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## New Goat's Milk KMR® (2022) – Part 2. Reflections on the product and comparisons to regular KMR®.

Some who read the lab and performance tests presented in Part 1 for the newly formulated Goat's Milk KMR® may ask "...OK, lots of interesting data, but what does it all mean for wildlife formula?" Or they may ponder "...what's the real difference between the two KMR®s - which should I use – and why?"

**General note on goat's milk.** Other than the lab testing and performance testing differences discussed below, the primary difference between the two KMR® formulations is that the Goat's Milk KMR® is obviously caprine/goat-based and the regular KMR® is bovine/cow-based. Goat's Milk KMR® includes dried whole goat milk powder, whereas regular KMR® includes the whole cow milk components separated into dried skimmed milk and cream. Goat's milk is widely known to be easier to digest, which explains the tagline "...For sensitive digestive systems..." on the Goat's Milk KMR® can label.

Many of the differentiating characteristics of goat's milk promote easier digestion and increased overall digestive health than that of cow's milk. A number of these key differences include the following:

### Enhancing digestion

- Smaller sized fat globules (with higher homogeneity and greater surface area).
- Better fat utilization (provides direct energy, less tissue deposition), due to twice as many medium chain fatty acids (MCFA).
- Favorable  $\alpha_{s1}$ -casein :  $\alpha_{s2}$ -casein ratio (less gastrointestinal allergenic inflammation).
- Lower concentration of lactose.
- Higher overall dietary mineral levels with higher bioavailability.

### Enhancing digestive health

- Contains 250-300 mg/l oligosaccharides (4-5x than in cow's milk) - reduces intestinal inflammation; aids in recovery from colitis; protects intestinal flora against pathogens (such as *Escherichia Coli*).
- Higher conjugated linoleic acids (CLA's) – immune stimulation, growth promotion and disease prevention.
- MCFA have been shown to possess antimicrobial properties that can protect against gram-negative bacteria.

Sometime during 2022, PetAg® added a new goat milk-based milk replacer in its 'new product' section on its website (<https://www.petag.com>). There did not appear to be any fanfare or

obvious marketing rollout to announce the new Goat’s Milk KMR®. As of November 2022, an online search only provided a single vendor as a source to purchase the product. As the product works its way through the supply chain to more vendors (and hopefully more price competition), the following provides a brief summary of some of the key similarities and differences between the two formulations of KMR®.

**Comparison – how are the two products alike?**

1. Other than the primary base ingredient differences (goat milk versus cow milk), almost all of the other ingredients appear to be the same. While many are the same, they are likely found in slightly different concentrations.

2. The [Guaranteed Analysis-GA](#) is identical for the two products. Previous KMR® users will note a change in the protein and fat concentrations in both products. 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 powder to 2 parts water, the chart at right shows that the 2022 KMR® produces protein and fat values closer to the midpoint of cat milk composition (taken from several research studies (4)(5)).

	Cat Milk <sup>(4)(5)</sup>	(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)

As for the lab test results, the Goat’s Milk KMR® produced a fat value of 31.9% (14% above the GA of 31.9%) and a moisture content slightly elevated over the maximum GA of 5%. These variations from the GA will need to be considered when developing a formula recipe to arrive at an appropriate match to mother’s milk. The [WildAgain Formula Calculator](#) now contains these new values in the drop-down menu to assist in these calculations.

3. Characteristic with PetAg®’s spray-dried powdered milk replacers, both powders show consistency that is loose, fluffy and sticky. This results in a +9 to -14% average error rate when measuring by volume (scooping). Weighing the powder eliminates this needless error. Both powders weigh about the same, at 8.0 – 8.2 grams per tablespoon.

4. Both products show almost total wetting and sinking (85-95%) in under 5 minutes when adding the powder to the warm water (in that order) when reconstituting the powder to a liquid. A thorough 5-minute hand whisk/stir is still required to separate most of the clumps of powder that settle to the bottom. While the powder then seems dissolved, it is still *not* completely reconstituted at this point. Both products show improved reconstitution when allowed to rest for eight hours, as described later.

## Comparison – how do the two products differ?

2. The obvious difference is the primary base for the two products – goat milk versus cow milk. As highlighted in the blue-shaded box above, the primary benefit of goat's milk is its easier digestibility. This fact is about the only differentiating characteristic on the can labels for the two products. The Goat's Milk KMR® label contains additional wording not found on the regular KMR® label including "...sensitive newborns...", "...growing juveniles...", "...stressful environments...", and "...for sensitive digestive systems..."
2. It is not surprising that the goat milk formulation is 22% lower in total ash for [dietary minerals](#). A relatively lower total ash content is not uncommon among some of the other goat milk based powdered milk replacer products. [Calcium](#) and [phosphorus](#) are both 24-25% lower than the regular KMR®. In order to achieve minimum required mineral concentrations in a final formula recipe, use of a recipe blended with other mineral-rich products should be considered and evaluated.
3. The two products tested very differently for presence of rancidity. Before discussing those results below, it should be noted that storage directions provided by PetAg® are identical for both products – but are *very* different between what is stated on the can label and on PetAg®'s website. The excerpt of the instructions from the website is shown at right. It provides a clear "Yes" to storing previously opened containers in the refrigerator, since the powders are milk based and contain high levels of fat. This would seem to be intuitive. Yet the excerpt that follows is from the label on the can for both products:

### A Common Question

#### Do your milk replacer powders need to be refrigerated?

Yes, all kitten and puppy milk replacers must be refrigerated after opening. Esbilac® and KMR® powders are milk-based and contain fat, therefore have the potential to spoil under certain conditions. They can also experience bacterial growth when stored improperly. The can of powder has to be kept in the refrigerator or freezer after it has been opened. The powders will keep in the refrigerator for up to 3 months, or in the freezer for up to 6 months.

**Storage:** Unopened container should be stored in a cool, dry place. Opened container can be kept at room temperature for up to 2 months and then must be refrigerated (up to 1 additional month). Opened container can be frozen for up to 6 months to preserve freshness. Use product before best by date stamped on container. Reconstituted liquid must be kept refrigerated for up to 24 hours.

The can label seems to be a complete contradiction, indicating it is permissible to store a previously opened container at room temperature for up to two months. This seems to be a critical misstep, as any exposures to air, light and/or heat (including a +30°F difference if not refrigerated) can promote the onset of rancidity and its progression. Attention to proper storage protocol is needed for products that demonstrate a low level of shelf stability. This would definitely include minimizing the time a container is open to remove powder, and then immediately refrigerating (or freezing) a previously opened container.

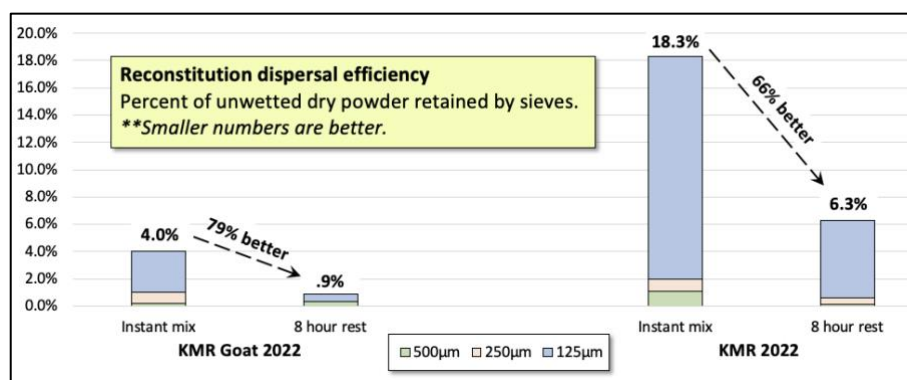
Two Goat's Milk KMR® samples had findings of rancidity as 'not detected,' meaning the results did not exceed the minimum reporting threshold of a value of 2. The two samples

were relatively fresh at only 60-75 days post manufacturing so a 'not detected' or very low PV would be expected. Subsequent testing is needed to determine if the new goat's milk KMR® formulation continues to demonstrate acceptable shelf stability during the quoted 24-month product life span.

Conversely, two samples of regular KMR® that were only 10 - 11 months post-manufacturing when tested for [rancidity](#), returned results of 55 to 64. These results were unexpected and surprisingly high, indicating that rancidity is present and increasing as time passes. These results are significantly above the max Peroxide Value (PV) of <10 for edible oils. Three 2021 samples had been previously tested with a mean test PV of 28 showing a trend of increasing PV results in KMR® with less than 18 months of shelf life. Subsequent testing is also needed to determine if the regular 2022 KMR® formulation continues to demonstrate unacceptable shelf stability during the quoted 24-month product life span, especially so relatively soon after manufacture.

4. The final step in reconstituting the powder to a liquid (after wetting, sinking and stirring/whisking), is [an 8-hour resting period](#) from preparation (mixing) to final use

(feeding). Testing found that this improves final reconstitution by 79% for the Goats Milk KMR®. Without the rest period, and rather quickly preparing for an instant



use/feeding, results in 4% of the powder remaining dry and not fully reconstituted. This is **5-6 times better** reconstitution performance than seen with the regular KMR®

Effective reconstitution affects the amount of nutrition available, digestibility and more. There are several steps involved in [reconstitution, including wetting, sinking, stirring, and resting](#). It may take a little planning and time to prepare the formula in advance to allow it to rest in the refrigerator for 8 hours. Doing so can significantly affect and improve the health, growth, and development of the wild orphan.

To summarize the steps of 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.

## **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 sell 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 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 as to whether the milk replacer (product and formula recipe) is working successfully with the specific species, age, developmental level, and overall 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.

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## Disclosures

Goat's Milk KMR® and KMR® are 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 to be 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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