



WildAgain Wildlife Rehabilitation, Inc. Evergreen, Colorado.

Wombaroo Squirrel Milk Replacer – Part 2. Reflections on the product.

Some who read the lab and performance tests presented in Part 1 for Wombaroo Squirrel Milk Replacer may ask “...OK, lots of interesting data, but what does it all mean for wildlife formula?” Or they may ponder “...Is it a close match to squirrel milk?”

To restate some of the introduction information from Part 1, Wombaroo Squirrel Milk Replacer is one of many specialized substitute milk formulas produced by Wombaroo Food Products, located in South Australia, Australia. Wombaroo products are also available online in North America. They make products for wildlife rehabilitators, aviculturists and animal breeders. They supply specialty formulated milk products for animal studies to universities, hospitals and research institutions worldwide. Many of their products, including the Squirrel Milk Replacer, include the use of human-grade food ingredients.



Assuming that Wombaroo’s Squirrel Milk Replacer is formulated for various species of wild squirrels and other rodents, what do the test results from Part 1 indicate for applicability for squirrel species found in North America?

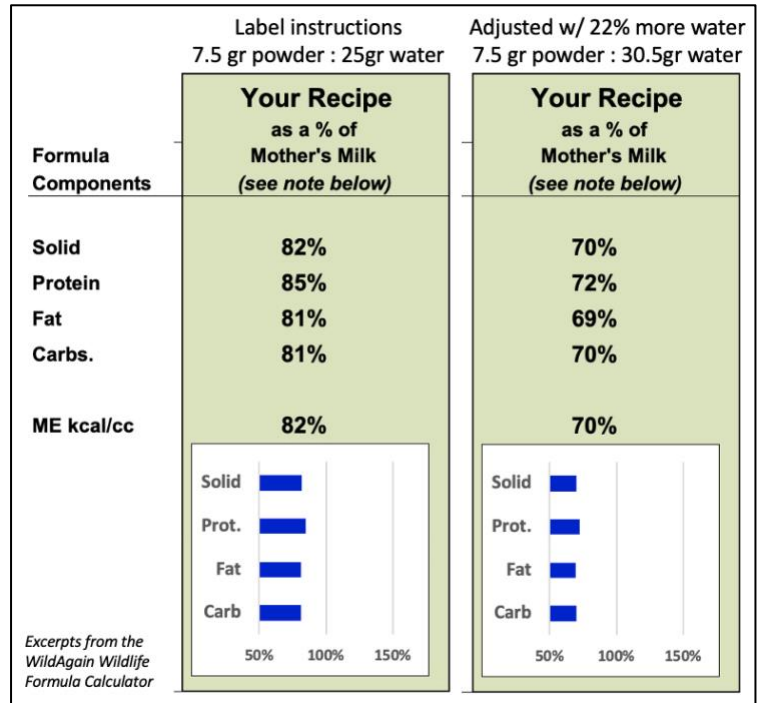
Overall impressions of the product

1. Since the manufacturer indicates that human food grade ingredients are included, the product is likely higher quality than other milk replacers that incorporate only animal feed grade ingredients. Cow’s milk based. No added pre- or pro-biotics.
2. The protein and fat concentrations tested close to the Typical Analysis on the package label. Moisture is slightly high.

3. If mixed according to label instructions, the product produces a remarkably [close match to mother's milk](#), though too high in total solids to likely be successful. Adding additional water reduces total solids to a more acceptable level (more discussion below).
4. A concerning observation of the product when mixed/reconstituted is that the additional vegetable oil in the formulation seems very resistant to effective dispersal and incorporation into the liquid formula during and after mixing. An oil residue is very noticeable as an oily sheen on the liquid formula itself, as well as on the mixing and feeding utensils. It is less noticeable after a an [8-hour rest](#), but still very present and noticeable. This lack of effective emulsion of the oil could negatively affect palatability and digestion in young animals. (More discussion below.)
5. Overall [ash content \(dietary minerals\)](#) is very acceptable at 6.26% and beneficially exceeds the Typical Analysis of 6%.
6. Consistency is loose, fluffy and sticky, suggesting spray-dry processing. This results in a +6 to -14% average [error rate when measuring by volume \(scooping\)](#) which is similar to other spray-dried milk powders. Weighing the powder eliminates this needless error.
7. Poor reconstitution even after allowing to rest 8 hours after mixing and before feeding. Wetting performance was very poor in a full 5 minutes and showed almost no sinking of the powder. Hand stirring/whisking for 5 minutes successfully submerged the powder and dispersed most of the dry powder, yet some remained when poured through the sieves.
8. The product appears to be very shelf stable with a very low Peroxide Value at \approx 21 months post manufacture, indicating low presence of [rancidity](#) and within acceptable limits for edible oils. The instructions do not indicate refrigeration is required after opening (only to store in a cool dry place in an airtight container). However, it is advisable to [store any high fat content milk replacer, once opened, in the refrigerator or freezer](#) to prevent the onset or progression of rancidity.
9. Though not a test result, availability and price are very significant considerations for this product imported from Australia. Choice of online vendors is very limited, with the product available only in 240-gram weight boxes. When comparing current unit pricing per ounce (excluding shipping), Wombaroo Squirrel Milk Replacer is about 30% higher than Esbilac[®] milk replacer, and about 50% above Fox Valley 32/40. The premium in pricing is likely attributable to several things, including the use of human grade ingredients; the limited packaging option of only a small size of Wombaroo Squirrel Milk Replacer (8.5 oz); and the overseas freight costs of an Australian sourced product sold in the U.S.

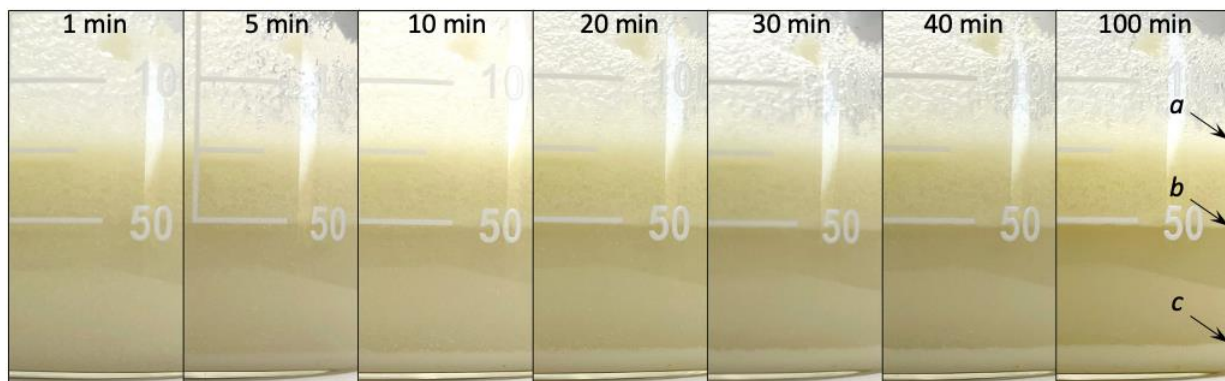
How it compares to squirrel milk – Overall nutritional components

As shown in the excerpt from [WildAgain's Wildlife Formula Calculator](#), the nutritional components have a remarkably close 'proportional' match to squirrel milk. Users of the Calculator are familiar with the graphs that show how a recipe compares to mother's milk. The recipe on the left is according to the package instructions. While an excellent proportional match, empirical data consistently shows that a recipe that produces >75% total solids is generally too thick and condensed to be easily digested by young animals. By adding 22% more water [the recipe on the right] the proportional match is preserved (around ≈70%) *and* the recipe provides a concentration of total solids that usually proves to be more successful.



Reconstitution properties are very poor compared to other products

When compared to other milk replacers tested by WildAgain, this product shows poor performance. [Wetting and sinking](#) is very poor as described in Part 1, as well as incomplete dissolution once submerged and dispersed after a 5-minute whisk/stir. The incomplete dissolution into a complete and amalgamated liquid is apparent in the series of images below. This shows the visible separation of the vegetable oil rising and forming a top layer (between points *a* and *b*), and the hard to reconstitute casein and insoluble minerals falling and forming a bottom layer (at point *c* to the bottom).



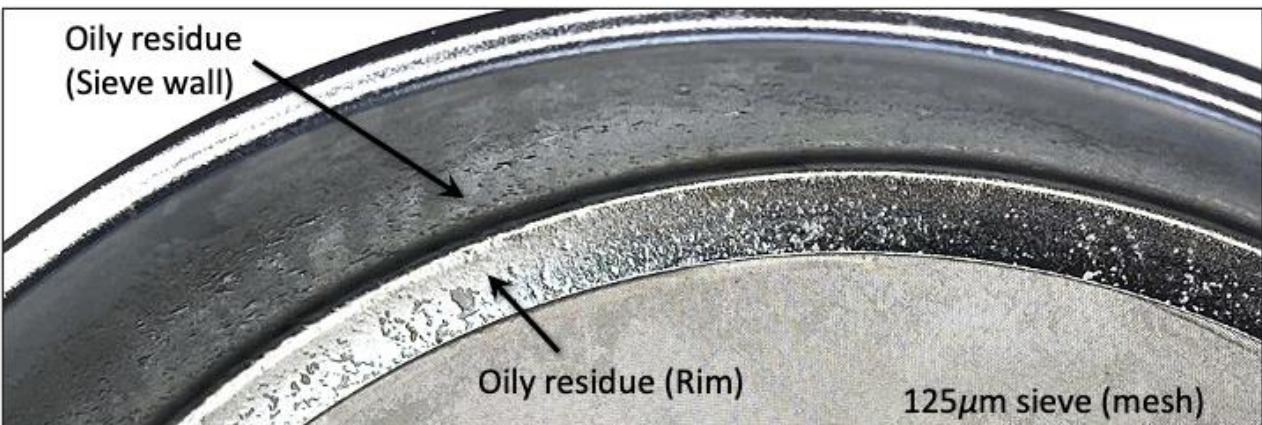
Wombaroo Squirrel Milk Replacer – Time after mixing @ room temp 68 °F

Excessive oily residue present compared to other products

A surprising and concerning observation was the significant presence of an oily residue, which was very noticeable to the touch by wiping a fingertip around the wall of the sieve. The top of the formula had developed a shiny, oily sheen (as shown below at the initial pour on to the 500 μ m sieve). It was also present on the utensils used in mixing, storing, and feeding the formula (which required extra cleaning to remove the residue). All other milk replacer products tested had a formula surface appearing as a slight luster to dull matte, with no oil droplets visible.



As shown in the following image, the sieves that are used in the reconstitution testing had an oily film and small droplets left behind on the rim and walls after the sieves had been dried at 165°F for about 3 hours until dry. This residue has not been observed in any of the other milk replacer powders tested.



Ingredients

Wombaroo Squirrel Milk Replacer contains human grade ingredients and no preservatives, suggesting it is a high quality product. Unfortunately, without a more complete and robust disclosure by the manufacturer, a consumer cannot really know critical details about any of the

individual ingredients, including their source, quality, size, digestibility, effectiveness, etc. This is a common concern among almost all milk replacer products made for animals.

It becomes even more of a challenge to ascertain what may or may not be included in the Wombaroo products, since Australian regulations governing pet food products require more 'lay' (vs. scientific) descriptions of the product's contents. What is not included on the label list of ingredients for Wombaroo is the inclusion of any added pre- or pro-biotics, which are becoming more routinely added to other replacer products because of presumed digestive benefits.

Probiotics. Research of species milks has shown that they naturally include a variety of 'healthy' microbes that are essential for development, microbiome, immune system and overall health. Since these can be degraded or eliminated during the processing of raw milk, manufacturers of human infant milk powders have added *probiotics* to support digestion, health, development, and immune response. Similarly, several manufacturers of milk replacers for animals have included common and more 'general' probiotics for years, again due to presumed benefits, safety and effectiveness. Those probiotics are more limited in both diversity and quantity 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.

Prebiotics. Similarly, 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. Cows' milk, the base of many milk formulas (including Wombaroo), has limited oligosaccharides compared to the milk of humans and many other species. Subsequently, various prebiotics that function like oligosaccharides are now added to some human infant formula products and other foods, including animal substitute milk replacers. That said, research continues and questions remain about the sources, types and amounts of prebiotics that are appropriate, safe, and effective for wildlife species of various ages and health. Since there is a small amount of oligosaccharides naturally in cow's milk, it is possible that Wombaroo Squirrel Milk Replacer may have some oligosaccharides, given that the primary ingredient is (powdered) whole milk – but additional prebiotics are not indicated on the label.

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. 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. These factors are always important and include hydration; providing supplemental heat for neonates or those with compromised health; minimizing stress; treating parasites; and 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 wildlife use. Wombaroo Squirrel Milk Replacer is developed and sold for use with squirrels and other rodents and contains 34% protein, 45% fat, and other nutrients. All 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 the species 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

Wombaroo Squirrel Milk Replacer is manufactured and sold for use with hand-rearing orphaned squirrels and may be suitable for other rodents. Wildlife rehabilitation is considered an on-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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The labelling guidance in AS 5812 [as revised 2017] has been developed to reflect and align with other existing global standards such as those in Europe and the US and help companies comply with Australian consumer law. The Australian Competition and Consumer Commission (ACCC) has a central role in promoting competition and ensuring fair trading.

[Excerpted] "...The Standard advises that pet food labels list the ingredients (with the exception of water) in descending order (by weight) and states: "Ingredients will be presented in an informative and consumer friendly manner" ...A further requirement is that the statement of ingredients shall list food additives, including advising if flavours, colours, preservatives, vitamins and minerals are added. The Standard specifically requires that where preservatives such as sulphur dioxide or sulphites are included these shall be identified on the label, by inclusion of their common, prescribed, proprietary name..."

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