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# Alternatives for the substitution of synthetic vitamin B2 or vitamin B2 produced from GMOs



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English summary

EXCELLENCE FOR SUSTAINABILITY

Das FiBL hat Standorte in der Schweiz, Deutschland und Österreich  
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# 1. Background

Today in conventional food and feed production added vitamin B2 is produced almost exclusively from a GMO,<sup>1</sup> namely the genetically modified *Bacillus subtilis*. Vitamin B2 applied in certified organic food and feed productions is an exception, as it is still synthesized conventionally. In fall 2007 and also recently, there has been a lack of non-GMO derived vitamin B2 on the European market, which has caused temporary supply problems for organic producers. This event triggered the political will to conduct new research in order to find alternative solutions for the substitution of synthetic vitamin B2 in organic agriculture.

## 2. Legal framework

Synthetic vitamins are not permitted in organic agriculture with the exception of feed. In Switzerland, the feed list of Bio Suisse, ALP and FiBL defines e.g. the types and the amounts of applicable synthetic vitamins according to certain animal categories. Synthetic vitamins which are produced with help of GMOs are, however, generally forbidden in organic production. During the 2009 revision of the former EC organic regulation (2092/91) the prohibition of vitamins produced from GMOs has been loosened in the EU. A process has been installed which can allow the use of food and feed additives (Art. 16, Art. 19 834/2007), given that they are necessary to use and their conventional pendants are not available on the market. Up to now, there was no need to take advantage of such an extraordinary allowance, as the shortage of conventionally synthesized vitamin B2 has not recurred. However, in order to forego a future scarcity, substitution possibilities need to be examined.

Further, substitution possibilities are also sought for because of the lacking transparency of the vitamin market, the insufficient amount of information on vitamin products provided by firms, the not always clear declaration of the non-GMO status of synthetic vitamins, and the complexity of the whole vitamin production system. All these contribute to the uncertainty surrounding synthetic vitamin use, and can be harmful for the credibility of organic agriculture.

## 3. Vitamin B2 demand in swine production

In an expert workshop in the Vitamin B2 production, Andreas Gutzwiller from ALP pointed out that data on recommended amounts of vitamin B2 purveyance for swine are either older or come from the industry, and is therefore to be judged critically. Further, the necessary amounts were calculated on the basis of synthetic vitamin addition and the natural vitamin content of the original feed was not assessed. Alternative feed for substituting synthetic vitamin B2 application can be yeast, milk or whey powder, resp. whey, which is however barely available in organic quality on the market.

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<sup>1</sup> According to EC Regulation 1829/2003 on genetically modified food and feed „‘produced from GMOs’ means derived, in whole or in part, from GMOs, but not containing or consisting of GMOs”.

For fattened pig production synthetic vitamin B2 could most probably be substituted or reduced through the use of yeast, milk and whey products. In case of farrows only whey powder could be applied, which would induce a price rise of the product. For sows a substitution does not seem feasible, because their demand for vitamins is too high.

#### Importance of vitamin B2 for poultry

In the poultry sector vitamin B2 supply is critical for parent animals, hatch eggs and fledglings. A sufficient vitamin B2 supply is indispensable for parent animals in order to sustain the normal hatch rate. It seems impossible to provide ample amount of vitamin B2 here through just natural feed components. Save, one accepts the reduction in hatching and so in fledglings and young hens.

Possible natural feed components for laying hens would be bran, wholemeal grind, a higher proportion of whole corn, lucerne, yeast or whey powder.

## 4. First experimental phase

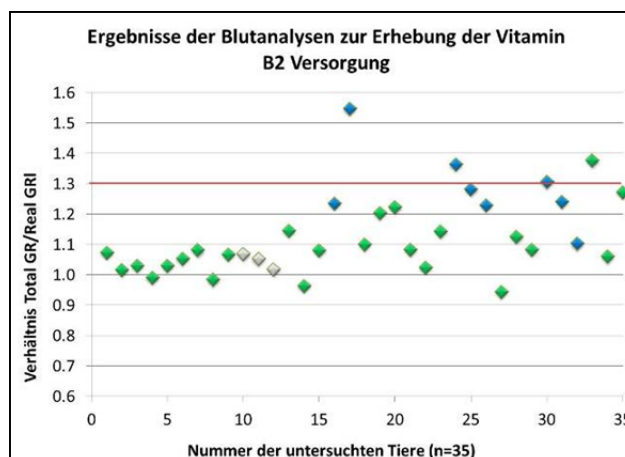
Following the above suggestions for research on vitamin B2 substitution possibilities, FiBL was appointed to conduct Experiment 1, in order to verify if synthetic vitamin B2 could also be purveyed through alternative feed for fattened swine.

7 different farms, applying different feed for swine were involved in the experiment. The different feeding solutions were:

- Organic feed with added synthetic vitamin B2
- Organic feed with whey
- Organic feed without any additive

Blood sample of animals were gathered when slaughtered. Samples were prepared according to standard process at the lab of FiBL. Samples were deep frozen. Vitamin B2 analysis was later carried out by ALP.

**Table 1. Vitamin B2 purveyance for fattened swine with different feed. Green: without additional vitamin B2. Blue: Added vitamin B2 in organic feed. Grey: excluded from the study. Red line: all points above this line show a vitamin B2 deficiency.**



All together 35 animals were sampled in the experiment. For three animals no exact information could be gathered regarding their feeding. They were therefore excluded from the study.

From the remaining 32 animals

- 19 have not had additional synthetic vitamin B2 purveyance, but received whey besides their regular feed.
- 5 animals were neither fed vitamin B2 nor with whey.
- 8 animals received mineral feed containing vitamin B2 and no whey.

Out of the 35 animals only 4 have been found to have a vitamin B2 deficiency. Interestingly three of these animals were fed with synthetic vitamin B2. Only one of them has been fed with whey and not mineral feed. None of the swine which received neither whey, nor mineral feed had a vitamin B2 deficiency.

On the whole, the results of the study do not show a clear picture. Nevertheless we can draw the following conclusions:

- The purveyance of organic fattened swine with vitamin B2 is in general sufficient, even when no synthetic vitamin B2 is additional to feed.
- Vitamin B2 deficiency can occur even when feeding additional synthetic vitamin B2. This might be explained by the low quality of added vitamin B2 or by improper feed storage and thus vitamin B2 quality loss.
- The application of whey as feed cannot always prevent vitamin B2 deficiency in fattened swine.

Our overall conclusion is that the addition of synthetic vitamin B2 to swine feed can be dismissed. Vitamin B2 content of feed can be heightened with other additives, such as milk, whey, milk powder or whey powder. It is unlikely that negative health risks due to vitamin B2 deficiency would occur in case of fattened swine production.

However, this might not be the case for breeding animals, which have a longer lifetime and need a higher level of vitamin B2 supply during the upbringing of farrows. Here further research would be necessary.

Regarding the vitamin B2 feeding of poultry, no consequences can be drawn from this study.

### **Suggested experiments**

In order to decide whether the use of synthetic vitamin B2 could be substituted by natural feed components in organic agriculture new research experiments are needed. Currently no studies are available on this topic. Three experiments were suggested by FiBL in 2008 in order to scientifically substantiate the arguments for a natural vitamin B2 substitution.

Experiment 1: Analysis of vitamin B2 purveyance of swine on organic farms using different feeds.

Experiment 2: Quantitative experiments with different alternative vitamin sources (yeast, whey) for swine

Experiment 3: Quantitative experiment with different alternative vitamin sources (yeast, whey) for laying hens

### **Suggested future activities**

- Discussions should be started in the IFOAM EU Group or in national associations in Germany, Austria and Switzerland about a common strategy regarding vitamin B2 purveyance.
- Producers should be once again surveyed regarding the supply and the quality of vitamin B2 on the market. Accuracy of non-GMO declarations should be verified.
- Discussions should be started with feed producers on the supply of vitamin B2. Further experiments with breeding swine should be planned in cooperation with feed producers. The fact that despite a vitamin B2 addition, deficiency could occur in animals has to be discussed.
- The method of blood analysis by swine needs to be tested for poultry. Subsequently, vitamin B2 purveyance should be research for poultry.

## **5. Sources**

OEHEN, Bernadette und FRÜH, Barbara 2008: Alternativen zum Einsatz von synthetischem Vitamin B2 oder Vitamin B2 aus GVO Derivaten. Forschungsinstitut für biologischen Landbau (FiBL), Frick.

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