Exclusively Pumping Breast Milk

A Guide to Providing Expressed Breast Milk for Your Baby

Second Edition

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To all the strong, determined, committed, loving mothers who continually amaze, encourage, and inspire me.

— S.C.

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Introduction to the Second Edition

It's hard to believe that almost ten years have passed since publishing the first edition of *Exclusively Pumping Breast Milk*. Over those years, many things have changed and many have stayed the same.

The option of exclusively pumping as an alternative to formula feeding has made small but steady gains in terms of recognition and acceptance, yet at the same time many women are still unaware of this opportunity to provide breast milk for their babies when breastfeeding doesn't work out or isn't desired. I still receive far too many emails in which women lament that they thought they were the only ones exclusively expressing breast milk for their little ones. My earnest hope is that exclusively pumping will become accepted in the medical and lactation communities for what it is—an alternative to formula feeding—and that expectant mothers will be informed of the option during prenatal and breastfeeding classes. Far too often it is seen as competing with breastfeeding, and while some women will choose to exclusively pump instead of breastfeed, the vast majority of exclusively pumping mothers are women who wanted to breastfeed but were faced with challenges they had difficulty overcoming. When we have accurate information and meaningful breastfeeding support for every new mother,

and a society that accepts and supports breastfeeding not just as a token but in meaningful ways, then fewer women will exclusively pump. But until then this is an option that needs to be supported and shared.

Sharing has become easier over the past ten years as the internet has grown and become the go-to source of information for many new moms. What would we do without it? As a tool, it is providing women the opportunity to research information about pumping and lactation, resulting in more well-informed mothers. However, the internet also leaves new mothers open and vulnerable to a plethora of inaccurate information, and so now, more than ever, it is necessary to find information that is from a reliable and trusted source—not always easy to do. As a communication device, the internet provides a valuable connection between women, offering support and camaraderie where it was once difficult to find. No longer do women need to go it alone. Regardless of your situation, you will find others who understand and have first-hand experience with what you are going through. You will find information and support online and do not ever need to feel isolated when exclusively pumping.

While there has been some research conducted over the past few years relating to expressing breast milk, most is, unfortunately, still not directly relating to long-term exclusive breast milk expression. Instead, research tends to be focused on the use of breast pumps to initiate milk production in moms of premature infants or is funded by pump companies attempting to prove the efficacy of their own pumps. Some of this information is still relevant to exclusively pumping mothers, but it is my hope that before the third edition of this book is released we will see an acknowledgement of the number of women who are exclusively pumping—and specific research on the topic. Having said that, this new edition does provide a significant increase in

the number of sources cited, with endnotes provided for both sources and additional information.

On a personal note, the past ten years have brought a number of changes. My second child was born in 2006 and although I was worried that I might again experience breastfeeding difficulties, these fears proved unfounded. My daughter breastfed for just over three years, and while I had a lot to do in order to work through the emotional baggage I brought with me from my first experience exclusively pumping for my son, I also gained a great deal of wisdom from the experience. Most importantly, I began to clearly understand the emotional aspects of breastfeeding—and not breastfeeding—and to recognize how breastfeeding affects not only our children but also us as mothers. Noting a void in current breastfeeding literature, I set out to write a book on the topic and to support mothers who have had past breastfeeding challenges move into their next breastfeeding experience with a sense of empowerment and knowledge. *Breastfeeding, Take Two: Successful Breastfeeding the Second Time Around* is the result of my experience with my daughter, but was initially born through my experience exclusively pumping for my son.

This revised edition of *Exclusively Pumping Breast Milk* draws on my experiences pumping for my son and breastfeeding my daughter. Since the first edition was published I've accumulated another ten years of research, completed a course in breastfeeding support, had the pleasure of communicating with hundreds of exclusively pumping women, and perhaps even gained a bit more of the wisdom that comes with age. All these elements come together to create a more complete resource for pumping mothers.

It has been a genuine pleasure over the past ten years to support other women who are exclusively pumping and to share both my knowledge and experience. These women truly are

heroes. They are inspirational and show the true meaning of love and dedication as they selflessly give of themselves to provide "expressed love" for their babies.

The book covers a lot of ground and ideally you'll want to read it from the beginning to the end. But if you're in a rush to get started, you may consider beginning with "Exclusively Pumping 101", "Pumps and Kits, Oh My!", and "Feeding Baby". These chapters will provide you with the basics. If you have a baby in the NICU, you'll want to ensure you read "Pumping and the NICU", in addition to the other three chapters, if you want quick access to information that will get you started. The book's index is also a handy way to help locate information or to find answers to specific questions you might have.

As you begin reading the book, I hope one thing is made clear: long-term exclusive pumping is possible. You will not be alone on your journey. I'll be here, as will many other women around the world who are, along with you, providing "expressed love" for their babies.

I would love to hear from you! If you'd like to share your successes—or need some emotional support—feel free to get in touch. You can connect with me through the book's Facebook page at www.facebook.com/exclusivelypumping or the book's website at www.exclusivelypumping.com.

Stephanie Casemore
May 2013

Chapter 3

The Emotions of Exclusively Pumping

Mommy guilt. Every new mother feels it. It creeps in uninvited sometime during the first few weeks of your baby's life. It is unavoidable and, in many ways, it is a sign that you are a good mother. Perhaps guilt is a signal that you love your child. You want to do everything you possibly can for your child; you want to give her the best. Who can fault you for that? Yet when you've gone through a stressful or challenging experience and have not been able to meet your expectations for motherhood and caring for your child, guilt can sometimes hit you early and hard. If you are exclusively pumping by choice, then this is likely not something you'll experience, but for those who are exclusively pumping because of challenges breastfeeding or an experience that was outside of your control (premature delivery, cleft palate, health issues) it is likely that you will at some point struggle with feelings of guilt. When the worry—the belief that you are somehow harming your child or not providing them with what they need—begins to overwhelm you or becomes all consuming or ever-present, mommy guilt has reached a new level. A mother who experiences difficulties with

breastfeeding often becomes consumed with a sense of guilt: a belief that she has let her baby down, that she has not given everything she could to her baby. 'Guilt' is the name women will commonly give to the emotion they are feeling. Discussing the use of the word "guilt" Diane Wiessinger, in her essay "The Language of Breastfeeding", suggests it is an ineffective and inaccurate word, pointing the finger directly at a system that isn't doing what it needs to do:

> "We don't want to make bottle-feeding mothers feel angry. We don't want to make them feel betrayed. We don't want to make them feel cheated." Peel back the layered implications of 'we don't want to make them feel guilty,' and you will find a system trying to cover its own tracks. It is not trying to protect her. It is trying to protect itself. Let's level with mothers, support them when breastfeeding doesn't work, and help them move beyond this inaccurate and ineffective word.[1]

So is it really guilt? Do we really feel guilty when we are unable to meet our breastfeeding expectations?

Guilt vs. Grief

Guilt is something that comes at us externally. It is based on the judgment—or perceived judgment—of those around us. We are afraid of judgment from those around us, or else know that there is reason for us to be judged, and this causes feelings of guilt. Perhaps for some women feelings of guilt are proper and deserved; however, my experience communicating with hundreds of women over the past ten years has been that while women often name these feelings as guilt there is something else going on. In most cases, what women are feeling—in my opinion—is more accurately described as grief rather than guilt.

Guilt is something we feel when we know we could have done more, but didn't; when we went against our better judgement and made a choice we knew wasn't the best for those involved; or when we blatantly make a decision that we know is only in our own best interest and not in the best interest of those who we are to care for and love. Yet almost every exclusively pumping woman I've ever met has pumped because of breastfeeding challenges and a desire to provide her baby with what she believes is the best—breast milk. Where is there room for guilt? While 'guilt' may often be the word used to describe their feelings, 'grief' is perhaps a more accurate term.

The distinction between guilt and grief is not based on the amount of effort you put into breastfeeding or the length of time you persevered. It really has more to do with the information you had at the time, your efforts to access information and support, and your dedication to do everything you could do *at the time.* Once you have exhausted your resources—and for some, those resources are going to be very thin—you have a decision to make. If you are faced with a baby who is hungry, who is not gaining weight, or who is crying incessantly, you need to feed your baby. Without the resources and support to help you breastfeed successfully, what else are you going to choose? You choose to bottle feed, whether it is expressed breast milk or formula in the bottle. When you have exhausted your resources, and done all you can do, there is no reason to feel guilty. As new mothers, we do what we believe is right at the time. There is no guilt in that.

On a very personal level, I understand this sense of guilt all too well. When my son was born so early and so tiny, the guilt set in. My body had failed him. I had developed preeclampsia at thirty weeks and he was showing signs of intrauterine growth restriction. The day before I was induced, doctors tested the umbilical blood flow and determined that it was in the ninety-

seventh percentile. This high percentile was not a good thing and meant the blood flow in the cord was compromised. My son was doing okay, but my body was quickly shutting down and the doctors determined it was best to deliver right away. My determination was then to ensure I could breastfeed. I remember asking several times during a quick tour of the NICU what the chances of breastfeeding were. Would I be able to breastfeed my son? All indications were positive, and so I clung to that hope. My body wouldn't fail my son again.

But five weeks later, even though my son was doing very well with expressed milk and I was determined to make breastfeeding work, it was not working. Feelings of failure were strong; I figured I just didn't know what I was doing. The lactation consultants in the hospital seemed frustrated that my son was not breastfeeding better than he was, and I internalized this frustration, thinking I was the cause. As I left the hospital for the first time with my son, I remember feeling emotionally numb. I was operating largely on auto-pilot and still clinging to the belief—the hope—that breastfeeding was going to work out.

Of course, life rarely goes as planned and things got progressively worse at home. Eventually, it got to the point where he was projectile vomiting several times a day, screaming after most feedings, and thrashing and wailing if I attempted to latch him. It became very personal. Was my son rejecting me? I sought out assistance from lactation consultants and breastfeeding experts. The advice ranged from "It's okay to switch to formula if that is what you want" to "You've got to get that baby to the breast" but with no offer of help or useful suggestions. After finally resigning myself to exclusively pumping, partly to preserve at least a small degree of my sanity and partly as a retreat from defeat, I found one doctor who suggested a diagnosis of reflux and offered a readily available, over-the-counter medicine to see

if perhaps it might help my son. In less than twenty-four hours it was as though a new baby had moved into the house.

Guilt? You bet! But I quickly realized that I had done everything I could do with what I was given. I had lactation support in the hospital. I sought out lactation support when my son was released from the hospital. I talked to my doctor. I demanded a referral to a pediatrician. I read the books. I searched online. I was screaming for help; and yet the system—or perhaps more accurately, society—failed me. What more could I have done? Could I have continued trying to breastfeed exclusively? Possibly. But if you have gone through the cycle of breastfeeding, pumping, and bottle feeding you understand what an incredible toll that takes on you. It is not a long-term solution. Could I have stopped pumping and just breastfed to see how well my son would have done if he was forced to breastfeed with no bottle in sight? I could have, but I felt at the time that all I had going for me was a strong milk supply and I feared I might risk it all if I stopped pumping. I felt alone and lonely in the experience. And in hindsight, I know that I did all I could do, physically and emotionally, to make it work. But still it didn't.

And so we're left with guilt and grief. Once you work through the feelings of guilt, and recognize that you have done all you could do given your knowledge, support, and physical and emotional limitations, you are left with the grief. Breastfeeding is a biologically expected activity. It is, for most women, a relationship that is deeply desired. To lose that relationship is to lose something very real, something that has value and purpose and meaning. Just as we mourn when we lose a person we love, we must also mourn the loss of the relationship we wished for.

Part of the challenge in understanding these feelings as grief, as opposed to guilt, is the way that breastfeeding is framed in our society. Many people surrounding you may have a "get over it" attitude. Many suggest to new moms who are having breast-

feeding difficulties, "Just switch to formula." But these attitudes and well-intended suggestions serve only to make us feel that our emotions are wrong and that feeling sad over our loss is invalid—but it most definitely is not! Working through these emotions is critical, both to your well-being and your baby's well-being. Coming to terms with your shared, rocky start will help you grow and move forward.

Moving Forward

Regardless of what we call it—guilt, grief, or regret—the experience of losing the breastfeeding relationship you had hoped for and expected can, and most likely will, affect you in the future. It may hide in a corner or be an obvious stumbling block in your decision to have other children. It may appear to have been tamed and controlled, only to unleash itself when you get that positive sign on the pregnancy test. The impact of breastfeeding failure can be varied, but for most women who experienced difficulties breastfeeding, the impact is very real.

Grieving takes work. It also takes time. But you can help yourself by identifying your feelings, examining them, and working to accept them and move forward from your experience.

First, it is important to take some time to reflect on what you expected. What expectations did you have for the process of breastfeeding? How were those expectations met or not met? It's natural to have expectations about things, but having expectations without flexibility can lead to an increased sense of loss. When you only picture one possible outcome, there is nothing but disappointment and loss from any other outcome. When faced with an experience that is not what you expected, it is necessary to comes to terms with it. It is the shared, developing relationship between you and your child that is most important. Exclusively pumping may not what you expected, but it is yours.

When breastfeeding doesn't go as expected, there is a true loss for both mother and baby. As mothers, we lose out on what we planned for and hoped for, and both we and our babies lose the natural process and bonding relationship fostered by breastfeeding. It is so important to recognize it as a loss and allow yourself to grieve the loss. It's okay, normal even, to be sad. Often those around us don't recognize the loss or understand why we feel so sad. If you're feeling overwhelmed and have no one to talk to, consider finding a doctor or therapist to whom you can voice your emotions. Do not bottle up your feelings, or push them away, thinking that you're overreacting. It *is* sad when a mother and baby lose the opportunity for a nursing relationship, and working through your emotions will help you put your experience in perspective.

The next important step is to recognize the experience for what it was. Everything we do is a learning experience. We don't always have all the answers; no one should expect us to. But we do have the opportunity to learn from our experience and move forward with intention. Once you're feeling capable of honestly looking at the reasons breastfeeding didn't work out, try to pinpoint what it was that went wrong. Consider the three big elements: lack of information, lack of support, and societal pressures and influence.[2] Where did it go wrong in your case? Be clear here. This is not intended to be a blame game. The idea isn't to find blame in what you did or didn't do. We all do the best we can, with the information we have, at a given time. But to move forward, we need to be able to look critically at our experiences and actions and understand what happened.

The grief you feel is deeply personal and is something that you alone need to work through. Jessica Restaino considers this personal aspect of grief and breastfeeding in her essay "Drained" in the book *Unbuttoned*, explaining, "In many ways that's what getting better was like. It was a breaking away from something

deeply personal, deeply mine."[3] This "deeply personal" aspect of breastfeeding is felt by almost every mother. It's our biology that creates it and yet it's our culture that defines it. If our society tells women that they are being ridiculous for being so emotional when they are unable to breastfeed, then mothers are left feeling badly about the sadness and grief. Restaino states that her "sadness became a source of guilt."[4] It is so important to recognize your emotions for what they are—sadness, grief, anger, guilt…whatever they may be. Accept them as your own, work through them, and then, most importantly, figure out a way to move past them.

Once you've grieved the loss and examined your experience and hopefully better understand what happened, the last steps are to reframe your experience in a positive way and then move forward with intention. While you may never look back on your breastfeeding difficulties with fondness, they are part of your story, your experience. They have added to the person you are today. Perhaps your experience has given you greater empathy, encouraged you to search out new ways to bond with your baby, or brought you new friends you may not otherwise have met. Your difficulties have certainly helped you understand the level of your own persistence and drive, as well as your own limitations. Considering what you have gained, and not just what was lost, can help you move forward with purpose.

Don't Overlook What You Have Done

The dedication required to exclusively pump, regardless of how or why you arrived there, is awe-inspiring. It is not an easy feat, but then again, neither is being a mother! If you are grieving the fact that you were unable to breastfeed, recognize that your attempt to breastfeed shows your care. Your determination to try and make it work shows your love. Your willingness to push through the pain and discomfort testifies to your dedication. If

you did all you could given your circumstances, then there is no room for guilt. Regret, yes. But not guilt. Grieve, move on, and learn from your experience.

If your experience is not what you expected, don't overlook the incredible thing you are doing and be sure to recognize the amazing commitment and strength you are exhibiting. Watching your baby growing because of your milk—whether you are able to provide 100% of your baby's nutrition requirements or not—is an incredible thing. *You* are doing that—no one else! Just as you nourished your baby in your womb, you are continuing to nourish him or her outside your womb. And the nourishment will continue. Once you wean your baby from your milk, the nourishment just takes a different form, relying more on love, compassion, guidance, and gentle discipline.

It's easy to point out the ways we feel we have let our children down: things we should have done, or did but shouldn't have. Mommy guilt. This is always going to be part of motherhood. So you weren't able to breastfeed your baby. That is a terrible loss, and one that you need to grieve and move forward from, but it's not the sum total of your value as a mother. Remember to keep it all in perspective. You love your baby, and you do everything possible to give your child the best you can. Sometimes as parents we don't do so well, and other times we are awesome! This is life. Breastfeeding is just another aspect of mothering. It's worth fighting for, and it is wonderful when it works out, but it does not define you as a mother, nor does it define your relationship with your child.

Chapter 4

Lactation and Breast Milk Composition (excerpt)

In order to successfully pump long term, it is important to have a basic understanding of lactation and the composition of breast milk. While it is not essential to have extensive scientific knowledge, it is helpful to have a general sense of how things happen. There are many books already published that go into great detail about the structures of the breast and the process of lactation, so this *won't* be a master class on the subject. Rather in this chapter we'll look at the basics of lactation and gain an understanding of the key factors in breast milk production which will enable you to make informed decisions when it comes to exclusively pumping. I do encourage you to search out as much information on this topic as you can. The more you know, the better prepared you'll be. When breastfeeding, it is easy to rely on your baby's instincts to manage lactation—when your baby is hungry, you nurse—but when exclusively pumping it is up to you to set the schedule and create the demand so your supply will be sufficient for your baby's needs.

Critical Factors in Milk Production

An understanding of the lactation process is important for all mothers. Understanding how lactation is initiated and regulated can help you establish a strong milk supply, maintain that supply, and make decisions that reduce any potential negative effects on your supply.

Stages of Lactation

Lactogenesis I begins during pregnancy. The mammary glands change from inactive to active preparing for lactation. About half-way through pregnancy, the breasts will begin to produce colostrum. You may or may not experience leaking at this time. Breasts usually enlarge, veins become darker, the areolas enlarge and darken, and the nipples become more erect.

Lactogenesis II begins following the detachment of the placenta. This stage of lactation is triggered by a sharp decline of progesterone following the detachment and subsequent delivery of the placenta. Any retained placenta can greatly affect a mother's ability to establish a full milk supply.

Formula provided during this time (even just once) changes the normal flora of the gut and it can take days for it to return to normal. The gut flora of a breastfed baby is significantly different from that of a formula-fed baby.

Milk production slowly increases over the first few days postpartum. It usually takes two to five days for milk volumes to increase, but it can take longer depending on a variety of factors such as certain birth interventions or medical conditions. First-time mothers will see an increase later than mothers who have already had children.

It is important to realize that lactogenesis II will happen regardless of whether a woman is choosing to nurse her baby, express her breast milk, or formula feed her child since lactogenesis II is a result of hormonal factors.

Stages of Breast Milk

There are three stages of breast milk:

Colostrum is present at birth and is all a baby requires until milk production increases. It is yellow to orange in colour and is very thick and somewhat sticky. Colostrum is high in antibodies and protein and has a laxative effect, which assists a baby in removing meconium from her system. If meconium is not removed from a baby's system, it can lead to jaundice since bilirubin from the meconium will be reabsorbed. Colostrum also coats the gut providing protection from potential pathogens. It's important to realize that a baby's environment is sterile until birth. Once born, a baby is suddenly exposed to a host of dangers. Nature has provided the initial dose of colostrum as an "inoculation" against these many dangers. Since the mother has already been exposed to these dangers in the environment, her colostrum will provide antibodies against those elements specific to her environment.

If pumping, it is important to collect and feed colostrum, not only for the laxative effect, but also its immunological elements that will assist your baby in fighting off infections. While some pumping mothers choose to supplement with formula at birth, this is not always necessary, depending on how long it takes your milk to increase. Colostrum will assist the baby's digestive system to begin its work, rather than being pushed into high gear immediately at birth.

Transitional milk follows colostrum. It can be seen as early as twelve hours after delivery—although usually takes longer—and usually lasts one to two weeks. It is the consistency of mature milk, but it retains some of the colour of colostrum.

Mature milk has a slight bluish tinge to it and is rather thin when compared to formula or whole cow's milk. It contains all the nutrition that a baby needs for at least the first six months of life. Breast milk will continue to change throughout lactation,

responding to the needs of the infant, the mother's exposure to viruses and bacteria, and the mother's diet.

The Hormones Involved

Prolactin

Prolactin is the hormone responsible for triggering milk production. It is also referred to as a "mothering hormone" because it creates nurturing responses. Prolactin levels rise sharply following delivery and fall substantially over the first twenty-four to thirty-six hours post-partum. Prolactin is produced by the anterior pituitary gland and causes a decrease in estrogen levels. It also inhibits the maturing and release of eggs from the ovaries. The absence of menstruation during lactation is known as lactational amenorrhea. Prolactin levels naturally vary throughout the day with the highest levels in the early morning hours between 1a.m. and 5a.m. Once lactation is established, prolactin takes on only a permissive role as opposed to a regulatory role: it no longer drives production but its presence simply allows milk production to continue. While there has been no research showing a correlation between serum prolactin levels and breast milk volume, it is necessary to maintain prolactin levels for its permissive role.[1] Prolactin and dopamine have an inverse relationship. As dopamine levels rise, prolactin will decrease. If you have a condition or take medications that raise dopamine levels, this may cause issues with lactation. Smoking is one common activity that will raise dopamine and smoking has been shown to have a negative effect on lactation.

Likewise, it is important to note that progesterone may interfere with normal prolactin production and its interaction with cell receptors.[2] Progestin-only (mini-pills) birth control is the best oral contraceptive to use while lactating; however, due to the possibility that it may interfere with the establishment of the milk supply, it is usually recommended that you wait until your

supply is well established before starting even progestin-only birth control. Oral contraceptives containing estrogen are not recommended for lactating women. Seek the advice of a knowledgeable physician who is experienced with lactation and the possible effects of birth control. If you do take hormonal birth control and find that your supply is starting to decline, stop immediately and use a different form of birth control.

Oxytocin

Oxytocin is vital during both the birthing process (contractions) and lactation (milk ejection reflex). It is also a "loving hormone" assisting in creating affection and social bonds with others. Oxytocin can help to create a relaxed, calm, and euphoric feeling, which both the mother and the baby experience when breastfeeding. Oxytocin is important to the bonding of mother and baby and, in the presence of prolactin and its influence on mothering responses, oxytocin helps to create a strong bond between mom and baby. Oxytocin levels in the brain soar immediately after delivery—this is one reason why immediate and uninterrupted one-on-one time following a baby's birth is so important. Unfortunately, when pumping, the release of oxytocin is not associated with the connection between mom and baby. However, oxytocin is not only released during breastfeeding (or pumping) but also when we share meals together, hug or kiss, or share close connections, and so you can still build a strong bond with your child, even when not directly breastfeeding.[3]

Oxytocin receptors in the breast increase during pregnancy and also increase in the uterus prior to delivery. The uterus uses oxytocin to prevent post-partum hemorrhages by contracting the uterus. Oxytocin is released from the pituitary gland when the nipple is stimulated. Just as with breastfeeding, mothers may experience after-pains when pumping in the days following delivery.

Oxytocin acts upon the smooth muscles of the breast and causes contractions which push the milk into the ducts and to the nipple. The milk ejection reflex, or let-down, takes place multiple times during a feeding or pumping session since the oxytocin is released in waves as stimulation continues. As a new wave of oxytocin is released, a new let-down will occur. This knowledge is important for the mother who is exclusively pumping. Many women will stop pumping once their milk flow has slowed, having been told they should pump only a few minutes after the flow of milk has stopped. However, since the milk ejection reflex is initiated by waves of oxytocin being released, the flow of milk will also come in waves. It may take two or more let-downs in order to remove a sufficient amount of milk from your breasts.

Once lactogenesis II has begun, milk production is largely controlled by the baby, or in the case of a woman exclusively pumping, controlled by the pump and frequency of pumping sessions.

Endocrine and Autocrine Control

The production of breast milk is dynamic and active, and the control of production changes over the first few weeks post-partum. The breast responds to the stimulation of an infant or pump with a series of events that release hormones, which in turn stimulate a milk ejection reflex, or let-down, and prompt further production or signal the breast to decrease production if, for some reason, the milk is not removed from the breast.

Endocrine control refers to the hormonally driven stage of lactation—lactogenesis II—which will happen regardless of whether a baby is nursing or not (with rare exceptions such as Sheehan's Syndrome or physiological conditions such as hypoplasia) and which lasts for a few weeks after a baby's birth. During this time, lactation is established and supply is set. Milk production will vary depending on the amount of stimulation to

the breasts, nipples, and areolas, and the frequency of stimulation. This is an amazing aspect of nature since the variation in frequency helps a mother regulate her milk supply depending on the number of babies she has. So milk supply will be different for the mother of a single baby as opposed to the mother of twins, and when exclusively pumping this must be taken into consideration. For this reason, it is vitally important that when pumping you pump frequently.

Autocrine (local) control is also referred to as lactogenesis III and is the maintenance stage of lactation. This relies on the principle of supply and demand, and it is both interesting and important to know that milk synthesis is controlled at the breast and independently in each breast.

So there are then three things necessary to maintain breast milk supply:

- there must be the required hormones present and they must successfully travel to the breast (known as endocrine control);
- there must be stimulation to the nipple, areola, and breast; and
- the milk within the breast must be removed (known as autocrine control).

Two Key Processes Controlling Milk Production

Milk removal is the primary control mechanism for milk supply. In other words, milk removed from the breast initiates more production of milk in the breast. As the scientific community continues to research lactation, the understanding of milk production continues to develop. One of the most important things to understand about lactation and milk production is this: milk production slows as the breast fills. This is a central tenet of milk production.

Far too often I read or hear women telling other women that perhaps they are not waiting long enough for their breasts to "fill up" again in between pumping sessions and this is why they don't have enough milk. This well-meaning advice goes against everything science teaches us about the process of lactation. If you want to produce enough milk you must pump frequently and remove as much milk as possible from the breast. Milk left sitting in the breast slows production. There are two reasons for this:

> 1) A mother's milk contains a protein called Feedback Inhibitor of Lactation (FIL). As the breast fills, naturally more FIL is present and production will begin to slow. Think of this process as a grocery conveyor belt. As you put groceries onto the belt, you have less and less room to add more groceries and eventually you must stop adding items because you have run out of room. In order to allow more groceries to be added—or breast milk to be produced—you must remove some of the groceries—or milk. Anyone who has ever suffered from engorgement will appreciate this little protein. It is important to have some limits on production or else engorgement, plugged ducts, and mastitis would be far more prevalent than they already are.[4]
>
> 2) When the alveoli (small sacs that contain milk-producing cells) are full of milk, their walls expand and the shape of the prolactin receptors changes. (You'll remember that prolactin is the hormone that both initiates lactation and allows lactation to continue.) This prevents prolactin from entering at these sites and, as a result, slows milk production. As the alveoli empty, the receptors return to their normal shape, allowing prolactin to enter again and milk production to increase.[5]

These two processes are key to understanding milk production. Both frequency and efficiency of milk removal are primary in the initiation and continuation of production. Anything that interferes with these two aspects has the potential to interfere with or harm the continuing lactation.[6] It is clear that when milk is removed more frequently, then production will increase.[7]

The Prolactin Receptor Theory

The prolactin receptor theory is another important idea in lactation and has implications for all pumping moms. The basic idea of the prolactin receptor theory is that milk production is "set" during the first few days and weeks post-partum. Frequent stimulation increases the number of prolactin receptors in the breast, allowing the body to utilize prolactin more effectively. This sets milk production for the rest of the lactation period. Newborns naturally feed for short periods but feed very frequently. This encourages the increase of prolactin receptors and the establishment of a strong milk supply. For mothers who are using a breast pump to initiate their milk supply, it is important to understand the prolactin receptor theory and to follow a pumping schedule that provides frequent stimulation and removal of milk.

The most important aspect of the prolactin receptor theory is that the newborn's seeming desire to breastfeed all the time is biology's way of ensuring the mother's milk supply is ample five months or more down the road. Even though it may seem that there is no milk in the breast and that a baby is getting "nothing", a newborn who is nursing frequently is getting exactly what is needed and ensuring that will continue as he or she grows and develops. Hospital practices that separate mom and baby, birth interventions that prevent a baby from nursing within the first hour following delivery, or early bottle supplementation all have an impact on this natural process and inter-

fere with the normal development of prolactin receptors that are critical to long-term breastfeeding. As a pumping mom, this means that you also want to pump frequently and follow nature's plan as closely as possible.

Storage Capacity and Milk Production

Storage capacity is the amount of milk the breast can hold between nursing or pumping sessions. Storage capacity is *not* directly related to the size of the breast and can differ between breasts; in fact the right and left breast rarely produce the same amount of milk.[8] Storage capacity also has been shown to change during lactation.[9] Storage capacity of the breast affects the rate of milk production.[10] A large storage capacity will allow milk production to continue for a greater length of time before slowing since the receptors will not "stretch" until full. Think of this concept as a cup: you can drink a large amount of water throughout the day using any size of cup. If you use a small cup you will simply have to refill more often.[11] This is not an indication that a woman with a larger storage capacity can produce more milk, only that a woman with a smaller storage capacity will need to nurse, or pump, more frequently.

For a breastfeeding mom, storage capacity may affect a baby's feeding pattern. Mothers who have a smaller storage capacity will likely have babies that nurse more frequently. This is important for both the mom's milk supply and for the baby's sufficient intake. Mothers who have a larger storage capacity may have babies who go a little longer between nursing sessions, depending on the amount of milk a baby wants when nursing. A baby whose mother has a large storage capacity will more likely feed from only one breast when nursing as opposed to nursing from both breasts during each feeding.

And what does this mean for a mom who is exclusively pumping? Just like a nursing mom who will need to nurse more

or less frequently depending on her storage capacity, moms who are pumping will also be lead by their individual storage capacity to some extent with regards to how frequently they need to pump. Although when initiating supply it is important to pump frequently, once milk supply has been established a mother with a larger storage capacity can often drop to fewer pumping sessions than a mother with a smaller storage capacity and still maintain her supply. Unfortunately, there is little you can do to thwart nature and you're stuck with the storage capacity you've been given.

Research has shown, however, that the storage capacity of breasts increases between one month and four months post-partum.[12] This is particularly heartening for women who have struggled with production in the early weeks. Many women do find that production will continue to increase with good pumping habits over the first two to three months post-partum and perhaps this increasing storage capacity plays a role in that. While milk production is not dependent on breast volume (i.e. the amount of breast tissue), the study does suggest that both do naturally decrease over time. Apoptosis, which is a process of cell death that is programmed to occur, begins to happen around six months and breast tissue begins to involute; however, milk production continues. Decreased prolactin plays a role in apoptosis, and decreased frequency of milk removal, which results in milk left sitting in the breast, can also encourage apoptosis. For this reason, frequent expression should be continued for as long as possible when long-term pumping is your goal. The good news is that while storage capacity is related to milk production, there is no such connection between breast volume and milk production.[13] Whether A cup or DD cup, it doesn't matter.

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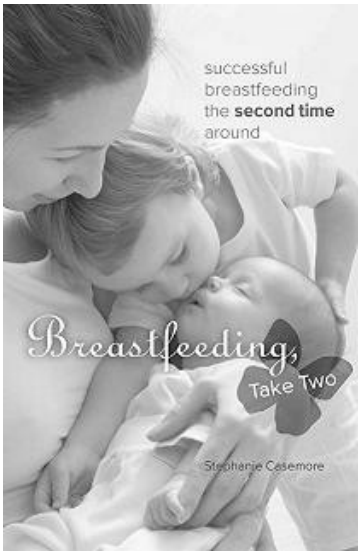
Also by Stephanie Casemore

Breastfeeding, Take Two

Successful Breastfeeding the Second Time Around



Breastfeeding is a biologically expected activity. It is, for many women, a relationship that is deeply desired, a relationship that is deeply emotional. To lose that relationship is to lose something very real, something that has value and purpose and meaning.

Breastfeeding Take Two: Successful Breastfeeding the Second Time Around examines the separation between biology and society and the balance that new mothers seek to find between the two. Written for women who have had previous breastfeeding challenges, *Breastfeeding, Take Two* will empower you to trust your body again, help you redefine what successful breastfeeding looks like, help you work through the emotions of your previous breastfeeding experience, provide information and advice to assist you in healing from the loss of your first breastfeeding experience, and position you for a successful experience—the second time around.

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