# EXPERIMENT ON B-CAROTENE EFFECT IN SOW FERTILITY

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## Introduction

In order to see if β-carotene, in any form, influences sow fertility, the present experiment was done. The experiment hypothesis considered that consistent doses of β-carotene added to the diets containing recommended doses of vitamin A can increase sow fertility if the pigment is transformed in vitamin A or acts by itself in this direction.

## Materials & methods

To have as high as possible homogeneity of the experimental and control groups sows of the same breed (Large White) and with only one farrow were used. In experiment were included sows giving birth to a number of piglets equal with average number of the first parturient sow in the herd or ± 1piglet. One group of sows was formed out of 30 heads to have a better accuracy of the data.

Sows were fed, during lactation, on dry combined feed resulted from a mixture of (in %) 67.0 ground maize, 8.0 ground barley, 5.3 wheat bran, 10.0 Soya bean meal extracted, 5.0 sunflower meal extracted, 3.0 fish meal, 0.7 salt and 1.0 premix containing vitamins and minerals. Sows received 4 kg of feed per day containing 10000 IU of vitamin A. per kg of food. Sows were fed 2,5 kg of feed per day containing 7500 IU vitamin A per kg of food. Thus sows in control group received per head and per day 40000 IU vitamin A when lactating and 18 750 IU after weaning.

The first experimental group received the same diet and the same amount of feed as the control group. In addition sows of this group received 400 mg of β-carotene per day 5 days before weaning and 10 days after weaning.

The second experimental group had undertaken the same treatment but in addition sows of this group received 200 mg β-carotene daily for the next 18 days after. All the sows were fed individually along all the experiment in order to control the quantity of the ingested food and β-carotene. In the day of weaning sows were not fed. There was necessary to have 9 extractions of sows till the experimental and the control groups were formed. Sows group completing is presented in the table 1.

As it can be seen from the table 6 sows included in experiment were excluded or lost during experiment. This fact didn't create significant differences between experimental groups concerning average prolificity.

Table 1. Completion of experimental groups in β-carotene experiment

| Series | Data of giving β-carotene | Weaning data | 1st experimental group | | | 2nd experimental group | | | Control group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. of sows | No. of piglets | Mean prolif. | No. of sows | No. of piglets | Mean prolif. | No. of sows | No. of piglets | Mean prolif. |
| 1 | 20 IX | 25 IX | 4 | 36 | 9.00 | 4 | 37 | 9.25 | 4 | 36 | 9.00 |
| 2 | 29 IX | 4 X | 4 | 38 | 9.50 | 4 | 39 | 9.75 | 4 | 38 | 9.50 |
| 3 | 4 X | 9 X | 3 | 28 | 9.33 | 3 | 28 | 9.33 | 3 | 28 | 9.33 |
| 4 | 18 X | 23 X | 3 | 28 | 9.33 | 5 | 46 | 9.20 | 3 | 27 | 9.00 |
| 5 | 25 X | 30 X | 3 | 28 | 9.33 | 4 | 37 | 9.25 | 4 | 37 | 9.25 |
| 6 | 3 XI | 8 XI | 5 | 46 | 9.20 | 4 | 36 | 9.00 | 4 | 36 | 9.00 |
| 7 | 15 XI | 20 XI | 6 | 56 | 9.33 | 5 | 47 | 9.40 | 4 | 38 | 9.50 |
| 8 | 23 XI | 28 XI | 3 | 31 | 10.33 | 4 | 40 | 10.00 | 5 | 51 | 10.20 |
| 9 | 1 XII | 6 XII | 4 | 39 | 9.75 | 4 | 38 | 9.50 | 4 | 38 | 9.50 |
| Total | | - | 35 | 330 | 9.43 | 37 | 348 | 9.41 | 35 | 329 | 9.40 |
| Lost | | - | 0 | 0 | - | 4 | 39 | - | 2 | 21 | - |
| Final | | - | 35 | 330 | 9.43 | 33 | 309 | 9.36 | 33 | 308 | 9.33 |

**Results**

The first phenomenon registered in the experiment was coming in heat after estrus. Results are presented in the table 2.

Table 2.Coming in heat of sows after weaning

| Exper. group | Total number of sows | Coming in heat of sows after weaning | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | In 1st cycle (2 – 13 days) | | | In 2nd cycle (14 – 35 days) | | | In overall period | | |
| | | sows | % | days | Sows | % | days | Sows | % | days |
| 1st | 35 | 23 | 65.71 | 6.0 | 12 | 34.29 | 24.8 | 35 | 100.0 | 12.1 |
| 2nd | 33 | 25 | 75.75 | 6.3 | 8 | 24.25 | 25.0 | 33 | 100.0 | 10.3 |
| Control | 33 | 26 | 78.78 | 7.2 | 7 | 21.22 | 28.1 | 33 | 100.0 | 12.4 |
| Total | 101 | 74 | 73.27 | 6.4 | 27 | 26.73 | 25.7 | 101 | 100.0 | 11.5 |

First heat after weaning appeared within 6 – 7 days. Adding β-carotene in the diet didn't help estrus to appear. If we deduce 6.4 days, the mean interval for estrus appearance of the first cycle from 25.7 days, the interval for estrus appearance of the second cycle we obtain 19.3 days a close value to the length of estrus cycle in swine. Since 100 % of sows entered heat in the first 35 days after weaning feeding is not involved in dilated mating. In case we accept that feeble heat intensity caused the dilated mating it is very clear that β-carotene doesn't help heat intensity.

The main reproduction indices registered after the first insemination in this experiment are presented in the table 3. Later data weren't considered relevant for β-carotene action.

The conception rate (pregnant sows) after the first mating including both estrus cycle, but no return in heat sows, is very high. There is no need for statistical demonstration of difference significance. Values in the table are too closed for that. We may say the vitamin A content of the diet used in control group feeding is satisfactory for a good fertilization of sows. If it is not so we must say β-carotene has no action in sow fertilization, or sows can't use it, as vitamin A precursor.

Table 3. Reproduction indices of sows in experiment

| Indices | 1st experimental group | | 2nd experimental Group | | Control group | | Total sows in experiment | |
|---|---|---|---|---|---|---|---|---|
| | Heads | % | Heads | % | Heads | % | Heads | % |
| No. of sows-initial | 35 | 100.0 | 37 | 100.0 | 35 | 100.0 | 107 | 100.0 |
| Eliminated sows | 0 | - | 4 | 10.8 | 2 | 5.7 | 6 | 5.6 |
| No. of sows-final | 35 | 100.0 | 33 | 100.0 | 33 | 100.0 | 101 | 100.0 |
| Sows mated | 35 | 100.0 | 33 | 100.0 | 33 | 100.0 | 101 | 100.0 |
| Pregnant | 30 | 85.7 | 28 | 84.8 | 28 | 84.8 | 86 | 85.2 |
| Abortions | 1 | 2.9 | 0 | - | 2 | 6.1 | 3 | 3.0 |
| Returns in heat | 5 | 14.3 | 5 | 15.2 | 5 | 15.2 | 15 | 14.8 |
| Sows giving birth | 29 | 82.9 | 28 | 84.8 | 26 | 78.8 | 83 | 82.2 |

Abortions have been produced accidentally. The 15 sows that return in heat were mated again. Two of them, one from the former second experimental group and one from the former control group did not conceive after three mates and have been slaughtered. Thus 4 sows out of 107 presented infertilty (2 sows were eliminated in the first part of the experiment for uterine infection).

Data concerning prolificity (total number of born piglets) are presented and statistically analyzed in the table 4. The last index considered was the live born piglets per farrow. Data concerning live piglets are presented in the table 5.

As it can be seen in the table β-carotene supplement didn't influence the prolificity of the sows. At the same time the coefficient of variability was rather high in all three groups of sows denoting the presence of some uncontrolled factors' action.The number of live born piglets after the first mating of sows in experiment is presented in the table 5.

Number of live born piglets has been not influenced by β-carotene supplement, as well. Neither short term nor long term of β-carotene administration has effect in stimulating prolificity or viability of the piglets born. Still birth in piglets measured 9.52% in the group receiving β-carotene for 15 days, 10.91% in the group of sows receiving β-carotene for 33 days and 9.98% in the control group, which did no receive any β-carotene supplement.

Table 4. Prolificity at the first mating after weaning in experimental and control groups

| Statistics | Groups in experiment | | | Total sows |
|---|---|---|---|---|
| | 1st | 2nd | Control | |
| Number of sows (n) | 29 | 28 | 26 | 83 |
| Total number of born piglets (Σx) | 338 | 321 | 302 | 961 |
| Mean number of born piglets ($\bar{x}$) | 11.66 | 11.46 | 11.62 | 11.58 |
| Sum of squares ($\Sigma x^2$) | 4106 | 3811 | 3754 | 11671 |
| Variance ($s^2$) | 5.91 | 4.78 | 9.47 | 6.52 |
| Standard deviation (s) | 2.43 | 2.19 | 3.07 | 2.55 |
| Standard error of mean ($s_x$) | 0.45 | 0.41 | 0.60 | 0.28 |
| Variation coefficient (V %) | 20.84 | 19.11 | 7.07 | 22.02 |
| Difference of means<br>Significance of differences | $\bar{x}_1 - \bar{x}_c = o.o4$<br>t=0.05<br>no significance | $\bar{x}_2 - \bar{x}_c = -o.12$<br>t=o.16<br>no significance | | |

Table 5. Number of live born piglets after the first mating of sows in experiment

| Statistics | | | | Total sows |
|---|---|---|---|---|
| | | | | |
| Number of parturient sows {n) | 29 | 28 | 26 | 83 |
| Number of live piglets born (Σx) | 305 | 286 | 272 | 863 |
| Mean number of live piglets ($\bar{x}$) | 10.52 | 10.21 | 10.46 | 10.40 |
| Sum of squares ($\Sigma x^2$) | 3393 | 3076 | 2998 | 9467 |
| Variance ($s^2$) | 6.3296 | 5.6129 | 5.2896 | 6.023 |
| Standard deviation (s) | 2.516 | 2.369 | 2.428 | 2.454 |
| Standard error of mean ($s_x$) | 0.466 | 0.452 | 0.476 | 0.269 |
| Coefficient of variation (V %) | 23.86 | 23.95 | 23.21 | 23.59 |
| Differences of means<br>Significance of differences | $\bar{x}_1 - \bar{x}_c = 0.06$<br>t=0.092 no significance | $\bar{x}_2 - \bar{x}_c = -0.25$<br>t=0.397<br>no significance | | |

## Conclusion

At the end of this experiment it is seen that no reproduction index was significantly modified after adding a representative supplement of β-carotene to a diet containing 10000 IU vitamin A per kg of food during lactation and 7500 IU vitamin A per kg of food after weaning. That means first of all that these doses of vitamins are good enough for feeding breeding sows. The second conclusion is that pigs are not able to transform β- carotene into vitamin A. High loses caused by still birth were registered but they are not related to the doses of vitamin A used in the diets of sows in experiment.

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