There is much growth and change that must occur in your baby’s body. For babies born full-term (37 - 40 weeks), this growth and change occurred within the warm, dark, watery womb. For the premature baby, this same growth and change must occur in a very different world. Growth and change in the body affects the way we feel and the way we act. The same is true for premature babies. Learning about how your baby’s senses form can help you learn how your baby may feel and how to respond to your baby.

**What role do the senses play?** Our senses are our link between the outside world (our surroundings) and our inside world (our body and mind). When your hand hits a sharp nail, for instance, your body sends a pain signal to your brain and you shout, “Ouch!” This response is signaled by a network of nerve fibers that runs from your fingers to your brain and to other parts of the body. Think of this network as being like the wiring in a house. It is this network of nerves that helps us make sense (feel pain) of the input (the sharp nail) from the outside world. All babies use their senses to explore their world. This is why they want to touch things and put them in their mouths.

**What happens to the senses of premature babies?** The premature baby’s house (body) is not yet fully wired. The wires (nerves) still are linking to each other and to parts of the body, such as the brain. And just as the wires in a house are covered with a plastic casing, the wires (nerves) of the body have a similar casing. This casing (called a myelin sheath) has not yet fully formed. The baby’s wires are, so to speak, exposed, so the baby can’t make sense of input from the outside world (lights, sound, smells, touch, taste) in the same way as fully mature infants. For premature babies, this input may seem stronger — the NICU lights may seem brighter and noises may sound louder. What might seem like normal light, sound, or touch to us, may be too much for the baby to handle. This sensory overload is stressful for the baby and he or she may feel discomfort and may be fussy. This type of stress affects many parts of the baby’s body (just as it does in adults). The stress may lead to increased heart rate and breathing rate. It may lead to tummy problems, which then may result in feeding problems. All of these effects together may lead to medical problems for premature babies whose body systems are not yet able to handle this stress.
**How do the senses form in a premature baby?** In the womb, each of the baby’s senses forms in a certain order at a certain time. As the baby’s wiring becomes more complete, the senses are able to form. And, as each sense forms, it helps more wiring to form, which then helps other senses to form. Outside the womb, this precise and timed process can be disrupted by too much input from sound, light, and touch that he or she would not have had inside the womb. This can disrupt many aspects of the wiring process still taking place, and may lead to long-term problems with growth, learning, movement, and controlling mood. Knowing how the senses form inside the womb helps us understand how the outside world might feel for your baby and why certain care is needed in the NICU. NICU nurses will show you special ways to handle your baby while his or her senses continue to mature. Here, we take a brief look at each sense and how it might affect your baby.

**Sight**

**Inside the womb**, a baby develops mainly in the dark. The eyes remain closed until about 25 - 26 weeks. The mother’s hormones help the baby’s body track the cycle of days and nights. After about 32 weeks, the baby begins to detect and react to light coming from outside the womb. As the baby reacts to this light, his or her body refines more functions, such as movement.

**Outside the womb**, a baby still is gaining body fat between 27 - 38 weeks. A premature baby may have very thin skin (as thin as tissue paper), because it does not yet have a full layer of fat. This includes the skin of the eyelids. If the skin is very thin, too much light can enter the baby’s eyes. When babies are able to open their eyes, they can’t always close them until they are about 32 weeks old. These factors combined can cause the baby to be exposed to too much light, too soon (such as from lights in the room or from sunlight). Too much light can make the baby tire easily.

**To help babies cope with light**, there are a few things the hospital staff can do to keep the baby’s world as much as possible like the womb:

- dim the lights in the NICU
- cover the baby’s eyes with a special shield
- place a cover over the baby’s bed

In premature babies, the nerves that link outside input with the body and brain are not fully mature. So, lights, sounds, and touch often feel more intense for the baby.
New studies are looking at whether babies can be helped by light that’s cycled to mimic day and night phases. After about 32 weeks, it is thought that babies can be introduced to these light cycles.*

What can parents do? While in the NICU, you will learn about your baby’s unique and changing needs. After about 32 weeks of age, most babies can handle more input through their eyes. At this stage, your baby may be more able to watch your face and to look at other objects. This, in turn, helps the eye structures and eye-brain connections to progress. As eye formation progresses, the baby’s eye skills improve. This helps the baby to focus on objects (at 10 - 12 inches) and to follow moving objects with his or her eyes. Just being able to look at your baby and for him or her to look back at you, can help you bond and can help your baby’s development.

Sound

Inside the womb, sound waves must travel through layers of the mother’s tissue and fluid before reaching the baby. Thus, sound is muted for the growing baby. The baby hears his or her mother’s voice more clearly than other sounds, because the sound of her voice travels straight to the womb and is not blocked by tissue. A baby begins to respond to sound (to listen) at around 16 weeks gestation, but the inner and outer structures of the ear are not developed until 24 weeks. The rhythm and pitch of sounds also can affect the baby’s heart rate. This change in heart rate can last for up to an hour afterward.

Outside the womb, sound is no longer muted by tissue or fluid and therefore may be more intense for a baby. This sound may sometimes be painful. We now know that stress and disturbed sleep, due to noise, can slow the baby’s growth.

To help babies cope with sound, NICU staff try to minimize noise around the babies. Too little sound is not good for babies, but precisely how much sound is best is not known.

What can parents do? It is hard for babies to hear the difference between separate sounds. To help your baby, it is best to keep background noise (such as other voices or music) very low. The most vital sounds for the baby are the parents' voices. As you learn your baby’s cues, you’ll be able to tell how much sound your baby can handle.

Premature babies have a higher risk for hearing problems. This risk is higher for babies born at a very low birth weight* (less than 3.3 pounds or 1,500 grams). This problem is called auditory neuropa-thy [noo–ROP–uh–thee]. It is caused by damage to the nerves that run between the ear and the brain.

This nerve damage can be caused by many things, such as severe jaundice; not getting enough oxygen at birth; bleeding in the baby's brain; medication exposure; infections in the womb; and hearing problems that run in the family.

Hearing problems can be found with a special test. Most states require babies' hearing to be tested before leaving the hospital. This test is called a hearing screen. The Joint Committee on Infant Hearing advises that all babies who have been in the NICU for more than 5 days should have an auditory brainstem response (ABR) test.**

It is important that babies receive a hearing screen. Babies rely more on hearing than on sight during their first 6 months of life. Hearing loss can lead to a delay in learning how to talk. This can disrupt the child's ability to learn and to relate to others. Even if the result of your baby's hearing screen is normal, your doctor may advise a repeat test after you leave the hospital if the baby has any risk factors for hearing loss.


Touch

Inside the womb, touch is the first sense to form. Touch begins to develop around 8 weeks gestation. Over many weeks, the baby's body develops the network of nerves that make up the sense of touch. Even while in the womb, a baby can feel things. By 32 weeks gestation, nearly every part of the baby's body can feel heat, cold, pressure, and pain. At birth, the sense of touch is the most finely tuned of all the senses.

Outside the womb, a gentle touch may feel intense to a premature baby, but this differs with every baby. Also, the skin of a baby can be very fragile and can tear easily. Since there are many ways in which babies must be touched, doctors and nurses focus on the unique needs of each baby and use the baby's own cues when providing care. Babies often will display jerky movements, however this is normal.

To help babies cope with touch, NICU nurses watch closely for signs that a baby has discomfort and the nurses arrange care by these cues. These cues include the way the baby acts, as well as vital signs, such as heart rate and breathing. These signs help nurses know how much touch the baby can cope with and the best times to give the baby the needed care. There also are special things that can be done to help reduce pain during care tasks.
Can my baby feel pain? Yes. Babies can feel pain, so your baby’s care plan will include ways to minimize pain as much as possible. For instance, doctors and nurses may:

- assess babies often for pain – look for facial signs, as well as vital signs, such as heart rate and breathing, that may indicate discomfort
- combine care tasks, such as feeding and changing, so the baby is touched and moved as little as possible
- give the baby a sweetener, a pacifier, and/or breast milk during care tasks that may cause pain, such as heel sticks for blood tests (research shows these methods may help reduce pain*)
- use special positions to help the baby cope with pain

Pain-relief medicines may also be given for painful procedures. Very strong medicines can disrupt the baby’s sleep, and can lower blood pressure and breathing rate, so their use is balanced with the baby’s need for pain relief.

What can parents do? A baby may be helped by grasping his or her hand or by holding him or her in a special way (called tucking). Most babies also may be helped by kangaroo care. This is a special way for mothers and fathers to hold their baby skin-to-skin. Kangaroo care also has been shown to help mothers produce more breast milk, and to help parents bond with their baby. Nurses also may show you how to give your baby a gentle massage if your baby is ready. Massage has been shown to help some babies.**

Taste and smell

Inside the womb, taste begins to develop at about 14 weeks. Babies can taste many things in the womb, such as the fluid that surrounds them (called amniotic fluid). Foods the mother eats also create tastes and smells. Although the structures of the nose begin to form between 11 - 15 weeks, babies can detect odors in the amniotic fluid through special cells in the nose area.

Kangaroo care has been shown to help premature babies sleep, eat, and grow.***

It also helps parents bond with their infant.

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At birth, babies show a preference for certain tastes and smells and are drawn to the odor of breast milk. Newborns also are drawn to the smell of their own mother and this helps them learn how to suck and then to feed.

Outside the womb, these smells can have a calming effect on your baby and may help soothe the baby during tasks that cause pain, such as heel sticks for blood tests.

What can parents do? Babies may be soothed by smells they recall from the womb. This includes the scent of their mother and of breast milk. Helping your baby be aware of your scent can help calm him or her at certain times. Work with your baby’s nurses to find out how this can be used in your baby’s care. It is best to avoid smells that your baby would not be exposed to in the womb (such as perfume, lotions, hair spray, etc.).

Learning about your baby’s senses and special ways to respond to them can be helpful to your baby and can be a useful way to take an active role in your baby’s care. Talk to your baby’s nurses to learn more about your baby’s cues and how cues can help you respond to your baby’s needs.

Premature babies are like a puzzle and the pieces of that puzzle still are falling into place. It is helpful to remember that what affects one part of the puzzle also affects other parts. That is, what happens in the outside world of the baby (light, touch, taste, sound, smell) affects the baby’s inside (the wiring of nerves and brain). And this, in turn, affects the baby’s growth, learning, and the way he or she relates to others. Despite our best efforts, we can’t make a premature baby’s world exactly like the mother’s womb. But, we can help by being aware of babies’ senses and by giving each baby the unique care he or she needs.

Notes

Ask Questions +
In an area that is new to you, asking these questions can be helpful:
What is the main problem?
What do we need to do?
Why is it important to do this?
+ Source: Partnership for Clear Health Communication at the National Patient Safety Foundation™
www.npsf.org/askme3

This information is for educational purposes only and is not intended to substitute for professional medical advice. Always consult with a health care professional if you have any questions about the health of your baby.

B2 - How babies’ senses develop