Rabbit neonatology is frequently relegated to a very small part of raising rabbits. New breeders and seasoned veterans can be astounded that despite every precaution being taken, a litter can simply fade away with no real understanding about why this unfortunate consequence was reached. A baby rabbit is not the same as an adult. Their anatomy and physiology is peculiar and these differences require discussion and exploration before we discuss how to save babies. Once we establish the foundation, we will break the baby rabbit down into various stages of growth.

**Pregnancy**

Ensuring a healthy litter starts before the baby rabbit is ever born. Make sure that a pregnant doe is provided an excellent diet of fresh food and water daily. Extra precautions should be taken to provide a good ambient temperature and avoid any stressful stimuli (sounds, smells, predators, etc.). Does that are excessively stressed or malnourished during pregnancy are prone to fetal resorption in the early stages (days 11-15) and fetal abortion in later days of the pregnancy.

**Parturition**

This is defined as the process of giving birth. The same concepts and principles apply as above in reference to reduced stress and a good plane of nutrition. Statistically speaking, most litters are born in the early morning or afternoon. Rabbits should be given a nest box that is appropriate for the size of the doe. Most commercial cage companies have an excellent guide for nest box sizes. The most common components for construction are stainless steel and wood. Many individuals have elected stainless steel due to ease of cleaning and durability. Hay and straw should be provided to the doe approximately 2-3 days before her due date (around day 25-27). This substrate mixed with plucked hair from the ventral abdo-

men will serve as the bedding material for the kits. The best nests are generally a mixture of hay/straw with maternal hair, a hole hollowed out in the middle, and a thin layer of maternal hair over the nest. Kindling takes approximately 30 minutes and kits will present in anterior or breach position. As each kit is born, the doe eats the placental membranes and severs the umbilical cord. Because this process is rapid, it is not unknown for a breeder to simply step out of the barn for a few minutes and return to a nest full of kits. This discussion does not include pregnancy complications, but a drug that rabbit breeders should have readily accessible via a licensed veterinarian is oxytocin. If the doe has not given birth by day 32, a dose of 1-2 U (U = hypotalamic unit) should be given intramuscularly to begin the birthing process. It is important to mention that rabbits receive most of their passive immunity from their mother prior to birth. This is in contrast to other animals that receive immunity via the colostrum ingestion from the first milk from the mother. Mother rabbits in poor health or with a clear disease state are at a high risk to pass this on to their young.

**Maternal Instinct**

Maternal instinct is a hot topic that has permeated the rabbit world. In the process of creating breeds of rabbits, we have also enhanced or subtracted from maternal instinct. Certain breeds of rabbits are championed as being superb mothers and are frequently used as foster mothers. Other breeds of rabbits (which will remain ambiguous for purposes of not offending the audience) are documented as poor mothers and may require fostering rather than even attempting to provide natural rearing by the mother. Maternal instinct is also a learned behavior. It generally improves with multiple litters. Studies have shown that it takes on average three litters before a mother has mastered the art of rearing a litter. Rabbits that have repeated failed attempts of raising young past three litters should be considered for culling. It should be
noted that rabbits do not retrieve their young like other mammals. Mother rabbits will mark their young via the scent gland under their chin. This is a crucial part that is often overlooked when breeders try to foster young.

Lactation

Does have four groups of symmetric nipples for a total of eight. They are evenly distributed in the ventrolateral axillary, thoracic, abdominal, and inguinal areas. While the normal number of nipples is eight, it is not uncommon (and advantageous) to have a doe with 10 nipples. The mammary glands develop rapidly after the first week of pregnancy. Maximum milk production takes place around 3 weeks post kindling and ranges from 170 grams to 220 grams per day in seasoned breeders. The milk from a rabbit is comprised of 12.3% protein, 13.1% fat, 1.9% lactose, and 2.3% minerals. This profile makes it richer than cow's milk. You can get a rough estimate of how well a doe is producing milk by comparing the weight of a litter at 21 days of age. Because they are a prey species, mother rabbits spend little time feeding their young. They generally feed between 8 p.m. and 6 a.m., which coincides with our sleeping schedule. Because of this, it is not uncommon to never witness a doe nursing her young. During this rapid feeding period of approximately 3-5 minutes, a kit will consume as much as 20% of its body weight. During lactation, the young will attach to the nipple and paddle with their front legs to stimulate milk let-down. It is important to recognize that this scheduled feeding of 24 hours is why we generally do not recommend hand feeding baby rabbits every 2-4 hours like we are accustomed to doing in puppies and kittens. After nursing, kits will immediately urinate and return to the bottom of the nest. They do not require stimulation to urinate like puppies and kittens.

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Neonatal Rabbit Problems

Hand Rearing of Kits

The reason for hand feeding a kit are numerous and can include loss of the mother giving birth, poor maternal instinct or rejection of the kits, failure for the doe to produce milk, and several other causes. Baby rabbits are susceptible to hypothermia and must be warmed if their body temperature drops below 97°F. Use plush blankets or even immerse the cold baby into a warm bath of water around 100°F. Even though rabbits nurse once daily with their mother, it is recommended to feed them 2-3 times per day (every 8-12 hours). Even though rabbits do not require stimulation to urinate and defecate by the mother, it is recommended that this be done as well after feeding. This can be discontinued after the first week of life. Beginning amounts should be approximately 4 mL of formula per feeding. Increase gradually as the kit grows. In a normal setting, baby rabbits will start eating a small amount of solid move around in a circular motion which helps regulate their temperature. Kits will become adventurous around 8 days of age and start eating their bedding material and eventually their mother's fecal pellets. This is believed to be what "seeds" the gastrointestinal tract of neonatal rabbits and helps produce their adult gut micro flora. Kits also begin leaving the nest around 18 days of age to explore and try new foods that the mother may be consuming. At 24 days of age, most kits have graduated from the nest box and can live outside the security of the nest. Baby rabbits are typically weaned between 5-8 weeks of age. A rabbit is born with a relatively neutral stomach acid pH (5-6.5). After a rabbit is weaned, its stomach acid pH drops to 2-3. A stomach this acidic is essentially sterile and can kill almost all bacteria. This is a crucial period of development in a rabbit's digestive tract. Because of this, it should come as no surprise that the highest incidence of rabbits lost is during this period.

Neonatal Rabbit Anatomy & Physiology

Kits are born altricial or defenseless. They are blind, deaf, naked, and weigh approximately 50 grams. The sense of smell is present at birth and acts as an important sense when detecting the mother. Scents of the mother are known within a day of life after she deposits fecal pellets in the box. Furthermore, a pheromone produced by the nipple of the mother attracts the kits to the region when it is time for feeding. Baby rabbits begin to hear around 7 days and their eyes open at 10 days. Baby rabbits cannot control their body temperature when they are newborn and this fact is a critical reason why many kits are lost from staying outside the nest box for too long. After feeding, the kits return to their nest and slowly

Domestic Rabbits

Nov-Dec 2013
food at 15 days. This may take longer if you are hand feeding. By the fourth week of life, a baby rabbit should be completely weaned off of formula. There are several published recipes for rabbit milk replacer that are listed below:

Cheeke’s Milk Replacer: 1 part evaporated milk, 1 part water; add 1 egg yolk and 1 tbsp. corn syrup to one cup of the mixture
Taylor’s Milk Replacer 1: 1 part Esbilac [KMR] powder, 0.25 parts heavy cream, 1 part water
Taylor’s Milk Replacer 2: 2 parts KMR liquid, 1 part Multi-Milk powder
Taylor’s Milk Replacer 3: 6 parts Esbilac, 4 parts Multi-Milk powder
Taylor’s Milk Replacer 4: 1 part Esbilac, 1 part Multi-Milk powder, 1.5 parts water

Fostering of Kits
As mentioned earlier, smell and olfaction are one of the first senses that a rabbit has at birth. Fostering kits to a doe that is known to produce consistent amounts of milk and has good maternal instinct is far more efficient and easier than hand rearing the kit. A mother rabbit will recognize her kits via their smell. Because of this, I recommend using a glove to transplant the kit into the new nest with the surrounding kits, rub the hair and bedding material on the new kit, and make sure the kit is placed at the bottom of the pile of babies to ensure that the scent is sufficiently infused into the new addition. Assuming maternal instinct is equal, the baby should be transplanted to the doe with at least 8 nipples and the smallest litter size to ensure that competition will not be excessive.

Cannibalism and Missing Body Parts
These two items can be intermixed and confused. At the time of parturition, a mother rabbit can inadvertently ingest a leg, ear, or other appendage while severing the umbilical cord. This tends to occur more commonly in first time mothers than seasoned veterans. Cannibalism involves ingestion of the majority of a fetus. Reasons for cannibalism include severe stress brought on by intrusion of predators or noise, malnourishment due to poor nutrition, and other external stressors on the doe. Maternal instinct can also dictate whether or not a mother will participate in cannibalism or not. Repeat offenders should be considered genetically inferior in a breeding program.

Birth Defects
Acrobat: Walks on forelegs only.
Brachydactyly: Absence of digits, nails, or limbs.
Juvenile cataracts: Blindness upon birth due to mature cataracts.
Cyclopia: Born with one eye.
Diaphragm hernia: Gastrointestinal tract enters the thorax via the diaphragm.
Max factor: Small stature, slit eyes, underdeveloped hind limbs, abnormal fur.
Peanut: Quite literally genetic dwarfism from two dwarfing genes. Generally underdeveloped and does not live long.
Furless: A rabbit lacking most of its hair.
Hydrocephalus: Large, fluid filled head due to excessive fluid in the cranial ventricles of the brain.
Malocclusion: Simple or complex. Can be iatrogenic!
Shaking palsy [tremor]: Continuous tremors and convulsions.
Osteopetrosis: Abnormal tooth and bone development.

Birth defects are common in rabbits because litter size is relatively high and female rabbits can produce many offspring in their lifetime. Most of these conditions are genetic in origin and unable to be managed medically. Consider using selective culling to prevent these problems. Some defects, such as the max factor, are unavoidable.

Coccidiosis
As we discussed earlier, when a baby rabbit is born the stomach pH is close to neutral. The mother’s milk is essentially sterile and therefore babies generally have a relatively simple diet with little challenge to their immune system. This changes as the rabbits begin to nibble on bedding, the fecal pellets of the mother, and other solid matter around 8-10 days. As the kit consumes a larger variety of food, the stomach pH changes. As an adult, the pH of a rabbit’s stomach renders it virtually sterile. Kits that fail to ingest the mother’s feces and therefore lack colonization of GI tract are also at very high risk of contracting the disease. Kits become infected with these species by ingesting
It is important to note that since the disease is common in younger rabbits, the situation generally deteriorates rapidly once diagnosed. Quick intervention is often needed. Breeders with multiple rabbits showing these signs should pool a fecal sample for diagnosis via a fecal float.

Treatment of intestinal coccidia is most commonly achieved with Sulfas and/or Amprolium. The most common of these combinations are:

- **Sulfamethoxine (Albon) at 75 mg/kg/day PO for 7 days**
- **0.02% Sulfamerazine sodium via drinking water**
- **Trimethoprim-sulfa at 30 mg/kg PO q12h x 10d.**
- **Amprolium 9.6% (Corid) in drinking water (0.5 mL / 500 mL / 17 oz.): 5 days on, 5 days off, 5 days on**
- **Ponazuril (Marquis in horses) at 20 mg/kg PO q24h X 7 d.**

Hepatic (liver) coccidia are a common ubiquitous organism in rabbitries not treated with coccidiostats. Kits that suddenly die with little to no clinical signs are prime suspects for this! Unlike the intestinal coccidia listed above, fecal floats DOES NOT identify this organism. Rabbits that have succumbed to this form of coccidia will have diagnosis made upon necropsy. Common findings include an enlarged liver, nodules on the liver, and an enlarged gallbladder. Prophylactic use of coccidiostats can be implemented in most rabbitries because of the low cost of the drug along with the fact that rabbits tolerate sulfa-based drugs very well. Because this is such a common source of death and loss in new babies, it is very important to consider using coccidiostats before, during, and after parturition in a doe.

Upper respiratory disease

Upper respiratory disease is a complex of bacteria (and possibly viral) causes that involve purulent nasal discharge from a rabbit's nares. Immunity is a concept that can added or subtracted via a breeding program. Those offspring who have a weakened immune system from genetics and/or environmental causes are highly susceptible to developing upper respiratory disease. The mother may be an inadvertent carrier or could actively be showing signs. Generally, young kits exhibiting signs of an upper respiratory infection will be lifelong carriers and should be culled from your breeding program.

Conjunctivitis (nest box eye)

Rabbits open their eyes around 10 days of age. Before this time, various environmental problems can contribute to nest box eye. They are generally due to unsterile conditions which include a doe who urinates and defecates too frequently in the nest box, poor circulation of air in the barn space, using a bedding material that is dusty and contributes to particulate matter becoming stuck in the eyelids, and other causes like injury. Nest box eye resembles conjunctivitis because the outer lids are swollen with the possibility of crust debris and ocular discharge (green, white, or brown) present. Left untreated, the infection will creep below the lids and lead to corneal ulceration and ultimately blindness and permanent scarring of the eye.

Intervention involves manual manipulation of the eyelids. Use warm saline to gently wipe away the debris adhered to the eyelids. For severe cases where the infection has penetrated into the eye itself, consider using ocular antibiotic drops. Common combinations include Ofoxacin, Ciprofloxacin, Tobramycin, or Gentamicin. Use one drop on the infected eyelid three to four times daily for a week. The eye will slowly resolve and manual opening of the eye will be much easier.

Triage Care for the Baby Rabbit

**Babies outside the nest box:** Use a gloved hand to replace the baby into the nest box with the littermates and visually inspect for signs of birth defects. If cold to the touch, warm the baby up! Use the warmth of your hands or consider emerging the baby into a warm water bath if he/she is too cold.

**Bloated belly, jelly-like loose stool:** Immediately separate the kit from its littermates. Consider a shock treatment for coccidia (it's too late for Corid, use something quick like Ponazuril). Give subcutaneous fluids under the skin with a 22-gauge needle. A simple rule of thumb is approximately 10 cc's per pound of body weight (a 0.5 lb baby would receive 5 cc's). Use

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Jay E. Hreiz, VMD.
Chairman of the ARBA Rabbit & Cavy Healthy Committee, Dr. Hreiz is a graduate of Penn's Veterinary School and currently owns a small animal / exotics practice in the Charlotte, NC area. He is also an ARBA judge # 789.

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DOMESTIC RABBITS

N O V - D E C  2 0 1 3
in the lower hindquarter and lacking the width through the hindquarter.

Jennifer Claucherty ACBD
There is something about doe A's from the top view I don't think looks the best. Her shoulder looks like a balloon. When I remember my old 4-H and ARBA ideals, that view from the top should be a very smooth, even flow from the very front of the shoulder all the way to a well-rounded behind. This doe, while very nice, does not keep that unbroken line. While B and C are almost too close to separate without feeling condition, I also feel D is clearly 4th due to the high point of the body rise coming far behind the ideal point right above the point of the hip. I would place them ACBD, but I am not raving as much about the first place doe. My placing for 1,2,3 might change with actually handling the does.

District 7 Report continued from page 40

This year 1381 rabbits were judged.

Winners were as follows: BIS Youth Show A - Mitchell Ross with his Netherland Dwarf Steel, BRIS Youth was Olivia Schupbach with her Broken Mini Lop. BIS Youth Show B was Olivia but with her Solid Mini Lop and BRIS was Mitch again but with his Otter Netherland Dwarf. BIS open Show A was Paul Grundrith with his New Zealand White and BRIS was Lisa Lewandowski with her Broken Rex. BIS open Show B was Paula Schutz with her Black Tan and BRIS was Kim Witherow.

And lastly, The North Country show was held in Bridgeport N Y on Sept 20th. A great building and a very well run show. This year, the club was down about 200 rabbits. Winners were as follows:

Melanie Lyons took BIS in the Youth Show A with her Self Jersey Wooly and BIR with her White English Angora. Youth Show B was Michael Himlin with his Otter Netherland Dwarf and Melanie again but with her Agouti Jersey Wooly. In Open Show A, Kim Pueschel took her first BIS with her Florida White Jr Buck and Chaz Hardin took BRIS with his black Otter Britannia Petite. Show B, Ted McBride took BIS with his Otter Netherland Dwarf and BRIS went to Dorothea Prine with her Blue Satinith her Colored French Angora.

I received the following from Renee Damoth on the Cayuga Lakes Rabbit Club held in Ithaca. There were 15 families camp this year. Everyone brought a potluck dish to share for dinner. The hopping contest had 42 rabbits entered with 30 exhibitors competing with a nice mix of youth and adults. They participated in a straight course and crooked course. Caitlin Damoth and her grandfather Rick Damoth were the time keepers and judges. This was a great year for youth events with 30 kids taking part in events. Depending on the youth age group determined their events. They competed in showmanship, breed id, judging, and knowledge. All the kids did very well and I can’t wait to see the numbers for next year. The winners in Royalty were: Lord - Aidrian Sheldon, Lady - Ella Auge, Prince - Zack Ludwig, Princess - Deanna Johns, Duke - Kenny Marion, Duchess - Lacey Johnson, Queen - Emily Barnes.

ARBA Announcements
Sanction requests for Silvers must be sent to: Frances Petty 10705 Dexter Dr Thornton, CO 80233-4552

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a balanced isotonic solution such as LRS, 0.9% NaCl, or Plasmalyte. For bloating, purchase Gas-X or generic Simethicone drops. Administer one drop orally 2-3 times per hour to relieve gas. Probiotics are a great thing to use once the rabbit is stabilized. Consider plain nonfat yogurt or Proviable specifically designed for rabbits (veterinarian Rx required). If stable, consider force-feeding 6-8 cc's per pound of body weight with something like Oxbow critical care.

Poor Doers” or runts: Begin by examining the kit for any signs of birth defects that could be contributing to the lack of growth or thriving. If nothing is appreciated, consider force-feeding to provide extra nutritional support.

The ARBA Rabbit & Cavy Health Committee
Chairman: Dr. Jay Hreiz (NC) 2012 Committee Members: Dr. Wendy Feaga (MD), Dr. Fritz Trybus (IL), Dr. Nicole Velotta (WAI), Denise Ancharski-Stutler (PA)

The ARBA Rabbit & Cavy Health Committee is a special committee appointed by the ARBA President. Our primary goal is to serve as an advisory board to the ARBA and its members who have concerns regarding rabbit & cavy health. The committee is composed of multiple veterinarians and individuals trained in various aspects of veterinary science.

ARBA members often forget that there are various committees that they can call upon for very specific issues in our hobby. This is one of them! Please consider using us for your specific questions if and when they arise.

Satin Fur continued from page 27

while lack of it detracts from them, making “finish” a factor that goes beyond the points allotted to “condition” and impacting the points allotted to fur and color in general.

A common mistake in evaluating any pelt is to mistake finish for quality. Finshed fur is finished fur. It can be thick or thin, harsh or soft, and long or short. Just because a coat is finished does not make it a quality coat. An excellent coat should have at least enough density to cover the skin, a soft silicone like texture with enough resilience to return properly, intense sheen, balanced length between the under and guard coats, and complete finish or prime. These characteristics should be uniform throughout the pelt, not just over the center of the back.

You can see a quality, prime coat from either side of the judging table. Adequate to excellent density will stand the soft, silky coat up slightly at an angle so that it does not lay flat on the back. The slightly coarser guard hair will extend just a bit over the undercoat, enhance the rate of return and appear even over the pelt. The prime condition will enhance the unique sheen to brilliance. When satin fur is at its best, the smooth, lustrous, full bodied feel of the coat when handled is like no other in the rabbit world.