



Maddie's Institute

Critical Care of the Sick Neonatal Kitten Video Transcript

March 2014

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Lynne Fridley:

Good evening. I'm Lynne Fridley, Program Coordinator for Maddie's InstituteSM. Thanks for joining us tonight for this exciting webcast, Critical Care of the Sick Neonatal Kitten. Our speaker tonight is Dr. Elizabeth Thomovsky, Clinical Associate Professor in Emergency and Critical Care at Purdue University College of Veterinary Medicine.

Before we get started there are a few housekeeping items that we need to cover. Please take a look at the left hand side of your screen, where you'll see a Q&A window. That's where you'll ask questions during the event. Dr. Thomovsky will answer as many as she can at the end of the presentation, but please submit your questions early. Questions submitted in the last few minutes will not be processed in time for a response.

If you need help during the presentation click on the question mark at the bottom of your screen. There are other little images there called widgets. The green file widget will take you to the resources that we wanted to share with you tonight.

Ten participants of this live event will be chosen in a drawing to receive a snuggle kitty, which acts as a virtual mom with a heartbeat and heat to comfort your orphaned kittens. We will contact the winners via e-mail, so good luck and be sure to check out our new learning tracks featuring orphan kitten care, which includes webcasts, video, articles and much more. The learning tracks are now on our website at www.maddiesinstitute.org.

Before I turn things over to Dr. Thomovsky, I want to say a few words about Maddie's Fund[®]. We are the nation's leading funder of shelter medicine education and it is our goal to help save the lives of all of our nation's healthy and treatable shelter dogs and cats. The inspiration for that goal was a little dog named Maddie, who shared her unconditional love with Dave and Cheryl Duffield. They promised her that they would honor that love by founding Maddie's Fund and helping make this country a safe and loving place for all of her kind. Please use what you learn here tonight to make the dream she inspired a reality. Welcome, Dr. Thomovsky. Thank you for being here tonight.

Dr. Thomovsky:

All right. Great. Thank you very much, Lynne, and hello everyone out there who I can't see. So, I mean I'm just going to warn you ahead of time, I talk pretty quickly, so I will try to keep it at this speed or slower, but if I get excited I may talk faster, so I apologize ahead of time. That's always the critique I always get on every presentation – she talks too fast.

Okay. So we're going to go through a presentation aptly titled *Caring for the Neonatal Kitten*. Again, if you have any questions please submit them and I will try to get to them and as many as we can at the end. This presentation will probably take a little bit over an hour, because I have a video clip and things I wanted to show.

Stay with me if you can. I know an hour is a long time, especially if you're in an Eastern Time Zone, but I think we should be good. Okay, let's get started.

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All right. So, today the objectives of today's presentation, we're going to start off with just a brief review of the normal neonatal kitten. And the reason I want you to include this is, I feel like, you know, we especially as veterinarians, we don't necessarily get to see neonates all the time in practice, and so having a rough idea. I know, whenever I see a neonate I have to always remind myself like what is normal for a kitten or a puppy of this age so that I can therefore kind of figure out everything from that point on. So I want to kind of go over that.

Then I wanted to hit some of the common diseases in neonates, because again, without seeing them that frequently as veterinarians we tend to forget sometimes or we don't remember all the real common stuff, so I just wanted to go ahead and go over that. And the old adage is common disease always occurs commonly, so we still have a good handle on that. And then we're going to over some of the care like the sick neonate and I've kind of divided it up into thermoregulation, fluid support and catheterization, medication administration, feeding, and then just briefly touching on blood transfusion for them, if necessary.

And then finally, I'm just going to, just for a couple of slides talk about serial monitoring and what you can do serially in the hospital when these patients are there and what you're looking for to change over time.

And this is actually such a timely talk for me, because Sunday – what's that, three days ago? We had a, let's see he was a 17 day-old puppy come in on Sunday that's still in the hospital right now. So I actually had to review some of this stuff myself, just on Sunday because this little puppy came in, but today we're talking about kittens, not puppies.

So, I wanted to start off with a poll question and I think Lynne is going to take it from here as far as the poll question; then we'll go from there.

Lynne Fridley:

Of the following areas which are you most interested in hearing about today? The review of normal kitten, the review of normal disease, fluid therapy, feeding interventions and transfusions. So please click on the screen for your answer and submit it. Do not put it in the Q&A box please. Just click on your screen, submit your answer of the following areas which are you most interested in hearing about today.

And since this is a pretty straightforward question we're going to just jump right to the results. Well, I think we have a neck and neck tie for the ones that people want to hear about the most, Dr. Thomovsky.

Dr. Thomovsky:

Great. Good, that's interesting, because I can blab on for longer about certain things or less about others, so okay, great. I actually have quite a bit on feeding, which is fantastic. And then normal disease I talk a lot about too, so that works out perfectly, great.

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We're going to go ahead and get right into what the normal neonatal kitten is supposed to look like. So, from basically the neonatal period is defined as the period from birth to about two weeks of age and that is typically your neonate. From two to four weeks we consider that the transition period and then once you get about four weeks it's called either the socialization or juvenile period, depending on the source that you read. And greater than four weeks is the kitten that most people will visualize in their head, the one that's interactive with people, interactive with the environment, things like that.

We're focusing on kind of that really young kitten that doesn't behave like the kitten that you expect it should. So, other things to remember, the kittens should be about 100 grams when they're born plus and minus about ten grams and that is going to be your best predictor of survival.

If you have a neonatal kitten come in that's a day or two old and it's 50 grams, that kitten has a very poor chance of surviving, just because it's already underweight when it's born. And underweight kittens often have endocrinopathies that they're born with. They're a result of poor maternal nutrition. They could have been from a very large litter, where there was enough uterine crowding that they didn't get enough nutrition or space to grow. Or sometimes they even have congenital abnormalities.

That's why birth weight is important, because all of those things play into why the kitten is so small to start with and a lot of those things it's very difficult to overcome. Certainly, it's worth trying, but that's where you're

giving the owner kind of a scenario where you're worried that despite our interventions, the kitten might not pull through.

Then a very important thing to look at with any kitten is that they should be doubling their weight in about ten days, so they should grow about 10 to 15 grams a day and they should be somewhere around 200 grams at about the week and a half mark. And if they're doing that, then even if they start off very small they have a good chance of kind of continuing and thriving from there.

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As far as behaviors go for our little neonate, they should sleep about 90 percent of the day and that's normal for them. And when they're up until from day zero until about the four week mark it's going to be a very, very deep sleep. Only a sleep where it's very difficult to rouse them and that's completely normal for them at that age.

By about ten days the kitten should be able to stand. Prior to that they're kind of pulling themselves around and doing kind of a pseudo crawling sort of thing. And at about the three week mark, when they're technically out of the neonatal period they can actually learn behaviors and things like that.

Prior to that no matter what you do, they're going to keep doing the same mistake over and over again, and that's totally normal. We really have to look out for them up until about three weeks. So, your playful kitten here is somewhere after three to four weeks; you're going to start to see them doing that.

Then next up we are going to talk a little bit about the things that you expect to see. So you shouldn't see open eyes in a kitten until they're about 10 to 14 days old. And their cornea will typically be cloudy when they first open their eyes, and then clear at about 24 hours and that's again, nothing to worry about.

They should have a corneal reflex, even at the moment of birth, so if you were to open their eyelids they will still have a corneal reflex, where if you tap on the cornea they'll pull the eye back and that's normal to have that from birth. The menace where you move your hand up to their eye and expect them to blink or pull their head back, they learn that and so they don't start to learn until three weeks, so you won't see that until after the age of three weeks.

If you want to hold the light up and look for pupillary light responses, you're not really going to be able to tell what the pupils are doing again, until they're about three weeks old. The muscles are not developed enough to move the pupil enough that you can really tell if they're

responding to light until about three weeks. But they will be able to tear and have kind of normal tear production, just when their eye gets dry or if something gets stuck in their eye. That's a reflex where the eye is able to produce tears from the moment they open, so that's a normal thing for them. And so again, we expect to see the little, close eyed kitten that's a very young age.

Next up if you were to do a neurologic exam on these guys, what we would expect to see is they should be able to right themselves. So if we put a kitten in lateral recumbency they should be able to put themselves up sternal right away from the moment that they're born.

Also if you touch their feet they should do a withdrawal reflex, you know, again from day zero on. And again, as we all know this, if you stimulate them in the anus or around the vulva or the prepuce they should urinate and/or defecate and we all know that, because all know how to stimulate kittens, and that's from day zero on.

They will suckle until about three weeks of age, and then they're going to start to get interested in more solid food at that point. They should root, which is where they're kind of pushing around on their bedding and things starting at birth on and that's something that they do to keep themselves warm and we'll talk about thermoregulation in a little bit again.

They will have crossed extensors, so if you do a withdrawal on the upper limb and lateral recumbency, they should – they will often extend the other leg and vice versa, and that normally in an adult we would consider that something abnormal, but in a kitten that is totally normal, but that will go away after week 2. So, if they're 30 days old or something of that nature and they have a crossed extensor, that is significant and that is something that's not normal neurologically with them.

And then after about 18 to 21 days they should be able to voluntarily urinate and defecate. And sometimes they can do that even sooner than that, so again, like the little puppy that came in this weekend, the owner had told me that after about day 12 that puppy was often urinating and defecating on its own without stimulation, but for sure by about 3 weeks they should be able to do that.

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So, now we're going to look at – talk about thermoregulation. Thermoregulation is super, duper important for neonates, because number one, they're not able to regulate their temperatures, and number two, they often – they're going to start off much colder than you think they should.

The first week of life they're only going to be 96 to 98 degrees, hence why they want to root around in their bedding and root around under other

kittens, and also under their mom just to try to stay warm. At week 2 they should be able to hold themselves at 99 degrees. And then at week 3 or more they should be up to what we would consider normal temperature of something around 100.

Kittens cannot shiver, so if they can't shiver if they get cold or in a cold area or get wet or something of that nature, they can't shiver to warm themselves up, and shivering is a very normal thing that you should do to increase your body temperature and they're not going to be able to do that. So that's very important to know so if you have a kitten that gets wet it's super important to dry them completely before you put them back in the cage, because their temperature can drop several degrees just right off the bat.

They don't have appropriate peripheral vasoconstriction, so as a result normally if you and I would get cold or an adult animal would get cold, you're going to take the blood that's in your fingers and put it back to your heart and lungs. Kittens cannot do that, so as a result they keep losing heat through the periphery very, very readily and get cold very, very quickly. And again, that's why wetness is such a big, big problem for them.

They have a very large surface area at that age – surface area to volume ratio is very large at that age, and there is a lot of skin that's not properly cornified and the cornification on our skin, which is the dry surface on our skin is what helps to keep moisture and also keep heat inside. And so when you don't have an appropriate amount of cornified skin, that's another reason you're going to lose a lot of moisture and a lot of heat really, really readily. And they also lack appropriate fat. So they may look fat and round, but they don't have the right kind of fat in the right locations to insulate themselves until they are much older. And so again, another reason why you get cold very, very quickly.

I didn't know this. I thought this was super interesting, but a kitten can only heat themselves 12 degrees warmer than their environment, so unless you keep them in a warm place – if you put them in a 60 degree room, they're only going to be able to keep themselves at 72 degrees. So if they are allowed to get as cold as the room temperature, so that's why it's very important to keep them in like an incubator. Mother Nature's incubator is mom and the other kittens. And if you have a singleton kitten that you are hand raising it's very important to keep them with a heat source all the time, because you've got to keep the temperature where they are probably at least in the mid 80's, so that they can keep themselves in the high 90's. I didn't know that it was that dramatic, so I thought that was actually very interesting when I put that together, because I didn't

realize it was that degree of, you know, that they could only raise themselves 12 degrees.

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Okay. So now, as far as the fluid balance goes in these guys I kind of made mention that they have a tendency to lose water and so again, the kitten have a very high percentage of their body which is water and its 75 percent, which is a little bit more than an adult. And again, they've got the non-cornified skin, so if you have skin that's non-cornified you lose heat and you also lose moisture and so they have a very high tendency to dry out, which can be a problem when they're not eating or drinking milk I should say appropriately.

Their kidneys are really – when they're born kittens do not have appropriate formation of their kidneys, so as a result they can't concentrate urine. They're going to lose moisture through their skin and they're also going to have extremely dilute urine where they can't reabsorb moisture through the kidneys. That makes them super duper susceptible to dehydration, and that's another reason it's so important that they keep getting milk or whatever we're deciding to feed them, so that they do not get dehydrated. And they turn water over at two to three times the rate of an adult. While we, as an adult can retain water and we can keep ourselves hydrated for hours without drinking a kitten cannot do that, and so that's another reason you have to feed them as frequently as you do.

In fact and as a result of the fact that their kidneys aren't formed correctly if you were to do blood work on them they're going to have a high BUN, and that's because one of the reasons is their kidneys can't properly filter the BUN out. So, it remains in the blood circulation and their specific gravity is very, very diluted too, so it's somewhere between 10-06 and 10-17, which is completely hyposthenuric to isosthenuric.

And they have quite a bit of glucose urea and protein urea for up to six weeks, because again, they're not able to properly filter things and they tend to lose a lot of glucose and protein and cannot reabsorb it, which is a little bit different than an adult obviously, and once they're about six weeks of age though, they should be able to maintain those things properly in the bloodstream.

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Okay. So, next up if we'd look at kittens a little bit more thoroughly, they also have decreased cytochrome p450 enzymes in the liver for up to 4 weeks. What that means is they can their liver is not able to properly take drugs or take other interventions that we're giving them and break them down, and that's up to four weeks. So a lot of – and this becomes important when you talk about drug therapy, because a lot of the drugs we're going to give them are cleared and broken down through the liver and if the liver is not able to do that properly. Then you have a higher

concentration of drugs circulating than you think you should, and so that affects our drug dosing a lot with these guys.

If you do blood work on them their bile acids will be abnormal and again, that's because their liver is unable to detoxify the blood properly. They have elevated ALP and a normal ALT, and that's just kind of your normal profile you will see in these guys. We don't do a lot of blood work on the young guys, so this is not a huge issue, but don't panic if you were to see these things. The ALP is elevated largely because the bone is growing, rather than anything to do with the liver, because of the bone isoenzyme of ALP.

The GI tract is sterile when they are born, and so I didn't know this either that I actually thought they were born with some gut bacteria, but apparently the GI tract is sterile at birth and they're going to get all of the bacteria from their mother typically. E-coli, protease, et cetera, et cetera, the things I have written down, all of those different bacteria come from being in contact with their mother and then being contact with their mother's feces and things also, and that's just again, part of Mother Nature, but you need your GI tract to be colonized, so that's what we want to have happen.

As a result of the fact that it takes some time to get the appropriate colonization of bacteria and also what they're eating at this age. Their stool will end up being a yellowish tan and very soft looking stool for the first several weeks of life, and then eventually it starts to look more like what we'd expect cat stool to look like.

They're also going to get from their mothers maternal immunity within the first 24 hours, and so again, they're going to need to drink that first milk that's produced by the mammary glands which contains colostrum just like a cow, and they're going to need to drink that in the first 24 hours and get maternal immunity that way, and if they're unable to do that like an orphaned kitten, that can affect their lives long-term also.

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So, if I was to do a vital exam on these guys and I mean is when they present and I do a normal physical exam what do I expect to see? So number one, I should not see an umbilicus after three days. If I see the umbilicus persistent after three days, something is probably going on. We don't want the umbilicus there for more than a couple of days, because it's a great spot for bacteria just to kind of go right up in the umbilicus and get inside the abdomen, so we want that to fall off right away, so that they don't have any kind of trouble with septicemia coming from the umbilicus.

The respiratory rate initially, if anyone has to resuscitate a kitten we've all seen this. They breathe strangely. They breathe deep initially, and then they breathe really, really shallow and really, really fast. By about three hours after birth they should have what we would consider a normal respiratory rate and so, from then on you would expect to see in a normal kitten a normal respiratory rate, just like an adult cat.

The mucous membrane should be dark pink or red for about a week, and then later on they have some more pallor, and that has to do somewhat with just the perfusion, so how well they're able to pump blood to different tissues. It has a little bit to do with what their hematocrit is when they're born and things. And some of it I don't totally – I couldn't explain exactly why the color change happens when it exactly does, but just know that they're going to be darker than you'd expect for about a week, and then they're going to look like a normal cat, so really, really pale, because I think normal cats are often really pale.

They should have a higher heart rate, a higher cardiac output and a higher central venous pressure than an adult, so their heart rates should be above 250 for at least 4 weeks of age, and that's largely because there is sympathetic nervous system tone that's unopposed for up to 4 weeks. So their parasympathetic nervous system is not properly functional until a month.

They should not have a sinus arrhythmia, so when you are scoping them it should be just a tachycardia. Sinus arrhythmias come because of the influence of the parasympathetic nervous system. So until you get parasympathetic tone, you're not going to have a sinus arrhythmia where the heart rate changes with breathing.

And any heart murmur you would hear is completely fine. I think we all know this up until about three months of age. If you're getting to a three or four month old kitten and you're still hearing a murmur, we're going to be worried about a congenital abnormality affecting the heart.

Then, if you were to take a blood pressure on these guys or measure a stroke volume, which nobody really does, their blood pressure will be much lower than an adult. I couldn't find an exact normal, but if I consider a Doppler blood pressure in an adult, you know, I'd say 120-ish, my guess is, because I haven't actually taken that I can recall, blood pressure of one of these little guys. But if I was able to successfully get a blood pressure I would suspect it would be 100 or below probably based on the way it sounded in our literature. I just couldn't find an exact number for us, but it will be something lower and that can be okay.

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All right. So, diagnostic testing in any neonates, you know, obviously blood work is going to be one big thing that you want to check in any of these guys, and so you're going to pretty much be limited to a jugular venipuncture for any neonate, because all of the other vessels are just too small. And if you were to try to sample from another blood vessel you often will have so much hemolysis, because it's such a small vessel and such a small needle that it would really negatively affect any of our lab values. So pretty much the jugular vein is the way to go.

But do not douse these guys in alcohol like we would normally do for an adult, because it's going to cool them off too much, because again, they don't have the appropriate cornification of their skin and they can barely keep themselves at a normal temperature. Alcohol is going to cool them off and have a really negative reaction in these guys. So try to use something like a little bit of you can use room temperature like sterile water. You can try to just clip a little bit of fur and visualize. You can try something like chlorhexidine or betadine as long as it's mixed with sterile water rather than being mixed with alcohol, but again, don't douse them in any liquid, because they have a tendency to get cold.

A 100 gram kitten, so that's a kitten that's like day 0, day 1 – only has 6 mls of blood total. They're going to slowly get more blood volume than that, but still, you're still looking at not very much blood volume in these guys, so if you're sampling one ml from these guys, that's ten percent of their blood volume, something like that. I mean that's a huge amount, so be very, very judicious on what you're drawing blood for.

Also, hematomas are hugely bad, so if you were to be poking around and end up with a hematoma, they could lose a ml of blood in their hematoma, which number one, makes them very dangerously anemic. That's a significant loss of blood. And then also if there is enough blood around their airway in the neck, it could cause an obstruction, where it's just putting pressure on the trachea. Their tracheas are not as formed as an adult, and so they're a lot softer and have a more tendency to collapse. So, just kind of it makes sense when you hear it. It's not something I would necessarily think of, because again, an adult animal, you know, you draw blood from a jugular, a little hematoma, it's no big deal.

Similarly if you hold off after a jugular blood draw, you need to be careful that you don't press too hard, because it could occlude their airway also, and again, not something I would necessarily worry about in an adult animal. And typically, if you're going to be drawing blood serially from these guys you need to be really careful to not draw – to draw more – less than 10 percent of their blood volume every 24 hours, so you need to be really careful about how much blood you draw and stop drawing blood and wait a day, and then maybe sample again for something else.

So again, for example, the puppy we were dealing with on Sunday, we really, really wanted to do some coagulation tests, because he had a humungous bruise and we couldn't figure out why, but on day one we just drew like a little bit of blood for a CBC, and then on day two we drew a little bit more for the coagulation times and on day three, I drew a little bit of blood for something else. You just really need to stage out your diagnostics, which is hard for me, as a critical care person, because we're used to running lots of tests right away. So that's like really a lot of restraint for me, so just be aware of that at all times. Okay.

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Okay. So now, if I was to get some blood from these guys and do a CBC, they're going to have a PCV that is really quite high at birth, 42 percent or so, which is quite a bit higher than even an adult cat might have. And their red cell mass, their MCB is pretty high also.

Eventually, over you know, by the time that they're two months of age, so about eight weeks old they end up being – dropping their PCV down to 24 percent, so they go from 42 at birth down to 24 percent. And the reason for that has a lot to do with the fact that the extra cellular fluid in these kittens – so all of the tissue around the blood vessels is very, very fluid rich when they are born.

And eventually that fluid moves into the blood vessels as they age and that dilutes down the red cell mass. And so that's the biggest reason why the PCV drops so much. Also obviously, their bone marrow is taking time to ramp up and make a normal production and as they get older, you know, as they grow older the bone marrow does a better job, but when they're the first couple of months it's not as productive with red cells either, but a lot of it is dilution. So, that was a bigger change than what I thought. I didn't realize they started off so high when I was looking into this. In my head I always thought they were in the 30's and I was surprised to see that some of the little guys can be as high as 42.

If I did a chemistry the BUN is going to be high for about a week, as I alluded to before, and that's again, because the kidneys are not properly formed. And then it should drop down to normal in the second week of life on. The creatinine will always be lower than an adult, and creatinine is a byproduct of protein breakdown and again, it has a lot to do with nutrition. So as they get older and start to eat a more protein rich diet, cats being true carnivores, their creatinine will come up, but when they're young and really milk dependent they're not going to get as protein as when they're older, so the creatinine remains low.

The ALP is elevated again, because of the bone isoenzymes

so that's the version of ALP that's involved in bone growth and later on again, as they stop growing the ALP will drop to normal and again, the ALT is a normal range, unless obviously there is some kind of damage to your liver.

Their phosphorous will be elevated and that's normal. Again it has to do with bone growth and all of their electrolytes should be normal. So whenever you interpret a chemistry panel from these guys, you just need to know depending how old they are you might see an elevation BUN. You always see a low creatinine and then depending on growth and things you'll often see a high ALP and phosphorous and that's totally normal.

And if I did a urinalysis on these guys, again as I alluded to, because the kidneys aren't totally formed, their specific gravity is low for about three weeks. Then they start to have proteinuria and they will have also proteinuria and glucosuria for up to six weeks, because the glomerulus is not properly formed. And so again, that's what you expect to see in these guys if you look.

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If I did some radiographs, which I did on the puppy on Sunday, as a matter of fact, they're often very hard to interpret, which it was, and that's because the animal is so small, number one, you end up taking like a "cat-o-gram" and looking at the entire cat, and so you don't get to like adjust your KDP and MAS like you normally would for one cavity versus another.

Also they don't have any abdominal fat, so pretty much you can't see anything in the abdomen at all, except some gas in the intestines. The bones are poorly mineralized, so they don't look like the normal opacity you would expect to see and yeah there is so many growth plates and the bones look like they're not attached to each other, because they're so far away from each other, because they haven't really grown to kind of meet each other at the opposing surfaces.

It's really hard to interpret; so you're looking for really big, big obvious changes when you look. And you can reduce the KBP by 50 percent and if you're using like non-digital you can try using a more detailed film screen, but you can make out the chest well enough to know if they have pneumonia. And that's so when you take a neonatal radiograph I think you're looking for bony fractures and you're looking for: what does the chest look like? Does it look like there is pneumonia or not? You're not going to get a lot more information other than that, realistically, from them.

If you were to do an ECG because you thought you heard an arrhythmia and again, you shouldn't really hear anything but tachycardia lead to you

can see if there is an arrhythmia you would be able to get a normal tracing on lead too. So, and I've never run an ECG on these guys, to be honest, but it would look normal if I did, so okay.

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So now we're going to move onto what kind of illnesses do we expect to see on these guys knowing roughly what they're supposed to look like in a normal setting. So first big illness I think we all know about is parasitism. And parasitism, fecal or oral, is going to be your big thing and it's going to be from the environment. When you're living with other animals or even living anywhere near the soil or cat boxes, potentially there are going to be parasites that the kittens are going to be exposed to. Also transplacentally the mother will naturally pass roundworms for sure, if not other parasites to them.

So, it's normal to have some parasites, hence why we deworm everybody. Obviously, the parasites in a debilitated animal can be a problem, because then they're going to be effecting the amount of nutrition the neonate is getting and causing diarrhea and things, which can cause them to get dehydrated and things like that. And as I kind of just got ahead of myself thinking dehydration, if you have hookworms you can worry about things like anemia, diarrhea as I alluded to, which can lead to dehydration.

If they have a big enough worm burden it can cause an impaction where these guys get, you know, it can be an upper GI like obstruction, where the worms are stuck in the jejunum or the illeocecal colic junction or it can be just like a fecal impaction where they're having trouble passing stool, which will need an enema and to be dewormed for.

And then if they have aberrant migration potentially can get a worm migration into the brain or something of that nature, I've never seen a case of that. It's you see it written in textbooks, so I have no experience in seeing this, but it's possible to occur. I think it's just very rare. Okay.

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Septicemia is our next most common thing and that's what our puppy friend from the weekend I keep talking about had. And so basically, septicemia is where bacteria are entering the bloodstream from somewhere, and so GI tract a common spot. Respiratory tract is the second probably a very or another real common spot. The urinary tract or the skin or the umbilical cord, and so again, that's why we want umbilical cords to fall off at three days and be gone and we don't want to have any big wounds in the skin and things where bacteria can enter. And our puppy had septicemia from his tail dock site. It was a boxer and I'm pretty sure that's where it came from.

If you're going to get septic from something and you're a kitten, it's going to be because you didn't get appropriate immunity from your mother from

the colostrum, and so that's where orphan kittens are going to be a high risk. If this animal is persistently hypothermic or hypoglycemic or has a poor nutritional state in general, those guys are more susceptible to getting septic.

If they're already infected by some sort of virus, which again, maternal immunity did not protect them from, or if they have lots and lots of parasites or they were drinking milk, which the product of mastitis from the mother, then any of those things potentially is going to set them up to be a high risk of getting septicemia and then being very sick from it. So, if you have a kitten or a puppy that comes in with septicemia you have to wonder what else is going on and what made them, you know, be this susceptible to it.

[Slide 14]

Okay. If you have a septic patient, because this is pretty common, I wanted to make sure everybody knew what to look for. So these guys will be crying and crying and crying all the time, which again, they should be deep sleeping, as I said, like 90 percent of the day. So if your kitten is up crying rather than sleeping, it's a possibility it's septic. I mean there could be other things, but that's definitely a common sign. They're often restless, seem extremely weak, especially compared to litter mates, if you have something to compare to.

They often look cyanotic, which is what this little picture is supposed to show, kind of your blue to dark purple tongue, or they could have very, very red mucous membranes like that classic horror septicemia we learned about in vet school what they're really injected mucous membranes.

And then can get really discolored extremities and have the skin slough, and that's what's happening to the puppy also that we're treating right now. His abdomen is the skin on is starting to slough off, and that's because he was septic over the weekend. So, common presentation and just something to think of if you see any of those signs.

[Slide 15]

Okay. Fading kitten syndrome is probably the other famous thing that everybody talks about, and so that's your scenario where the kitten is not gaining weight, is very, very weak. We're comparing it often to the litter mates, and then a lot of these guys will die when they are very young and there is no other apparent reason.

You know you can't find anything else. It seemed like the kitten was trying to eat. It seemed like it was suckling. You thought everything was okay, although it was, it granted smaller than everybody else, and then the little guy just doesn't make it. And so, there can be underlying infections. There can be congenital abnormalities that lead them to have fading kitten.

And I went to a very interesting talk at Western Vet Conference not this last year, but the year before, and the speaker there was positing that at least in dogs she thought a lot of the kind of the fading puppy syndrome that they were seeing in these – she worked with a lot of breeders of seeing eye dogs. She thought the fading puppy that they would see tended to be from – tended to be the puppies who had dystocias at birth, where they were hypoxic for a prolonged period or there was some kind of trouble where they weren't born kind of in that natural way that we expect.

And I believe too after hearing her talk to be quite honest and it made a lot of sense, and I've never heard anyone say that about kittens, but I wouldn't be surprised if there was some kind of tie in. Kittens obviously, there is not as much dystocia in cats as in dogs, but potentially, it's something where you're having hypoxia at the time of birth or right before you're born.

I would imagine in a cat would be the same thing, where you're going to potentially have trouble putting weight on and be at risk of having this condition. And so this little picture here is actually not a fading kitten. However, it looked to me like the way the fading kittens often will, so they have like alopecia. They kind of don't look like you're in your normal kind of – they don't look healthy. They don't look the way they're supposed to. This is some kind of weird exotic breed of cats that I can't even remember what the name was that I had never heard of, but this little dude here looked like the way a fading kitten could look and I can imagine normal litter mates that didn't look like this around it, so okay.

[Slide 16]

The next illness that I want you to touch on is neonatal isoerythrolysis. And so, I had forgotten that cats get this until I reread about this. I haven't seen one in years. I remember learning about it in school and I think I saw one way back years ago, but it's been a really long time.

But if you have a type B mother cat with a type A tom cat – father cat, basically what happens is if any of the kittens are type A or type AB, the maternal side – the dam – has anti-A antibodies naturally, and so her anti-A antibodies will attack her kittens and those antibodies are found in colostrum and so when the kittens are nursing, they're going to be taking in antibodies that are going to attack their own body system. So it ends up causing hemolysis amongst the little kittens who are type A or type AB and they end up being very, very jaundiced looking, and so this picture, if you can kind of make out their noses are very, very yellow looking, and so that's what an isoerythrolysis syndrome looks like, where they are very, very jaundiced and very, very icteric.

They will often get renal disease as a result of all of the pigments that are being released, so when the red cells lyse and there is hemoglobin that's in

free circulation getting filtered by the kidney, those pigments can potentially cause renal damage. Their kidneys aren't totally formed, but potentially they're never going to form correctly if they have this condition.

And they can potentially go into DIC, which is disseminated intravascular coagulation secondary to this condition. And so the massive immune response that happens in the body and all the inflammation can sometimes activate the coagulation system and cause these guys to clot uncontrollably, use up all their clotting factors, and then potentially be bleeding, and that's what happens with DIC.

And this is going to typically happen in a couple of hours – you'll see signs of it a couple of hours to a day or two after that initial nursing, where they got the colostrum. And that's a tough situation and obviously, we'll get to it in a little bit, but one of the first things you do is take them away from the mother's milk and make sure they're not getting any more antibodies that can perpetuate this response.

[Slide 17]

Okay. The last thing I was going to touch on I think everybody knows this, there is a couple things that should run through your mind always with the neonate, and so one is hypoglycemia. So any young animal of any age really, but especially neonates that they're not nursing or not feeding enough are going to be susceptible to hypoglycemia. Their liver does not have the stores of glucose that an adult liver would have, and so if they don't feed regularly enough they get hypoglycemic.

Hypothermia as I alluded to early on is a big problem with these guys. And again, if you see a neonate, think cold and think hypoglycemia. And again, no insulating fat. They don't thermo regulate well, and so if they can't keep themselves above 93 degrees or you can't help them to stay above 93 degrees potentially that's going to leave to fatalities in these guys, so warm, warm, warm, warm very, very important.

Lastly, remember dehydration is a big thing as I talked about before. So because they can't keep the water in their bodies because of losing it through the kidney and losing it through the skin and anything can throw them over the edge, so they kind of barely are keeping themselves hydrated normally.

If there is any diarrhea, any anorexia or where you're not feeding them and giving them fluids enough, you know, it's when you feed them they drink fluid with it. If you're not doing that enough dehydration is going to be a big problem, so just keep those things in mind. And I put these all on the same slide, because yeah, I probably could have put this up front and center, because these are the most common three things you're going to

see, but I wanted that to be the last thing you thought of, because like last slide we talked about because this is the most common. So, okay.

[Poll]

So now I have another poll question right here, just so I could see. I'm curious what you guys have to say about this.

Lynne Fridley:

Okay. Which disease most commonly causes death in neonatal kittens in your practice? This is for our veterinary friends out there. Neonatal isoerythrolysis – did I say that right, Dr. Thomovsky?

Dr. Thomovsky:

Isoerythrolysis.

Lynne Fridley:

Okay. Well that sounds better.

Dr. Thomovsky:

Close enough.

Lynne Fridley:

Hypoglycemia, septicemia, fading kitten syndrome or parasitism. So, doctors, which disease most commonly causes death in neonatal kittens in your practice? Please answer on your screen and not in your Q&A window and we'll click on over to the results. That's not surprising, fading kitten syndrome.

Dr. Thomovsky:

Interesting, yeah. So, that's a tough thing, because it's they just kind of die and you don't know why, so that always makes you wonder is there something else going on that you've missed or it just is unfortunately those kittens aren't going to make it, so interesting. Good, good, good. All right.

[Slide 18]

So now we're going to talk about some of the treatments for these guys when they do come in sick and they're fairly kind of nonspecific, so no matter what disease you're dealing with you're going to want to think about doing each one of these things, so we'll kind of touch on each one of these.

We're going to start with thermoregulation, move to fluid support and I'll kind of, I'll spend less time on that since from the poll not that many people were interested in that. We'll talk briefly about glucose supplementation, because there is not a lot to say. We'll talk a bit about antibiotics and then feeding we're going to spend some time on and then briefly touch on blood products at the end.

[Slide 19]

First up give me thermoregulation, so I've said 100 times, hypothermia can be deadly. If you don't remember anything else, remember that. So remember, below 94 degrees they have trouble suckling. Their intestines aren't moving correctly and they end up being tachycardic, and that's just in response to the rest of their body not doing what it needs to do.

If you get colder than that, where they are 85 degrees or below their guts stop moving entirely. Bacteria translocate from the gut into the blood stream and they get septic. Their heart rate will decrease and they get hypoglycemic if they weren't already.

And then below 70 these guys are motionless. Their hearts aren't beating at all or very, very slowly. There is no pulse and they look like they're dead. They may not be dead yet, and that's why we always say warming up is so important and there, one of my teachers in vet school used to say you can't say something is dead unless it's warm and dead. Because potentially if you warm up one of these really, really cold kittens there is a chance they can make it. I mean obviously they've got some things stacked against them, but warming is so important, because you can't say that they have totally gone until you warm them up, so it's worth a try. But remember that it gets, you know, they have more chance of sepsis and more chance of other side effects, the colder that they have gotten, so don't let them get that cold to start with, so okay.

[Slide 20]

Thermoregulation. We want to re-warm them slowly, so if they do come in cold, you take your time and you warm them up slowly over several hours. We don't want them to go from 80 degrees up to 99 degrees in half an hour. We need to give their body time to kind of slowly acclimate to the warmer temperatures and we only shoot to get them to 98 or 99 degrees, then we stop from there. If they are a young enough kitten that is normal for them, but if they're a little bit older kitten, where they are expect to be low 100's we'll let them warm themselves up to the last, you know, up to the 100 degree level on their own.

As you increase the body temperature we want to do it just very passively so we want to have heating blankets, hot water bottles and we want to always make sure that as the kitten kind of comes back to life and starts to warm up if they feel like they need to move away from the heat source they can. If they're not moving, you know, they're that cold, they're just not moving, we need to go there and rotate them every 10 to 20 minutes, because we don't want their abdomen to be warm and their back to be cold. We don't want their tail to be really warm and their head to be cold. We want to just keep them moving and kind of simulate the scenario where when they are more motile they're going to move on their own. Another great thing to do is make sure you turn the heat up in the room that you're in and take away any drafts, because again, if we can get them back to the point where they're a more functional kitten they're going to be able to keep themselves about ten degrees warmer than the room. So if we can get the room up into the high 70's at least, we can get, you know, they can hopefully hold themselves at 90 degree range.

And then warm fluids do a lot and you can do – you can warm your fluids up as warm as 95 or 98 degrees, so kind of almost a hot temperature and give it very, very slowly either intravenously or intraosseously.

I've never warmed fluids personally that warm, but I've had them pretty darned warm, like in the 80 degree temperature range, but you can go up into the 90's if necessary, but just be careful again, because you don't want to warm them up too quickly, so take your time when you're doing it and slowly get them up to the 98 degree temperature range.

The reason we don't want to warm them up too quickly is as you warm up the tissues the tissues will start to metabolize and have a greater oxygen demand and the problem is when you're doing that number one, we're not sure that they can keep up with the oxygen demand if their heart rate is still slow and they haven't gotten their heart rate back up.

Also warming too quickly means that they're going to have excessive water loss, both from the metabolism and then also from the body itself just through the skin and both those things put together where they're asking for oxygen in their tissues and they're losing water and becoming hypo bulimic potentially, that can lead them to go into like a shock situation. Warm them very, very slowly so that you have less of a chance of something like that occurring. Okay.

[Slide 21]

So, what would you do if you do need to give these guys fluids? We're going to give them crystallized fluids typically to start with and we usually do an isotonic crystallize so plasma, LRS or .9 percent saline. You can give the fluid support for resuscitation so if they are hypo bulimic or severely dehydrated, you can give it for either one. So you can bolus some fluids to resuscitate them from shock or give them a little bit more slowly to replace dehydration.

If you are dealing with a situation where you think you need to resuscitate them so they're hypotensive or hypobulimic you can give them boluses of like ten ml per kg at a time. So give them a bolus, reassess them, give them another bolus of ten ml per kg and repeat until you think that they're resuscitated.

But again, always warmed fluids, because you don't want to cool them off too much by giving them cold fluids and you can give kittens up to 60 mls per kg of body – of fluid, I'm sorry, which is one body – one blood volume, but I would just break it up into aliquots of 10 mls per kg each time.

[Slide 22]

If you're dehydrated and you want to give crystalloids when you're doing it just like with an adult you're going to replace the dehydration and then

provide maintenance fluids. So replace what they've lost and then give them what they need to keep going. So with dehydration replacement – probably everybody knows this – but you're going to estimate how dehydrated you think they are, multiply that by their body weight and that gives you their fluid deficit in liters. And you're going to add that dehydration deficit to what they need for maintenance.

And so maintenance in a kitten I would figure maintenance out the following way. So I would do 70 times their weight in kilograms raised to the .75 power and that's going to be their metabolic requirement for water on a daily basis. And then I'm going to add in what are called the insensible losses, which are 20 mls per kg per day, and that's how much they're going to be losing just from the evaporative losses from essentially their skin.

I'm going to add those two numbers together and that's your daily fluid requirement and it should come out to be somewhere between 60 and 100 mls per pound per day as a shorthand, but I typically use the first equation to be a little bit more precise when I'm giving the fluids, so I have an example on the next page, I think here.

[Slide 23]

Oh, one brief moment before I give the example. The reason we're using isotonic crystalloid is for dehydration especially. Is that when you give an isotonic crystalloid in the intravascular space, which is over here on the left side of your screen as you're facing it.

We intend that that crystalloid is going to leave the vascular space in short order and in fact, in about 20 to 30 minutes about 75 percent of the fluid that we gave vascularly will end up in the interstitial space. And so if you're dehydrated, you want the fluid to not be in your vascular space, but to be in your interstitial space, and that's why crystalloid is such a great fluid to give for a dehydrated patient.

Conversely, the reason we give – we bolus fluids quickly when we're giving – when we're resuscitating for hypobulimia is we know that in 20 minutes of fluid we're going to give is going to be out of the vascular space.

So when I say bolus on the previous slide for shock, I mean like fill a syringe with fluid and inject it into the patient really quickly and bolus some fluids that way so that the fluid gets in the vessels and then goes to – goes around to supply oxygen to the tissues so the fluid increases your vascular volume and then supplies back into the tissues right away before the fluid naturally leaks out into the interstitial space.

[Slide 24]

Here is our little example here. So if I have 100 gram kitten who is 7 percent dehydrated, I would go ahead and figure out his dehydration deficit by taking his weight, converting it to kilograms and then, taking the weight in kilograms and multiplying it by the 7 percent dehydration.

And this animation is a little bit slower here than it was, but I made this, so 7 percent dehydration is .07. This little kitten's weight – the example kitten is .1 kilograms, so it comes up to be .007 liters or a total of 7 mls that this little guy is dehydrated.

Then I'm going to go ahead and figure out what I think his maintenance fluid rate should be. So if I did the 70 times the weight to the .75 power, you do what's in parenthesis raise the power first. Then you multiply by the 70, and so you end up at 12.4 mls per day.

And then if I do the insensible losses which is 20 mls per kg per day that comes out to be 2 mls a day. So my total for this guy as maintenance fluids would be 14.4 mls a day or .6 mls an hour. And then obviously I'm going to add that amount to the dehydration amount and replace it that way.

You can choose to replace the dehydration over 24 hours or you can choose to replace the dehydration faster. It doesn't really matter, however you want to do it. So if I would replace this little kitten's total dehydration over 24 hours I would give him 21.4 mls per day or about .9 mls an hour. I'd probably round it up to one ml, but about .9 mls an hour for the first 24 hours. And at that point I would say okay, he shouldn't be dehydrated anymore and then I can take away. I can turn the fluid rate down to .6 mls an hour from there, which is his maintenance rate. Okay.

[Slide 25]

If I'm going to give colloids I can give colloids to a kitten and so there is no data to say if it's bad or good, so go ahead, what the heck? You might as well try it if you really need it. We use colloids for hypobulimia or hypotension. And so typically, if I've given crystalloids, especially multiple boluses and the kitten is not resuscitating and not responding to them I'm going to want to go ahead and give a colloid, because the colloids will stay in the vascular space rather than going out into the interstitial like a crystalloid would.

I could use Hetastarch or VetStarch. Those are the two that are the most common in the United States. Those of you who are not from the United States if there is anybody listening, obviously there is some other colloids you could use as well that are available in other markets. Hetastarch or VetStarch are both 20 mls per kilogram per day and typically we're going to bolus them at about a portion of that each time, so five mls per kg is a common bolus amount and usually I do five mls per kg once, reassess.

Five mls per kg again, reassess and kind of go from there. And again, we're bolusing, so we're injecting quickly in the amount of fluids rather than giving it slowly over time if I'm trying to resuscitate these guys.

There is no difference that I can tell as far as like one being safer than another or anything like that. VetStarch does have a label for small animals which Hetastarch does not and it's getting harder and harder to get Hetastarch, so we're probably all going to end up using VetStarch here pretty soon anyway, just because it's the one that we can still get our hands on. But either one there is no data one way or the other for kittens or for cats, so you might, you know, if you really need it I would just go ahead and use it.

[Slide 26]

Okay. So just a brief review of how colloids work again. When I give a colloid remember, over in the intravascular space if the colloid is my orange molecules the colloid is going to go ahead and stay in the vascular space and not diffuse across to the interstitial space. And so as a result it creates more particles in the vascular space. If there are more particles in the vascular space the fluid will stay there and that's why colloids hold fluid. They could put more particulars in the vascular space and therefore hold the fluid in that location.

[Slide 27]

Okay. So, now we're up to how do we give the fluids or blood products or whatever the heck else we want to give. So, you could give fluid support orally and I would only do that in an animal that's not very critically ill. So they can't really be cold, because we know their gut's not moving properly if they're cold, so they can't be cold if we're giving oral fluids.

And really, if we're giving oral fluids you really are going to end up tubing these guys like with an orogastric tube. We'll get to that in a little bit more detail in a second. You can also give subcutaneous fluids if you wanted to and if they're not that sick, but maybe they're a little bit dehydrated you could try subcutaneous fluids.

Make sure they're warmed and usually the dose in a little guy like this is 1 ml per 30 grams as your amount of subcutaneous fluids to give. And I would throw in here if you have lactated ringers that's the fluid of choice, because that is the least acidic fluid, so it burns the least when you give it subcutaneously and I would do for any type of animal give them LRS if you can.

[Slide 28]

And so here is a cat getting sub-Q fluids obviously a lot bigger than our neonate, but this gives you the idea. And you can give intravenous fluids and you can put any size catheter you can get into these guys. Normally you're looking at 24 gauge or if you have something smaller – something

smaller than that. You can put in any vein you want, although it's really, really the smaller the animal the harder it is to put an intravenous catheter in.

So, you know, if you can do it you can get a kitten that looks like this with a cephalic catheter another grade if you can do that. However, don't forget about using a regular catheter as a jugular catheter and that's like that little puppy I alluded to before, that's what we've had with him all weekend.

So, if this is a jugular vein right here that's clipped the head being on the left and the rest of the neck on the right. This is a clipped spot and that's slightly raised vessel is the jugular vein. You would go ahead and clip and prep that like you would a normal vein for a catheterization and then I would take my 24 gauge catheter and I would go ahead and put the catheter into that vessel.

And then there is no great way to keep these in place. You end up jury rigging something with tape and a neck wrap to hold it in place, but if these guys are sick enough and not motile, it's going to hold just fine, and so that's a great way. And so when you end up with your catheter in that location, you end up with your neck wrap and your cat receiving fluids through the jugular vein.

That's a great way of doing it and I advocate that for anybody who is, you know, if you have a 24 gauge catheter and you can see the vein in the neck go for it, and it's a great way to – and you can maintain those catheters for quite a while.

[Slide 29]

But don't forget about the intraosseous route either. So the intraosseous route is going to be a fool proof way to give, you know, to get fluids to these guys no matter what. So if you don't have – if you're not able to get a catheter anywhere else or you don't have a technician that can do it anywhere else you can always use an intraosseous catheter.

And so intraosseous catheters can go in pretty much any bone. The femur or the humerus are going to be your most likely bones that you're going to use, because they're the biggest and the easiest to kind of isolate the location for your catheter. And if you get one in, here is your kitty cat with this catheter in place. Now, I should just mention that intraosseous catheters are not regular catheters placed into the bone. You're going to use typically a hypodermic needle and so this little kitten in this picture has a 22 gauge hypodermic needle stuck into the femur.

The reason you don't use a regular catheter is the stylet part would be okay, but the catheter – the plastic stuff or whatever in the catheter is going to bunch up and not go into the bone, so you have to use something

that's metal or firm enough to get into the bone. So hypodermic needle is the way to go, works the best. You could try a spinal needle also, but hypodermic needles are my needle of choice, because they're nice and short also for the neonates. Okay.

[Poll] So I had another poll question here for you guys, so go ahead, Lynne. Is Lynne there? Hello?

Lynne Fridley: Which of the – yes, I'm here. Sorry.

Dr. Thomovsky: Sorry.

Lynne Fridley: Which of the following items cannot be given through an IO catheter: blood products, dextrose, fluids, nutrition or antibiotics? Sorry about that, I had muted myself because my dog was barking. You know how that can be.

Dr. Thomovsky: Yes.

Lynne Fridley: So, which of the following items cannot be given through an IO catheter? And this, I'm sure is going to be answered by all of our veterinarians that are watching tonight. And what do you think about that?

Dr. Thomovsky: All right. Great, good. So I just wanted to make sure as I ask the students at Purdue all the time what can we not give through an IO catheter so I want to make sure we're all on the same page. So yeah, no nutrition, but pretty much everything else.

[Slide 30] You can give anything else on this slide except not nutrition through that IO catheter and that's what makes them so versatile, because they're essentially the same as IV minus you can't do like parental nutrition. So, but we don't want to do that in a neonate anyway. We're getting to that. Advantage of the intraosseous catheter. You can put them in any size kitten, I don't care how small they are, they will have a bone that's large enough that you can put a hypodermic needle in – 22 or 25 gauge are the way to go and again, everybody should have those readily accessible. They're cheap. You have them in your clinic and you can go ahead and do it.

And then again, fluids, blood products, dextrose, antibiotics, pretty much anything you would want to give to a neonate can go into that catheter. Just remember if you're giving dextrose it needs to be a little bit more diluted than you would put in an IV, because the in the bone marrow you've got all of the bone marrow progenitor cells and you don't want to lice those cells by giving too high of a combination of dextrose. So just make sure it's a little bit more diluted so instead of at least one to one

dilution do at least like one to four dilution of your dextrose before you administer it. Okay.

[Slide 31]

So speaking of dextrose, that fantastic segue, you can give dextrose to these guys who are hypoglycemic pretty much any way except sub-Q. Intraosseous, intravenous or per oss. Any of those things are great ways to give dextrose. Sub-Q dextrose can cause the skin to slough. I've seen it before, don't do it. Just don't do it. If you give it orally, you can give it via syringe or via the feeding tube for your orogastric feeding and again, we'll get to that in a little bit more in a second.

And generally speaking if you want to dose, although I honestly I'm just like well, I'm going to give this much dextrose, but if you want to dose it's usually a quarter to a half ml to 100 grams. And that's of a ten percent solution of dextrose, so that's a diluted solution.

So it starts off 50 percent in the bottle, so that's where your diluting at least like one to five to get it down to ten percent, but I, like I say, I tend to just eyeball and go oh, I'm going to give about a half a ml of dextrose and dilute it down to three mls or something. But either way, because the worst thing that could happen is it's either not enough and they're still hypoglycemic so you give more, or they're a little bit hyperglycemic and you give them a half an hour to an hour and they'll settle back down to normal. So this is a very safe thing to give. It's you can't really under – you can under dose to just give more, but you can't really overdose dextrose.

If I'm giving dextrose IV or intraosseous again, as I said, we want to dilute it to 12.5 percent solution and that's more important intraosseous than IV to get it that dilute. And generally speaking, if you're doing the 12.5 percent solution it's .1 to .2 mls per 100 grams as a dose. Or like I say, give some, check the blood glucose. Give some more if you need to, which is again the way I usually do it.

[Slide 32]

So, okay. Antibiotics are next. So, antibiotics would be for like upper respiratory disease, neonatal septicemia, anything where you think these guys have a bacterial component that you need to treat. It's usually not for diarrhea, so don't give antibiotics if a puppy or kitten is having diarrhea, because it can disrupt the normal flora and then they get worse diarrhea.

Just be really careful of the neonates to not give them antibiotics for diarrhea as their complaint. Deworm them first and see what happens with the stool at that point, and remember, you're not expecting normal stool here. You're expecting a soft stool anyway in these guys and that's totally expected for them.

And if you're giving antibiotics because of the issue with the gut flora it's better to try to give them parenterally, so IV, IO, something of that nature. Even sub-Q, depending on the antibiotic, but IV or IO is going to be your best way to do it.

Penicillins and cephalosporins are really the only things that are safe for these guys. You're going to want to go ahead and avoid things like TMS, Chloramphenicol, aminoglycosides, tetracycline, all of them have potentially negative side effects in a young, growing animal.

So I kind of listed them. Everyone kind of learned in vet school, but kidney damage and ototoxicity from glycosides, changes in the teeth from any tetracyclines. Bone marrow suppression with Chloramphenicol and the fluoroquinolones can affect cartilage growth, although probably more so if the mother is getting a fluoroquinolone and the baby, but why risk it if you can get something else, so penicillins and cephalosporins.

[Slide 33]

If you're going to dose them you want to use 30 to 50 percent of your adult dosage, and again, the liver is not properly formed in these guys so they're not going to clear the antibiotic appropriately from the bloodstream. And also, because they have such low albumins at this age, so their total proteins are lower than an adult.

They have extra amounts of the antibiotic in circulation to go to the tissue. So even though you are giving a lower dose, they're going to be exposed to a higher amount of the drug than an adult would. Also, their water and fat percentages – body water and fat percentages are different, which causes the drugs to act differently in the body, so you just need to be really careful, because overdoses are very, very easy. And there is few to no drugs that are labeled for neonates or that have been tested in neonates, so that's why again, penicillin and cephalosporins are usually our standbys and you want to typically give liquid formulations.

So whether you're giving intravenous, which is obviously a liquid or you're giving something oral you're going to have to do it those formulations. You're never going to get a pill or a capsule small enough for a neonate obviously. So, that's just kind of common sense. Okay.

[Slide 34]

Now we're going to move onto feeding. So a lot of people have some interest in this, so we'll – I have quite a few slides on this, so hopefully this will help. So feeding again, that you can do oral feeding if you need to, but again, they need to be normal thermic, because if they're not their gut is not moving correctly and they're not going to be able to suckle correctly if they're cold.

But if they are normal thermic and they are suckling go ahead and you can bottle feed them with any milk replacer that's commercial and go ahead and use what the manufacturer says for that. And if you want more information if you go to the Maddie's Institute website they had a really, really nice video on like how to bottle feed a normal neonate. So if you've never done it before or you just want to make sure you're doing it correctly, I would recommend that video because it's very, very helpful for just normal feeding with a bottle.

[Slide 35]

Now if you have somebody who is sick enough that they can't feed with the bottle we're going to do some actual tube feeding. So when you break into tube feeding we worry about overfeeding these guys, which is one big thing, and so we need to be very careful with that and I'll talk about more numbers with that.

And the types of tubes we're limited to are like orogastric or nasogastric maybe in a neonate depending on their size. So, we have a little poll question about that.

[Poll]

Lynne Fridley:

Yes, which type of tube feeding are you comfortable doing: orogastric, nasogastric, both A and B or neither A and B? So, our veterinarian friends are going to answer this orogastric, nasogastric, both A and B or neither A and B. And we'll go on ahead and look at our results.

Dr. Thomovsky:

Okay. Great, so orogastric tube. So it looks like at least half the audience are comfortable with that, so that's great and some people have done nasogastric and orogastric too, which is great, good. But it looks like the people haven't try either, so we'll talk about that and make sure we're both on the same page, so good, good. Okay.

[Slide 36]

So the orogastric tube is the one that a lot of folks who breed kittens or puppies are very comfortable doing and that's where you're going to place a tube through their mouth into their stomach. Anybody who took large animal medicine in vet school, we had to do this in cows all the time, so this where I first did it was in a cow.

Typically, you're going to use a 5 Fr red rubber tube. You could use one that's slightly larger, but in a neonatal kitten you're probably limited to the 5 Fr. And just like the picture shows, you're going to basically measure from the last rib to their mouth. So, and then the rostral part of their mouth, so where the lip kind of ends. And you're going to mark on the tube where that location is and that's how far in that you're going to go. So typically, you're going to hold the little kitten in the sternal position, flex the head forward and just kind of move the tube along the roof of the mouth and then just kind of keep feeding it.

Most of the time, 9.9 times out of 10 it'll go ahead and drop right into the esophagus and go straight into the stomach. So you'll often hear the kitten meowing while you're feeding them. That's good, because that means the trachea is not occluded by the tube and they shouldn't be coughing. And you can do just a little test injection of water. Make sure you give enough water that it gets through the tube, so you're probably looking at least a ml to a ml and a half of water, because it has to go all the way through the tube and then get into wherever the tube is.

They shouldn't cough. They shouldn't have any problems with it, so if you're feeding the – you give them a little bit of water. They don't cough. They don't gag. They're continuing to cry, you're in business and you're in the stomach and you can go ahead and feed them your amount of food.

When you remove the tube you always kink it, because you don't want any additional food that's left inside the tube to drop out of the tube as you're drawing it out and end up in the lungs and cause aspiration. So, just remember that.

These guys can hold 4 to 5 mls of food per 100 grams. so when you're feeding them, the reason we recommend multiple small feedings is you don't want to exceed this amount per feeding, because then they have a high chance of regurgitation or vomiting.

[Slide 37]

So, here is a picture of a kitten. So basically, you kind of tilt their head up, feed the tube in and go. When you first do this you're like oh my gosh, I'm really scared. What if I end up in the lungs, but it's like so easy. When you do it once you're like oh, that was really easy and it's not a problem from then on.

We were doing it with the puppy over the weekend at school and I kept telling the students, hey remember everybody like laymen breeders do this all the time, so if they're comfortable doing it, we can do it too. We're veterinary professionals. That's what I kept telling them. So, it's really very easy. It's not a big problem at all. It's just a matter of doing it the first time.

[Slide 38]

So, the orogastric tube you're going to remove after each feeding. The nasogastric tube, which is through the nose into the stomach you can leave it in all the time. You don't have to keep taking it out, so it's a little bit more permanent. And it allows for continuous feeding, and there isn't a risk of aspiration, because it's permanently through the nose into the stomach, you're done. You don't keep taking it in and out so they should not – and you're sure you're in the right spot when you're done, so you shouldn't have a problem with aspiration.

Typically, we're limited to a 3.5 Fr red rubber tube and if that, because that's how small the kittens are. If that does not fit in the kitten's mouth, so it's not it's not going to work. You're going to have to do orogastric, because just physically we don't have a tube that's smaller than that, but 3.5 Fr is pretty small and so you can usually get that into most of the little guys into their nostrils. Obviously, they're not going to breathe through that nostril though, because you're going to occlude the airway. And so when you put it in it's going into the cat's nose just like this would show and you're in place.

[Slide 39]

So when you place it, you're going to measure tip of the nose to the last rib and mark the tube. So the last rib is always where your stomach should be and this time we're going from the tip of the nose, and then you're going to put some lidocaine into the nostril and just do a very little bit in little guys. They don't need a lot. One drop is all they're going to need.

You can also just put a little bit of lidocaine jelly on the tube in lieu of putting it in the nostril, and then you're going to feed the tube through the nostril to the mark that you made on the tube. And so instead of just automatically kind of tipping their head up like to put an orogastric tube, you actually want to put their nose down a little bit to start. And then once you think the tube is in the back of the throat, then lift their head up and that allows kind of the epiglottis to fall down, and then you can feed the tube into the esophagus and down into the stomach. And then once it's in place you suture it.

I have a video showing this and one of the reasons that I – oh, and I'm sorry. One more thing, you radiograph it at the end, because you always want to make sure, because this tube is going to stay in place that it's where you think that it is. But again, if they're crying around it and not coughing when you give them food, you're in business. You can also aspirate through one of these tubes and if you get stomach contents, you're in business, but to be safe we always recommend a quick radiograph also.

[Video]

The reason I wanted to show this particular video that yes, it's us with an iPhone in ICU a while ago taking this video. The reason I wanted to show this was this is a student placing this tube. It is a dog, but it is a student placing a nasogastric tube. It's the first time she's ever done it and she got it in no problem. So I want to show you that even if you don't know what you're doing, you can go ahead and do this right away. So we have someone holding the nose and the dog's head is kind of pointed up toward the camera.

And she is feeding the tube down the left nostril. And so she had already premeasured and pre-marked and what she did was she just went ahead and started feeding into that nostril and it just kind of dropped right into

place. This dog is not sedated, nothing like that. He is just sitting there. We do have a muzzle on, because he was a little nippy. The neonatal kittens are not going to be you won't need to muzzle them or anything. They're just probably going to sit there and lay there for you. So she's gone ahead and there is a black mark on the tube right beneath her finger, where she has fed it into.

So now what I'm doing is, this is a kind of a fancy tube that you wouldn't probably use for a neonatal kitten because it's pretty big, but it has a stylet in it to make it a little bit firmer, so I'm just putting a little bit of saline in or water in and I'm pulling out the stylet so the tube is now ready to go for feeding and I'm capping it off right there. You would just go ahead and use a red rubber tube, which is naturally a little bit stiffer than these yellow catheters and just feed it right in the way that I said.

So once you're in place, you just have someone hold the tube so it doesn't come flying back out, and then you're going to go ahead and I would recommend suturing these in place. Don't glue them, because all it does is rip the skin off the side of their face and that's really painful when you go to remove it, so just go ahead and suture it and that, I'm just pointing right there where she's going to put her first suture.

So she's going to go ahead in a second and place just a hypodermic needle – this one happens to be 20 gauge – through the skin right next to the nostril and she's going to poke on through. And then she's going to go ahead and surprisingly that doesn't hurt at all. It's like a piercing. The animal will respond just for the just to the – just one instant to the first little prick, and then they're not going to care that it's in there at all.

And then she is getting suture in her hand right now off, we just have some suture that's on a reel and she is getting a piece of it and she is going to come and go ahead and feed the suture through the needle and go ahead and I'll show you where you place the first suture.

In the second she should be coming any moment here. Here she comes. So she's getting some suture. I'm telling her what to do. So she is getting the suture. The dog is just hanging out and a cat would do the same thing. And I'm telling her don't feed the suture through the backside of the needle. Go to the skinny part of the needle, because it's a lot easier to get the suture in. So she is feeding it in – simple, simple. And then she is going to pull the needle out and leave the suture behind. And so again, vet student, you know, never did this before. No problem so far. Everything is going really, really smoothly.

She is pulling out the needle and she just has a suture, and then she is going to go ahead and there is a little bit of bleeding, which we're going to

blot in a second. And then she is going to go ahead and tie a knot. And so I would always recommend tying a three to four throw knot to the skin before you do anything else.

And you can pre-place this suture before you put the tube in if you want to. So when you tie this knot – sorry, it'll get back on the camera in a second – when you tie this knot it's going to basically anchor the suture to that area, so that it will never tighten any further to the skin.

You can go ahead and tie it just a nice, snug knot that's not too tight. Leave it as is, and then you can go ahead and tie to the tube as tight as you want and it will never tighten any tighter to the skin of the animal. So she is going to go ahead and do four throws that are just kind of a nice, comfortable amount of tightness to the animal. And then his skin is happy. We don't worry about necrosing it, anything of that nature. And then she'll start tying to the tube in a second. And this is just normal, good old four throws with a hand tie. And again, if this vet student can do it, anybody can. No big deal. You can also use an instrument to tie if you want to.

She is doing one more throw, and then she is going to start a Chinese finger trap and I'll just let you see one of those throws, and then we'll move on, because I think everybody knows how to do that. So it's same thing. Everything is on smaller scale with the kitten, but it's the same exact idea.

Now she's going to put her suture on the other side of the tube. We're making sure the tube is at the black mark that we put with the Sharpie and then she is going to go ahead and start tying to the patient. And she now she can tighten the suture as tight as she wants, because it's going to, you know, it's not going to tighten to the patient any further, so we should be in great shape. And so there she is. She's got a couple of throws and we're in business.

Great. So I'm going to go ahead and click off of this. It goes on for quite a bit longer with her doing a Chinese finger trap technique. I think we could all figure it out, once we kind of see where the suture goes the first place. You can anchor a couple more sutures to like somewhere on the cat's head, just so the tube is not like flopping around their face. I usually put a suture on the top of their nose, and then on the top of their head also just to hold it in place and keep it out of the way, but you can do whatever you want with that. The one by the nose is the critical suture for holding the tube in place. Okay. So now I'm going to click off of this and we're going to move onto a couple more things about feeding. Okay.

[Slide 40]

So how much to feed when you do get a tube in place? So caloric requirements are going to vary, but generally from one to three days old they get 15 kilocalories per 100 gram of body weight. And then when they're greater than 6 days old, they go to 20 to 25 kilocalories per 100 gram of body weight.

And between 3 and 6 days you kind of make your best guess, somewhere in between and if you want to feed them water separately it's 13 to 22 mls per 100 grams of body weight, but if you're feeding a liquid milk replacer the food and water stuff kind of goes together, and so if you're looking at what the manufacturer recommends you're probably going to be able to do the appropriate amount.

So, let's see, in general it's going to be 10 to 15 percent of their body weight is milk replacer for the first week, 20 to 25 percent of their body weight is milk replacer from the 1st week to the 4th week. And then you're going to monitor their body weight daily and feed them more or less, depending on whether the animal is growing or not growing.

And generally, you feed every two to four hours. If you're going to be doing an orogastric tube or you can feed continuously through an NG tube. You can do intermittent feeding with the NG tube, but I usually just feed continuously and put the food on a pump that I can just go ahead – you can just use an IV fluid pump.

You just use an empty IV bag and just pour a little bit of replacer in there. You only want to put about four to six hours' worth of food out at air temperature at any one point, so it doesn't get rotten as the day goes on, but I just usually just do that and continuously feed them. You can also use a syringe pump also. But remember, if you are doing intermittent feeding, no more than 4 to 5 mls per 100 grams of body weight, because that's their stomach capacity, so just don't exceed that. That's the one big thing. Okay.

[Slide 41]

Now, moving off of food, we're going to talk a little bit more about a couple of other interventions, so if you have an anemic kitten from neonatal isoerythrolysis you want to take the kitten off of the dam as soon as possible. See if they get more anemic and see if they're developing that or maybe they're just going to lice themselves and be okay. And then, but if they are getting more anemic you may need to intervene.

And if they have parasitism you also might need to intervene and with a blood transfusion, so typically when the PCV is below 15 percent we're going to go ahead and intervene and make these guys feel better and feel stronger.

The best way to figure out the amount is to do their desired PCV minus the current, divided by the donor PCV times 100, which is the mls per kilogram of body weight or of blood volume for these guys. And then by their weight in kilograms and that gives you the amount to use, and you just go ahead and calculate that and then you can go ahead and give a blood product.

[Slide 42]

Blood products typically are going to be whole blood for cats and if the kitten is greater than three days old you should blood type the kitten and make sure you're giving a type A kitten type A blood and a type B kitten type B blood.

And it only takes about three drops of blood to do that, so that's why we're in okay shape with these guys, even at that young of an age. If they have neonatal isoerythrolysis and it's the first three days of life you can still use the mother's blood and the good thing is she won't react against her own blood, so that's actually great.

But after three days the kitten can potentially start to make their own antibodies so we want to use the correct blood type for the kitten. And any kitten that's less than three days old you can use, you know, the same blood type as the mother. It's fine.

Transfusions go over one to four hours and you just obviously just like an adult make sure they're not having a transfusion reaction. And you can give the transfusion either intravenously or intraosseously. I think we just did this twice in a row. We're going to quickly go through this here. Hold on, sorry. And one more. Onto the next slide. Here we go.

[Slide 43]

Now if they have failure of passive transfer they should receive their colostrum within 18 hours of birth, so if you have an orphan kitten who has no mother or something of that nature, this is a big problem. And so, you want to make sure they're getting colostrum as soon as you can. So if you have another mother cat who is lactating go ahead and you can use her, but she has to have just given birth recently or in the next slide we'll talk about what you can do; but remember, any kitten who has failure of passive transfer that risks for infection until they're about a month old, because of the concerns with their immune system.

[Slide 44]

If you have failure of passive transfer you can give serum from an adult cat with the same blood type to that kitten and usually it's 15 mls of serum per 100 grams of body weight and you can give that subcutaneously divided up into 3 injections.

So you spin the blood down from the adult, figure out how much that you need and go ahead and give it divided into three aliquots, one aliquot

given every eight hours. And they'll absorb the antibodies from that and be in good shape.

[Slide 45]

A couple of quick words on monitoring, so we can get to our questions. So basically if you've done any interventions in a kitten, no matter if it's just feeding, just treating dehydration, just deworming them, whatever the heck you're doing, just giving a blood transfusion we can go ahead and do some serial monitoring. And one thing I would check is PCV, because if we're giving fluids, we're deworming them or transfusing them, anything of that. They're having isoerythrolysis, any of those things are reasons why their PCV can go down.

So if you've transfused them wait a couple of hours until after the transfusion and check their PCV and then check it about once a day. And the reason we don't want to check more often is because of the – us causing anemia by blood draws.

If their dehydration – if they were dehydrated to start with or you suspect they were, it's tough on the neonate because the physical exam findings differ from an adult to tell exactly how well you are doing and their specific gravity of their urine, they don't really concentrate to start with, so it's hard to follow that serially. But what you want to look for is make sure the specific gravities of their urine is well less than 10-17, because that means, you know, we want it to be 10-06 or below, because we're giving plenty of fluids that are just being flushed out the kidneys and that's okay. And just make sure their urinating frequently and regularly and in decent amounts and if they're not urinating enough it could indicate that they're dehydrated.

[Slide 46]

Also, body weights is like your biggest thing that you can monitor in these guys and serial body weights are very, very important, because they need to be gaining weight and if they're not gaining weight we're either not feeding them enough or the animal is getting sicker, and so just pay really close attention of that. And if they're gaining weight, we have a pretty good feeling like maybe this little guy can pull through. If they're not gaining weight we may be in trouble.

Stool color is very important also, so a normal stool should be a beautiful pasty yellow tan color. If we're overfeeding them it may be watery, more yellow or green and that's bad, so stop feeding them so much. If it looks white, they could have liver disease or some kind of enzyme deficiency where they're just not able to utilize nutrients correctly. And if it looks bloody worry about things like coccidia, sepsis, something of that nature, because any of those things can cause some bleeding into the colon.

And make sure these guys are behaving like they should be. So they should be moving around, making some little kitten noises, rooting around

trying to move to the heat and not and if they're not doing those things or any of the stuff you'd expect to see in an older kitten, then something is probably wrong with them. You need to kind of look again at them and see what's going on.

[Slide 47]

So hopefully at the end of the day you'll end up with a kitten that's cute and healthy as this little calico here. And so I just want to thank you for your attention and quickly get to the questions here, because I want to make sure we have plenty of time to answer everybody's question. So I guess, Lynne will take it from here.

[Questions]

Lynne Fridley:

Well, we'll get right on to the questions. I'm going to push the first question to the viewer. And can you address common shelter disease infections such as panoleukopenia and ringworm? I run a kitten nursery and our environment mimics the shelters, so we see a lot of the same diseases and infections.

Dr. Thomovsky:

Okay. So panoleukopenia, when you're dealing with that, that's going to be one of your viral things, and so what we're going to see in a neonate is going to be kind of the effects of the virus. So you're going to see dehydration. Potentially you're going to see GI signs sometimes like a lot of diarrhea that's leading to dehydration.

You're going to see them not thriving, maybe not suckling normally, things like that and if they have ulcerations in their mouths or anything it's going to cause them to not suckle comfortably. So it's going to be more of following things like keeping these guys hydrated. Keeping them proper nutritional basis by maybe tube feeding them.

And hopefully, if you can keep them warm and you can keep them normal glycemic and you can keep them from getting dehydrated, they should be able hopefully to pull through. I mean you never know obviously, but hopefully you could pull them through to the point where they're able to kind of mount an immune response and clear the virus.

The problem with any virus is there is nothing you can give them to kill the virus. We just have to support the little patient through, so that their own body can eventually clear the virus. And just be careful with any kitten that they didn't have failure of passive transfer, because if they didn't have maternal antibodies, that's when they're more risk of getting the infection in the first place – the viral infection in the first place.

So, just be careful of orphan kittens and things and I would maybe err on the side of giving them colostrum. Either giving them colostrum from a mother or giving them the sub-Q injections of serum if I'm not sure if they

got enough colostrum from their mother and that will help to protect them from that, so panleuk is like prevention and then just really basic nursing care to get them through it.

Ringworm and things is, you know, I haven't, me personally, I haven't seen any ringworm in a neonate, but if I'm thinking of my experience with a little bit older cats who have ringworm. As long as they're able to kind of like keep up a good nutritional state, eventually they should be able to, you know, be able to clear that infection on their own, as well, given time.

Or, they may eventually need some medication for it, but they need to be really at least four to six weeks old before we start giving them something for antifungal. So it's going to be more of keeping them healthy and thriving and growing and making sure the nutritional status is good.

And same ditto, ringworm they're going to be more risk of if they don't have appropriate immunity. So just be really aware of cases of failure of passive transfer. So, I hope that answers your question.

Lynne Fridley: Great, let's take the next question. You emphasized not to give antibiotics with diarrhea, but what about developing septicemia from bacterial translocation with diarrhea, hypothermia and all that other kitten badness?

Dr. Thomovsky: So, just to clarify, it's a good question. Thank you. We want to really be careful of giving oral antibiotics. I guess I should have stressed that more with diarrhea, because it's going to actually make the gut flora be in even worse shape and potentially lead to worse diarrhea.

If you think they've gotten sepsis because of diarrhea or because of something else, where they got translocation, then you do need to give antibiotics for the sepsis part, and that's where you're going to give IV or intraosseous antibiotics.

You need – so if you think you have sepsis they need antibiotics and give them IV or IO. If you just see some diarrhea – cat's otherwise doing great I would deworm them and not touch any antibiotics and also be careful not to give oral antibiotics for sure. So I hope that makes sense. I hope that answers your question.

Lynne Fridley: Okay. Great, let's take the next question. What is general treatment for constipation in neonate?

Dr. Thomovsky: Okay. So just as it seems in an adult you want to make sure they've not gotten dehydrated, so constipation with any animal, if they're dehydrated that's a problem. So make sure they're properly hydrated. You might give supplement water. Mix a little bit of extra water in with their replacer. Make sure you're diluting the milk replacer correctly.

So make sure they're not dehydrated or make sure they're getting plenty of water. And then you can do enemas like warm soapy water enemas in these guys, so just put in a 5 or maybe 8 French red rubber catheter, depending how big these guys are and give them 10 – 20 mls of warm soapy water, just to give an enema and clear things out, just like an adult. So, nothing special. Make sure it's warm water so you don't cool them down too much, so okay.

Lynne Fridley: Good. Let's take the next one. Is it harmful to give serum to kittens if you just suspect failure of passive transmission?

Dr. Thomovsky: Yes. So I kind of, I think I kind of answered that already, but just to reiterate. So if you worry they have failure of passive transfer, you should be fine just giving serum erring on the side of giving them like the dose of serum. Just make sure that the cat you're taking the serum from is properly vaccinated, doesn't have any blood born infections, anything like that and I should have said that in the talk.

If you're drawing blood from a cat to give to another cat, try to make sure that cat is properly screened for disease. You know they don't have leukemia, they don't have SIV. So if you have a healthy cat available and the cat – and you know, that you are worried has failure of passive transmission I personally would err on the side of giving them the serum, so just have a good donor.

Lynne Fridley: Very good. One more question here. In fact, I think we have time for a couple more. How effective is colostrum or replacement for newborn kittens that never get their mother's milk?

Dr. Thomovsky: So, if you mean colostrum replacement like giving the serum, extremely, extremely useful and it, you know, giving the serum subcutaneously replaces pretty much everything that mom would have given them. If you're talking about any kind of a like if I'm using a fake colostrum supplement I can't speak of those because I have never used one, but the serum is very, very good. And so if you suspect it give the serum for to replace the colostrum.

Lynne Fridley: Good, okay. Here is the next question. We see a lot of coccidiosis in kittens, especially orphan kittens. Could you address how to prevent, treat this condition?

Dr. Thomovsky: So coccidiosis is commonly, commonly passed from the mother to the kittens, so coccidia is just something that goes by placental transmission. So, or they got from their mom or they got from the environment. So it's impossible to prevent it. They're going to have coccidia. So the big thing

is you just want to go ahead and deworm them when they're old enough. So usually you need to wait until at least two weeks, maybe even a little bit older before you start deworming these guys.

You're just going to go ahead and use Albon to deworm them, but if you're dealing with a two – three week old kitten and especially one that's maybe very sick and you're just a little worried it's not strong enough to be dewormed yet, you're not going to do a lot for them other than making sure they're still eating or supplementing food if you need to.

You know keeping them warm, keeping them hydrated. It's just supportive care through that initial period, so if they are having diarrhea from the coccidia, that you are making sure that they don't get dehydrated from it so they can grow big enough to safely be dewormed. But you can keep their environment as clean as you want, but they probably got the coccidia from mom as they were being born, so there is really not a lot of way to actually prevent it.

Lynne Fridley: Next question is does five percent dextrose in LRS IV help with preventing hypoglycemia for critical cases?

Dr. Thomovsky: So can you – yeah, so you can if you would want to you can absolutely can mix your dextrose into your fluids and give it continuously. So you can give it at 2.5 percent dextrose per liter of LRS or 5 percent. Either one is fine. I usually don't routinely give dextrose in my bag of fluids unless the animal shows me that it can't maintain its glucose.

And the reason I say that is because I'm feeding these guys every two to four hours, most of the time if I have given them a bolus of dextrose to get them normal glycemic, after that if I'm feeding them regularly and they're tolerating the food and that's going well, they usually don't get hypoglycemic after that. And so if I keep dextrose in the bag they often get hyperglycemic, you know, too high and I don't necessarily want to keep them hyperglycemic continuously. So, you can do that. I don't know that you always need to if you're feeding them and I usually don't need to when I'm feeding them.

Lynne Fridley: We're going to take this as the last question. How would kittens get appropriate colonization of bacteria in their GI system and other immunities if their mother is out of the picture?

Dr. Thomovsky: Good question. All right. So the bacteria live everywhere; most of the bacteria that they need to get into their GI tract is going to be fecally transmitted. So if they're around pretty much any other cat of any sort, they're going to get it from the other cat. So other kittens in there, you know, if they have a bunch of kittens or there is a bunch of cats or there is other cats in their environment, any of those ways they can get the

bacteria, but truthfully things like e-coli, which is really common in your GI tract is in the environment also.

You know, if they are living not in a bubble they're going to be able to be exposed to the bacteria to get colonized. It's just that being in that environment with their mother is going to be the most likely place to get it, but they will pick it up otherwise. If you're handling them, we have enough e-coli on our skin and things that potentially is going to colonize them as well, so any, you know, those bacteria are very prevalent in the environment.

Lynne Fridley:

Great. Well, that's the end of our event tonight. We want to thank you, Dr. Thomovsky, and all of you for your time. Please click on the link to take our survey. It might have been blocked by your pop up blocker or it may be in a different screen. But don't worry, if you can't see it, we'll send the link to you and we would really appreciate it if you could take a few minutes to respond.

Veterinary professionals who have signed up for ACE should receive your certificates within two weeks. Make your plans to join Maddie's Institute on May 8th for our next webcast, *Things You Need to Know About What's New in Social Media* with Christie Keith.

Here is a link to our new learning tracks featuring orphan kitten care. Please take the time to check it out and many of the questions that we didn't get to tonight can be answered in our learning tracks. We have a lot of material on there that would be of interest to you.

The archive version of tonight's webcast will be available soon. Please visit our website and sign up for our newsletter and our blog and show your support by liking us on Facebook. Thanks again for sharing your evening with us tonight and goodnight.

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