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Revisiting maternal–infant bonding's effects on asthma: A brief history

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Abstract: The concept that asthma is psychosomatic and may be related to parenting has been debated since the 1930s. With the growing focus on the multi-dimensional nature of physical and mental illness currently present in the health fields, recent research has once again begun to support such a theory. This article provides a brief review of the literature pertaining to the possible relationship between the early maternal–infant bond and later onset and severity of asthma with a focus on the history of this theory. Modern research suggests that multiple asthma risk factors are also possible results of poor maternal–infant bonding, supporting the theory that a poor maternal–infant bond may make a child vulnerable to the development of later asthma. However, the impact of such a bond needs to be investigated further and with better methodology to help develop better and more comprehensive models of asthma, maternal–infant bonding, and early experiences.

Subjects: Asthma; Child & Adolescent Psychiatry & Clinical Psychology; Environment & Health; Health Psychology; Maternal and Child Health; Mental Health; Parenting; Parenting and Families

Keywords: asthma; maternal–infant bonding; parenting; psychosomatic disease; maternal–infant attachment; ecobiodevelopmental perspective

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The authors hope that the research presented in this paper will inspire other scientists to study the extent to which early experiences affect lifelong physical and mental health.

PUBLIC INTEREST STATEMENT

Historically, some have argued that asthma is a psychological illness in addition to being a physical one. Although this has been debated for decades, recent research is beginning to support that asthma has a wide range of risk factors, including social ones. This paper explores the idea that the strength of a bond a mother feels with her baby during the first year might affect the likelihood that the child will develop asthma later on. A history of the research supporting this theory is provided, along with implications if this is true and the limitations of the theory. We conclude that, although future research on the topic is necessary, such a framework seems promising and can be related to other diseases as well.

1. Introduction

Asthma, an inflammatory disease in the airways, is the US's most prevalent chronic pediatric condition, affecting over 6.8 million children (Bloom, Cohen, & Freeman, 2012; Klinnert, Price, Liu, & Robinson, 2002; Roberts, 2002) and making it a pressing public health and medical concern. It accounts for over 14 million physician and approximately 1.8 million emergency department visits annually (Centers for Disease Control, 2014; Moorman et al., 2012). However, despite advances in both asthma research and treatment, no cure for this condition has been found and many questions about its etiology remain unanswered (Myers & Tomasio, 2011).

A variety of risk factors have been suggested to contribute to asthma's prevalence. These include genetics (Myers & Tomasio, 2011; Valerio, Andreski, Schoeni, & McGonagle, 2010; Yang, 2010), exposure to respiratory-related pathogens during infancy (Sigurs et al., 2010; Simões et al., 2010), obesity (Ginde, Santillan, Clark, & Camargo, 2010), environmental conditions (such as exposure to tobacco smoke (Mackay, Haw, Ayres, Fischbacher, & Pell, 2010; Wilson, Farber, Knowles, & Lavori, 2011), air pollution (Gehring et al., 2010; McConnell et al., 2010), and allergens (Leickly, 2003; Lupoli, Ciaccio, & Portnoy, 2009; Morgan et al., 2004)), and sociocultural factors (largely ethnicity, health care usage, and socioeconomic status(Piper, Glover, Elder, Baek, & Wilkinson, 2010; Stewart et al., 2010)). Recent research has also begun to emphasize the role that early childhood experiences may play in the incidence, duration, and severity of childhood asthma. Alas, no single risk factor for asthma has been empirically identified as more important than the others (Myers & Tomasio, 2011), suggesting that asthma is a multi-factorial condition. Due to the uncertain mechanisms through which asthma functions, the previously partially discredited theory that asthma may be psychosomatic to a certain extent (Edgell, 1952; French, 1939; Fritz, 1983; Lehrer, 1998) is beginning to resurface in the medical community.

Modern research examining the relationship between early life stress and the manifestation of physical illness has determined that early life experiences have lifelong effects on both physical and mental health (Phillips & Shonkoff, 2000). Among the potential stressors examined, a weak relationship with the primary caregiver during childhood appears to have a particularly high risk of poor developmental outcomes (National Scientific Council on the Developing Child, 2004b; National Scientific Council on the Developing Child, 2005/2014, 2008/2012; Phillips & Shonkoff, 2000). This relationship begins at birth and initially develops through the maternal-driven maternal–infant bond, characterized as the affective state and emotions that felt by the mother toward her child in early life (Bicking Kinsey & Hupcey, 2013). This bond eventually leads to the formation of attachment behaviors and feelings between the mother and child, commonly referred to as maternal–infant attachment (Rowan, 2003), and manifests in the lifelong relationship between the two.

The purpose of this review is to provide a brief history of the research suggesting that childhood asthma may be related to a poor maternal–infant bond in the child, and also to propose a potential theoretical framework for this relationship. The implications and limitations of such a theory will also be discussed, along with suggestions for future research. Although both the quantity and quality of empirical research relating asthma and the maternal–infant bond remain relatively low, a number of theoretical works and observational studies have begun to lay the foundation for such a relationship. Examining the psychosomatic characteristics of asthma further may help future research identify additional risk factors for the development of this condition, potentially eventually leading to new, better treatments and preventative interventions.

2. History of the study of asthma as a psychosomatic condition

2.1. Twentieth century: the rise and fall of the "asthmatogenic mother"

The concept that pediatric asthma may be related to maternal–infant bonding originated in the late 1930s, when French and Alexander (French, 1939) proposed that asthma may be a psychosomatic condition resulting from a child being overly preoccupied with perceived maternal rejection. According to them, asthma attacks were triggered by separation anxiety. Studies conducted during

the same era of psychology supported this theory, finding that asthmatic children appear to show more signs of maternal rejection if institutionalized (Miller & Baruch, 1948), present with greater separation anxiety while between the ages of 7 and 11 (Harris, Rapoport, Rynerson, & Samter, 1950), and have more intense dependence on their mothers later on in life (Knapp & Nemetz, 1957) than non-asthmatic controls. Such findings led to the development of the concept of an "asthmatogenic mother," a maternal figure whose poor relationship with her child exacerbates the child's asthmatic condition (Block, Harvey, Jennings, & Simpson, 1966) and whose absence, even in the presence of the same possible allergens, relieves asthmatic symptoms (Mascia, 1985; Peshkin, 1960). Alas, the methods of data collection and reporting during this era of psychiatric studies were not as empirical as modern research, forcing modern researchers to question their validity.

The psychosomatic nature of asthma was not associated with maternal–infant bonding for another several decades, not until the advent of Klaus and Kennell's highly controversial 1976 book, Maternal-Infant Bonding, which described the physical, emotional, and biological attachments naturally present between mother and child unless impeded by an emotional or traumatic separation event (Klaus, Kennell, & Mosby, 1976). Although Klaus and Kennell's conclusions were largely criticized by the scientific and social communities at the time, several initial studies were conducted in an attempt to prove the link between asthma and poor emotional maternal–infant bonding. Asthmatic children were found to be less likely to be well-bonded with their mothers in several unpublished dissertation studies (Feinberg, 1988; Pennington, 1991; Schwartz, 1988). Furthermore, these studies showed that children with pediatric asthma had a higher incidence of events known to impede bonding (Klaus et al., 1976), such as birth complications (Feinberg, 1988) and early maternal–infant separation between mother and newborn (Pennington, 1991), than children without asthma. Other events associated with non-bonding, including delays in initial holding, maternal grief, and emotional problems in the family during either the pregnancy or the first year, were also found to be more common in asthmatic children than their non-asthmatic counterparts (Pennington, 1991). Even in samples of children genetically predisposed to asthma, early coping and parenting problems (as assessed by researchers during a home visit in the infant's third week) were associated with greater incidence of early asthma symptoms throughout the first two years of life (Mrazek, Klinnert, Mrazek, & Macey, 1991). Alas, due to controversy related to the decline of psychoanalysis and the public's resentment of the mother being blamed for her child's illness, not much research on this topic was conducted during this time.

2.2. Twenty-first century: a focus on early life adversity

The twenty-first century was met with a renewed interest in the effects of early life adversity and toxic stress on later life physical and mental health with the development of various research teams devoted to studying this relationship. The early childhood environment began to be critically and empirically examined for its influence over brain development and health (Phillips & Shonkoff, 2000). An empirical association was determined between the quality of the relationship a child has with their primary caregiver during early childhood and both developmental outcomes and (National Scientific Council on the Developing Child, 2004b) and the development of brain architecture (National Scientific Council on the Developing Child, 2004a). Early life stress, especially resulting from the lack of a strong relationship with the caregiver, was linked to an increased risk of physical and mental illness, sometimes manifesting as detectable conditions as early as ages two–five (National Scientific Council on the Developing Child, 2005/2014; National Scientific Council on the Developing Child, 2008/2012), while strong early relationships appeared to promote the development of resilience to the effects of later life stress (Center on the Developing Child at Harvard University, 2015). Such effects were most potent during the "sensitive period" of brain development, occurring between birth and five years of age, during which the brain is most receptive to changes (National Scientific Council on the Developing Child, 2007). Specifically, in the case for maternal–infant bonding, the sensitive period appears to be the first year of life, though changes in the bond can occur throughout the lifetime (Bicking Kinsey & Hupcey, 2013).

Although much of the recent literature examining bonding and asthma has remained observational due to ethical concerns, modern studies have shown that there is likely a relationship between the two. Both asthmatic children and their mothers exhibited signs of less secure attachment to one another than healthy controls when attachment was assessed while the child was aged between two and five (Cassibba, van IJzendoorn, Bruno, & Coppola, 2004). Likewise, the number of parenting difficulties experienced by the mother and measured at three weeks of infant age, which may hinder maternal–infant bonding, was positively correlated with the presence of asthma in the child at six years of age (Klinnert et al., 2001). Some of these associations remain even after adjusting for parental asthma, such as in a study of 10,000 Finnish college students asked to provide a detailed history of stressful life events, where childhood parental and personal conflicts, often signs of poor maternal–infant bonding, were associated with increased asthma risk (Kilpeläinen, Koskenvuo, Helenius, & Terho, 2002). Thus, although much of the data are either from self-report or otherwise observational; conclusions about correlation can be drawn and causation may be speculated.

There has been a growing body of evidence that perceived maternal rejection, a symptom of poor maternal–infant bonding, may both precede the development of asthma and have a dose–response relationship with it. Although maternal rejection is not always an indicator of poor early maternal–infant bonding, actions that suggest rejection is less common in well-bonded maternal–infant pairs (Klaus et al., 1976). Parenting styles that utilized either "active" or "passive" rejection were found to precede the worsening of asthma symptoms during the following year in a cohort of asthmatic children aged 2 through 12 (Nagano et al., 2010). Maternal perception of her child's asthma care being a burden predicted lower asthma quality of life scores through increases in maternal rejection in children approximately nine years of age (Fiese, Winter, Anbar, Howell, & Poltrock, 2008). However, as this study did not include a follow-up, it is difficult to establish the direction of this relationship. A different study examining the association between positive family interactions at meals and asthma severity found the two to be related, even when medication adherence is controlled for, with separation anxiety appearing to function somewhat as a mediator (Fiese, Winter, Wamboldt, Anbar, & Wamboldt, 2010). Taken together, these results may suggest that parenting attitudes were potentially influenced by poor early maternal–infant bonding and are at the very least correlated with more severe asthma symptoms. Furthermore, a higher frequency of parental mental health problems, which children may perceive as parental rejection, was associated with a higher incidence of asthma attacks in already asthmatic youth aged 4–17 (Ortega, McQuaid, Canino, Goodwin, & Fritz, 2004), indicating the possibility of a dose–response relationship. Likewise, the number of depressive symptoms and negative life stressors experienced by mothers, specifically those that may impair maternal–infant bonding, was correlated in multiple studies with higher asthma morbidity in their children, aged 18 months to 17 years (Shalowitz, Berry, Quinn, & Wolf, 2001; Walker, 2012; Waxmonsky et al., 2006).

Many studies have also found that depressive and anxiety symptoms are more common in asthmatic children than non-asthmatic controls (Center on the Developing Child at Harvard University, 2009; Feldman, Ortega, Koinis-Mitchell, Kuo, & Canino, 2010; Friedman, 2007; Goodwin, Pine, & Hoven, 2003; Goodwin, Messineo, Bregante, Hoven, & Kairam, 2005; Katon et al., 2007; Klinnert et al., 2001; Meuret, Ehrenreich, Pincus, & Ritz, 2006; Morrison, Goli, Van Wagoner, Brown, & Khan, 2002; Ortega, Goodwin, McQuaid, & Canino, 2004; Ortega, McQuaid, et al., 2004; Vila, Nollet-Clemençon, de Blic, Mouren-Simeoni, & Scheinmann, 2000; Walker, 2012; Waxmonsky et al., 2006). It is unknown if the physical condition influences the psychological distress or vice versa. Studies conducted in the United States and France, specifically, show that anxiety disorders are more prevalent in asthmatic children aged 4–17 than their non-asthmatic counterparts (Ortega, Goodwin, et al., 2004; Ortega, McQuaid, et al., 2004; Vila et al., 2000), supporting earlier generation findings of greater separation anxiety in asthmatic children. Likewise, maternal reports of internalizing and behavioral problems and clinical interviews found associations between emotional difficulties and asthma severity (Klinnert et al., 2001). However, as there is no follow-up in these studies, temporality cannot be assumed.

2.3. Initial attempts to treat asthma by repairing the bond

Little empirical research has been conducted about the possibility of reducing asthmatic symptoms by repairing the maternal–infant bond. However, several small-scale, non-RCT studies have found that repairing the maternal–infant bond through an intervention aimed at maternal–infant bond have been successful in reducing, and in certain cases entirely removing, asthma symptoms in children (Madrid, 2005; Madrid, Ames, Horner, Brown, & Navarrette, 2004; Madrid & McPhee, 1985; Madrid, Morgan, Taormina, Laforest, & West, 2012). This intervention, conducted with children aged 18 months to 12 years and their mothers, consisted of a three-step process: identifying the "non-bonding event" (Pennington, 1991) that hindered the natural development of the maternal–infant bond, processing the non-bonding event through hypnosis, and the creation of a new "birth story" through hypnosis (Madrid et al., 2004). Non-bonding events were identified during in-depth clinical interviews conducted with the mother by a trained counselor seeking either physical or emotional separation in the child's early life. The mothers were then asked to observe and record their child's asthma symptoms for several months before returning for treatment and to continue recording symptoms during treatment. The initial treatment stage involved multiple sessions of hypnosis, in which the mother was first asked to explore and come to terms with the non-bonding events and later told to imagine a different scenario without them. The theory, supported by multiple studies, was that the mother would no longer have the non-bonding event impeding her ability to bond with her child and, thus, the maternal–infant bond would be repaired, leading to alleviation of asthma symptoms in the child (Madrid, 2005; Madrid & McPhee, 1985; Madrid et al., 2004, 2012). However, all of these studies had severe methodological limitations, including lacking control groups and inadequate reporting of symptoms and results, causing the validity of their results to be questionable. Still, when interpreted as initial, pilot studies, these promising results call for replication in empirical, RCT designs providing early evidence that it is possible to repair a poor maternal–infant bond and, more importantly, that such a repair may be effective in alleviating asthma symptoms.

3. Proposed model for poor maternal–infant bonding as a risk factor for asthma

Building on the proposed ecobiodevelopmental approach to healthy development (Shonkoff, Garner, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, & Section on Developmental and Behavioral Pediatrics, 2012), where the social and physical environments, genetic and physical biology, and social and behavioral development all impact a child's lifelong potential for good health and disease, the presence of a strong maternal–infant bond in a child's early life may have a protective effect against conditions such as asthma.

In this framework, poor maternal–infant bonding is one of the many potential risk factors for asthma, including those already well-established in the medical literature (Myers & Tomasio, 2011). This proposes that asthma is at least somewhat psychosomatic in nature, with its onset sometimes triggered by the stress and psychological distress that arise from a poor maternal–infant bond. Such triggers include perceived maternal rejection, conflict with parents, separation anxiety, mental illness, and developmental aftereffects of early life stress. Thus, a poor maternal–infant bond may act with other known environmental and genetic risk factors to cause the onset and severity of asthma. However, like the other risk factors, poor maternal–infant bonds likely do not account for all of the cases of asthma. Support for such a theory lies in an examination of the relationships between asthma, internalizing psychiatric disorders, maternal rejection, and maternal–infant bonding. According to this theory, interventions promoting a stronger maternal–infant bond would decrease the incidence of asthma across the population and therapies meant to repair these bonds would help reduce the severity of symptoms.

4. Discussion

4.1. Implications

If poor maternal–infant bonding does, indeed, cause some of the incidence and severity of asthma, low-cost interventions can be created in order to prevent later development of asthma, especially in

high-risk infants, through promoting early maternal–infant bonding. Such interventions would require more of a social change than a medical one and could have strong protective effects without high personal or societal costs. Because the combination of relationship problems between mother and child and the onset of asthma during childhood appears to be at least partially intergenerational (Cassibba et al., 2004), such interventions have the potential to provide a protective effect against asthma even in future generations.

A possible intervention that could promote maternal–infant bonding would be participation in a kangaroo-care routine after birth. Kangaroo-care involves two main components: upright, skin-to-skin contact between mother and infant in a "kangaroo" position and nutrition consumed in a natural-seeming way (preferably breast-milk). Mothers who have undergone kangaroo-care regimens after giving birth report feeling more competent in their role as a maternal figure and perceive stronger positive emotions toward their child, indicative of stronger maternal–infant bonding (Tessier et al., 1998). Meanwhile, infants who participate in kangaroo-care are also more likely to be affectionately touched by their mothers (Feldman, Weller, Sirota, & Eidelman, 2003). Such touch, in itself, has been linked to better maternal–infant bonding and growth in the infants' neurobehavioral and social learning (Feldman & Eidelman, 2003; Feldman, 2007; Feldman, Gordon, Schneiderman, Weisman, & Zagoory-Sharon, 2010). Thus, affectionate touch may be able to promote maternal–infant bonding even outside of kangaroo-care. Kangaroo-care is also associated with longer duration of breastfeeding, reduced maternal stress, and the enhancement of maternal–infant bonding as a whole (Charpak et al., 2005).

If future research finds that strengthening a poor initial maternal–infant bond is possible through therapy, and that it does, indeed, improve asthma symptoms as Madrid and colleagues' preliminary research currently suggests (Madrid, 2005; Madrid & McPhee, 1985; Madrid et al., 2004, 2012), this could provide an alternate avenue for families whose asthmatic children do not respond well to current treatments to explore. Furthermore, if, as in several of Madrid's patients, asthma symptoms can permanently disappear in some patients after bonding therapy, this may be the first treatment for the condition that may lead to an actual cure rather than simply symptom suppression.

Wider study of this theory would also promote the examination of other physical and mental illnesses from more integrated and multi-disciplinary approaches. Two consistent trends in health research suggest that: (1) genetics, the environment, personal experiences, and behavior all interact with one another to promote either vulnerability to or resilience to illness and affect lifelong health (Shonkoff et al., 2012) and (2) early experiences are more important to brain development than previously believed (Phillips & Shonkoff, 2000). As medicine begins to accept that more diseases than previously believed may have psychosomatic components, developing strategies to lower risk factors across all such diseases will become more important. Due to its early timing and proposed association with later psychological conditions, promoting early maternal–infant bonding can become the forefront of such research. With time, this can translate to a social change where proper maternal–infant bonding is deemed as important by most of society as proper infant safety currently is.

4.2. Limitations

The most significant limitation to the theory that maternal–infant bonding may affect later asthma is the lack of empirical research done to examine this hypothesis. To the authors' knowledge, there have been no randomized studies suggesting causality rather than mere correlation. Furthermore, due to ethics pertaining to neonatal research, it may be difficult to ever conduct such a study, especially due to how early such a bond is formed and how important this bond may be to lifelong health. Instead, observational studies will have to be utilized, preferably with follow-ups to help establish temporality, to further examine this and related concepts, and randomized studies will have to be reserved for interventions meant to fix poor maternal–infant bonds.

At this time, reverse-causation cannot be entirely discounted. Although it is known that children with asthma often have more severe symptoms of depression and anxiety (Center on the Developing Child at Harvard University, 2009; Feldman, Ortega, et al., 2010; Friedman, 2007; Goodwin et al., 2003; Goodwin et al., 2005; Katon et al., 2007; Klinnert et al., 2001; Meuret et al., 2006; Morrison et al., 2002; Ortega, Goodwin, et al., 2004; Ortega, McQuaid, et al., 2004; Vila et al., 2000; Walker, 2012; Waxmonsky et al., 2006), specifically greater separation anxiety (Fiese et al., 2010; Harris et al., 1950), it is impossible to state at this time whether the psychological distress leads to the onset of asthma, the asthma leads to the psychological distress, or each causes the other to become more severe. Likewise, the larger perceived burden reported by mothers in more severe asthma cases (Fiese et al., 2008) may be a result of the severity of asthma rather than a cause of it. In fact, because the maternal–infant bond develops before most children present any early symptoms of asthma, any study which looks at this relationship using a sample that has already developed asthma cannot definitively state if the relationship with the parent influenced or was influenced by the physical condition. Thus, more studies that include assessments of the maternal–infant bond during early infancy and follow the children to see if asthma develops at a later time are critical to this field. If early infant populations are impossible, measuring the parent–child relationship and presence of asthma at several points throughout childhood would help establish some evidence of temporality.

The present theory will likely not account for all cases of asthma. However, like most risk factors, poor maternal–infant bonding is likely to be present in a subset of asthmatic children rather than the entire population. Because the way in which related risk factors interact with to mediate their combined effect on asthma risk is currently unknown, the exact extent of bonding's impact on asthma risk is likely to remain unknown until better medical research and biostatistical methods are developed to better account for mediation and confounding. An example of this is breastfeeding, which is both positively related to maternal–infant bonding (Else-Quest, Hyde, & Clark, 2003; Jansen, Weerth, & Riksenwalraven, 2008) and theorized in some studies to be protective against asthma (Dell & To, 2001; Oddy, de Klerk, Sly, & Holt, 2002; Oddy et al., 1999). It is unknown if both breastfeeding and a strong maternal–infant bond are protective against asthma or if one variable mediates the other. This relationship is further complicated by the fact that breastfeeding seems to increase the risk of asthma in certain cases instead of protecting against it (Sears et al., 2002) and by the relative lack of empirical research (rather than "common sense" statements) that links maternal–infant bonding and breastfeeding (Jansen et al., 2008). Thus, further studies would have to include variables commonly associated with maternal–infant bonding, such as breastfeeding, in their analyses in order to further explore this area and remove this limitation.

Finally, due to a long and complicated history of study, the concept of "maternal-infant bonding," itself, is difficult to clarify. Despite the clear distinctions between "maternal-infant attachment" and "maternal-infant bonding," many researchers are still using the terms interchangeably (Bicking Kinsey & Hupcey, 2013), hindering research attempts and making generalizations of results even more difficult to prove. Furthermore, because the earlier maternal–infant bond influences later maternal–infant attachment, it is difficult to tell which of the two, if either, might be affecting the development of asthma in children. Until specific definitions for the two terms and others related to them are developed and accepted by the research community, this confusion will continue to negatively affect research efforts.

4.3. Recommendations for future research

Future research is necessary to further demonstrate the extent to which initial maternal–infant bonding either does or does not affect future risk for asthma. An example of an ideal design for such a study would include multiple assessments of maternal–infant bonding during the child's first year (and preferably later on as well) and related factors such as breastfeeding, followed by assessments of multiple health outcomes throughout childhood and adolescence. Such a design would help establish temporality, making a stronger case that there may be causation instead of mere correlation. However, because of the financial and other costs of such a study, smaller scale observational studies and replications of previously published results utilizing modern biostatistical techniques and examining more possible mediators are also needed. Furthermore, studies examining either asthma

or any aspect of early experiences should record variables relevant to the each other during data collection, in case an association is discovered within their analyses. Finally, randomized control trials should be conducted to examine whether 'bonding therapy' can, indeed, reduce the symptoms of asthma.

5. Conclusion

This article addressed the specific question of whether or not the early maternal–infant bond affects the onset and severity of asthma. Following the trend that health is a result of multiple factors, the article suggests that poor initial maternal–infant bonding may be a risk factor for future asthma onset. Although empirical research connecting the two is lacking, a review of the history of this relationship provided evidence that factors associated with a poor maternal–infant bond, such as maternal rejection, internalized psychiatric disorders, and weak caregiver–child relationships, have consistently also been associated with increased risk of or prevalence in asthma. Furthermore, preliminary evidence has suggested that repairing the maternal–infant bond may cause relief of asthma symptoms. To move the study of asthma forward, future research has to take a more broad approach when considering potential risk factors, beginning as early as the initial maternal–infant bond.

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