

## URBAN FARMER MACRO SOLUTIONS

### MACRO PREMIXES AND VITAMINS

An Urban Farmer Macro Solution includes the provision of analytical services, the design and formulation of feeds, the manufacture and supply of customized macro premixes, as well as ongoing monitoring and support of the solution. The Solution brings together the knowledge and products of the world's leading animal nutrition and animal health companies and makes them accessible to the farmer.

#### MACRO PREMIXES AND VITAMINS

An Urban Farmer macro premix is a complimentary feed additive, consisting of vitamins, minerals, trace elements, amino acids, enzymes and non-nutritive ingredients on a limestone carrier. Urban Farmer engages the world's leading premix companies to blend its macros premixes and only uses the highest quality ingredients. The vitamins employed are included at the correct levels for their intended purpose and are selected based on their stability, bioavailability, mixability and safe handling characteristics.

#### WHAT ARE VITAMINS?

Vitamins are organic compounds that are required in small amounts by animals for normal growth and maintenance of life. Vitamins are not building blocks or energy-yielding compounds such as amino acids or carbohydrates; they are nutrients that are involved in the metabolic pathways within the animal's cells. This group of organic compounds was first discovered in 1912 by Dr Casimir Funk. Since then, at least 14 different vitamins have been identified and are accepted as being "vital" for growth and survival. Vitamins are consumed daily via an animal's feed, and sometimes through its drinking water. Vitamin deficiencies in the feed will manifest as specific diseases, or in subclinical cases as depressed performance.

Vitamins can be divided into two main groups: fat-soluble vitamins (Vitamins A, D, E and K) and water-soluble (B-vitamins and Vitamin C). The B-vitamins are absorbed quickly via the gastrointestinal tract and are widely distributed in the various tissues throughout the body. Because these vitamins are water soluble, they are not efficiently stored in the body and need to be consumed daily to avoid deficiencies. Conversely, fat-soluble vitamins are more easily stored, typically in fatty organs such as the liver, but these vitamins are also more susceptible to degradation.

Some naturally occurring compounds found in the animal's diet only function as vitamins after undergoing a chemical change; such compounds, which include  $\beta$ -carotene and certain sterols, are described as provitamins or vitamin precursors.

#### VITAMIN REQUIREMENTS

The vitamin requirements for different animals vary and levels are informed by the species, the phase of production and the desired level of performance. These levels are well researched and are published as supplementation guidelines. Typically, an animal only needs milligrams of any one vitamin per day; for example, the Vitamin B1 (thiamin) requirement of a 50 kg pig is only 3 mg/day. Some vitamins are added at higher than prescribed levels in order to optimize the performance of the animal, or to enhance the quality of the animal product, e.g. "enriched" table eggs.

## VITAMIN STABILITY AND BIOAVAILABILITY

Vitamins are susceptible to degradation through a chemical reaction with oxygen called oxidation. Once oxidized they are no longer functional. Oxidation of vitamins can be accelerated by heat, moisture and light, and in the presence of certain metals such as iron. Companies responsible for manufacturing vitamins have developed specific technologies to protect their vitamins against oxidation. Generally, two basic technologies are utilized: chemical modification of the vitamin molecule and physical protection of the molecule.

Chemical modification is applied to the fat-soluble vitamins and involves esterification of the reactive hydroxyl group. Physical protection, as its name suggests, is a process of creating a physical barrier, or coating, to protect the vitamin against oxygen, heat, moisture or light. Antioxidants may also be included in the final product form for added protection.

Importantly, the chemical and / or physical protection of the vitamin should not interfere with its bioavailability to the animal. Often, the product formulation for a specific vitamin will differ between companies due to patents and proprietary techniques; hence, not all vitamins are equally protected, nor equally bioavailable.

## VITAMIN PREMIXES

While vitamins do occur naturally in the raw materials fed to animals, generally the contribution of these natural sources is considered variable and too unpredictable given the vital role of vitamins in growth and production. The vitamin needs of an animal are therefore addressed through the daily fortification of its feed, and sometimes its drinking water, using a premix.

Vitamins are pre-mixed with other essential ingredients such as trace minerals and amino acids to produce a pre-mixture on ingredients that will be added to a ton of feed at an inclusion rate of 500g to 20kg, depending on its composition. These ingredients are generally blended with an inert substance such as limestone which serves as a carrier for that premix. The carrier ensures that the unstable ingredients such as vitamins are physically buffered from each other minimising the risk of oxidation. It also assists to distribute all the ingredients homogeneously throughout the premix ensuring that these ingredients are ultimately evenly mixed throughout the final feed when added to the balance of the ingredients such as maize and soybean meal during the feed mixing process.

A good premix considers the particle size of the individual ingredients to ensure an even and wide distribution of the ingredient in the premix, and to guard against de-mixing or separation of the premix; a process that is more likely to occur with irregular particle sizes.

## URBAN FARMER MACRO SOLUTIONS – MACRO PREMIXES AND VITAMINS

Urban Farmer's team of qualified nutritionists formulate its macro premixes to meet the specific nutrient requirements of the target animal, its specific phase of production and its anticipated performance. The vitamins employed in its premixes are selected based on their stability, bioavailability, mixability and safe handling characteristics. Urban Farmer engages the world's leading premix companies to manufacture its premixes and only indicates validated best-before-dates on its products ensuring that what is stated on the label is in the bag, and ultimately reaches the animal through its feed.