

FORMULA PREPARATION: USING WATER OR HYDRATION SOLUTION?

By Allan & Shirley Casey

Instructions on the milk replacer powders commonly used with young wild mammals specify to mix with water. However, a few people have suggested trying to accelerate rehydration by mixing milk powders with a hydration solution containing electrolytes, such as Pedialyte®, LRS, Normosol-R, or saline (either at full-strength solution or diluted with water). Others combine a hydration solution with formula that has already been reconstituted with water. Here are three reasons why using electrolytes when reconstituting the milk replacer powders is not advisable:

First, and most importantly, the objectives of providing a hydration solution (to rehydrate) and a substitute milk formula (to feed) are very different. Their simultaneous use disregards these critical differences. If an animal is dehydrated, it is not able to digest, absorb or utilize formula (either full-strength or dilute). If formula is provided to a dehydrated animal, it can actually worsen the level of dehydration. Conversely, if the animal is fully hydrated and healthy enough to be fed formula, it does not need further hydration solution. The two products are not complimentary and should not be combined.

Medically, dehydration usually means that an animal has lost enough fluid so that the body begins to lose its ability to function normally. Dehydration can range from mild to severe. Along with water loss, the animal also loses small amounts of salts or electrolytes, as the body continually adjusts the water/electrolyte balance to compensate for the fluid loss. When replenished with a hydration solution, the body once again readjusts the balance between water and electrolytes losses. Attempting to simultaneously provide nutrition (milk solids in the formula) can delay or even complicate the progress towards full hydration.

Once the animal is fully hydrated (barring any other medical condition or injury that would impede normal digestive function or additional fluid loss - diarrhea, fever, etc.), the animal is likely hungry and able to eat and effectively use formula as its primary source of nutrition. At this point, it has the sufficient fluid/electrolyte equilibrium necessary to digest the formula, and the blood and tissue cells have sufficient capacity to transport and accept the supplied nutrients. No additional electrolytes are needed at this point in the animal's diet.

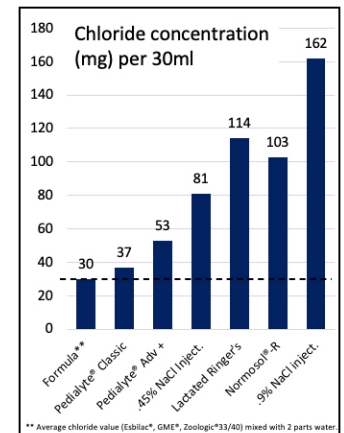
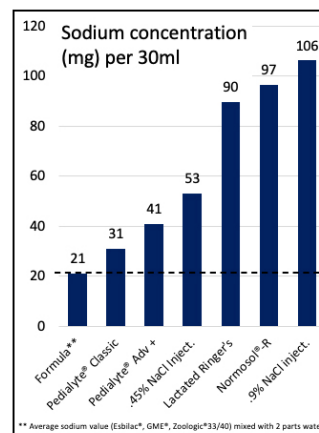
This critical distinction is very well stated by Dr. Richard Evans, DVM, (NWRA, 2002) as follows when describing the use of milk replacers with incoming young wild animals:

“Generally, you will find that the neonate is mildly to moderately dehydrated, which should be corrected prior to instituting feeding. This is of vital importance and MUST be resolved prior to feeding, as the fluid needs of neonates may be two to three times those of adults since the total body water content of the neonate is about 70-80% of its body weight, compared to 60% in adults.”

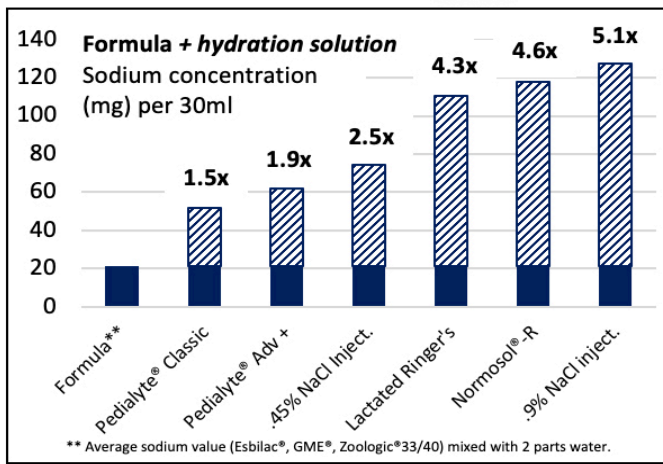
While the quote from Dr. Evans addresses neonate care, the same principle holds true for juvenile or adult animals. If they arrive dehydrated (or become dehydrated, e.g. as a result of diarrhea), the suggested protocol is to refrain from providing any food. The goal is to fully rehydrate prior to resuming the normal diet and feeding regimen for the age and species of the animal (which may include diluting with plain water for a more gradual transition to a full-strength formula). NOTE: Training on Fluid Therapy regularly conducted by veterinarians at rehabilitation conferences provides more in-depth information on this for both new and experienced rehabilitators.

Second, the commonly used rehydration solutions are highly concentrated in electrolytes because of their intended purpose and formulation. Powdered milk replacers contain dietary minerals in their product formulation (sodium, chloride, potassium, etc.) and are intended to be mixed only with water, free of any additional electrolytes. Mixing the milk powder with electrolytes changes the mineral and nutrient contents and balance, and the osmolarity - which can all cause a variety of health problems. In addition, as described later, the formula can become clumpy, hard and even ‘curdle’ when the sodium and chloride present in the electrolytes is added.

The charts below compare the sodium and chloride concentrations between formula (indicated as a baseline) and some of the most commonly used rehydrating solutions (in mg/30ml).



Mixing any hydration solution and a milk replacer together can increase the salt and electrolyte concentrations up to *five times* (see the following chart). When infant mammals consume excess sodium, serious medical conditions can develop (including kidney damage, respiratory and cardiac distress, and even fatalities). Such conditions can be difficult to diagnose in a small mammal and can range from minor to severe. Plus, the person mixing the milk powders with the hydration solution may not realize that the practice could have contributed to the animal's health problems. As a result, they may fail to mention that as a possible causative factor when consulting with a veterinarian or asking for a necropsy (if one was even conducted).



Third, the scientific and industry literature reports that excess salt can affect the reconstitution of the casein proteins in powdered milk products. Most of the powdered milk replacers used by rehabilitators (PetAg® and Fox Valley) use casein as a major, or even primary source, for protein in their respective milk powders. While some amount of salt can actually assist with the reconstitution (presumably the amount already in the formulation), the literature suggests that more significant concentrations of salt can work to impede the reconstitution efficiency. This can likely result in less than completely reconstituted/dissolved casein milk particles/clusters, which can cause clumping or curdling. This can be very difficult for neonates and young juveniles with immature digestive systems to digest, since casein proteins are already the most difficult for young animals to process. Such conditions can lead to GI upset and more severe digestive issues, including bloat and diarrhea.

In conclusion, except for a case of extreme emaciation, an animal will die from dehydration far more quickly than from starvation. When the animal is provided supplemental heat, its energy requirements (kcal from nutrition) are decreased enough to allow for sufficient time to follow a complete fluid therapy rehydration protocol, even if over a day or two. Specific protocols and guidelines are available in scientific publications, veterinary texts, some of the wildlife rehabilitation community literature and conference proceedings, and from consulting veterinarians.

Bottomline – Most agree that it is best practice to hydrate first and feed second. Additionally, do not overlap or combine the two, as they are mutually exclusive processes.

(A more thorough discussion of this issue and references are posted at WildAgain Wildlife Rehabilitation Inc's website: www.ewildagain.org. © 2020 Shirley and Allan Casey. Reprinted with permission.)

Shirley and Allan Casey have been licensed wildlife rehabilitators since 1986. Co-founders of WildAgain Wildlife Rehabilitation, Inc., they conduct research, publish, and conduct training on a variety of wildlife rehab related topics, including nutrition, health, regulations.