EPISODE 3: Lactation and Human Milk

Transcript

A video went viral of a woman holding her baby outside of a gorilla enclosure. A mama gorilla sat on the other side of the glass fascinated by the baby. She was touching the glass and looking at the human baby with awe and curiosity. She too had a baby and showed the woman her baby - a primate and human bonding over the shared experience of motherhood. Years ago at the Columbus Zoo, a female gorilla who had been born and raised in captivity had a baby. She didn't know how to breastfeed because she'd never seen it happen before. The baby gorilla sadly died. When she got pregnant again, the zoo director contacted a group of breastfeeding women and asked for volunteers to breastfeed their babies at the zoo in front of the gorilla enclosure to show the gorilla how to feed her baby. She watched with curiosity. When the baby gorilla was born, the mom appeared to not know what to do so the women came back and breastfed their babies again in front of the glass for the gorilla mama to observe. She started to copy the women step by step and successfully breastfed her baby. Breastfeeding is natural but it doesn't always come easy and natural to everyone. Sometimes all it takes is a little help and encouragement, a shared connection and experience.

[Music and Intro]

Hey there. This episode is about lactation and human milk. As Registered Dietitians, you may end up working with the pediatric population and there may be a question or two on the RD exam that relates to infant formula and human milk. This is one of my favorite topics which is why I became a Lactation Consultant. I've seen many women struggle with breast-feeding their babies and with a little love and encouragement and minor adjustments, the experience can become a beautiful experience for both mom and baby.

So let's go over a couple sample questions and discuss the answers.

Which hormone is responsible for milk synthesis during lactation?

Is it Oxytocin, Estrogen, Prolactin or Progesterone

This question is all about hormones. So let's start by breaking down the role of these four hormones. It's hard to answer the question if you don't understand the potential answers.

Prolactin is the hormone that promotes milk production which is also called milk synthesis. So this hormone helps stimulate milk production.

The next hormone is Estrogen which is responsible for developing the sex characteristics and is produced in the placenta. Both estrogen and progesterone are responsible for maintaining the menstrual cycle.

Progesterone is essential for maintaining pregnancy and helps with developing milk producing cells during pregnancy. One of the questions Lactation Consultants ask new moms who are struggling with milk supply is whether they had breast changes during pregnancy because it gives an idea of how her body responded to the hormones during pregnancy.

And lastly, oxytocin is the love hormone. Oxytocin causes the muscles to contract around the milk producing cells which pushes the milk through the mammary ducts. It essentially is responsible for milk letdown which feels a lot like pins and needles in the breast during breastfeeding. Lactating women have been known to have a letdown when they hear a baby cry, even if it's not their baby. The culprit is oxytocin. This response goes back to when there were wet nurses in villages who would breastfeed all the babies. It's a maternal response but even more than that, it's a hormonal response.

So now that the role of each hormone has been discussed, let's get back to the question. What hormone is responsible for milk synthesis? The answer is prolactin. Here's a fun fact that helps reinforce what you just learned. Delivering a baby does NOT trigger milk production. It's actually the delivery of the placenta. Once the placenta is delivered, it causes a shift in hormones. Progesterone levels drop, prolactin levels increase and oxytocin levels stimulate milk to push through the ducts. If a new mom is struggling with milk production after delivery, the woman should be assessed to make sure the placenta was fully delivered and that there were no placenta fragments left inside the uterus. Any fragments of placenta left over can cause the progesterone levels to remain elevated and therefore interfere with the production of prolactin.

So that's your lesson on hormones and breastfeeding. Now you know the role of each hormone in lactation. If you get a question similar to this, since you now know the role of the different hormones, you'll be able to answer the question accurately. Remember studying isn't just about memorizing, it's about understanding. If you approach studying like a toddler will with infinity "But why" questions, you'll have the knowledge you need to successfully answer the questions because you'll be able to draw on your knowledge and not just memorize something. Often times when you memorize, if you get asked a slight variation of a question you studied, you

can get tripped up because of the slight change but if you have a good understanding and use your critical thinking skills, you'll nail those questions.

Let's move onto another related topic that may show up on the exam and if it does, I want you to have the knowledge to answer it correctly. If it's not on the exam but you have an interest in working in pediatrics, then this is for you to soak up because you need to know this!

What if you're asked to compare the difference between human milk and infant formula. Working in pediatrics, this is something that will come up regularly since these are the two sources of nutrition for an infant. Cow's milk is not recommended before 1 year of age so that leaves human milk as the primary source of nutrition and if human milk is not available, commercially prepared infant formula is the next best option.

So what if you're asked compare human milk to infant formula and these are the possible answers:

1) There's no difference in nutrition content between human milk and infant formula.
2) Infant formula has the same amount of calories and antibodies as human milk.
3) Infant formula is lower in protein, iron and calories, and has no antibodies
4) Infant formula lacks antibodies but contains more protein and iron

Let's break this down. Human milk is a living substance so it cannot be replicated. Formula companies study human milk and do their best to produce something that is very similar to human milk. But it can't be exactly the same as breastmilk because formula is produced commercially in a lab and breastmilk is made fresh at home and like I said, it's a living substance. One of the many amazing qualities of breastmilk is that it contains antibodies. These antibodies help fight bacteria and viruses. The mom has lived on this planet longer than her newborn. She's gotten sick and recovered, each time producing antibodies to help fight off future infections. She's also likely been vaccinated against numerous diseases and has antibodies circulating to help her fight off these infections if they ever try to invade her body. These antibodies circulating in mom can cross into human milk which would then be passed on to her baby. This is also called passive immunity.

Let me give you a really incredible example of this. I'll call the mom Alexis. Alexis gives birth to a baby named Jordan. Alexis has to go back to work after her maternity leave so Jordan will be going to day care. Alexis is worried that Jordan's gonna get sick because he hasn't been able to receive all his vaccinations yet. She's worried about all the bugs circulating in the day care center. Jordan's exclusively breastfed so Alexis will pump at work and send Jordan to day care with bottles full of breastmilk. This means Jordan will continue to get all the nutrition he needs plus antibodies from his mom. If Alexis is really worried about the specific bugs in the day

care center, she could spend some time hanging out in Jordan's new environment at day care. By doing this, Alexis's body will detect and fight off any of the viruses and germs that Jordan may be exposed to and her body will then produce antibodies to fight off these infections which will then cross into the breastmilk that Jordan will receive. Those antibodies will help Jordan fight off the same viruses and germs if he too is exposed. I love this so much. The human body is so amazing. It makes this powerful, incredible substance that not only provides a baby with all the nutrition they need to growth and develop, but also provides additional antibodies that are specific to the babies environment.

Now in order to answer the question comparing human milk to formula, you need to compare the nutritional value of human milk and commercially prepared infant formula. Standard infant formula is 20 kcal/oz. This is also true for human milk. Infant formula was produced to mimic human milk as much as possible. It's important to know that the caloric density of human milk can vary depending on the time of day. It tends to be less calorically dense in the morning, meaning lower in calories but is higher in volume, meaning there's usually more milk in the morning. As the day progresses, the quantity of milk can decrease BUT the milk tends to be higher in calories. When you analyze human milk over a 24 hour period, it averages about 20 kcal/oz. That's what we use when determining the calories provided from human milk.

Human milk is lower in protein than commercially prepared infant formula however, human milk protein is much more bioavailable, and easier to digest and absorb compared to infant formula. Even though it's not as high in protein, it doesn't mean that the baby doesn't get enough protein. In fact, if the baby is born at full-term, even if human milk is lower in protein than infant formula, i's enough to promote growth and will meet the DRI's for most healthy babies. In this question, we're not talking about babies that have health issues. I want you to pay close attention to that. The question didn't ask about a baby with a heart issue for example. The question simply asked you to compare infant formula to human milk so make sure you don't overthink the question. Answer the question that was asked. Getting too much in your head could cause you to answer the question incorrectly.

So what about iron. Infant formula is higher in iron than human milk. Because of this, the American Academy of Pediatrics recommends that exclusively breastfed and partially breastfed infants receive iron supplementation until 6 months of age which is when solid food is introduced.

Going back to the potential answers to the question which was to compare human milk and infant formula. Is the nutrient content the same between human milk and infant formula? No it's not. It's the same calories per ounce but infant formula has more protein and iron than human milk. Is infant formula similar to human milk in nutrient content and antibodies? Nope. There's no antibodies found in infant formula so that answer can't be

correct. Is infant formula lower in protein, iron and calories and lacks antibodies? Well, no. It's true that infant formula lacks antibodies but infant formula is higher in protein and iron. Also, human milk and infant formula have around the same amount of calories so that option isn't correct. Does infant formula lack antibodies but contains higher amounts of protein and iron? Yes, sure does. You learned all about the amazing antibodies that's found in human milk that can't be replicated in infant formula. Also breastfed babies often need an iron supplement because human milk is lower in iron. Breastmilk is also lower in protein than infant formula but the protein is more bioavailable. And this my friend, is why human milk is often referred to as liquid gold. Because it's amazing and cannot be found or made anywhere else. You did it!

So let's review. Oxytocin is responsible for contracting the milk-producing cells and pushing milk through the ducts. Prolactin stimulates milk production. Estrogen and progesterone are important but do not play a direct role in lactation and progesterone can actually interfere with milk production. Human milk is the preferred nutrition for infants. It's lower in protein and iron and has the same amount of calories as standard infant formula but the protein is much more bioavailable in human milk. Infant formula is missing the incredible antibodies that are found in human milk that helps newborns and infants fight infection. And lastly, cow's milk is not recommended before 1 year of life. So there you have it.

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If you need a refresher on lactation and human milk, come back to this episode anytime. Until next time my friend.

[Music and Outro]