

# 10 Things You Need to Know About Premixes

by DSM Nutritional Products



Approximately 80% of the pet food industry uses premixes in the production of their complete and balanced pet food products. A premix is a blend of micronutrients that are individually added to pet food in “micro” amounts. Combining these ingredients in a premix simplifies the weighing process and improves accuracy in mixing and distribution of these micronutrients throughout the food. But, if you think a premix is “just a blend”, think again.

Based on more than 50 years of experience producing micronutrients and premixes for the animal nutrition and health industries, here are the 10 most important things you need to know about premixes:

**1 Nutrient form quality** – Be it a vitamin, mineral, carotenoid, or other nutritionally active compound produced by either chemical synthesis, fermentation, or mined and milled, quality plays no less a role than any other food or feed ingredient. During production of these nutritional compounds there is a possible quality risk based on exposure to chemical solvents, unreacted intermediates, compounds produced by side-reactions, and the introduction of other contaminants. This is controlled by use of proper chemistry (not always producing the highest yield) and a strict incoming and outgoing quality control system. This should be the basis for selecting nutrient compound producers that are reputable and have brand equity to protect.

**2 Nutrient form potency** – Much depends on the potency of a nutrient form used in a premix. If the dietary requirements are low (e.g. biotin), proper distribution of the nutrient compound throughout the food product is dependent on a nutrient form that has a consistent amount of that nutrient in each particle. Simply diluting the nutrient compound with a carrier increases the risk of over or under fortification. Conversely, use of a high potency nutrient form may be necessary to avoid excessively diluting the other components in the premix ultimately negatively impacting the homogeneity of the blend.

**3 Nutrient form stability** – Many nutrient compounds react with their environment (e.g. oxygen, moisture) or other compounds in close proximity (e.g. metals, acids) which reduces their potency and/or forms undesirable compounds. Building a nutrient form to protect the nutrient compound is essential. Many form technologies can be used to stabilize nutrient compounds by controlling oxidation, minimizing contact with hostile compounds, or shield the compound from high heat processing. These technologies employ a variety of methods such as molecule appropriate antioxidants plus specialized carrier materials and processes designed to encapsulate small amounts of the nutrient compound in a matrix.

**4 Nutrient form physical characteristics** – producing a quality premix requires an understanding of particle dynamics. An example of how mixing different types of particles together can influence premix quality would be to place magnetized heavy metal balls in a bowl with the same size wooden balls. After mixing, the two types of balls would not be uniformly mixed together no matter how vigorous or long they were mixed. Particle size, shape, density, and electrostatic characteristics of each nutrient form play a huge role in how easy it is to create a homogenous mixture and how stable that mixture is through transport and application. To ensure a homogeneous mixture, the closer the particles are in physical characteristics – the better the mix. It is also important to avoid particle characteristics which contribute to electrostatic buildup to prevent separation in the premix.

**5 Carriers and other adjuncts** – Since nutrient forms will not be the same in size, shape, or density, carriers and other adjuncts can help bridge the gap. Carriers such as rice hulls and wheat middling provide a large surface area or pockets for the nutrient forms to adhere. Mineral oil helps the particles stick to the surface of the carrier and holds down fine particles that can produce dust. Calcium carbonate is used to increase the bulk density of the premix and improves flowability.

**6 Mixing equipment and procedure** – There are many types of dry blending equipment. Each type is designed to impart a particular mechanical action depending on the purpose. For micronutrient premixes, the focus is on low shear and interlacing particle flow to generate a homogenous mixture in the least amount of time. This not only improves production efficiency, but also promotes nutrient integrity by limiting the wear and tear of the mixing process on the various nutrient product forms. Using the proper mixing equipment and procedures help to ensure a homogeneous and stable premix. Carryover from one premix batch to the next, is another concern in a premix production facility. Carryover is minimized through line isolation, sequencing, system flushes, and wash down protocols.

**7 Premix formulation and use rate** – Like building a quality finished pet product - formulation is key. Formulating a vitamin concentrate premix, vitamin and trace mineral premix, or complete blend requires careful consideration. Beginning with a target nutrient requirement for the finished pet food product, experienced formulators understand how all these points affect premix quality. They must also account for the intended use and required shelf life of the pet food product. The intended use drives the nutrient form and carrier selection, nutrient overages, and use rate unless dictated.

**8 Quality program** – In any production operation, a strong quality program is needed to ensure ongoing success. During routine premix operations it is necessary to have proper weighment controls, inventory monitoring systems, and control sample checks, to identify non-conformities before the premix is approved for shipping. Monitoring programs to routinely measure homogeneity, formulation accuracy, and carryover are necessary and require careful consideration and planning. This encompasses choosing the nutrients to test and the frequency of testing, ensuring collection of representative samples, determining appropriate analytical methods to ensure accurate measurement of the active compounds, and understanding all the variances associated with each element of the program.

**9 Handling of premixes** – Even after a premix is produced, premix quality can be affected by handling and storage conditions. Transport and storage under humid or high temperature conditions can contribute to nutrient degradation. Application of the premix in the pet food production site can further stress premix components. The physical conveyance of a premix through the pet food production process (via screw conveyor or pneumatic transfer) can negatively impact nutrient stability or premix homogeneity depending on the formulation.

**10 Pet food process and point of addition** – There are several different processes that can be used to add a premix to pet food products. The premix may be mixed with other dry ingredients prior to extrusion through high pressure, high temperature, and high shear conditions before baking/drying. Or the premix may be mixed with semi-frozen meats, and then heated, canned, and retorted under high moisture and heat conditions. Consideration should be given to how effectively the premix particles are distributed throughout the pet food formulation and to the environment at the point of addition. Some processes, such as adding the premix to a liquid slurry prior to mixing with macro ingredients, could be thought to enhance distribution of the premix components. However, the slurry environment (possibly a very high pH) may act to accelerate degradation of some nutrients.. The alternative would be to add the premix separately into the macro ingredient blend where the environment is neutral and more conducive to stability. Care and consideration should be given to how each step of the process influences the quality of the premix.

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