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**Phytogenic feed additives –
black box or reliable products!**

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Phytogenic Feed additives

Black box or reliable products ?

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Overall view



- 1. Definition**
- 2. Regulatory affairs**
- 3. Mode of action – effects in animal nutrition**
- 4. Requirements for reliable and successful use**
- 5. Conclusion**

Definition



Plant feed materials

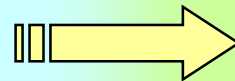
Phytogetic feed additives

Phytobiotica

Herbs

Oleoresins

Spices



Essential oils

(Botanicals)

(Plant Extracts)

Definition



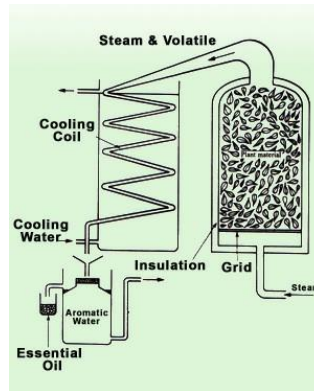
BOTANICALS

= grounded plants or parts of plants as roots, seeds



ESSENTIAL OILS

= volatile, natural vegetable products extracted from herbs and spices by steam distillation



OLEORESINS

= less volatile, natural vegetable products extracted from herbs and spices with a non-aqueous solvent



↙ ↘

Active principles = Secondary plant metabolites

Secondary plant metabolites are bioactive substances which can have a potential value as feed additives in animal nutrition.

Definition



Active principles in phytogetic feed additives

Basic plant metabolites

Example

- Water
- Carbohydrates (Glucose)
- Protein
- Vitamins
- Minerals

Function/characters

- high concentration in the plants
- part of the basic metabolism
- **nutrients**

Secondary plant metabolites

Example

- Essential oils
- Bitter substances (Alkaloids)
- Colorants (Carotinoides)

Function/characters

- 5000-10000 substances
- low concentration in plants
- not a part of the basic metabolism
- interaction with other plants and insects/defense mechanisms/growth regulators
- **bioactive substances**

Regulatory affairs



Status quo

- Feed additives are regulated in accordance to EC No. 1831/2003
- all phytogetic feed additives are notified in the sensory group

Categories of feed additives (EC No. 1831/2003)

<u>Group</u>	<u>Example</u>
Technological additives	Silage additives, ant caking agents
Sensory additives	Colorants, Flavouring compounds
Nutritional additives	Vitamins, Amino Acids, Urea
Zootechnical additives	Digestibility enhancers, Gut flora stabilizers
Coccidiostats and Histomonostats.	

Sensory additives: any substance, the addition of which to feed improves or changes the organoleptic properties of the feed, or the visual characteristics of the food derived from animals.

Regulatory affairs



Development

- All feed additives have to go through a registration process
- for this companies have to hand in a complete dossier

⇒ depended on their mode of action phytogetic feed additives can apply for a registration in the sensory group or zootechnical group

Since Nov. 2004 all phytogetic feed additives are notified in the sensory group

Registration process

Complete dossier
Required until end of 2010

**Approval by
Commision**

Regulation EC 1831/2003 (categories for feed additives)

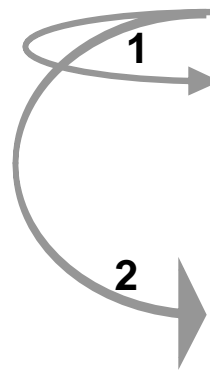
Technological

Sensoric

Nutritional

Zootechnical

Anticoccidial und antihistomonical



Mode of action – effects in animal nutrition



Effects of phytogetic feed additives in animal nutrition



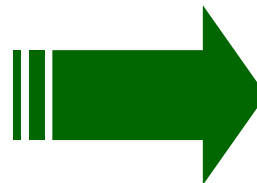
Stimulation feed intake

Antibacterial, coccidiostatic, anti-viral effects

Stimulation of the secretion of digestive enzymes

Stimulation immune system

Antioxidative effects



Higher feed intake

Improved growth

Better FCR

Improved carcass quality

Improved health status

Mode of action – effects in animal nutrition



Stimulation Feed intake

Effect of different plant products on feed intake and growth performance

Starter: Day 0-14

	Control	Aloe Vera	Sangrovit*
Feed intake(g)	487	475	476
Weight gain (g/d)	31,8	30,9	31,0
FCR	1,09	1,09	1,09

Grower: Day 14-31

	Control	Aloe Vera	Sangrovit
Feed intake(g)*	1758	1804	1844
Weight gain (g/d)*	65,0	67,4	71,2
FCR*	1,59	1,57	1,52

Mode of action – effects in animal nutrition



Antibacterial properties

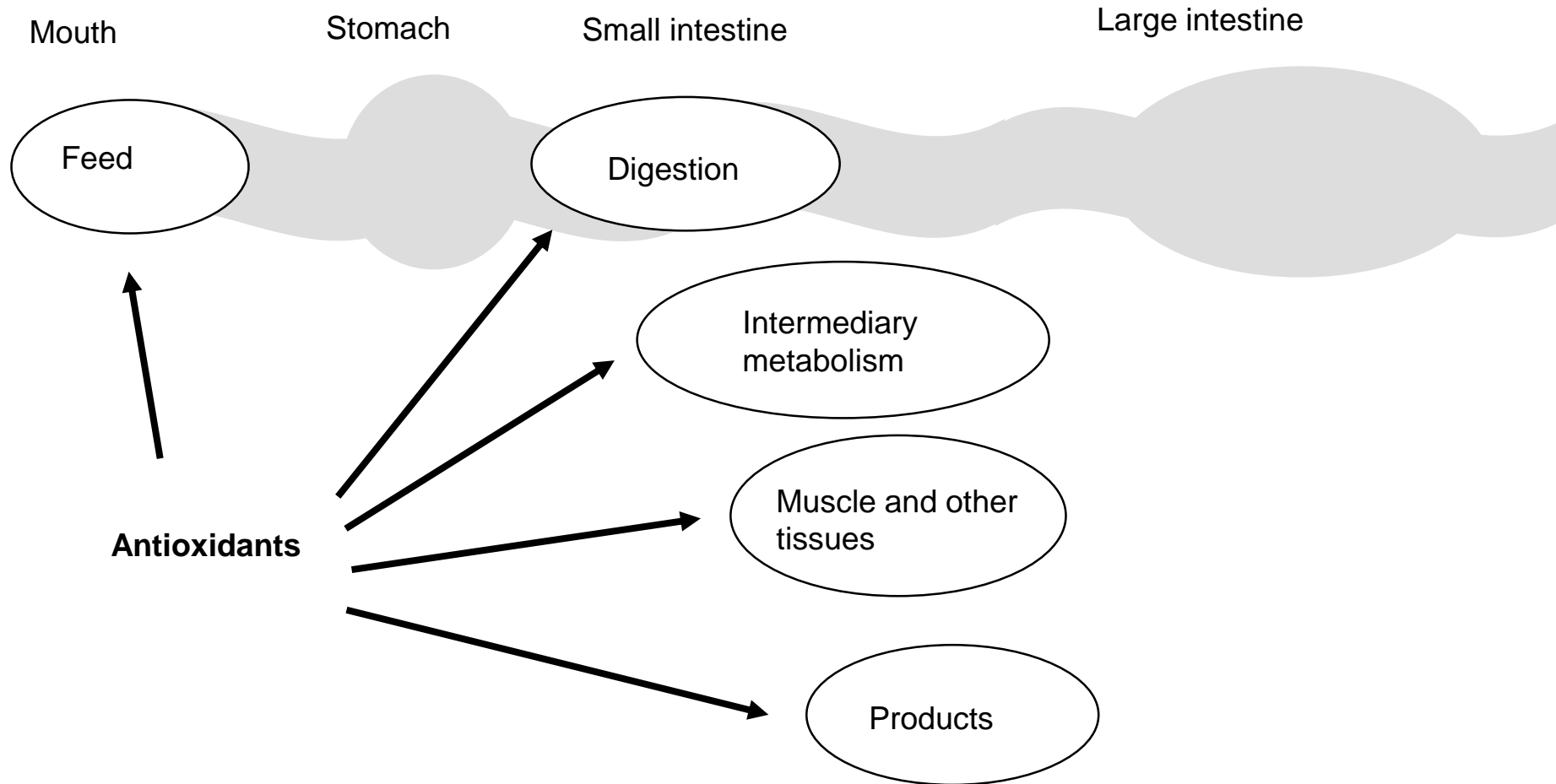
- *in vitro* studies show the antimicrobial effects of many plant extracts
- results in the Literature quite variable, due to different product composition (often not described) and testing methods
- the scientific proof of these antibacterial effects *in vivo* is rare
- in comparison to AGP's natural antibiotics are less selective and have often to be used in a high dosage to reach the same effect (can influence the feed intake negative)
- the unselective effects can harm the positive flora as well

Mode of action – effects in animal nutrition



Antioxidative properties

Activity of Antioxidants in Farm animals



Wenk, C. (2002). Herbs, spices and botanicals: 'Old fashioned' or the new feed additives for tomorrow's feed formulations? Concepts for their successful use. In: *Biotechnology in the Feed Industry* (Lyons, T. P., Jacques, K. A., eds.), 79-97.

Mode of action – effects in animal nutrition



Immuno properties

- the intestine is the biggest immune organ in the body
- the use of immunomodulation phytogetic feed additives can play an important role in particularly stress situations (e.g. weaning)
- many in *vitro* studies show immunomodulation properties of phytogetic substances (Borchers et al., 1997; Craig, 1999), whereby these substances act mainly on non-specific humoral and cellular immunity system
- one of the most known plant for immunomodulatory effects,
- especially associated with virus infections, is *Echinacea spp.* (Tandon, D. 2001)
- another recognized active principle is Garlic (Allicin)

⇒ Immune system stimulating agents can increase in vivo the overall health status in the stable and by this lead to a reduced mortality and more stable performance.

Mode of action – effects in animal nutrition



Performance enhancing properties

Effects of a botanical on growth, performance and N-balance in growing pigs

	Control	Sanguinarin	Advantage
Weight gain, g/d	796	821	
FCR	2.24	2.16	
N-excretion	100	91	Higher protein retention, higher weight gain,
N-retention	100	108	
N-balance	100	109	
Urea blood	100	76	Reduced detoxification for liver → more healthy liver
Ammonia blood	100	92	

Ader, P., Roth, H. (2003). Feeding *Papaveraceae* based feed additives inhibits amino acid decarboxylation and improves protein metabolism and performance in growing swine. In: 7th Conference of the European Society of Veterinary and Comparative Nutrition (Kamphues, J., Wolf, P., eds.), Hannover.

Mode of action – effects in animal nutrition



Performance and carcass quality enhancing properties

Effects of different botanicals on growth performance and carcass quality

Growth Performance

	Control	Sangrovit	Product A	Product B
Body weight Start (kg)	30,5	27,0	30,8	30,7
Body weight End (kg)	102	107	106	108
Daily weight gain (g/d)	753 ^a	842 ^b	792 ^c	814 ^b
FCR	2,78	2,57	2,70	2,62

Carcass quality

	Control	Sangrovit	Product A	Product B
Lean meat content, %	54.95	55.90	55.85	56.05

Let's avoid the Black Box!!!



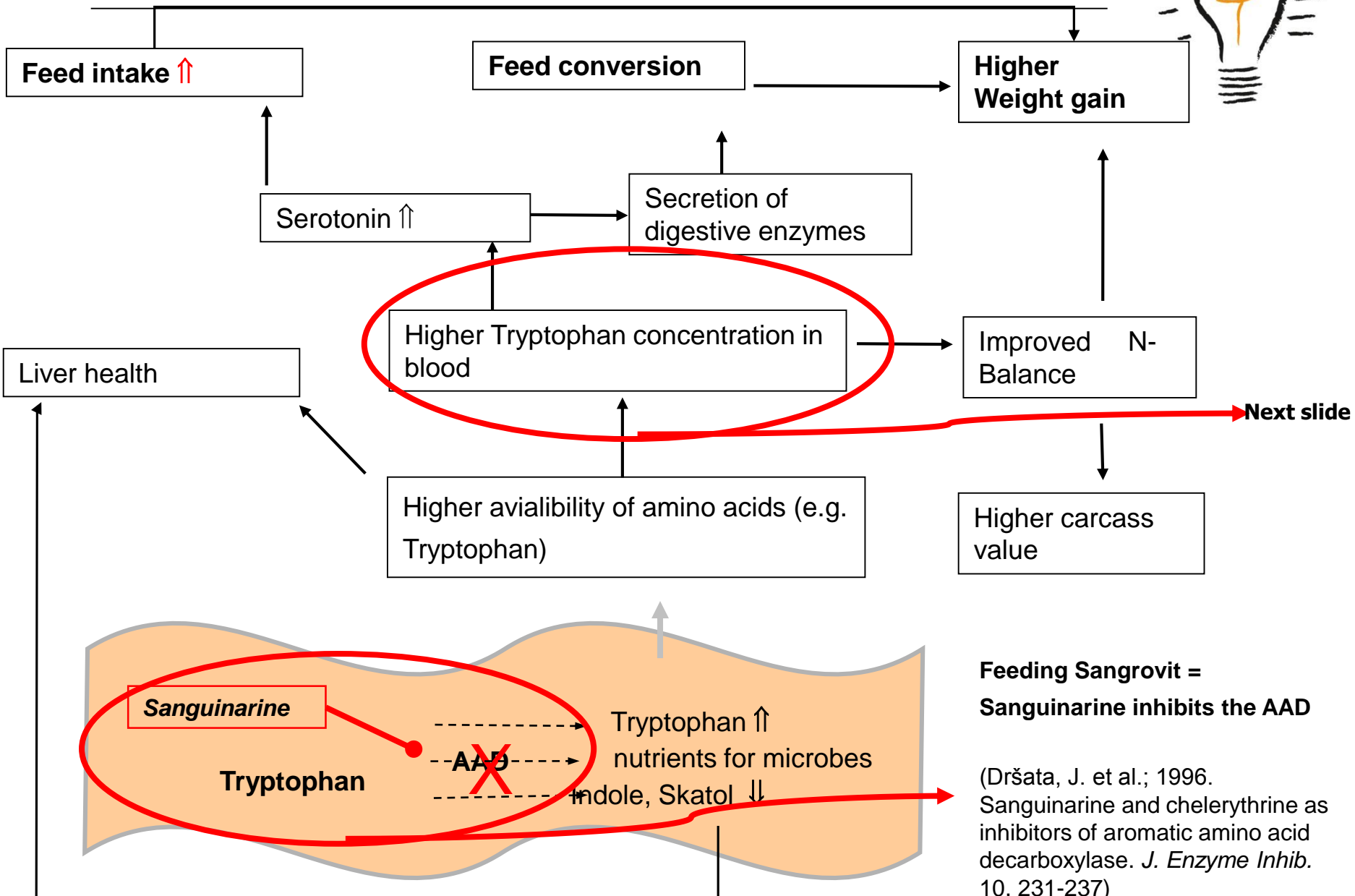
Requirements for a reliable and successful use of phytogetic feed additives

- **Analyses/Product Standardization**
- **Proven technical and physical properties (e.g. heat stability)**
- **Safe in use (for workers, animals, consumers)**
- **Proven efficiency**
- **Known mode of action**
- **Knowledge about the bioavailability, pharmacology and metabolism of active principles**

Kluth, H. et al. (2002). Zur Wirksamkeit von Kräutern und ätherischen Ölen bei Schwein und Geflügel. In: 7. Tagung Schweine- und Geflügelernährung (Rodehutsord, M. ed.), 26.-28. November, Martin-Luther-Universität Halle-Wittenberg, 66-74.



Known mode of action

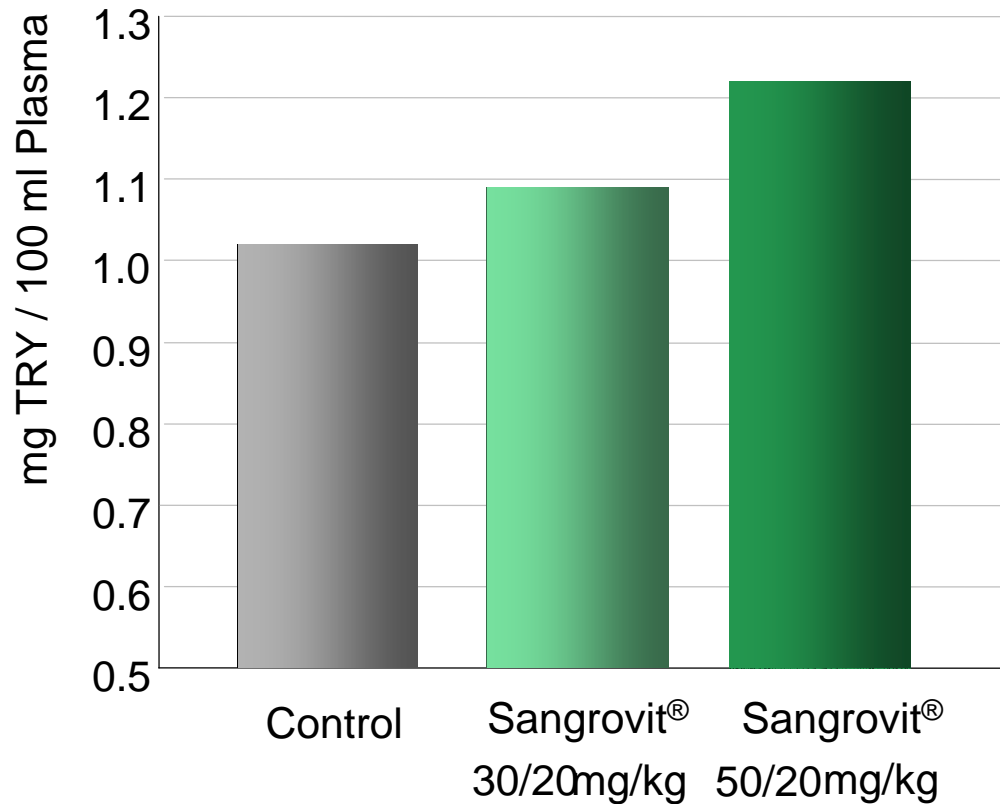


Known mode of action



Effect of Sangrovit® on tryptophan availability in broilers

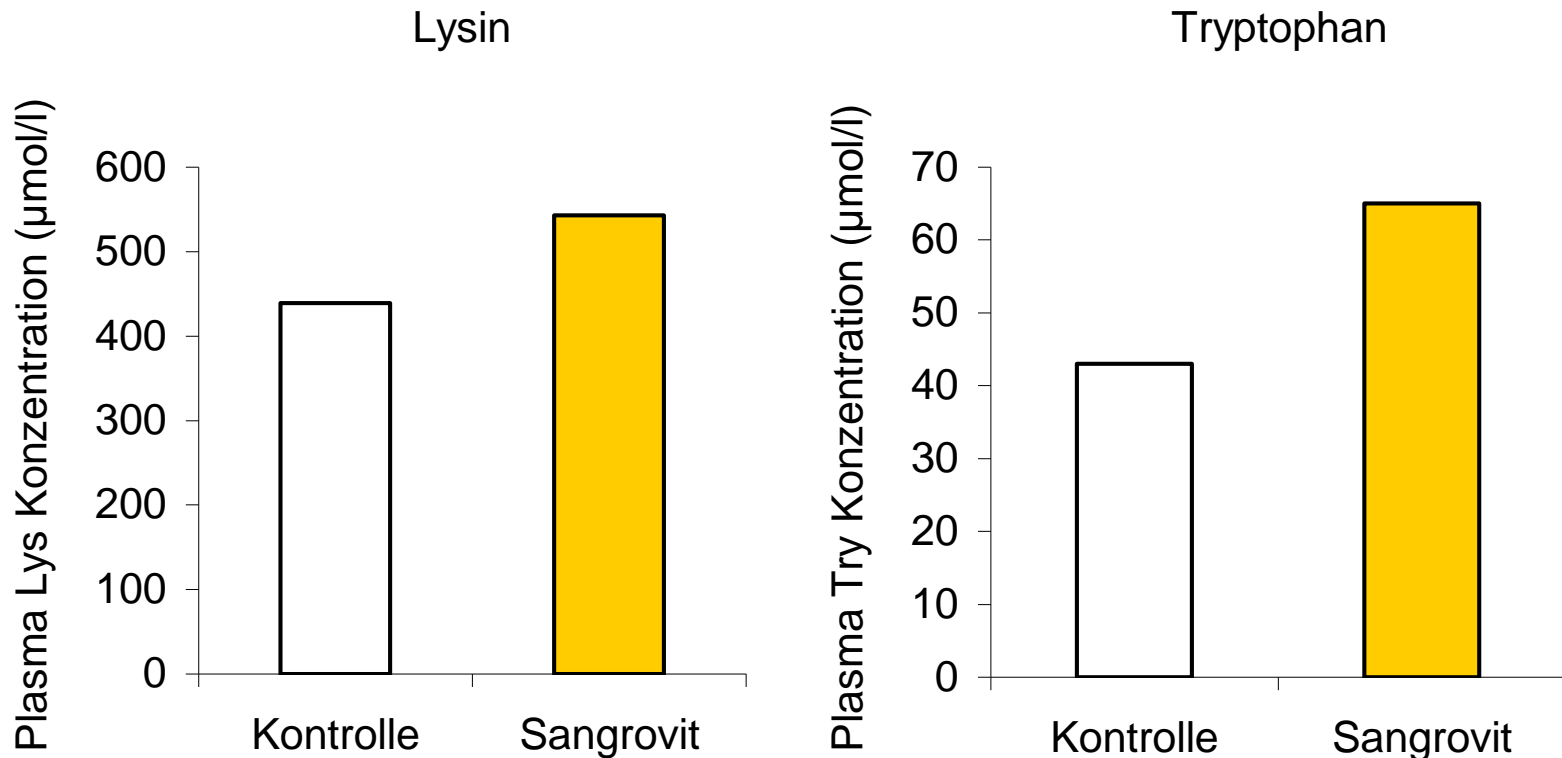
Itochu, Japan (2004)



Known mode of action



Effect of Sangrovit on tryptophan and lysine availability in pigs



Conclusions



- Plant based feed additives represent one alternative the banned AGP's
- These substances are not new, as they have been used since a long time in human nutrition and medicine
- A lot of *in vitro* and *in vivo* studies show their potential for animal nutrition
- Nether less this for a successful use in a long term view the following points should be demonstrated by the supplier of the additives:
 - ✓ Product Standardization
 - ✓ Proven technical and physical properties (e.g. heat stability)
 - ✓ Safe in use (for workers, animals, consumers)
 - ✓ Proven efficiency
 - ✓ Known mode of action
 - ✓ Knowledge about the bioavailability, pharmacology and metabolism of active principles



“Please visit us at the *ADDCON* stands 9 – 13“

Thank you for your attention