Influence of treated water (BioQuel®) in piglet breeding

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Antibiotic performance enhancers in the critical weaning phase can simply no longer be made attractive for consumers. In the search for adequate alternatives, feed additives of all kinds have been applied. In recent years discussion on the quality of water as well has risen again. It has long been known that poor water quality has a negative influence on animal health.

However, water as a source of healing is a new approach in animal nutrition, despite the fact that it is highly regarded worldwide in health spas. Following positive experience reports from large-scale livestock farms in Canada, the Federal Research Station conducted an experiment with treated water in cooperation with the firm BioQuel (www.bioquel.com).

Weaning stress frequently settles on the animals' stomach in the literal sense of the word and often ends in strong attacks of diarrhoea. The bacteria from the group of coliform germs have a not inconsiderable influence on the diarrhoea history.
Representatives of Escherichia Coli also belong to this bacteria group that is feared in piglet rearing. Under adverse conditions, for example during weaning, certain strains of this otherwise quite normal intestinal inhabitant can lead to Coli enterotoxaemia etc. and cause major economic damage. The main infection path is oral intake of these bacteria, whereby the drinker water plays a crucial role.

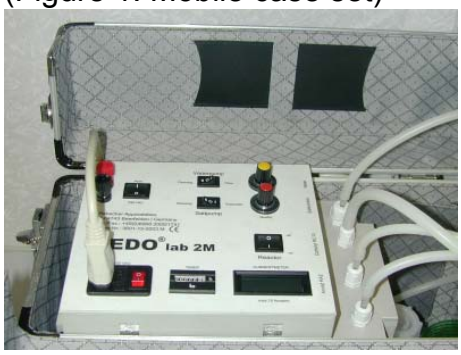
Conceivable reasons why drinker water may be contaminated are

- soiling of the water due to the drinker technology, e.g. through soiled drinker bowls, or
- the water already contains disease-producing germs from the start.

The second point applies above all for farms with their own wells. A frequently encountered procedure for water treatment is to add an acid. Often, however, this calls for replacement of existing piping systems as the acid additive can attack the material.

The firm BioQuel from Switzerland has struck out along another avenue and reverts to the familiar method of electrolysis. In this procedure water is conditioned electrolytically and activated with the aid of simple common salt. In addition to electricity and water connections, saturated common salt solution is also needed to operate the device. It is automatically fed into the liquid. These liquids are produced in a special diaphragmatic reactor developed by BioQuel GmbH in which an electrochemical process takes place.

(Figure 1: Mobile case set)



Fixed installations are available for larger units.

The device contains two electrodes separated from one another by a diaphragm. In an electrolytic process, the common salt solution added is broken down into positively charged sodium ions (Na^+) and negatively charged chloride ions (Cl^-). In accordance with their charge, the ions wander to the electrodes with an opposite charge and form new products of reaction with the water. From the chloride they form "hypochlorous acid" (HOCl), the disinfectant agent that BioQuel calls "AnoQuel". At the cathode caustic soda (product name CathoQuel) develops and can be used for cleaning work. The products gained by the electrochemical process are largely metastable, in other words they degrade themselves in time. For our experiment we used the BioQuel case set that was in operation for one hour a day and produced fresh disinfecting and cleaning agents each time.

In addition to these products, according to the manufacturer further compounds containing oxygen, such as e.g. ozone are produced. These forms of oxygen in addition to atmospheric oxygen are said to stimulate metabolism and lead to more vital animals. Depending on the purpose of use, it is possible to add acid, lye or a mixture of both to the drinker water at a rate of 1.5 – 3%. In order to avoid any detachments in the water line, it was agreed after consultation with the manufacturer that the product should be dosed for this experiment as a virtually neutral solution (the pH value was 6.88 on average) with the recommended maximum dose of 3% (on average 2.8%). Figure 2

The function of the membrane pump was checked by volumetric measurement.

The oxygen contents and pH values in the drinker water measured at the drinker nipples do not differ. The chlorine contents in the activated water were extremely elevated (on average 3.3 mg/ L) compared with zero in "normal" water. This chlorine content was evident already from the odour of the water in the drinker. For reasons of cost it was decided not to examine the water for ozone. The Federal Research Station Forchheim is connected to the water network of the City of Karlsruhe so that the animals can be supplied with drinking water.

Figure 2: Membrane pump

Experimental structure:

At the Federal Research Station in Forchheim the question of whether piglets supplied with such water can achieve better performance than comparison animals provided with normal water was investigated.

The experimental location was a piggery with outdoor climate with two compartments each for 40 piglets, and heatable piglet beds (sketch). There are three drinkers and materials for the animals to occupy themselves with in the yard area of each compartment. The floor in the boxes is paved flat, insulated and temperature controlled. The floor in the yard area consists of fully perforated Tenderfoot.

Sketch:

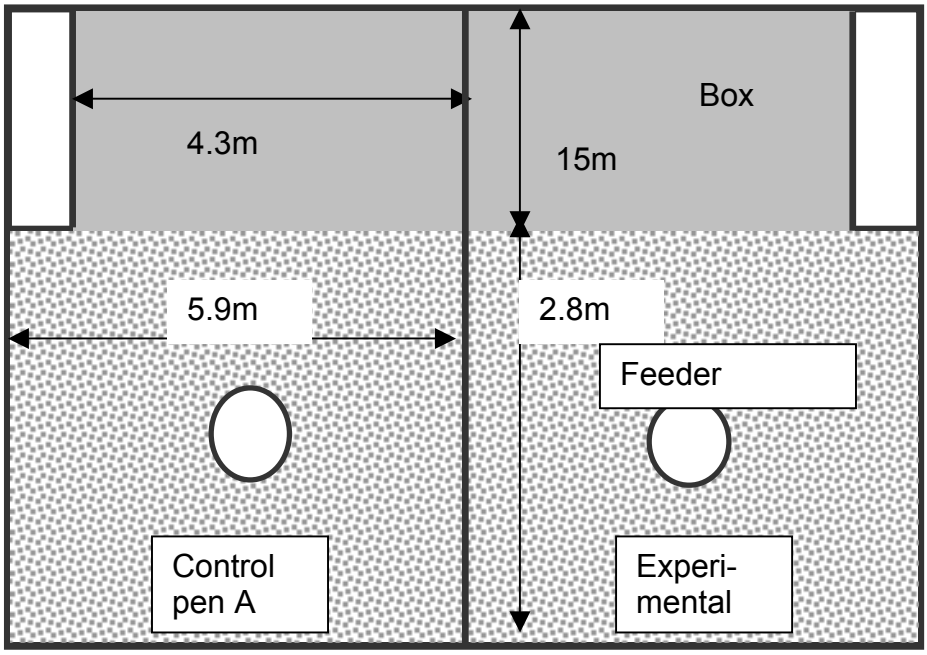


Figure 3:
Box pen with piped mash feeder:

Altogether 160 Baden-Württemberg hybrid piglets (Pix(LWxDL)), divided into 2 treatment groups (control group A and experimental group B) were examined. The piglets were housed in mixed gender groups with a balanced gender ratio. The animal weight on intake was on average 9.8 kg.
Animal losses were encouragingly low. Only one animal from the experimental group was eliminated from the experiment prematurely. The piglet rearing phase in Forchheim extends over 40 days.
The animals were fed ad libitum using piped mash feeders, but for experimental reasons these were run as dry feeders. The feeding scheme followed the standard Forchheim method with customary farm feed mixes.

Feeding scheme:

Suckling phase up to day 2:	Piglet muesli
Day 3 - 4:	Piglet muesli + weaner feed
Day 5 - 11:	Piglet rearing feed I
Day 12 - 13:	Piglet rearing feed I and II blended
Day 14 - 40:	Piglet rearing feed II

Results:
After conversion to piglet rearing feed II, the animals were subjected to intermediate weighing after 14 days.

The results of the 40-day rearing phase are shown in Table 1.

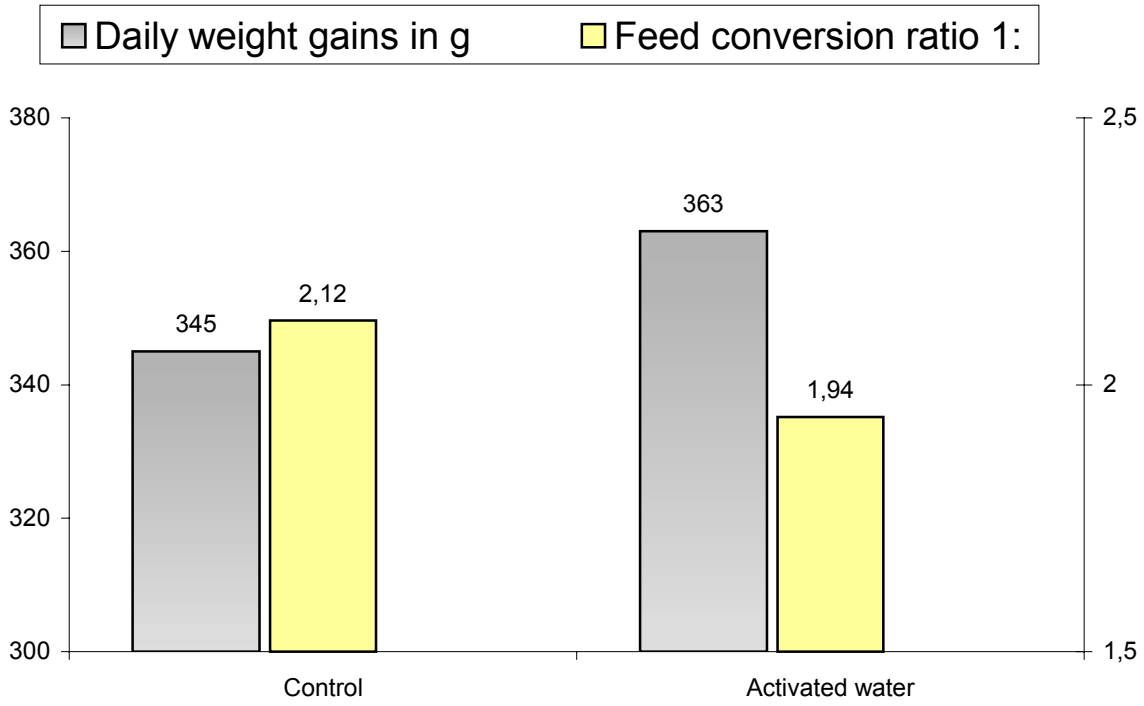
Table1: Biological performance

Designation	**Control** **A**	***Activated water*** ***B***
Evaluated piglet	**80**	***79***
Average initial weight kg **SA**	**9.9** **0.9**	***9.8*** ***0.9***
Average final weight kg **SA**	**23.7** **3.7**	***24.3*** ***3.1***
Average weight increase kg **SA**	**13.8** **3.3**	***14.5*** ***2.9***
Average daily weight gain g **SA**	**345.1** **82.1**	***363.2*** ***71.8***
Average feed consumption d/kg **SA**	**27.8** **1.2**	***27.2*** ***0.5***
Average feed conversion rate 1: **SA**	**2.12** **0.47**	***1.94*** ***0.38***
Average feed TuT kg **SA**	**0.70** **0.03**	***0.68*** ***0.01***

Under the same starting conditions characterised by the same age and weight, the animals supplied with activated water gained almost 18 g more weight per day than the piglets in the control group. **The animals supplied with activated water were 0.6 kg heavier at the end of the 40-day rearing period than the pigs in the control group.** The total feed consumption in the experimental group was significantly lower by 0.6 kg than in the control group. The higher daily weight gains of the experimental group were coupled with a better feed conversion rate (1:1.94, control group 1:2.12).

The graphics show a comparison of the daily weight gains and feed conversion rates of the two groups as the most important biological performance parameters.

Graph 1: Daily weight gains and feed conversion rate



In Table 2 the performance of the different groups is compared.

Table 2:		
Relative view of the performance achieved in %	A Control	B Activated water
Average total weight gain	100%	***105%***
Average feed consumption per animal	100%	***97%***
Average feed conversion rate	100%	***109%***

The animals supplied with activated water achieved a higher weight gain at lower feed consumption.

With the feed costs per animal there is hardly any advantage for the experimental group, but if the feed costs are compared with the increase in body substance the picture becomes more distinct.

Table 3:		
Relative view of feed costs in %	A Control	***B Activated water***
Feed costs per piglet	100%	***99%***
Feed costs per kg weight gain	100%	***94%***

The feed costs per kg weight gain for the experimental group are six per cent above those of the control group, taking into account the extra costs for the product BioQuel. As the compartments regrettably did not have calibrated water meters, the water consumption per animal was calculated, leading to a cost burden of euro 6 per animal in the experimental group.

Cost reduction using large-scale systems:

A stationary system from BioQuel can produce approx. 40 litres of product per hour and just under 1000 litres of product per day. According to the information supplied by the manufacturer, the investment costs are around Francs 20,000 depending on the model and accessories (currently equivalent to just under euro 13,000). Adding a dose of three per cent to the drinker water could thus activate some 33,000 litres of drinker water per day. The manufacturer quantifies the costs per litre of finished product at approx. euro 0.03 including amortisation.

Conclusion:

This experiment was conducted under ideal conditions (housing/drinkers and healthy animals). That is why the values recorded show an admittedly slight difference by comparison with our healthy reference group. However, we achieved this optimisation by adding only approx. 2% activated water.

The performances of the weaner piglets were impaired by Circo viruses. However the positive effects on the BioQuel group are clear. Questions arise regarding the costs of investment and maintenance. It is not easy to determine the cost / benefit effect here. As already mentioned, the procurement costs of the installation are euro 13,000. In addition to purchasing salt, the operating costs also include spending on the regenerating salt for the water softener. The fluids produced by the device can also be used elsewhere on the farm, for example caustic soda for cleaning. In this way it is not necessary to buy these inputs at all, or at any rate in such quantities. Examinations by impartial laboratories show that the system is suitable for water treatment.

For further information, on other animal species too, contact your local dealer or call:

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