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New KMR® (2022) – Part 2. Reflections on the changes.

Some who read the lab and performance tests presented in Part 1 for the newly formulated KMR® may ask “...OK, lots of interesting data, but what does it all mean for wildlife formula?” Following are 8 key takeaways from Part 1 of this series, with each of the points discussed in further detail here in Part 2:

1. The first three primary ingredients listed on the new KMR® label are the same and listed in the same order of prominence. The next two ingredients are reversed in order, suggesting new concentration levels. It appears little has changed in the first five ingredients. Maltodextrins and dried corn syrup (glucose) have been added. *Probiotics* included are exactly the same and listed in the same order. *Prebiotic* content has been increased with the addition of the new ingredients of powdered cellulose and oat fiber [which likely explains the increase in crude fiber content in the Guaranteed Analysis].
2. Protein has decreased 5%, but is still within tolerance of [Guaranteed Analysis-GA](#). Moisture has also decreased, but remains above the GA maximum of 5%. Fat remains unchanged and crude fiber is not detected. Collectively, these nutrient changes result in a 44% increase in calculated carbohydrates (NFE). Previously used formula recipes should be recalculated for the new levels of moisture/protein/carbs, as well as for the change in powder weight (now about 9% heavier per volume from last year’s sample). Recalculations will help to assess an appropriate match to mother’s milk and to determine if adjustments are needed in previously used recipes. The [WildAgain Formula Calculator](#) now contains these new values in the drop-down menu to assist in these calculations.
3. Dietary minerals have changed, with the new formulation having a 12% decrease overall, as well as individual decreases in all mineral concentrations except for sulfur and magnesium. [Calcium](#), [phosphorus](#) and potassium are all measuring lower, ranging from 13 - 20% decreases. These lower levels may prompt blending with other milk replacers with higher dietary mineral concentrations, in order to better match the animal’s dietary requirements.

4. The overall mix of fatty acids has changed significantly, with a 24% increase in polyunsaturated fats (a 60% increase in the Oleic and Linoleic individual acids combined) and a 37% decrease in saturated fats. This may further compound previously noted shelf-stability issues from 2021 samples, with elevated rancidity markers that increase early on during the 24-month product shelf life.
5. The 2022 KMR[®] demonstrates concerning shelf-stability issues, with the 2022 sample testing at a PV=55 at only 10 months since manufacture, which is [well above established guidelines for edible oils](#). This continues the trend of elevated PV levels in three 2021 samples tested at less than 18 months old, which is concerning. Therefore, increased attention to product freshness and proper handling and [storage](#) may be more critical in order to prevent the further onset of rancidity. Subsequent testing of additional 2022 KMR[®] samples is needed to assess if early onset of rancidity continues to be an issue.
6. Powder consistency is still loose, fluffy and sticky, resulting in a +11 to -13% average error rate when measuring by volume (scooping). Weighing the powder eliminates this needless error and takes into account that the powder now weighs more than previous formulations, up over 40+% heavier in the last 5 years.
7. Adding the powder to the warm water (in that order) shows total wetting and sinking in under 5 minutes. However, a thorough 5-minute hand whisk/stir is still required to separate most of the clumps of powder that settle to the bottom. While it then seems dissolved, the powder is still not completely reconstituted at this point.
8. Tests show that 18% of the powder remains dry and not fully reconstituted when mixed and prepared for an immediate use or feeding. Refrigerating the prepared formula for 8 hours improves the powder dispersal/dissolution by 66%. This provides a more complete reconstitution, which is critical for digestion in immature and developing GI systems.

Background

In early 2022, PetAg[®] announced changes in several of their widely used milk replacer powders on their website (<https://www.petag.com>). KMR[®] was one of the products that was 'reformulated'/changed. This is not necessarily a cause for immediate concern, as manufacturers regularly make product changes from time to time, for many reasons. The results of these changes are often positive and go unnoticed by most consumers. For example, while some previous changes with Esbilac[®] have been helpful (e.g., improving shelf-life), some were not, (e.g., the change of the size and digestibility of dicalcium phosphate (DCP) in 2018). As a result, wildlife rehabilitators have become wary about *changes to any* milk replacer powder product and possible adverse impacts. They want to understand the nature and scope of the changes and consider how to prevent or reduce any possible issues, preferably before any problems develop when fed to very young wildlife in rehabilitation.

The 'new' KMR® formulation manufactured in 2022 may be a great product – and wildlife rehabilitators may find it effective with wild mammals as is, or when used as part of a formula recipe with multiple ingredients. The previous article (Part 1.) showed a variety of factual test results on the 'new' KMR® when compared with previous KMR® lots (pre-2022). The test results may be what some rehabilitators want to read, fully understand, and analyze. Others may simply say “...those test results are interesting, but what do they show and how might they affect my decision to use it...”.

Following are some things WildAgain considers when deciding if and how to use any new product, or any previously existing product that has just been reformulated (as in this case). However, they are not conclusive, nor do they necessarily suggest recommendations, since decisions about use are up to each rehabilitator. WildAgain believes that rehabilitators will consider more factors throughout the process of selecting and using a milk replacer formula, including the growth, development, and health of the wild orphans.

The product label

As always, first check the product label, with focus on the guaranteed analysis (GA) of the nutritional composition and kcals, ingredients, and mixing instructions. Look at the lot number and expiration date. Also, make a note of the product and lot number, and expiration date, as well as when and where it was purchased. There are some things to learn from the label, including comparing the label disclosures to the actual lab test results in Part 1. Making and keeping such records are essential should any product questions arise after opening and using.

Product composition

How does the product adhere to the Guaranteed Analysis (GA)? For the new KMR®, lab tests show the fat content levels are unchanged and test right at the GA specification of 28%. The protein content level is now closer to the GA minimum of 40%, testing just above at 40.8%. This represents about a 5% decrease from prior years. On the other hand, content for moisture and fiber all fall outside the guaranteed content. For domestic use with kittens, people may not notice any change at all, since they generally use it as a supplement to mom's milk and thus feed smaller amounts. However, when feeding as the primary food source for wild mammal *orphans*, even minute changes in proteins, fats and minerals can make a significant difference. Such changes in composition need to be considered when evaluating a formula recipe (already existing or newly created) to compare to the species milk (such as when using [WildAgain's Formula Calculator](#)).

Some of the primary changes to keep in mind include the following:

- Proteins continue to test above 40% of the contents (guaranteed minimum), and about 5% less than in recent lots tested of the previous formulation. As with any milk replacer product based upon cow's milk, KMR® provides a balance of whey protein (easier and faster digestion) and casein proteins (more gradual digestion).
- Overall, fat content tests remain unchanged at the guarantee of minimum of 28% but now has a changed fatty acid profile. With a 24% increase in polyunsaturated fats, concerns regarding rancidity arise, since polyunsaturated fatty acids are the most prone to onset of rancidity. More on this later.

	Cat Milk ⁽⁴⁾⁽⁵⁾	(Mixed 1:2 as per label)	
		2022 KMR (40/28)*	Pre2022 KMR (42/25)*
Solids	22-23%	20.2%	20.2%
Protein	8-9%	8.5% ↓	8.9%
Fat	5-7%	6.0% ↑	5.3%
Carbs (NFE)	5-7%	4.5%	4.7%
Kcal/cc	1.2	1.06	1.02

(* Based on the Guaranteed Analysis on the can label for moisture, protein and fat)

A note on protein and fat. It should be noted that the amount of protein% to fat% has changed from a 42/25 formulation (KMR pre-2022) to 40/28 (dry powder matter basis). Mixed 1 part to 2 parts water, the chart at right shows the result produces values more near the midpoint% of cat milk composition (taken from several research studies ⁽⁴⁾⁽⁵⁾).

- Since the level of carbohydrates is a calculation involving the other nutrients, the decreases in moisture, protein and fiber levels results in a 44% increase in the calculated carbohydrate level (which now includes the addition of the dried corn syrup and fiber).
- Moisture level (water) remains above the maximum guaranteed minimum of no more than 5%. Though the 2022 sample is an improvement from 2021, this could be an issue since more moisture in a milk powder could make it more susceptible to development of bacteria if it is not stored and handled correctly.
- Kcals are slightly higher than prior samples tested – but unlikely to have a substantial impact. Tests showed that the kcals in the ‘new’ KMR® powder were 3% higher in energy content than the lots tested pre-2022, due to the increase in carbs. This suggests a small amount of change in metabolizable energy, assuming that the following factors remain consistent: formula preparation (reconstitution efficiency), feeding regimen (amount and frequency), and overall animal health (hydration and digestibility).
- Tests show that the concentrations or amounts of most minerals in the KMR® have decreased, including both calcium and phosphorus. Calcium is still acceptable at 1.28% but is down 13% from prior pre-2022 samples. Phosphorus, also still acceptable, is down 20% from prior samples. This is not necessarily a problem for kittens receiving only supplemental feedings but may prompt some rehabilitators to consider when using

KMR® to create a formula recipe to get closer to the species milk composition analysis. It must be emphasized that trying to supplement any minute amount of a mineral in KMR®, especially with elemental calcium (e.g., calcium carbonate, calcium citrate), can easily result in unintentional imbalance or overdosing and create extremely high risks – which can be fatal. A highly effective and much safer and easier way that rehabilitators have used to add minute amounts of minerals since 2008 is ‘blending’ KMR® with a milk powder from another manufacturer that has higher levels of minerals. Again, [WildAgain’s Formula Calculator](#) provides a tool that provides calculated amounts of calcium and phosphorus for single or multi-product formula recipes.

Product ingredients

Most of the ingredients listed in the ‘new’ KMR® are the same as in recent years (except for the new addition of dried corn syrup, powdered cellulose and oat fiber), though a change in the order listed shows that the amounts have changed. As usual, without a more complete disclosure by the manufacturer, a consumer cannot know about changes regarding the ingredient source, quality, size, digestibility, effectiveness, etc.

Like most other PetAg® milk replacer powders, KMR® continues to include the same common and ‘general’ probiotics to support digestion, health, development, and immune response. However, those probiotics are more limited in diversity and amounts than in the microbiota for individual species – wild or domestic. Some rehabilitators are exploring natural, effective, and safe ways of building microbiota of the specific species in care, rather than relying on those general probiotics in milk replacers or commercial sources.

As for *prebiotics*, researchers have learned that oligosaccharides, a key component of carbohydrates in mothers’ milks, play a crucial role in digestion, development, immune system, intestinal barrier functions and more ⁽¹⁾. KMR® still contains an oligosaccharide called Fructooligosaccharides (FOS) for its prebiotic effect, which appears to be in a higher concentration. The new KMR® formulation also added two more ingredients considered to be *prebiotics*: oat fiber and powdered cellulose, both of which PetAg® obviously considers safe and beneficial. Some rehabilitators may assume those prebiotics in the new KMR® are beneficial and safe, and use it immediately, while others may delay the decision due to the questions of safety with young wild mammal of various species.

In short, oat fiber is an insoluble dietary fiber that is made from grinding oat hulls and composed of lignin, cellulose, and hemicellulose, or the outermost protective seedcoat of the oat kernel. The oat hull is rich in non-starch polysaccharides (especially xylan and glucan, also arabinan and galactan), forming complex and intricate fibrils. Oat-hull fiber is used for dietary-fiber enrichment and as a multi-functional food ingredient. It acts as a water-activity modulator, texturizer, calorie controller, and more. From a physiological aspect, oat-hull fiber is recognized for promoting gastrointestinal wellness, particularly bulking. ⁽²⁾

While KMR® is clearly intended for use with young kittens, questions arise due to the fact that powdered cellulose is generally banned for use in human infant formulas ⁽³⁾. As a result, wildlife rehabilitators may have questions about the exact type of cellulose being added to KMR® - and its safety when used with young wildlife.

Weight of the product

Tests show that the weight of a tablespoon of KMR® has gradually increased over previous years, amounting to a 40+% weight gain over the last 5 years. This could affect the amount of nutrition in the mixed formula, unless the person mixing it adjusts the amount by weighing it and making corresponding adjustments in the recipe (including water). Knowing the weights have changed and could change in future lots, it is even more prudent to weigh the ingredients when preparing a formula (rather than scooping a given volume).

Most of the milk replacer powders used to make formulas for wildlife vary in weights, both from lot to lot, and even within a package. This is because loose and fluffy powders are susceptible to compaction. KMR® is a perfect example of a powder weighing differently between lots and within a container. While many manufacturers describe measuring by volume (scooping or by parts), this results in different density of formula batches – which can affect nutrition, the amount of fluids ingested, and more. As said before: weigh the ingredients of the formula. [For more info on this, click here.](#)

Mixing instructions on the label

Mixing instructions on the label state to add powder into warm water, gently stir to mix, and then feed immediately – or at least within 24 hours. *[Awaiting an additional sample to conduct reconstitution performance tests to assess the accuracy of these instructions.]*

Product storage, shelf life and rancidity

Lab tests for rancidity (Peroxide Value - PV) performed on KMR® since 2018 have revealed that KMR® has gradually declined in relative shelf-stability. Remarkably stable in 2018 near the end of its shelf life, subsequent 2019 tests showed the same results when tested within about 6 months since manufacture. Yet in 2021, three samples that were within 15-18 months old, showed elevated PV levels in the 25-30 range, indicating the rancidification process had begun. This is significantly above the standard level of <10 for edible oils.

Currently (October 2022), the 2022 sample shows an unexpected and significant presence of rancidity at only 10 months post-manufacture. This would only be about 30% into the product's disclosed 24-month shelf. Subsequent and regular testing of the new 2022 KMR® later into its

shelf life is necessary to determine if this level of rancidity increases with product age. Subsequent PV tests could show even higher rancidity levels based on: (1) the length time between manufacture and use, (2) exposure to heat in transport or during storage at a warehouse or rehabilitation facility, and (3) exposure to air once opened for use or when repackaged for ‘sharing’ with other rehabilitators.

Fatty acid profile tests reveal that the *types* of fats have changed to a higher percentage of polyunsaturated fat – which is susceptible to faster rates of rancidity when exposed to air, heat, sunlight, and when not stored properly. Any newly opened can or package should always be assessed for sensory traces of rancidity ([Click here](#)).

To reduce the chances of rancidity onset, good practices include: (1) purchasing and using KMR® closer to the manufacture date ([check lot number](#)), (2) choosing transport and storage options that minimizes risk of exposure to heat and air, and (3) [continuing to monitor for rancidity](#) each time a container is opened. These steps are important for ALL high-fat content milk powders – and not limited to KMR® and PetAg® products. The new and prior labels direct that the user must refrigerate an opened container for up to 3 months, or frozen for 6 months. Milk powders that become rancid and used to make formula can cause a variety of palatability, digestive and health problems for young animals. It is important to prevent or reduce the chance of such problems, including monitoring the animal’s willingness to eat and evaluating their overall health.

Reconstitution

This refers to how the milk powders disperse and dissolve in liquid - which affects the amount of nutrition available, digestibility and more. There are several steps involved in [reconstitution, including wetting, sinking, stirring, and resting](#). The preparation may take a little planning and time to make the formula in advance to allow it to rest in the refrigerator for 8 hours. But doing so can significantly affect and improve the animal’s health, growth, and development. It absolutely makes a difference in the growth, health, and well-being of the wild orphan. To summarize the steps to effective reconstitution: (1) add the powder to warm water and allow up to 5 minutes to wet and sink, (2) hand stir or whisk until no dry clumps of powder are visible, (3) allow the prepared formula to rest in the refrigerator for 8 hours prior to use.

Unexpectedly, the new formulation of KMR® (22) was considerably *less* dispersed and reconstituted than KMR® lots from 2021. This was noted both when first mixed AND after ‘resting’ in the refrigerator for 8 hours to improve dissolution, as shown in the photos and charts in Part 1. As shown in one of the charts, *the 2022 KMR® contains 3 times the amount of remaining dry powder* than the other products, even after an 8- hour rest. This is a significant difference from prior years.

This could affect young wild mammals’ ability to effectively digest formula made with the new formulation of KMR® - and might result in various health conditions. This could include: slow digestion, diarrhea, constipation, dehydration, reduced nutrition and more. While effective

mixing and reconstitution methods can overcome some reconstitution problems, it is unclear what alternatives may be used in this situation. [For example, straining would not be effective as it would reduce the volume of powder in the recipe and could exclude key nutrients and minerals.]

Other factors that can affect success of any powdered milk replacer product

Product quality, availability, and costs. Availability and the ease of obtaining a product may be factors – but will vary depending on things such as manufacturing capacity, supply chain issues, distributors, storage, and shipping. The new formulation has been difficult to locate (as of October 2022 - 10 months after the new product was launched by PetAg®) and is just now beginning to be more easily available as retailers work through inventory of the prior formulation. Quality control is another factor – and, as with all products, continues to deserve monitoring by the end user in its performance with the wild mammal orphans. Cost of the product is certainly another factor that will influence purchase and usage over other similar milk replacers. With the current scarcity of the new formulation, cost comparisons are not something WildAgain can provide at this time.

Effective rehabilitation practices are always important (e.g., hydration, providing supplemental heat for neonates or as appropriate those with compromised health, minimizing stress, treating parasites, keeping accurate and thorough daily and records).

Effective feeding practices. Feed considering the appropriate amount and frequency for the species (e.g., do not over- or underfeed during a 24-hour period) and use clean and appropriately sized feeding utensils. Equally as important is monitoring stool - frequency, amount, and consistency. This can provide direct clues whether the milk replacer (product and formula recipe) is working successfully with the specific species, age, development, and health of the animal.

Modifications for off-label use. KMR®, a milk replacer powder developed and sold for kittens, contains 40% protein, 28% fat and other nutrients. All other mammal species milks have a different % composition of protein, fat, carbohydrates, kcals, etc. Rehabilitators should review published scientific [milk composition analysis studies for their species](#). Recipe modifications are generally needed to create a closer match to the milk of the wild mammal species in their care. Calculating formulas for different species can be a complex and time-consuming exercise – consider using the Wildlife Formula Calculator.

Modifications through blended formulas. Many times, matching mother's milk can be more closely achieved by blending several milk replacer powders and possibly adding other ingredients. Since individual powdered milk replacer products will reconstitute in slightly different ways, specific blending protocols should be followed to do so effectively and safely. This means reconstituting each powder individually and combining only after each has fully reconstituted in liquid form. ([Mixing Guide](#))

More. Stay alert to and consider expanding research related to nutrition, health and more that can affect these topics, such as microbiome, glycans, oligosaccharides, manufacturing changes.

Disclosures

KMR® is manufactured and sold as a food supplement for kittens, and not intended to be a sole source food for developing kittens. Wildlife rehabilitation is considered an off-label use.

Product assays performed by the independent lab, as presented in Part 1, and referred to here in Part 2, adhere to the *Official Methods of Analysis of AOAC INTERNATIONAL* (Association of Official Analytical Chemists) and the *Official Methods and Recommended Practices of the AOCS* (American Oil Chemists Society).

The authors have no conflicts of interest with the independent lab, or any of the products or manufacturers discussed in this article.

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