Humens

Feed additives for animal nutrition

Bicarbonate Feed
Novafeed
Sodafeed

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Cattle nutrition

Novacarb and Novabay produce sodium bicarbonate which has been shown to have several benefits for cattle:

- Positive impact on feed consumption and milk production
- Sodium intake
- Anti-acidosis
- Optimal dietary electrolyte balance

Humens has also developed a new product — Novafeed. Novafeed is a buffer compound suitable for cattle feed that can effectively replace sodium bicarbonate without changing the ration formulation. Novafeed SA, an aromatized grade of this product, is also available. Two field assessments of Novafeed and Novafeed SA were performed in 2014 and 2015 by European ruminant nutrition experts. The aim was to compare the two products to standard sodium bicarbonate (Bicarbonate Feed) in terms of palatability, feed consumption and performance (milk production) with high-producing dairy cows.

Two proven solutions to prevent acidosis in dairy cows have been found.

The study found that the use of Novafeed and Novafeed SA in feed rations yielded results that were equal to or better than standard sodium bicarbonate.

• Field results

	BICARBONATE FEED	NOVAFEED / NOVAFEED SA
Customer satisfaction	Easy to use, storage in a cool, dry place	Easy to use, storage in a cool, dry place In a survey of 100 breeders, 100% were satisfied and 95% would recommend Novafeed SA
Milk production	Optimal	Optimal
DCAD*	+11,700 mEq/kg dry Bicarbonate Feed	+11,900 mEq/kg dry Novafeed
Buffer capacity (pH=6)	8,800 mEq/kg (in vitro, pH=6) ruminal pH with sub-acidosis periods (pH< 6 about 8hr./day, bolus in vivo)	9,300 mEq/kg (in vitro, pH=6) **No sub-acidosis period (bolus in vivo)**
Sodium content	27.2%	27.4%
Palatability / Feed consumption	-	Equal or superior **+10% feed consumption**

**DCAD: Dietary Cation-Anion Difference*

Recommandation:

DCAD = 300-350 mEq/kg (feed)

1% $NaHCO_3$ in dry matter

In case of heat stress: 250-400 g $NaHCO_3$/cow/day during heat stress and for the following 10 days

Pig nutrition

Sodium bicarbonate has several benefits for swine:

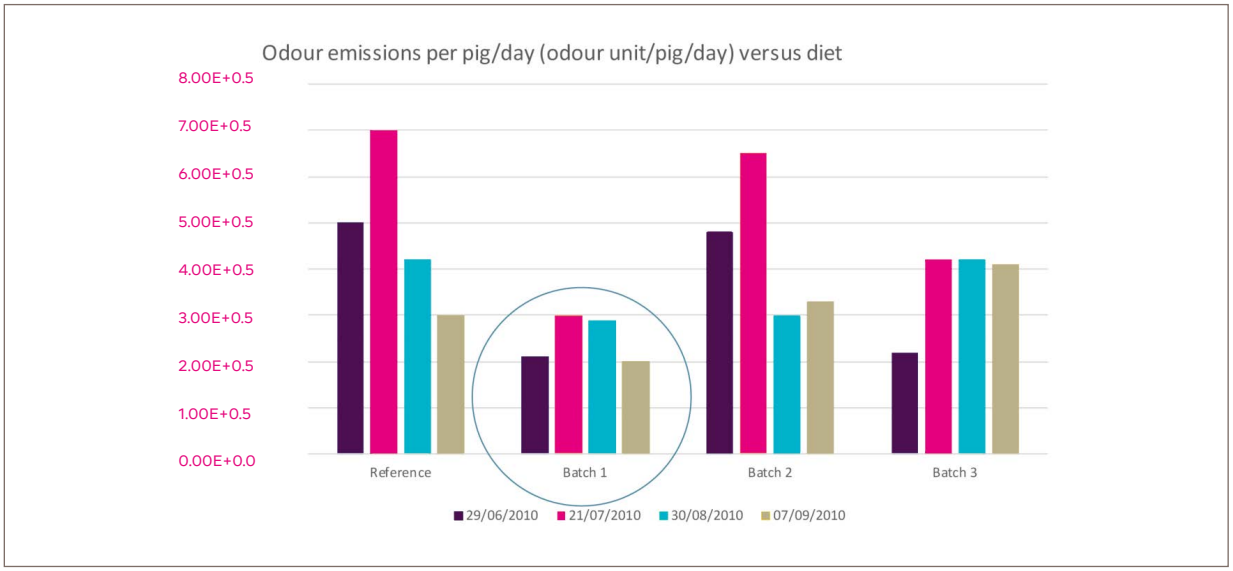
- Improved Daily Weight Growth (DWG)
- Improved Feed Consumption Ratio (FCR)
- Reduced odour emissions

Humens performed a field study comparing improvements in DWG and FCR, and reductions in odour emissions.
The objective of this study was to examine four diets that differed in terms of their salt content to compare zootechnical and environmental performance. The study focused on four batches comprising 40 growing finishing pigs each.
The diet was fed ad libitum with two types of rations (biphase feeding) composed of wheat, barley and soymeal:

- A grower diet provided from the start of the fattening stage until about 65 kg live weight (LW)
- A finisher diet

One diet per batch
Reference: 4.5 kg of salt/T of feed

- Batch 1: 1 kg of salt and 5 kg of bicarbonate/T of feed
- Batch 2: 1 kg of salt and 4.3 kg of sodium sulphate/T of feed
- Batch 3: 1 kg of salt, 2.3 kg of bicarbonate and 2.3 kg of sodium sulphate/T of feed



• Zootechnical performance

entering fattening stage: 28.0 +/- 1.4kg
Good performance for bicarbonate feed

- +2% average weight after 97 days
- -1% feed consumption
- Synergy with addition of sodium sulphate

• Environmental parameters

Identical ambient temperature, hygrometry and ventilation. Odour emissions decrease significantly when bicarbonate feed is present.

Poultry nutrition

Sodium bicarbonate produced by Novacarb and Novabay is known to have many benefits for poultry:

- Positive impact on feed intake
- Increased feed to weight ratio
- Better laying performances and eggshell quality
- Sodium intake
- Optimal dietary electrolyte balance

Good nutrition is the determining factor for bird performance, and this is also the greatest production cost.
Most diets contain corn for energy, soybean meal for protein, and vitamin and mineral supplements. Since protein is generally one of the most expensive feed ingredients, the industry uses targeted rations, reducing the amount of protein and increasing the amount of grains. This negatively impacts dietary electrolyte balance (DEB). Potassium (K^+) requirements are largely covered by the diet, so Na^+ and Cl^- are the main focus.

What is DEB ?
Sodium and chloride are extremely important for animal metabolism due to the role they play in regulating cellular osmotic pressure and acid base equilibrium (linked to blood pH). DEB is calculated by finding the difference between ingested and excreted ions, specifically Na^+, Cl^- and K^+.

• Impact on DEB

SODIUM DEFICIENCY	SODIUM SURPLUS	CHLORIDE DEFICIENCY	CHLORIDE SURPLUS
Decreased: • feed intake • weight gain • laying performance	Decreased: • performance • carcass quality	Decreased: • weight gain	Decreased: • feed consumption • growth • laying performance
-	Increased: • water consumption (=wet litters)	Increased: • mortality • risk of tetany	-

Sodium bicarbonate and Novafeed: effective at supplying minerals
Impact on DEB:
$NaHCO_3$ and Novafeed: sodium content around 27%
10g $NaHCO_3$ or Novafeed/kg feed corresponds to 120 mEq/kg feed
Buffer effect; supplies HCO_3^-

Recommendation:
DEB = 250-300 mEq/kg (feed)
Replacing half of the sodium supplied NaCl by $NaHCO_3$ = 3g $NaHCO_3$/kg feed,
In the event of heat : 4-5 g $NaHCO_3$/kg feed

Aquaculture

Ammonia must remain below toxic levels, but fish produce ammonia as a waste product. A nitrification process performed by bacteria is required to transform ammonia into nitrate. The drawback is that this produces acid and decreases the pH in water. This acid production inhibits bacterial function, including nitrification. When this occurs, ammonia accumulates to the point where the appetite and feeding responses of the fish are curtailed. This limits the daily feeding rate, feed conversion efficiency, and ultimately, yield. Furthermore, shrimp and fish are very sensitive to pH and there is a high risk of mortality if the pH < 7.

Bicarbonate Feed as pH buffer

Water pH can be adjusted with regular additions of sodium bicarbonate.
Recommendation: 0.25 kg sodium bicarbonate/kg feed
Sodium bicarbonate is not classified as a corrosive, unlike other reactants such as lime. In addition, sodium bicarbonate controls pH better than lime.

An extensive range of animal nutrition products

$NaHCO_3$ (EU Reg n°68/2013) is classified as a feed additive. $NaHCO_3$ is approved for use in organic farming (EU Reg n°2018/848) and is used by producers of animal feed and vitamin and mineral supplements as an additive in animal rations.

3 Buffer minerals

- Bicarbonate Feed
- Novafeed
- Novafeed SA

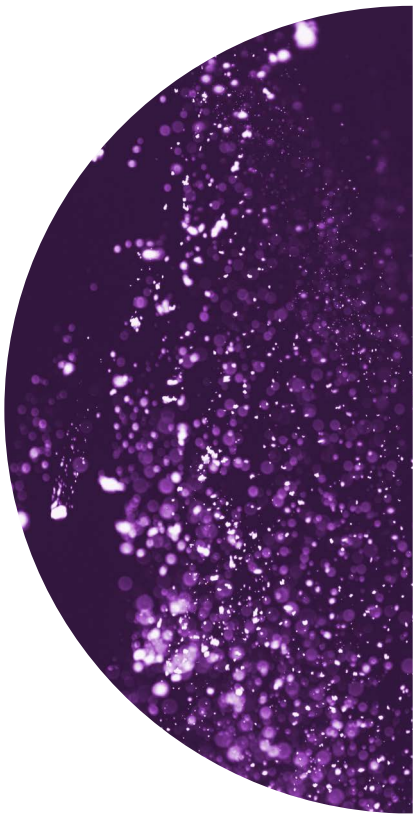
1 Basic mineral

- Sodafeed

GRADE	PLANT	AVERAGE DIAMETER (d50 in µm)	SODIUM BICARBONATE ($NaHCO_3$) (%)	SODIUM CONTENT (%)
Bicarbonate Feed P	Novacarb	55	≥ 99.0	27.2
Bicarbonate Feed N	Novacarb	130	≥ 99.0	27.2
Bicarbonate Feed (Granular)	Novacarb	550	≥ 99.0	27.2
Novafeed*	Novacarb	80	>82.0	27.4
Novafeed SA* (aromatized grade)	Novacarb	80	>82.0	27.4
Sodafeed* (sodium carbonate)	Novacarb	500	-	43.2
Bicarbonate Feed	Novabay	≥ 120	≥ 99.0	27.2

**only available in Europe*

Humens
the purity makers



Our company

Historical know-how

Humens produces sodium-based mineral compounds. Our company has a production history that goes back more than 160 years at our La Madeleine plant in Laneuveville-devant-Nancy, France. Our products are made from two high purity natural mineral raw materials extracted in the Lorraine region: limestone from our Pagny-sur-Meuse quarry and salt from our Lenoncourt salt field. From local to global player, Humens set up a greenfield sodium bicarbonate unit in Singapore in 2016.

Shared goal for product quality

Humens is a state-of-the-art company with 400 skilled and committed employees. We have been passionate about products purity and satisfying our customers' needs since our industrial activities were launched in 1855.

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