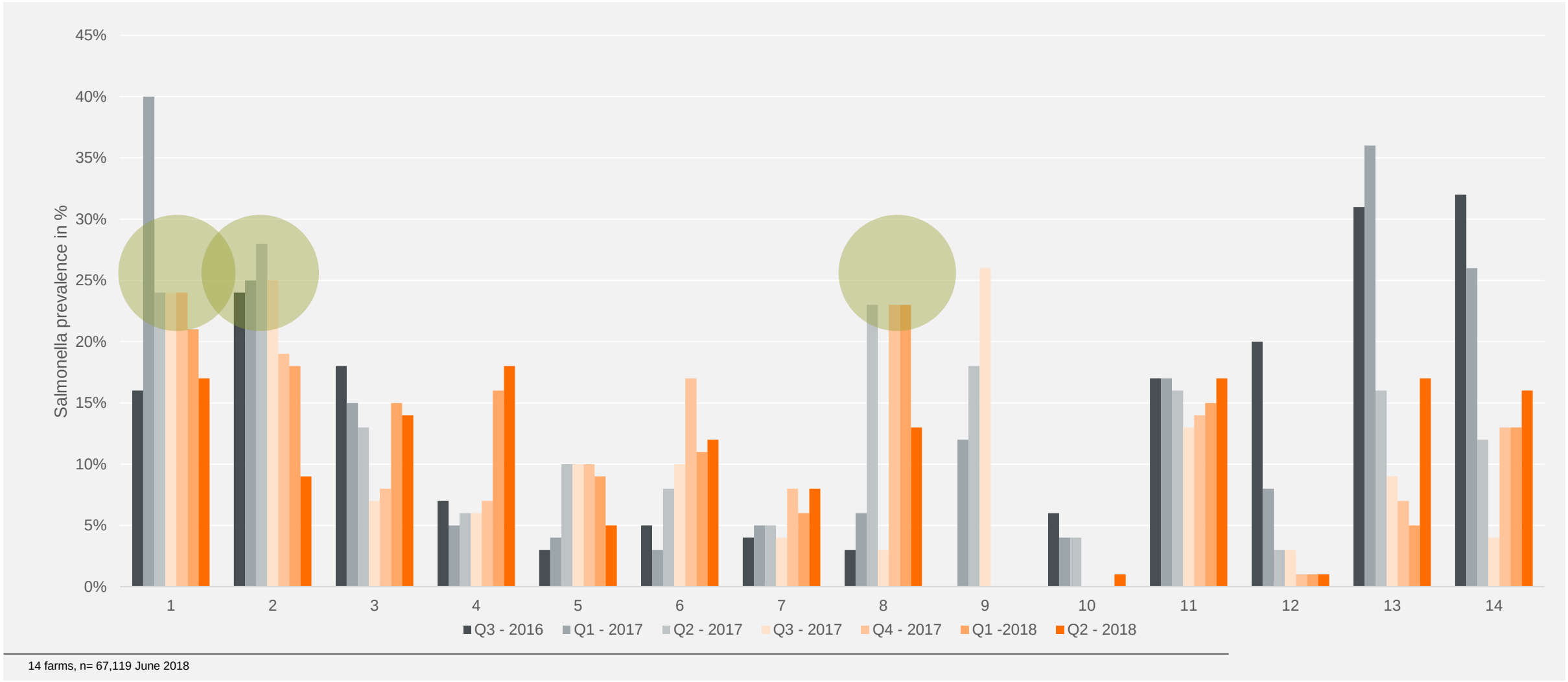


Salmonella reduction over time



n= 67,119 June 2018

Salmonella prevalence of all farms over 7 quarters



14 farms, n= 67,119 June 2018

Overview about boar taint deviators, n=46,061 boars

8 out of 9 farms are without stinkers since 1 year

Farm	1	2	3	4	5	6	7	8	9	Total
II 2017	887	1.464	700	804	960	699	225	1.638	1.968	9.345
Boar taint deviators 2nd quarter	228	25	54	0	155	0	0	123	0	585
III 2017	893	1.466	700	800	960	700	220	1.650	1.900	9.289
Boar taint deviators 3rd quarter	0	0	0	0	0	0	5	0	0	5
IV 2017	893	1.466	700	800	960	700	220	1.650	1.900	9.289
Boar taint deviators 4th quarter	0	0	0	0	0	0	93	0	0	93
I 2018	893	1.466	700	800	960	700		1.650	1.900	9.069
Boar taint deviators 1st quarter	0	0	0	0	0	0		0	0	0
II 2018	893	1.466	700	800	960	700		1.650	1.900	9.069
Boar taint deviators 2nd quarter	0	0	0	0	0	0		0	0	0

Evaluation until quarter II 2018: 14 farms with 12,761 fattening places offer in total 67,119 pigs

Results by individual housing conditions and given feeding concept:

- Salmonella reduction (-30%)
- Reduction or avoidance of boar taint deviators
- At the same time good performance on some farms 1,000g daily increase in weight

Reduced mortality rates

Calm animals

Field study II: location and partners

- The offical (state) advice service in Lingen, Joachim Schulz together with 2 farms conducted the trials in 2018
- 40% Rye at the final stage (80 kg LW) plus 25% Barley coarsely grinded
- 4105 pigs in 11 batches
- Salmonella prevalence recorded
- Slaughter characteristics
- Performance

Field study II: results, n=4105 pigs on 6 farms

	Wheat based – no Rye	40% Rye above 80 kg
batches	5	6
Feed intake, kg	2,53	2,57
Feed conversion, 1:	2,76	2,79
Daily gain, g	917	916
Slaughter weight, kg	122	124
Meat quality index (AUTOFOM)	0,986	0,982
Mortality rate, %	3,1	2,5
Veterinary costs, €/100 kg growth	0,81	0,63
Salmonella prevalence, %	13,3	10,0

- Good performance level
- Markedly lower mortality rate
- Remarkable reduction of vet.-costs
- Significant reduction of Salmonella infections!

Conclusion: The feeding concept with PollenPlus® hybrid rye creates:

1. **Improved safety** in food (less susceptibility against ergot and mycotoxines)
2. Satiesfied animals with **improving animal welfare**
3. Significantly **decreased boar taint and Salmonella infections**
4. **Comparable** fattening production **performance**
5. Especially **N/P reduced feeding**
6. **Highest water and nitrogen efficiency farming**
7. Very **healthy varieties**

Thank you very much for your attention

PollenPlus® hybrid rye raises animal welfare and profitability

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Is there a special need for high butyric acid levels in pig‘s digesta?

Favoring gut health due to „trophic effects“ regarding the mucosa

life time, renewing, regeneration, maturation

improved health/reduced amounts of antibiotics

Lowering the „boar taint“ prevalence in fattening boars

polyfructanes (inulin) highest efficacy against „boar taint“

rate of condemnation of carcasses due to sensorial deviations

Reducing salmonella prevalence at individuals/herd level

at high butyric acid levels: down regulation of invasion genes in salmonella

improved food safety and favored consumers‘ protection

Fostering the feeling of satiety/avoiding behavioral disorders

mass of digesta, more continuous serum levels of glucose/insulin

improved animal welfare/wellbeing/image of pork production

Source: University of Veterinary Medicine Hanover, Foundation, 2019

Fructan contents in different cereal species
(VERSPRET et al. 2015)

Cereals	Rye	Corn	Oats	Barley	Wheat	Triticale
Fructan level (% of dm)	3,6 - 6,4	near 0	< 0,2	< 1,0	0,9 -1,9	1,5 – 2,9

*DM = dry matter

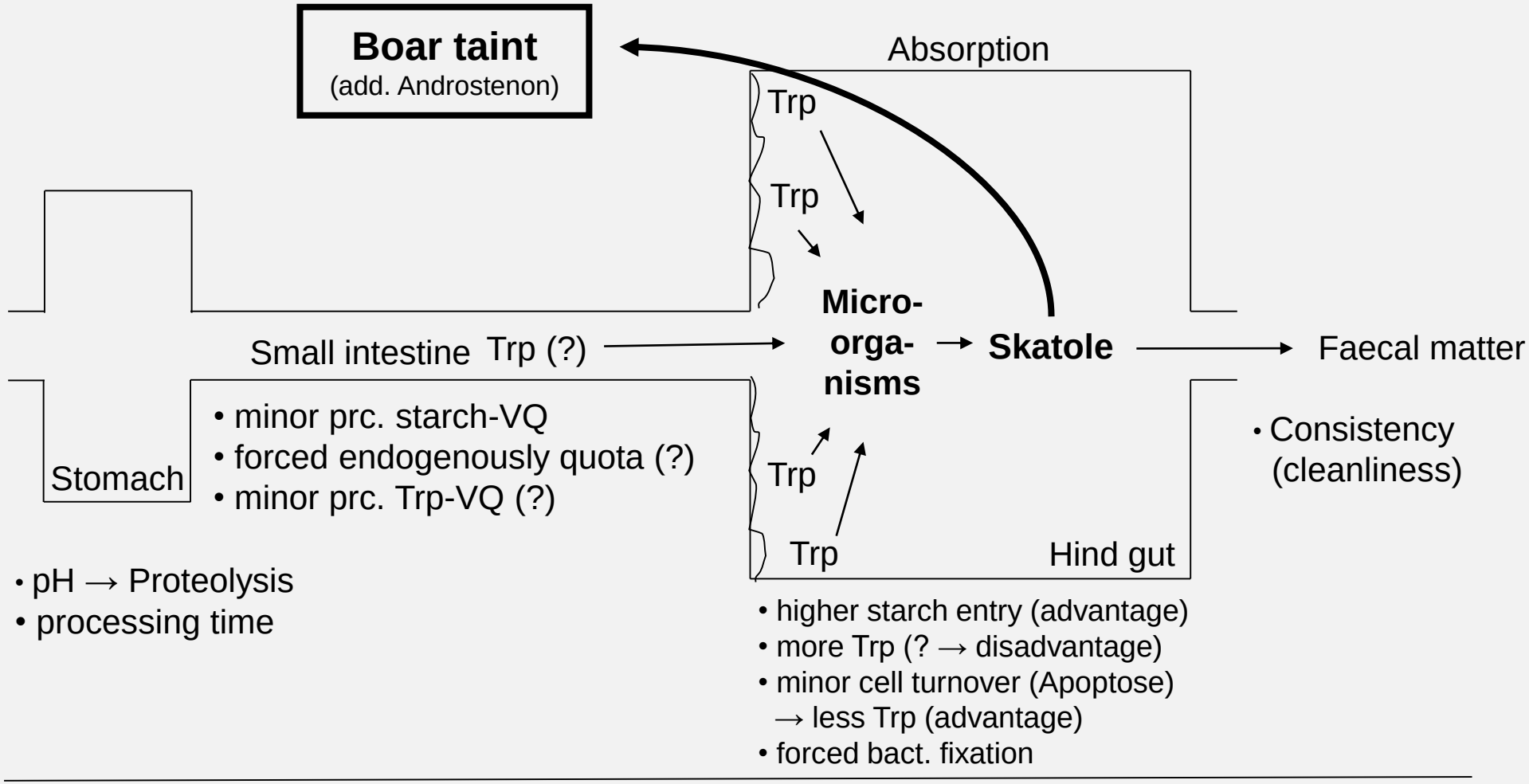
By far the highest fructan level: Rye

Highest stimulation of intestinal butyrate production

And after various in vitro studies: water soluble arabinoxylans + oligofructose/fructans are the most potent promoters of butyrate formation by the colon flora (human!)

Source: University of Veterinary Medicine Hanover, Foundation, 2019

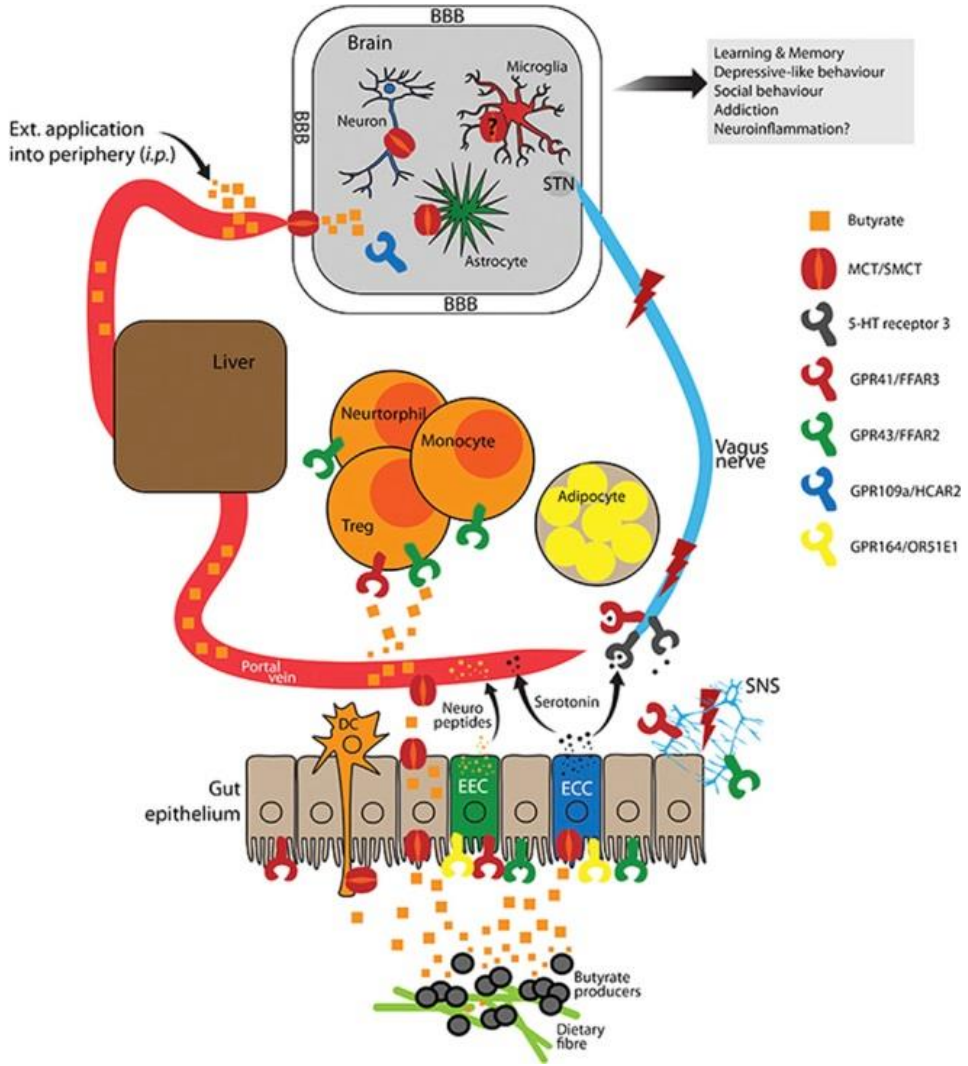
Boar taint



[1)] hypotheses deduced from analysis for the use of **row potato starch/inulin**
(Claus et al. 2003, Lösel a. Claus 2005, Zamaratskaia et al. 2005, Chen et al. 2007, Rideout et al. 2004, Hansen et al. 2006)

Source: Kamphues and Betscher 2011, University of Veterinary Medicine Hanover, Foundation

Schematic summary of butyrate effects on host physiology and brain function



- Learning & Memory
- Depressive-like behaviour
- Social behaviour
- Addiction
- Neuroinflammation?

Key:
STN: Solitary tract nucleus
BBB: Blood brain barrier
SNS: Sympathetic nervous system
EEC: Enteroendocrine cell
ECC: Enterochromaffin cell
DC: Dendritic cell
Treg: T-regulatory cell

Source: University of Veterinary Medicine Hanover, Foundation, 2019