MRI Max Rubner-Institut
TLL
FRIEDRICH-LOEFFLER-INSTITUT
FLI
Bundesforschungsinstitut für Tiergesundheit
Federal Research Institute for Animal Health

Transfer of iodine from animal feed into pork and milk

K. Franke [1)] , F. Schöne[2)], A. Berk[1)], U. Meyer[1)] , H. Wagner[3)], G. Flachowsky[1)], P. Lebzien[1)]

[1)] Institute of Animal Nutrition, Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Bundesallee 50, 38116 Braunschweig, Germany
katrin.franke@fli.bund.de
[2)] Agricultural Research Centre of Thuringia, Naumburger Straße 98, 07743 Jena, Germany
[3)] Department of Safety and Quality of Meat, Max Rubner-Institut, Federal Research Institute of Nutrition and Food E.C.-Baumann-Straße 20, 95326 Kulmbach, Germany

Background

The trace element iodine (I) is characterized by a high risk for deficiency but also for overdosing. Besides salt iodination, I can be added to animal feed to concentrate it in food of animal origin (milk, eggs, meat). Otherwise an excessive I intake of men should be obviated by maximum levels in animal feed. Objective of the studies was to evaluate the I content of pork, other edible pig fractions and milk at various feed I supplementations. Furthermore the impact of rapeseed (I antagonist) in the ration and the applied iodine species on the milk iodine concentration should be investigated.

Material and Methods

Pig trial

- 70 BHZP-hybrids in 5 groups
- supplementations 0, 0.5, 1, 2 and 5mg I/kg diet
- Analysis of iodine content in thyroid, muscle/fat, innards/blood

Dairy cattle trial

- 32 German Holstein cows
- Comparison of rapeseed meal (RSM, 3.5µmol glucosinolates/g) with distillers dried grains with solubles (DDGS)
- Comparison of applying KI (iodide) or $Ca(IO_3)_2$ (iodate)

→ 4 groups: DDGS/iodide (1), DDGS/iodate (2), RSM/iodide (3), RSM/iodate (4)

- 7 periods (21 days) with supplementations of 0, 0.5, 1, 2, 3, 4 and 5mg I/kg DM

Results

Pig trial

- Iodine concentration of muscle/fat increased significantly up to 17.1 µg/kg (Table1)
- Significant increase of iodine content in thyroid but not in innards/blood (Table 1)
- Carry over into muscle/fat 0.10-0.24%

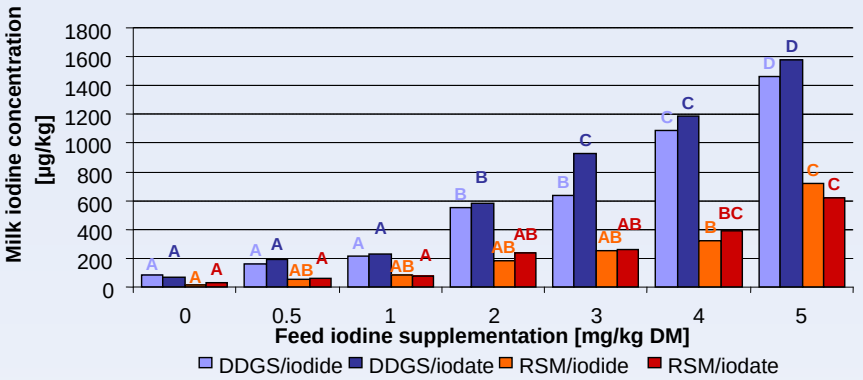
Dairy cattle trial

- Significant increase of milk iodine content with rising supplementation (Figure 1)
- Significant reduction of milk iodine by application of rapeseed meal
- No significant differences between application of KI or $Ca(IO_3)_2$
- Carry over 11-25% with RSM in the ration and 30-56% with DDGS

Table 1: Iodine concentration of the thyroid and the fractions innards/blood and muscle/fat at the various iodine supplementations (mean ± SD, n=4)

Supplementation	mg/kg	without	0.5	1.0	2.0	5.0
Analysis	mg/kg	0.17	0.41	0.99	2.20	4.38
Thyroid gland	µg/g	620^{A} ± 71	1054^{B} ± 280	1154^{B} ± 191	1699^{C} ± 184	1645^{C} ± 159
Innards/blood	µg/kg	94 ± 61	63 ± 40	138 ± 73	230 ± 145	126 ± 38
Muscle/fat	µg/kg	3.9^{A} ± 0,6	6.0^{B} ± 1,9	8.5^{B} ± 1,9	10.8^{B} ± 1,2	17.1^{C} ± 1,5

ABC show significant differences in a row (P<0.05)



ABCD show significant differences between the supplementation levels in the respective groups (P<0.05)

Figure 1: Milk iodine concentration in the groups and different supplementation levels (LSMEANS, n=8)

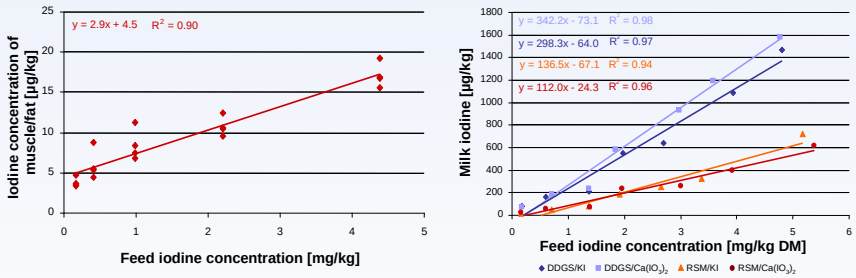


Figure 2: Dependence of iodine concentration of muscle/fat of pigs and milk iodine concentration of dairy cows on iodine concentration of feed

Conclusions

The I content of pork, and consequently its contribution to human I supply (~1 %), is very low, even at high supplementation of feed. In contrast the milk I concentration increases intensively with rising I content of feed and even may lead to exceeding the Upper Levels in human nutrition at the highest recently permitted iodine concentration of feed (5mg/kg). Therefore the maximum level in cow´s feed has to be reevaluated. When estimating the iodine content of milk from the iodine concentration of feed the application of RSM with the ration has to be considered.