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The hormones that support breastfeeding also help mothers tolerate, or even enjoy it. But what happens when the hormones of breastfeeding turn against mothers? What if these very hormones make breastfeeding intolerable by biological mistake? That appears to be the case with D-MER. D-MER refers to Dysphoric Milk-Ejection Reflex, where mothers experience dysphoria during milk ejection. D-MER can range from mild to severe. It is a burst of negative emotions in the first few minutes of breastfeeding. In some cases, D-MER is so severe that mothers feel forced to wean. In this article, we examine the phenomenon of D-MER in the light of hormonal research, offer some hypotheses on the causes of D-MER, and suggest possible strategies mothers can use to help them cope.

Keywords: D-MER; dysphoric milk-ejection reflex; dysphoria; breastfeeding

For millennia, mothers' ability to feed their infants was critical to human survival. The hormones of breastfeeding are meant to ensure that breastfeeding happens, that enough milk is produced, and that mothers can tolerate it. As many breastfeeding mothers will attest, even with this hormonal support, breastfeeding is not always enjoyable. Sometimes, it can be frustrating, irritating, and even unpleasant. Overall, however, the hormones of breastfeeding are supposed to help mothers tolerate, or even enjoy it. So what happens when these hormones turn against mothers and make breastfeeding intolerable? That appears to be the case in D-MER.

D-MER refers to dysphoric milk-ejection reflex, where mothers experience dysphoria during milk ejection. There is much we do not know about D-MER. Evidence for this phenomenon is anecdotal. There are two published case studies in the literature (Cox, 2010; Heise & Wiessinger, 2011). The rest of what we know is summarized on a helpful website that Alia Macrina Heise, IBCLC, founded called D-MER.org. This forum lists many mothers' stories showing that it is a real syndrome, although the incidence is unknown.

In this article, we summarize what we know from these case reports of D-MER, examine possible biological mechanisms, especially the role of oxytocin, and propose some possible ways to address these troubling symptoms.

Symptoms of D-MER

Mothers describe the symptoms of D-MER as occurring suddenly, coming like a wave, when they begin a feed. In case reports, mothers describe experiencing a range of negative feelings: dizziness, overwhelming sadness, irritation, restlessness, anger, panic, or severe depression or anxiety. These symptoms occur within seconds and disappear within 10 minutes after initiating a feeding. In more severe cases, mothers may experience waves of suicidal ideation and severe depression (D-MER.org, n.d.). Most of these mothers continue breastfeeding, despite these troubling symptoms. For some women, however, the symptoms may be so severe that they feel forced to wean. These symptoms are brief, so the mothers are not diagnosed with postpartum depression or anxiety, but they can co-occur with depression and anxiety, as Bonnie describes.

It took me quite a while to pick up on the pattern of symptoms I was having because I was simultaneously battling postpartum depression and anxiety. It wasn't until after I had my birth control removed, and I started pumping regularly at work, that I noticed there was a consistent pattern. The symptoms of my postpartum depression had dissipated as my hormones balanced out when I removed the Nexplanon. Every time I pumped or experienced letdown, my symptoms would return with a vengeance. My chest would tighten, my mood would shift to panic and sadness, and I'd sometimes feel quite dizzy. It usually passes within a minute or two of my pumping or nursing session. I experience them more when I pump, and it's been over a year now with no sign of change.

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Thanks for giving me a space to share my story. I haven't seen too many people who know about this.

The symptoms can last anywhere from a few days to several weeks or longer. Some mothers experience symptoms for the entire length of their breastfeeding experiences. Aleesa experienced D-MER with each of her three children.

I had D-MER with all three of my children and symptoms ranged from a general feeling of sadness to suicidal thoughts and to crying. Most of the time it felt like feeling homesick. With my first baby, I noticed symptoms within maybe a week of giving birth and they lasted about six weeks. With my second, I noticed symptoms after my milk surged and they lasted several months. With my third, I pumped antenatally a couple times, and I actually felt it then. It lasted about 4–6 weeks with him. Generally, the feelings would wash over me the first few minutes of breastfeeding, and then it would go away within a minute or two of a letdown.

The Role of Oxytocin and Prolactin

The pattern of symptoms suggests a hormonal etiology. There are two hormones that release in response to breastfeeding: oxytocin and prolactin. Oxytocin causes milk ejection and prolactin causes milk production. Oxytocin is released almost immediately in response to suckling, and is released in small pulses maximally for approximately 10 minutes. Milk is ejected in response to each oxytocin pulse because oxytocin contracts the myoepithelial cells in the mammary gland (Uvnas-Moberg, 2015). Prolactin, in contrast, is released more gradually, 10–20 minutes after the onset of breastfeeding. The release profile of the two hormones suggests that oxytocin is the most plausible one responsible for symptoms since it is released so quickly in response to suckling.

How, then, could oxytocin, a hormone that is associated with well-being and calm, be responsible for the symptoms of D-MER?

Biology of Oxytocin

Oxytocin is produced in two cell groups in the hypothalamus: the supraoptic nucleus and the paraventricular nucleus (PVN). Neurons, or nerves, containing oxytocin from both these cell groups reach the posterior pituitary and release oxytocin into the circulation. In addition, the PVN sends nerves to many important regulatory centers in the brain. When the PVN is activated, oxytocin is, therefore, released, not only into circulation but also into the brain (Uvnas-Moberg,

2015). The PVN controls both the stress and oxytocin systems; when one is upregulated, the other is normally downregulated. Each system is associated with a particular set of emotional responses (see Figures 1–3).

Oxytocin is released into areas such as the amygdala, the center in the brain that regulates fear and social interaction. In addition, oxytocin is released into areas of the brain that regulate pain, well-being, calm, blood pressure, pulse rate, digestion and metabolism, thirst, and appetite. Women often experience a short period of thirst while breastfeeding, and they are hungrier, which is normal. Oxytocin is regulating their intake of nutrients. Some women experience a short period of decreased pulse rate and blood pressure. These adaptations, from a basic physiological point of view, help mothers cope with breastfeeding. In addition, oxytocin released during breastfeeding facilitates interaction with the baby and makes the mother happier and less anxious (Uvnas-Moberg, 2015). In fact, researchers have found a link between circulating oxytocin levels and the level of attachment between mother and baby (Strathearn, Mamun, Najman, & O'Callaghan, 2009).

Nurture and Protect

Oxytocin not only helps mothers feed, warm, and care for their babies but also helps mothers protect their babies, and can trigger both aggression and the fight–flight response. The protective action of oxytocin is linked to negative feelings in the mother, such as fear and anger. Oxytocin promotes this protective response, and it is activated when the mother perceives the environment as hostile or dangerous for her baby (Uvnas-Moberg, 2015).

The symptoms of D-MER resemble a short-term expression of maternal aggression or the fight–flight response. In these women, breastfeeding appears to trigger this response via oxytocin. This symptom pattern resembles chronic hyperarousal symptoms in post-traumatic stress disorder (PTSD), with a chronically activated stress system on the lookout for possible danger (Ruglass & Kendall-Tackett, 2015). Symptoms of D-MER do not mean that mothers have negative feelings toward their babies. These negative feelings are triggered in a part of the brain that is not within the mother's conscious control. Rather, we believe that the burst of oxytocin activates, by mistake, mothers' defense reactions, rather than the more positive feelings normally associated with breastfeeding (Uvnas-Moberg, 2015). Defense and protective reactions are, in fact, part of the mother's care of their babies. If necessary, the mothers must be able to protect them, but these reactions should only be induced if there is a real danger.

Figure 1. Normally, when oxytocin is upregulated, the stress response is downregulated. Conversely, when stress is up, oxytocin is down. In D-MER, it appears that oxytocin is up-regulating the stress response. Photo credit: Fotolia.

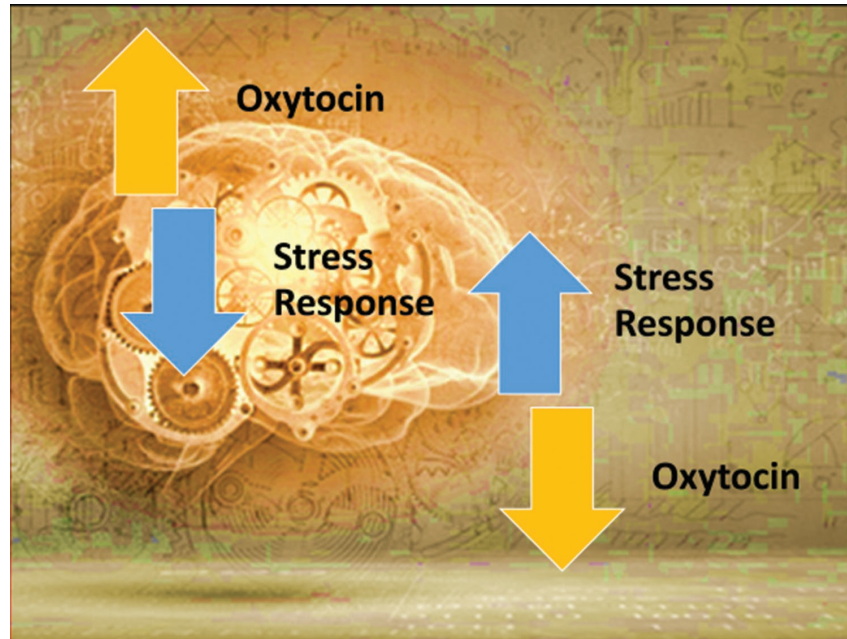


Photo credit: Fotolia.

Figure 2. Oxytocin is normally associated with positive feelings, bonding, and affiliation.



Photo credit: Fotolia.

Figure 3. An upregulated stress response is associated with increased depression, anxiety, and other negative feelings. Photo credit: Fotolia.

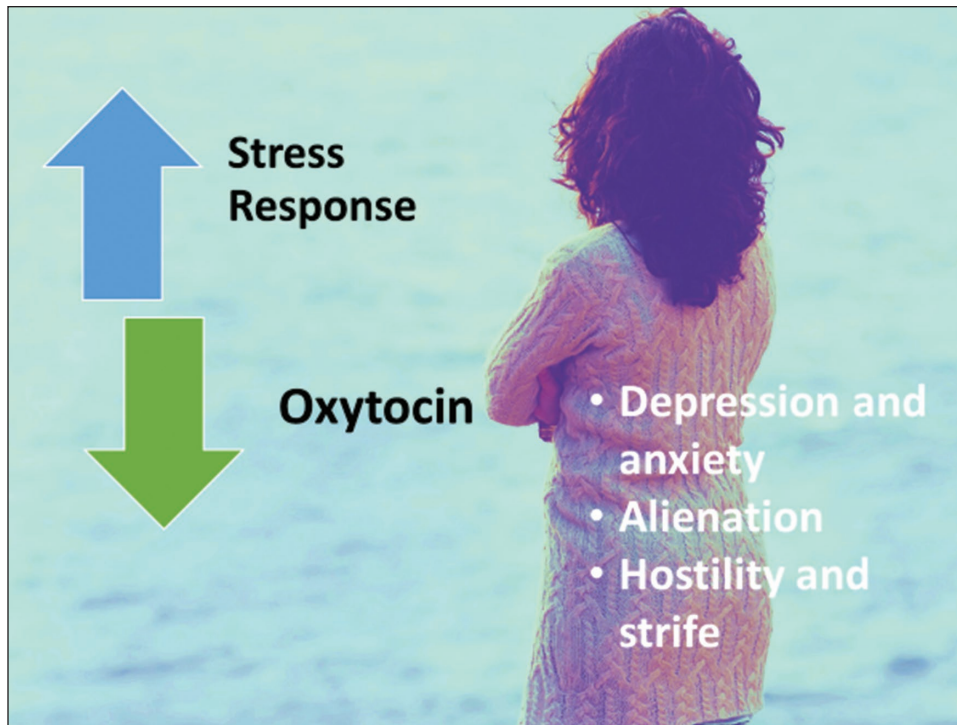


Photo credit: Fotolia.

Why Does This Happen?

The truth is that we don't know why D-MER happens to some mothers and not others. It could be trauma, but the D-MER.org site correctly notes that many women without a history of trauma have D-MER. A mother's prior experience of any significant stress may make her overreactive to current stressors, which, in a way, protects her and her baby. Stress can come from many sources.

Stress during pregnancy can trigger this defensive response. Animal studies have found that stress during pregnancy can reverse the suckling-related positive effects of oxytocin release and lead to negative, inhibitory effects (Hillerer, Reber, Neumann, & Slattery, 2011). A stressful labor can also trigger a negative response. For example, in a recent study, mothers who had synthetic oxytocin (Pitocin) during their labors had significantly more anxiety and depression postpartum compared with mothers who did not have synthetic oxytocin (Kroll-Desrosiers et al., 2017). Synthetic oxytocin makes labor more painful and blocks the action of a naturally occurring oxytocin, which enhances stress levels and increases the risk of postpartum mood disorders. In addition, mothers who have synthetic oxytocin during

labor are more likely to have epidurals, which also block the release of naturally occurring oxytocin during birth and therefore increases the risk of depression (Kendall-Tackett, Cong, & Hale, 2015).

Sometimes, mothers simply do not know why this is happening. And we may not need to. Determining the origin of the stress or trauma that triggered D-MER is not as important as recognizing that this system has been disrupted and taking steps to counter it.

Is D-MER Related to Dopamine?

Some researchers have attributed the phenomenon of D-MER to a decrease in the levels of dopamine, the substance that is released in the reward center in the brain to cause well-being (D-MER.org, n.d.). In our view, the evidence from hormonal research does not support that hypothesis. The possible involvement of dopamine is not consistent with the hormonal reaction that takes place during breastfeeding, nor with the symptoms the mothers describe. Of particular relevance is the rapidity of the symptoms, which suggests oxytocin as the culprit, rather than prolactin or dopamine, as it is released within minutes of breastfeeding: when the symptoms of D-MER occur.

Prolactin release is, in part, mediated by a decrease in the levels of dopamine in some nerves in the hypothalamus, which reach the prolactin-producing cells in the anterior pituitary. Prolactin is released slowly in response to suckling; the levels increase 10–20 minutes after feeding begins and then remain high for at least an hour. This delay of prolactin release is not consistent with mothers' symptoms (Uvnas-Moberg, 2015), which occur almost immediately after the onset of suckling.

Since dopamine mediates prolactin, not oxytocin, it also seems unlikely that it is involved in the symptoms of D-MER. In addition, it's unclear whether the activity of the dopamine neurons that control prolactin secretion in the anterior pituitary parallel the activity of the dopamine neurons in the reward center. These dopamine neurons may act independently of each other (Uvnas-Moberg, 2015).

Ruling out dopamine has implications for treatment. Medications that act as dopamine antagonists, such as Wellbutrin (bupropion), have been recommended to treat D-MER. However, since the treatment with this type of medication is based on the assumption that lowered dopamine levels cause D-MER, and as dopamine is not likely involved in D-MER, this medication is unlikely to be effective, as Bonnie describes.

After I noticed what was going on, I Googled it and my symptoms popped up under a small article about D-MER. It was a relief to know what was going on and the article even suggested medication that was supposed to help: Wellbutrin. I took the recommendation to my doctor and have been on it for some time. It has helped with my depression, but the D-MER symptoms have persisted.

Some mothers claim that bupropion helps, and we do not want to discount their experiences. However, this medication has never been used in a double-blind trial to treat D-MER, which is necessary to rule out the placebo effect (i.e., mothers believe that it will help, so it does). The placebo effect accounts for about a 30% reduction in depressive symptoms. For an antidepressant to prove efficacious, its efficacy rate needs to exceed that 30% (Khan & Brown, 2015; Sonawalla & Rosenbaum, 2002).

What Will Help?

As so little is known about D-MER, we are hypothesizing some possible treatment approaches based on hormonal research. Previous research suggests that the oxytocin pathways have been miswired, so the solution is to help them be rewired, so they are no longer triggering

the fight–flight response, and instead the positive experience that normally occurs. The principle behind this is classical conditioning. MER has become paired with the stress response. A similar process is involved in PTSD: normal sensations become paired with a fright response. An important part of the treatment for PTSD is to unpair the stress response from those normal sensations (Ruglass & Kendall-Tackett, 2015). Using the literature from PTSD, we hypothesize that it is possible to re-pair MER with positive sensations, and unpair it from the stress response. The first step is to help the mother's hormonal system upregulate oxytocin while downregulating her stress system.

Promoting Safety

With D-MER, breastfeeding triggers the fight–flight response, suggesting that mothers do not feel safe. The primary strategy, then, is to help mothers with D-MER feel safe. In the early days, mothers need to be surrounded by people they trust. This may mean blocking some people's access to the mother if they are not helpful—even if they are relatives or hospital staff. The goal is to turn off the hyperactive stress response.

Skin-to-Skin Contact and Massage

Skin-to-skin contact is another potent way to increase oxytocin and downregulate the stress response in both mother and baby. If newborn infants are put in skin-to-skin contact after birth, stress is reduced in both mother and baby. In the baby, pulse rate and cortisol levels go down, the skin temperature increases, which is linked to decreased sympathetic nervous activity. The babies are less afraid and more socially interactive with their mothers. Mothers also experience these antistress effects as reflected by lower cortisol, greater calm, and more interaction (Bigelow, Power, MacLellan-Peters, Alex, & McDonald, 2012; Handlin et al., 2009; Jonas et al., 2008). Birth is extremely stressful for both mother and baby. Skin-to-skin contact has a powerful antistress effect and decreases the stress of being born (Bystrova et al., 2003).

Increasing skin-to-skin contact may override the negative reaction mothers experience with D-MER. The reason we suggest this as a strategy is that skin-to-skin contact and massage have stronger links to the antistress (or parasympathetic) system than suckling and MER (Uvnas-Moberg, 2015). Skin contact could counter the negative effect associated with MER and possibly help re-pair MER with positive sensations.

There is only one caution. For some mothers, especially those with significant trauma histories, skin-to-skin

contact can trigger negative reactions, so clinicians should be aware of this. However, for most mothers, it may help.

Mindfulness

Mindfulness is a technique adapted to Buddhism that has proven highly efficacious for a number of health conditions. It involves paying attention to breathing, and observing, but not engaging with thoughts. Mindfulness provides a break from the mental clutter that often occurs in all of our minds (Praeclarus Press Podcast, 2017; Sanford, 2018).

Mindfulness might also be helpful when mothers are flooded with the negative symptoms associated with D-MER. With mindfulness, mothers focus on their breathing, are in the present moment, and treat themselves with compassion. They remind themselves that the negative thoughts they are experiencing are *thoughts*, not *facts*. Patient education about the symptoms can also be helpful, so mothers know what these symptoms are and that they will go away soon. Aleesa described how changing her thinking about her symptoms made it easier for her to cope.

Before I knew what it was, it was very disconcerting and not the feelings I expected to have while breastfeeding. When I understood what was happening, then I could manage through those few minutes by distracting myself and positive self-talk, like reassuring myself that it wasn't really me, it would go away soon, and I would feel better.

Mindfulness, particularly combined with cognitive-behavioral therapy, is a highly effective treatment for PTSD. PTSD also involves a hyperactive stress response, which mindfulness helps downregulate (Ruglass & Kendall-Tackett, 2015). Similarly, we believe that mindfulness gives mothers a way to cope with D-MER until the negative emotions subside. It also provides a powerful mechanism for downregulating the stress response.

Environmental Factors

A clean and orderly environment can be helpful in downregulating a mother's stress response—have music the mother enjoys, with a comfortable place to sit, and nice things to look at. Warmth also triggers the oxytocin response (Uvnas-Moberg, 2015). Give the mother a hot pack around her shoulders, or suggest that she soak her feet in warm water. The goal is to use the mother's environment to help her feel comfortable and safe.

Self-Care and Nutrition

In a case study of a mother of a 10-day-old infant with D-MER in *The Breastfeeding Atlas* (Wilson-Clay & Hoover, 2017), Wilson-Clay suggested that the mother add 4 oz of protein at each meal to help recover her strength and maintain blood sugar levels. The mother noted the following:

Adding protein helped my symptoms dramatically!!! I wonder if my blood sugars were just fluctuating like crazy. I was carb loading just to try to keep something in my stomach to control my nausea. (p. 141)

This case illustration is of interest because insulin, a hormone that lowers blood sugar levels, is also released by oxytocin and suckling (Uvnas-Moberg, 2015). In some women, breastfeeding may be linked to very high insulin levels, but this response can be modulated by diet, in particular by removing excessive amounts of carbohydrates.

Significantly, the mother also stopped her extra pumping and simply focused on breastfeeding, “instead of pushing my system to make loads of extra milk” (p. 141). That also eased her symptoms. The combination of self-care and protein seemed to help this mother's symptoms improve.

Summary

We are grateful to Alia Heise, who started the D-MER.org site. That site helps mothers know that they are not alone, and that they are not going crazy. It also gave us a place to start understanding this puzzling condition.

For mothers suffering from D-MER, re-programming the oxytocin response seems key. Mothers can do this by increasing their feelings of safety, and by stimulating the oxytocin response. This can be done by touch: skin to skin with the baby, being held by a caring adult, and massage. Mindfulness, also, specifically turns off the stress response. When D-MER symptoms hit, mothers can focus on their breathing, and talk themselves through their symptoms, which lowers the stress response. Adding protein and fat will help regulate blood sugar levels and may lessen symptoms.

D-MER is a genuine puzzle and quite difficult for the mothers who experience it. We have hypothesized a possible underlying mechanism based on what we know about the hormonal responses. We hope that researchers will eventually learn more. But for now, understanding the underlying physiology suggests some ways that we can help mothers cope.

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Kerstin Uvnäs Moberg found among other things that oxytocin reduces pain and anxiety, decreases blood pressure, and reduces the levels of stress hormones in both sexes. She also found that the speed, by which wounds and other types of physical damage heal, increases and that atrophic (thin) mucosal membranes become rejuvenated. The latter research findings form the basis for patents and clinical studies with the aim to create a pharmaceutical drug for relief of menopausal symptoms.