Ideally, if at all possible, every baby should be placed immediately skin to skin with its mother at birth.
It should be left there undisturbed and left to do what all newborn babies are hard-wired to do – go through the **9 INSTINCTIVE STAGES**.

Skin to Skin

for all Moms and Babies leading to a baby's healthy microbiome

THERE ARE AMAZING BENEFITS TO MOM AND BABY TO BE SKIN TO SKIN.

Skin to skin regulates a baby's heart rate, breathing and temperature as well as aiding bonding to mention just a few.

Vaginal birth helps baby receive the correct bacteria which are vital for baby's immune system development, with baby receiving mom's vaginal and gut microbiomes which kick the baby's microbiome development off to a perfect start. Skin to skin further helps baby receive mom's good skin micro-organisms.

These **9 INSTINCTIVE STAGES CULMINATE IN BREASTFEEDING** and baby will then receive the ultimate boost to its microbiome development by receiving breast milk. These beneficial and vitally important micro-organisms lead to a baby's healthy gut formation - a healthy microbiome which leads to a baby's healthy immune system development and puts it on the road to life-long health and not one of chronic disease.

The 9 Instinctive Stages

Based on the research of Ann-Marie Widstrom, a Swedish researcher on skin-to skin contact between mother and baby. There are nine observable newborn stages that occur in the first hour or two after birth when a baby is placed *immediately* skin to skin with his mother. These are innate and instinctive to the baby. Within each of these stages, there are a variety of actions the baby may demonstrate. The baby may do one, some, or all of these actions.

The evidence supporting the practice of skin-to-skin contact after birth is robust, indicating multiple benefits for both mother and baby.

Advantages for the mother include

- earlier expulsion of the placenta,
- reduced bleeding,
- increased breastfeeding self-efficacy
- lowered maternal stress levels.

It has been suggested that the rise in the mother's oxytocin (love hormone) during the first hour after birth is related to the establishment of mother–infant bonding.

Advantages for the baby include

- a decrease of the negative consequences of the 'stress of being born',
- more optimal thermoregulation, continuing even in the first days
- less crying.

Skin-to-skin contact has been shown to increase breastfeeding initiation and exclusive breastfeeding while reducing formula supplementation in hospital, leading to an earlier successful first breastfeed, as well as more optimal suckling. During this first hour after childbirth, both mother and newborn infant experience a special and unique time, a sensitive period, which has been biologically predetermined, especially after vaginal birth. This is aided by the physiological state of each: the mother's high oxytocin levels and newborn infant's extremely high catecholamine (stress hormone) levels.

Being in skin-to-skin contact with the mother after birth elicits the newborn infant's internal process to go through what could be called *9 instinctive stages.* This process is suggested to contribute to an early coordination of the infant's five senses: sight, hearing, touch, taste and smell, as well as movement.

The mother is attracted to the infant's smell, facilitating a chemical communication between the two. This highlights the importance of a new mother's access to her newborn infant's bare head to smell her baby.

The newborn infant has high levels of catecholamine immediately after a normal, vaginal birth. These are highest closest to the time of birth, especially for the first thirty minutes.

Catecholamines strengthen memory and learning. The odour of the mother's colostrum increases the amount of oxygenated haemoglobin over the olfactory cortex. In addition, the closer to birth, the more oxygenated haemoglobin was observed over the olfactory cortex (part of the brain that deals with smell). This increased sensitivity for the odour of breastmilk, especially soon after the birth, indicates a physiologically based early sensitive period in the newborn infant. This reaction matches the mother's biologically based enhancements of the breast odour through the increase of the surface of the areola and Montgomery gland secretions during the corresponding time. Thus, the increased early sensitivity for the odour of breastmilk, in the presence of high levels of catecholamine which strengthens this memory, is indication of a physiologically based early sensitive period in the newborn infant.

STAGE 1

Stage 1 - The Birth Cry

This distinctive cry occurs immediately after birth as the baby's lungs expand for the first time as the newborn infant transitions to breathing, and other survival instincts. These behaviours could include the moro reflex, grimacing, coughing, lifting the full body from the mother's tummy, abruptly opening the eyes and tension in the body. The baby's motions during the birth cry stage emanates from the drive to survive.

During this extremely alert period, the newborn infant is able to make defensive movements with the hands to protect their airway, for example against a suction catheter. The initial birth cry, and the subsequent crying during the first minutes after the birth, has the effect of clearing the airways of the amniotic fluid. In addition, extremely high catecholamine levels at birth help in absorbing liquid from the airways.

Standard practice includes drying the baby's head and body with a clean, dry towel to help maintain body temperature. The baby's face should initially be turned to the side, which facilitates free airways and monitoring of the baby's breathing. After settling in the skin-to-skin position with the mother, the baby's body should be covered with a dry towel, leaving the face uncovered.

Placement of the newborn infant skin-to-skin increases uterine contractions immediately after birth, increases the completeness of the delivered placenta and decreases excessive blood loss. Skin-to-skin also significantly decreases the duration of the third stage of labour.

Safe interactive skin-to-skin contact in the first hour after birth

1. Make sure that the mother is in a comfortable semi-reclined position with support under her arms.
2. After drying the newborn infant, lift the newborn infant gently to avoid compression of the thorax when placing the baby skin-to-skin. Put the baby on his tummy, in a lengthwise position with the head on the mother's chest above the breast.
3. Cover the baby with a dry blanket/towel. Leave the face visible.
4. Make sure that the nose and mouth are not enveloped by the mother's breast or body or obscured by the blanket. Initially, the baby's head should be turned to the side.
5. The newborn infant must have the opportunity to use its reflexes to lift the head so the nose and mouth can be free. This is of special concern if the mother has large and/or very soft breasts.
6. The nipple must be accessible to the newborn infant. For some mothers, this may require positioning a towel or pillow under or on the side of the mother's breast.
7. Support the breast to secure free airways especially during the time the baby starts searching for the breast.
8. Parents to focus on the newborn infant and follow the newborn infant's early behaviour, making sure that the parents follow the 9 stages. The other parent should be observant, not distracted by mobile phones, etc., during skin-to-skin.

STAGE 2

9. Extra attention may be required if the mother is affected by sedation after childbirth as well as during possibly postpartum suturing. The other parent should be aware of the situation and watch for the safety of the infant.

Stage 2 - Relaxation

The newborn's hands are relaxed. The baby is skin to skin with the mother. During the relaxation stage, the newborn infant is still and quiet, making no movements. It is not possible to elicit a rooting reflex during the relaxation stage. The baby's sensory system seems to be depressed.

When lying quietly on the mother's chest, the baby can hear the mother's heartbeat. This familiar sound from in utero seems to comfort the newborn infant after the rapid transition to extra-uterine life.

It is suggested that the pressure on the head through the birth canal is the cause of extremely high catecholamine levels after birth, a level 20 times higher than that of a resting adult. This high catecholamine concentration might partly be the cause of the higher pain threshold in the baby close to birth and be a mirror of nature's way to relieve pain in the baby when passing through the birth canal. Consequently, the baby's temporarily impaired sensation at birth causes the relaxation stage – the baby has decreased sensitivity to the surroundings.

Babies do NOT need to be rubbed or massaged in a disruptive and vigorous manner, repositioning or lifting the baby from the mother. If, during the relaxation stage, the newborn infant is disturbed by the actions of the staff, the baby will react with crying, grimacing and protective reflexes.

It is possible to conduct the assessment of the APGAR score, as well as any other necessary assessments, on a healthy full-term newborn infant without disturbing the infant, allowing skin-to-skin to continue uninterrupted. It is more effective and advantageous to assess the newborn infant when skin-to-skin with mother since babies are less likely to cry; they are more likely to remain warm and not waste energy.

If administration of vitamin K injection is a routine, this should occur soon after birth while the catecholamine levels are highest, preferably with the newborn infant skin-to-skin with the mother, as skin-to-skin contact has been shown to lower the baby's reaction to pain in the postpartum. The smell of breast milk also reduces how a newborn perceives and reacts to pain.

Stage 3 - Awakening

The awakening stage is a transition from the relaxation stage to the activity stage.
The newborn exhibits small thrusts of movement in the head and shoulders. Occurs about 3 minutes after birth. His eyes will probably be open. The baby makes small motions. Small movements of the head, face and shoulders gently ripple down through the arms to the fingers. The baby makes small mouth movements. They will gradually open their eyes during this stage, blinking repeatedly until the eyes are stable and focused.

Stage 4 – Activity

The newborn begins to make increased mouthing and sucking movements as the rooting reflex becomes more obvious. This stage begins about 8 minutes after birth

The newborn
- has more stable eye movements
- looks at the breast, then at mom and back to the breast
- increased mouthing and suckling movements
- moves his hand to the mouth
- protrudes the tongue
- looks at his mother
- massages the breast with one or both hands

During the activity stage, the baby exhibits a greater range of motion throughout the head, body, arms and hands. The limbs move with greater determination; the baby may root and lift the head from the mother's chest. The fingers often begin the stage as fisted but may expand to massage, transfer tastes with a hand-to-nipple-to-mouth movement, catch the nipple and explore the mother's chest. Rooting also becomes more obvious during this stage.
The successive protrusion of the tongue continues throughout this stage. At the beginning of this stage, the newborn infant may have only moved the tongue within the mouth.
During the activity stage, the baby will bring the tongue to the edge of the lips, then protrude beyond the lips, then protrude repeatedly beyond the lips. These tongue exercises, which may pave the way for later tongue behaviours, specifically suckling, can be affected by medications, such as pethidine.

During pregnancy, the nipple has become more pigmented and is easy for the newborn infant to discover. We have observed that soon after birth, the areola expands and takes a bulb-like shape. The Montgomery glands also become more pronounced. The scent of areolar secretions has been linked to behavioural responses, such as head turning and directional crawling in newborn infants. This release of the breast odour by the Montgomery glands is known to help the newborn infant find the nipple. The newborn infant recognises the scent of the mother's breast from the amniotic fluid, touches the breast and transmits the taste of the breast to the mouth (hand-to-breast-mouth movements). This stimulates rooting and crawling movements in the newborn infant to reach the nipple. The connection between the taste of amniotic fluid and the scent of the breast from the Montgomery glands highlights a biological survival mechanism – a pathway of flavour with lifelong consequences.

The infant has learned to recognise the mother's voice during intrauterine life. The infant's learning and memory skills are quite sophisticated; the foetus can learn to recognise a vowel from the surrounding language and is some days after birth able to discriminate this vowel from a vowel from a foreign language.

After the newborn infant has located the nipple by sight, the mother's voice will attract the baby's attention to her face. Pupillary contagion (respond to pupil size with changes in one's own) is fundamental for social and emotional development. 'Immediately after birth the newborn's eyes become wide open, usually with large pupils'. When skin-to-skin with the mother after birth and free to safely move, the newborn infant searches for eye contact with the mother around half an hour after birth. Infant–maternal bonding through pupillary contagion may start early after birth as mothers often recall the first moment of eye-to-eye contact as unforgettable. The complex experiences of the newborn infant during the first hour encompass more than simply a journey to the breast; the opportunity for eye contact emphasises the importance of parents valuing instinctive behaviour during this time, and the avoidance of interruptions.

Stage 5 - Rest

At any point, the baby may rest. The baby may have periods of resting between periods of activity throughout the first hour or so after birth. This does NOT mean baby is disinterested in the breast and needs help latching.
JUST let him rest. He will continue in his own time.

Stage 6 - Crawling

The baby approaches the breast with short periods of action that result in reaching the breast and nipple. Begins about 35 minutes after birth. Can involve crawling, leaping, sliding or pushing, bulldozing or many other interesting names of ways to move from the position between the breasts to a position very close to the nipple. Sometimes this process is so subtle that parents are surprised to notice that the baby has made its way over to the breast. Other times, the baby may make strong and overt motions, collecting the attention of everyone in the room.

The newborn infant's innate stepping reflex becomes clear as the newborn infant crawls to the mother's breast. The movements of these steps of the feet over the mother's uterus may contribute to the contractions of the uterus, and the decreased time to expel the placenta and decreased blood loss during skin-to-skin.

During this process, it is important to protect the newborn infant's effort to reach the breast, with the intention not to lift or turn the baby's body. Placing a towel or pillow under the mother's arms is important during this stage, since the newborn infant will be travelling over to one side of the chest and therefore (in many settings) close to the edge of the bed.

This support can help the newborn infant to reach the nipple without becoming exhausted by unnecessary sliding in the wrong direction. It is also important for parents to be aware of the travelling process, since they may try to reorient the baby back to the middle of the chest, to keep the newborn infant from the edges of the bed. Support under the mother's arms may also allow the nipple to remain in an area easy for the baby to find and grasp. A mother might use her own palm to arrange the breast as well.

A baby needs to use the feet to achieve crawling, and sometimes the feet are in a less than ideal position. They may be off the side of the mother's body or pushing in the air. In those cases, it may be helpful if the mother puts her hand under the newborn infant's foot to give the baby something to push against in order to move towards the breast.

Stage 7 - Familiarization

The newborn becomes acquainted with the mother by licking the nipple and touching and massaging her breast. Begins around 45 minutes after birth and can last for 20 minutes or more.

Since the baby is prone on a semi-reclined mother, the alert newborn infant has the control over their experience, rather than being placed in a dependent position by the mother. To reach the breast, it must be possible for the baby to manoeuvre into an appropriate position. When approaching the breast the newborn infant performs specific soliciting calls to mother – a short clinging call that usually results in a gentle response from the mother. The frequency of these sounds increases as the newborn infant gets closer to the mother's nipple. The odours from the mother's breast are likely to be inducing this response. Parents respond to the newborn infant's soliciting.

During the familiarization stage, the baby becomes familiar with the breast by licking the nipple and areola. This period could last 20 minutes or more. The newborn infant massages the breast, which increases the mother's oxytocin levels and shapes the nipple by licking. During this stage, it is evident that the baby is smelling and tasting, and previous actions become more vigorous and more coordinated. Therefore, it is important not to interfere or introduce odours from unfamiliar hands.

The baby continues with tongue activity during this stage, now more overtly related to eventual breastfeeding, by licking above and below the nipple. The baby may make noises with the mouth and lips, like smacking sounds, during this stage. The breast and nipple are shaped by the massaging and licking actions of the newborn infant. The newborn infant is preparing the tongue, breast and nipple for the moment of attachment and suckling.

The actions of the tongue inform the staff of the newborn infant's coordination of the tongue with the rooting reflex, and the ability to move the tongue to the bottom of the mouth, curved and thin. The newborn infant needs to practice this coordination of the rooting-tongue reflex. Staff and parents should allow the baby the time needed to practice this coordination during this stage; the newborn infant is perfecting many important oral-motor functions. This learning is vital as the newborn infant initiates the suckling process.

There is often a resting stage between the familiarization stage and the suckling stage, which unfortunately can make parents and staff prone to (so-called) help the newborn infant to the breast. It is also common for the baby to attach, suck once or twice, and then disengage. The

newborn infant will be conducting a normal step of the familiarization stage, but it may look like the newborn infant is unable to attach. The baby must thus be allowed to do these moves to adjust into an instinctive position. This is conducive to the newborn infant's chin making an initial contact with the mother's breast as the baby endeavours to catch the nipple.

'Chin-first contact' is associated with sustained deep, rhythmical suckling. In a study of babies who had later been diagnosed with significant latch problems, the majority of mothers reported that the newborn infant had been forced to latch to his mother's breast. According to the mothers, the babies screamed, acted in a panicky way, exhibited avoidance behaviours and had other strong reactions against the forceful treatment. It has also been shown that mothers who had this type of so-called help have a more negative experience of the first breastfeeding and breastfeed for a shorter time. If infants with an aversive behaviour are allowed to peacefully go through the stages in skin-to-skin contact at a later time, they may successfully reach the nipple, attach to the nipple by themselves and start suckling. This could happen even weeks after birth if not possible earlier. This is a promising way to calmly solve breastfeeding problems.

Baby may

- Touch the mother's breast
- Mouth on his own hand
- Lick the breast
- Look at mom
- Make sounds to get moms attention
- Look at other people in the room

During all these stages, baby moves in a purposeful manner but without frustration or hurry. The challenge for those watching is to relax, leave the baby and the mother alone and marvel at the amazing drama unfolding as the baby finds the breast, latches and suckles without assistance or interference. Interestingly – the newborn's tongue is flat and high in the roof of the mouth, whereas just prior to self-attaching, the baby cups the tongue and drops it while opening the mouth wide for a deep and effective latch. When babies are rushed to the breast before all their senses are awakened and before their tongues are familiar enough with the nipple, latching is often unsuccessful and everyone is frustrated.

Stage 8 - Suckling

The newborn takes the nipple, self attaches and suckles. This early experience of learning to breastfeed usually begins about an hour after birth. The newborn infant attaches to the nipple during this stage and successfully breastfeeds. When babies self-attach, they are positioning the wide-open mouth appropriately on the areola and nipple, protecting against sore nipples. It is interesting to note that the hands, which have been so busy, often stop moving once suckling begins; the eyes, which have been looking at the breast, the mother and the room, often become focused after attaching.

During this first hour, when the unmedicated baby self-attaches, it is a perfect first breastfeeding, although the infant will continue to readjust until satisfied with the latch. The newborn infant does not need *help* to adjust the latch. Babies who self-attach during the first hour after birth have few problems with breastfeeding, latch and milk transfer. Skin-to-skin in the first hour strengthens the mother's self-confidence, including decreasing the concerns about having enough milk. When babies are placed skin-to-skin with the mother, they have more optimal blood glucose levels. Both skin-to-skin and the suckling contribute to this effect. Thus, this reduces the risk of supplementation.

Medicated babies can successfully go through the nine stages and self-attach. However, there is increasing evidence concerning the negative consequences of certain medications such as fentanyl and oxytocin, on success with breastfeeding. Parents and staff must take into account the consequences when considering amount, timing and choice of specific labour medications. If the mother has had analgesia or anaesthesia during labour, it may take more time with skin to skin for the baby to complete the stages and begin suckling

Stage 9 - Sleep

The final stage is sleep. The baby and sometimes the mother fall into a restful sleep. Babies usually fall asleep about 1 ½ to 2 hours after birth.

Skin-to-skin contact the first hour after birth, underlying implications and clinical practice
Ann-Marie Widström, Kajsa Brimdyr, Kristin Svensson, Karin Cadwell, Eva Nissen
First published:14 February 2019.
https://doi.org/10.1111/apa.14754
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Skin to Skin

for all Moms and Babies at Birth and Beyond

STAGE 1 – The birth cry

STAGE 2 – Relaxation

STAGE 3 – Awakening

STAGE 4 – Activity

STAGE 5 – Rest

STAGE 6 – Crawling

STAGE 7 – Familiarisation

STAGE 8 – Suckling

STAGE 9 – Sleep

9 instinctive stages of the newborn

STAGE	BEHAVIOURS
1 BIRTH CRY	Intense crying just after birth
2 RELAXATION	Newborn resting/recovering. No activity of mouth, head, arms, legs or body
3 AWAKENING	Newborn begins to show signs of activity. Small thrusts of head: up, down, from side-to-side. Small movements of limbs and shoulders
4 ACTIVITY	Newborn moves limbs and head, is more determined in movements. Rooting activity, "pushing" with limbs without shifting body
5 RESTING	Newborn rests, with some activity, such as mouth activity, sucks on hand
6 CRAWLING	Pushing, sliding and leaping movement which results in shifting body
7 FAMILIARIZATION	Newborn has reached areola/nipple with mouth positioned to brush and lick areola/ nipple
8 SUCKLING	Newborn has taken nipple in mouth and commences suckling
9 SLEEPING	The newborn has closed its eyes

The first half of pregnancy offers a developmental learning period for the majority of foetal movement patterns, and these learned patterns continue throughout the second half of the pregnancy, and after birth. The behaviours of the newborn during the first hour follow a similar pathway as the prenatal motor repertoire of the foetus. In addition, the sequence of behaviours of the newborn echo the order of learned motor patterns of the foetus. The 9 stages may be a performance of previously learned intrauterine behaviour. Following this pattern, from in utero through the first hour after birth, provides long-term benefits for both the mother and newborn.

The 9 instinctive stages and the intrauterine movements of the foetus with timing

	NEWBORN PATTERN OF BEHAVIOUR (MEDIAN MINUTES)	FOETAL PATTERN OF BEHAVIOUR
STAGE 1 – Birth cry	Immediately after birth: Moro reflex	Week 9–10: Startle reflex
STAGE 2 – Relaxation	After birth cry: Pause after exposure to high levels of catecholamines	N/A
STAGE 3 – Awakening	2.5 min: Small body movements	Week 9–10: General movements, slow with a complex sequence
STAGE 4 – Activity	8 min: Larger body movements	Week 9+ to 10+: General movements continue
STAGE 5 – Rest	Interspersed between periods of activity throughout the first hour	Resting between activities
STAGE 6 – Crawling	36 min: Step reflex for crawling	Week 11: Isolated and coordinate leg movements
STAGE 7 – Familiarization	43 min: Coordination of smell, sight, hands and mouth	Week 11+: Coordinated head and hand movements
STAGE 8 – Suckling	62 min: Suckling	Week 12+: Sucking and swallowing movements
STAGE 9 – Sleeping	90 min: A deep and restful sleep	Week 30+: Sleep patterns observed

The pattern and sequence of intrauterine movements of the foetus seem to be a survival mechanism, which is implemented by the newborn's patterns of movement during the first hour after birth when skin-to-skin with the mother. The behaviours described as the 9 Stages have been developed and practiced in utero, in the same specific order. The newborn has thus been training for and prepared for this experience immediately after birth, to find the breast, to initiate breastfeeding and to contribute to post-birth maternal uterine contractions which serve to minimize blood loss and speed placental expulsion. The newborn has invested much in learning these behaviours, necessary for survival.

Skin to Skin

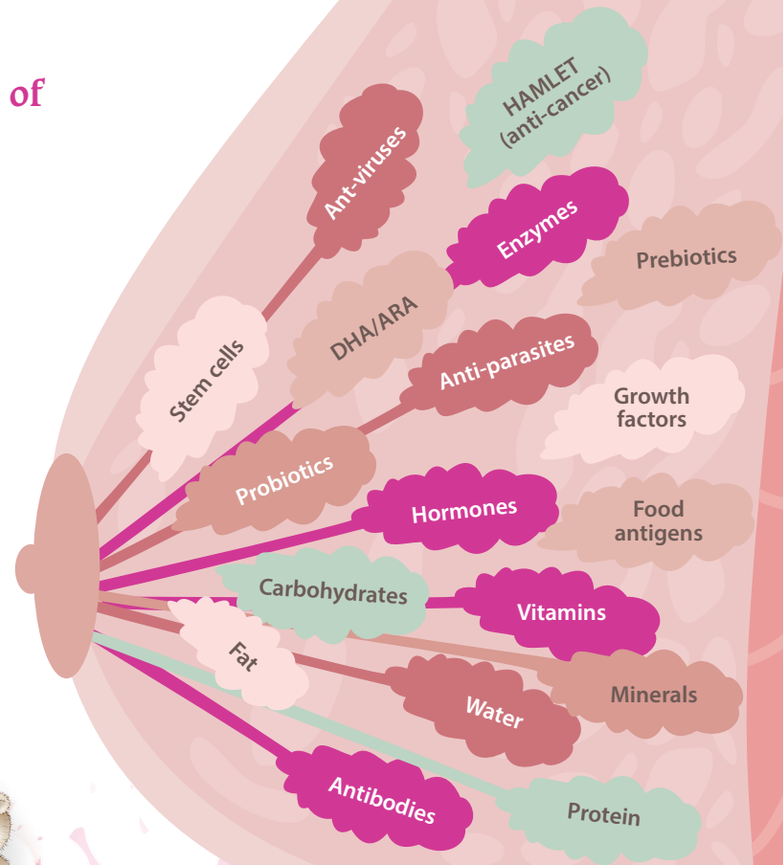
for all Moms and Babies
leading to a baby's healthy microbiome

Skin to skin
↓
The 9 instinctive stages of the newborn
↓
Breastfeeding
↓
Baby's microbiome formation
↓
Baby's healthy immune system

Human milk is...

- Tailor made for tiny humans
- Baby's first vaccine
- A superfood
- Devoted to brain development

Components of Breastmilk



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THOUGHTFUL CHILDBIRTH

Dis-Chem baby city

HUGGIES

Breastfeeding

shaping the baby's microbiome

Breast milk

Unique to each mom and baby

- Breast milk differs between mothers
- Breast milk is individualised to your baby
- Breast milk changes from month to month as baby's needs change
- Breast milk changes from morning to night with increased melatonin to help baby sleep at night
- Breast milk changes within each feed – increasing in fat at the end of the feed to help baby regulate appetite and intake

Mother-Infant-Milk Triad

Factors determining the baby's microbiome

- Breastmilk – most important factor
- Birth mode – vaginal vs caesar
- Probiotics
- Vitamin D
- Household siblings
- Household furry pets

Human microbiome

- The human microbiome is made up of more than 100 trillion bacteria, fungi, protozoa and viruses that live on and inside the body
- We have 10 times more microbial cells in our body than human cells and the majority live in our guts – especially the large intestines
- The bacteria in our microbiomes are essential to human health
- Breastmilk is not sterile
- Babies consume 10 000 000 bacteria daily

Key discoveries about Breastmilk, baby's immune system and their microbiome

Birth mode affects micobiome, obesity & allergy risk

C-section
babies are more likely to have a **high body-mass index score** at ages one and three

Prolonged
labour is associated with a higher risk for **obesity** and **allergic sensitization**

Caesarean-section delivery and prolonged labour are linked to changes in the gut microbes of infants, with specific microbes influencing different health outcomes at different ages.

Azad MB, et al. Canadian Medical Association Journal, 2013; 185:385-94.

CHILD COHORT STUDY

'Good' bacteria is shared through breastmilk

Breastmilk
and an infant's gut share some of the same **bacteria**, including bacteria that may protect against wheezing in the lungs, which can lead to asthma

Sharing
of 'good' bacteria is greater when infants nurse **directly** at the breast

Moms give not only nutrients and immune components to their babies through breastmilk; they may also share 'good bacteria' that might protect babies from illness and infections.

Breastmilk may protect and deliver certain bacteria to a baby's intestines.

Fehr K, et al. Cell Host Microbe. 2020 Aug 12;28(2):285-297.e4.

CHILD COHORT STUDY

Vitamin D supplementation influences a baby's gut microbiome

Lower
abundance of a specific gut **bacteria** among infants given vitamin D supplements

Lower
incidence of bacterium ***C. difficile*** in guts of exclusively breastfed infants

Vitamin D supplementation is associated with a lower abundance of the bacterium *Megamonas*.

***Megamonas* in infancy** may be linked to asthma or respiratory viral infections, so vitamin D may offer benefits for childhood health.

Drall KM, et al. Gut Microbes. 2020 Nov 9;12(1):1799734.

CHILD COHORT STUDY

Antibiotics in childbirth affect microbiota; breastfeeding mitigates

Significant
alterations in the gut **microbiota** of infants whose moms received antibiotics during delivery

Microbial
imbalance improved among infants exclusively **breastfed** for at least their first 3 months

Antibiotics used during delivery are associated with a microbial imbalance in infant gut microbiota.

Breastfeeding modifies some of these effects by the time the infant is 12 months old.

Azad MB, et al. BJOG 2016;123:983-93.

CHILD COHORT STUDY

Gut bacteria are important for neurodevelopment

More advanced cognition and language skills among 2-year-old boys who had an abundance of the bacteria *Bacteroidetes* in their gut at age 1

Girls
at early ages generally have more *Bacteroidetes*, possibly explaining their usually **superior cognition** and language scores over boys early in life

The bacteria in a baby's gut in the first year of life may be associated with enhanced neuro-development at age 2.

Bacteroidetes are bacteria that produce metabolites called *sphingolipids*, which are instrumental for the formation and structure of neurons in the brain.

Tamana SK, et al. Gut Microbes. 2021 Jan-Dec;13(1):1-17.

CHILD COHORT STUDY

Breastmilk bacteria are different when pumped

Bacteria
in breastmilk are different in moms who pump, compared to those who feed their babies directly from the breast

This finding may offer a clue as to why directly-breastfed infants are less likely to suffer from asthma, allergies and early obesity.

Pumped breastmilk gives babies many of the same health benefits as nursing at the breast, but the two are not the same.

Moossavi S, et al. Cell Host Microbe. 2019 Feb 13; 25(2): 324-335.

CHILD COHORT STUDY

Exclusive breastfeeding reduces *C.difficlile* presence in baby's gut

C. difficile
colonization rates are lowest among babies who are exclusively **breastfed**

The microbiome
of breastfed infants colonized with *C. difficile* resembles that of **formula-fed** infants

Some infants carry the diarrhea-causing bacterium *Clostridioides difficile* (*C. difficile*) in their guts without any symptoms—until a bacterial imbalance leads to illness.

Drall KM, et al. Frontiers in Immunology, 2019; 10:2866.

CHILD COHORT STUDY

Breastfed newborns have lower blood pressure at age 3

Blood pressure
is **lower** for 3-year-olds who were breastfed as infants—even if they only received breast milk for a few days as newborns

Infants who drink even a little of their mother's early **breastmilk**, known as **colostrum**, have lower systolic blood pressure at age 3 no matter how long or exclusively they were breastfed.

A small reduction in blood pressure can reduce the risk of heart disease and strokes in later life.

Miliku K, et al. Journal of the American Heart Association, 21 Jul 2021.

CHILD COHORT STUDY

Furry friends & bacteria help fight obesity & allergies

Lower risk
of childhood obesity or allergies if a **cat or a dog** lives in the home

2x
the amount of **two gut bacteria** that protect against obesity and allergic disease with a furry pet in the home

Babies exposed to furry pets in early life have higher levels of two gut bacteria that help train a baby's developing immune system.

The presence of pets may also reduce the chances of a mother passing on a Group B Streptococcus (strep) infection to her baby during birth.

Tun HM, et al. Microbiome 2017;5:40

CHILD COHORT STUDY

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