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New Goats Milk Esbilac® [GME®] (2022) – Part 2. Reflections on the changes.

Some who read the lab and performance tests presented in Part 1 for the newly formulated Goats Milk Esbilac® (GME®) may ask *"…OK, lots of interesting data, but what does it all mean for wildlife formula?"*

General note on goat's milk. Other than the lab testing and performance testing discussed below, the primary difference between the two Esbilac® formulations is that the Goat's Milk Esbilac® (GME®) is obviously caprine/goat-based and the regular Esbilac® is bovine/cow-based. Goat's Milk Esbilac® includes dried whole goat milk powder and dried goat milk protein, whereas regular Esbilac® includes the whole cow milk components previously separated into casein, dried whey protein concentrate, 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 GME® 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 α_{s1}-casein : α_{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.

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. Many of the primary ingredients listed on the new GME® label are the same, though listed in a different order, suggesting new concentration levels. Dried corn syrup (glucose) has been added. *Pro*biotics are newly added, and additional *pre*biotics have been added in the form of guar gum, fructooligosaccharide and powdered cellulose (fiber).

2. There are reductions in protein (-2%) and dietary minerals (-9%), with protein remaining below the guaranteed minimum by about 3%. Fat content is up 9%, along with increases in moisture (water) and crude fiber. Collectively, these nutrient changes result in a 19% decrease in the calculated carbohydrate concentration. Previously used formula recipes should be recalculated for the new levels of moisture/protein/fat/carbs, in addition to the change in powder weight (now about 8% heavier per volume). Recalculations will help to assess an appropriate match to mother's milk and to determine if adjustments are needed in prior recipes. The WildAgain Formula Calculator now contains these new values in the drop-down menu to assist in these calculations.

3. Dietary minerals continue to be light (relative to other milk replacers), with calcium declining slightly to only 0.82% and phosphorus declining 20% to a low concentration of only 0.54%. These low levels may prompt blending with other milk replacers with higher dietary mineral concentrations to better match the animal's dietary requirements.

4. The overall mix of fatty acids has changed significantly, with a 27% increase in polyunsaturated fats and a 25% decrease in saturated fats. This may further compound previously noted shelf-stability issues, with remarkably high rancidity markers that increase early on during the 24-month product shelf life.

5. The two 2022 samples showed elevated rancidity levels at only 7.0 to 7.5 months post manufacturing, 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.

6. Powder consistency is still loose, fluffy and sticky, resulting in a +5 to -17% average error rate when measuring by volume (scooping). Weighing the powder eliminates this needless error and takes into account the powder now weighing more than previous formulations, up over 20% heavier in the last 5 years.

7. Adding the powder to the warm water (in that order) shows total wetting and sinking in under 30 seconds, much better than most other milk replacers tested. A thorough 5-minute hand whisk/stir is still required to separate and wet most of the clumps of dry powder that settle to the bottom. While it then seems dissolved, the powder is still not completely reconstituted at this time.

8. Tests show that 23.8% of the powder remains dry and not fully reconstituted when mixed and prepared for immediate use or feeding. This is an increase in dry powder over the pre-

2022 formulation. However, refrigerating the prepared formula for 8 hours prior to feeding improves the powder dispersal/dissolution 96%, to just 1% of the dry powder remaining. This extra time 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). GME® 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' GME® formulation manufactured in 2022 may be a great product – and wildlife rehabilitators may find it effective with wild mammals as is, or when they make some adjustments when using it. The previous article (Part 1.) showed a variety of factual test results on the 'new' GME® when compared with previous GME® 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? For the new GME®, lab tests show the fat content levels are now closer to label guarantees than in recent years – and that is a positive result. On the other hand, content for protein, moisture, and fiber all fall outside the guaranteed content. For domestic use with puppies, 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 below 33% of the contents (guaranteed minimum), and about 2% less than in recent lots tested of the previous formulation. As with any milk replacer product based upon goat milk, GME® provides a greater amount of balance of whey protein (easier and faster digestion) than casein proteins (more gradual digestion).

- Overall fat content tests at around the guarantee of minimum of 40% (up 9%), but now has a changed fatty acid profile. With a 27% increase in polyunsaturated fats, concerns around rancidity arise since polyunsaturated fatty acids are the most prone to onset of rancidity. More on this later.

- Since the level of carbohydrates is a calculation involving the other nutrients, the increases in moisture, fat and fiber levels results in a 19% decrease in the calculated carbohydrate level (which now includes the addition of the dried corn syrup and fiber).

- Moisture level (water) has increased above the maximum guaranteed minimum of no more than 5%. This could be an issue, as 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 lots – but unlikely to have a substantial impact. Tests showed the kcals in the 'new' GME® powder were 2.7% higher in energy content than the lots tested pre-2022, due to the increase in energy-rich fat. This suggests a small amount of change in metabolizable energy, assuming other factors remain consistent, such as 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 GME® have continued to decrease, including both calcium and phosphorus. Calcium is a remarkably low .82%, which is below the generally accepted level of 1.0% in milk. This is not necessarily a problem for puppies receiving only supplemental feedings but may prompt some rehabilitators to consider when using GME® 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 GME®, 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' GME® 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' GME® appear the same as recent years (except for the new addition of dried corn syrup), though a change in the order listed shows that the amounts have changed. As usual, without a more full disclosure by the manufacturer, a consumer cannot know about changes regarding the ingredient source, quality, size, digestibility, effectiveness, etc.

With most other PetAg® milk replacer powders containing *probiotics* to support digestion, health, development, and immune response, GME® has now included several common and 'general' probiotics. 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)]. GME® now contains a newly added oligosaccharide for its prebiotic effect: Fructooligosaccharides (FOS). It is assumed that it is acceptable in GME® since Esbilac® contained FOS for years. The new GME® formulation also added two more ingredients considered to be *pre*biotics: guar gum (also a thickening agent) and powdered cellulose, both of which PetAg® obviously considers safe and beneficial.

While GME® is clearly intended for use with young puppies, questions arise due to the fact that powdered cellulose is generally banned for use in human infant formulas [(2)]. Research continues to question, investigate, and assess the safety of guar gum in foods for human infants and young children [(3)]. As a result, wildlife rehabilitators may have questions about the guar gum and exact type of cellulose being added to GME® - and their safety when used with young

wildlife. Some rehabilitators may assume those prebiotics in the new GME® 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.

Weight of the product

Tests show that the weight of a tablespoon of GME® has gradually increased over previous years amounting to a 20% 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. GME® 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. Reconstitution tests conducted by WildAgain and presented in Part 1 show that the Esbilac® does appear to be milky and dissolved within a couple of minutes. However, the test photos and measurements reveal (by using the various sized sieves/filters) that it is NOT completely dissolved – and has a thick paste-like sludge by the time it is trapped by the smallest sieve. For improved reconstitution, consider deviating from the label mixing instructions as described in the reconstitution section below.

Product storage, shelf life and rancidity

Lab tests for rancidity (Peroxide Value - PV) performed on GME® since 2019 have revealed chronic and problematic levels in GME®, indicating a relatively lack of shelf-stability while still well within the quoted shelf life. As mentioned earlier, the overall amount of fat in GME® is close to the guarantee on the label, which is an increase from previous years.

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. The PV tests conducted for the new GME® samples

were performed 7.0 - 7.5 months after the manufacture date and have already demonstrated the onset of rancidity. Subsequent PV tests and rancidity levels could show even higher 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 when opened for use or when repackaged for 'sharing' with other rehabilitators.

To reduce the chances of rancidity onset, good practices include: (1) purchasing and using GME® 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 GME® and PetAg® products. 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.

The 2022 GME® samples were 7.0 -7.5 months post manufacturing when tested for rancidity, with PV test results ranging from 39 to 62. Those PV test results are significantly above the standard level of <10 for edible oils. This would be about 30% into the product's disclosed 24-month shelf life. Seven pre-2022 samples had been previously tested (2019-2021) with a mean test PV of 50 (ranging from 13.9 to 142). GME® continues to be far less shelf stable than the other PetAg® products (Esbilac® and KMR®). GME® is also less stable than other goat milk based, whey-rich milk replacers such as Wombaroo and Tailspring [both brands contain human grade ingredients]. The increase in polyunsaturated fats could, however, negatively affect the shelf life and could accelerate the onset of rancidity as time passes from manufacture of the GME® powder until when fed. Any newly opened can or package should always be assessed for sensory traces of rancidity (Click here).

Proper storage and handling will help to ensure that the product does not exceed maximum PV levels within the stated shelf-life, as based on the expiration date stamped on the can or package. The new and prior labels direct that the user must refrigerate an opened container for up to 3 months, or frozen for 6 months.

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 a minimum of 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 at least 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 is still difficult to locate (as of October 2022), even after 10 months after the new product was launched by PetAg®. 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. GME®, a milk replacer powder developed and sold for puppies, contains 33% protein, 40% 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

Goats Milk Esbilac® (GME®) is manufactured and sold as a food supplement for dogs, and not intended to be a sole source food for developing puppies. 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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