

Baby's Developmental Care with Sounds

Takeshi Arimitsu

Pediatrics Department,
Keio University School of Medicine

Hidenobu Ota

Psychiatry Department,
Medical Corporation Seiwakai, Asai Hospital

INTRODUCTION

All members related to babies conduct developmental care with sounds. To do so, it is important to remember that babies do not like excessive noise and should be subjected to comfortable sounds whenever possible.

Why developmental care with sounds is necessary.

Babies grow and are protected in their mothers' wombs until they are born. This means that babies' senses of hearing are also protected in their mothers' wombs. This means that external noises around mothers are adjusted when they pass through mothers' wombs and are not directly transmitted to babies. Prior to being born, babies, including their sense of hearing, continue to grow in the protected environment of their mothers' wombs.

As prenatal medical treatment has developed, infants' survival rates have improved significantly. On the other hand, the rate of babies being born early is also increasing. Currently, improvement of the neurological prognosis of surviving babies is a major goal. It is considered that one of the causes that adversely affects neurological prognosis of babies who are born early is that they – while not fully developed – are exposed to an environment outside of their mothers' wombs when, ideally, they would be in the protective environment of their mothers' wombs.

Reduce loud external noises.

Environments to which babies are not originally exposed to include those containing surrounding noises. It is understood that babies who are born early recognize and respond to sounds. Therefore, instances may occur in which babies suffer due to loud external sounds immediately after they are born. Therefore, to minimize any potential harm, it is necessary to strive to reduce any harm or damage that may be caused due to the noises that babies who are born early are subjected to.

The principle concern in relation to loud external noises in the proximity of newly born babies is noises within the newborn baby ward. Loud external noises can potentially

destabilize a baby's cardiorespiratory fitness and prevent them from gaining weight, and even reduce their future development index. Table 1 shows that babies in incubators are affected by and suffer as a result of loud external noises that are readily generated by medical practices.

An incubator is one of many sources of loud external noises. When an incubator is handled, a device that does not generate loud external noises is needed. In addition to such a device, use of the latest incubator makes it possible to further reduce generation of loud noises. For example, the hook slider type snap-open access port of a conventional incubator (example: V2100-G) easily generates a noise of 80 dB or more without modification (Table 1). However, the latch-type snap-open access port of the latest incubator (example: Dual Incu i®) has a mechanism that ensures it is difficult to generate loud noises without modification (Table 1). In addition, when water is supplied to the incubator's humidifier tank, opening and closing the humidifier tank generates loud noises.

Table 1 External noise levels in NICU's incubator and factors generating external noises (Issued based on literature 1 to 7.)

Sound level (dB)	Noisiness	Unit sound or staff member's actions, etc.	Familiar example	Influence of sounds on humans
120-140	Painfully noisy	Banging incubator	Nearby thunderclap, jet plane 30 m over head	Pain and soreness
80-100	Noisy to very noisy	Tapping the incubator. Flicking snap-open access port of a conventional incubator (example: V-2100G). Closing the door of the metallic shelf under the incubator. Placing an object on the incubator.	Busy traffic. Phone ringing. Under the guard when a train passes. Road construction. Drilling sound. Loud voice. Lawn mower. Vehicle horn	Hearing loss develops if continued
60-70	Slightly noisy	Normal conversation. Sound generated as condensation accumulates in respiratory circuit.	Vacuum cleaner. Noisy street. Key typing	Unpleasant
40-50	Quiet	Motor sound of the incubator (example: V2100-G, Dual Incu i®). Gently closing the snap-open access port of a conventional incubator (example: V-2100G)	Average home, library, city in the middle of the night, minor traffic, air conditioner outside unit start-up, quiet office	Upper limit of the average external noise recommended by NICU (45 dB or less), acceptable sound level for work (50 dB or less)
20-30	Very quiet	Gently closing the snap-open access port of the latest incubator (example: Dual Incu i®)	Sound of rustling leaves, whispers, suburb in the middle of the night	Acceptable sound level for sleeping (35 dB or less)

However, when an external water supply unit is used, it is not necessary to open and close the humidifier tank when water is being supplied. Thus, loud noises are not generated.



Make babies hear comfortable sounds

On the other hand, it is understood that quiet environments around babies are not always beneficial. In a study of babies who were born early, it is reported that babies who grow up in quiet environments have low future development indexes. The reason for this is that undeveloped babies are born when they would otherwise typically be growing inside their mothers' wombs and hearing the soothing sounds of their mothers' heartbeats and voices. Therefore, it is considered that such babies miss the opportunity to hear voices and sounds that help facilitate growth. This means that it is necessary to make babies who are born early hear comfortable sounds that promote healthy development.

Sounds that promote healthy development include talking voices, songs, and music from parents and medical staff. It is reported that when babies hear such sounds, not only does their cardiorespiratory fitness become stable and feeding improve, but their future development index also increases. Keio University School of Medicine, Pediatrics Department jointly studies with Keio University Department of Literature about the mechanisms under which

newborn infants are influenced by sounds and voices. According to the study results thus far, it is understood that brains of term infants exhibit responses to changes in melody and intonation of music or mothers' talking voices in the same manner as adults from the early period after they are born. (Figure 1) Relatively matured babies' brain responses to sounds may relate to the mechanism of developmental care with sounds.

Left cerebral hemisphere

Right cerebral hemisphere

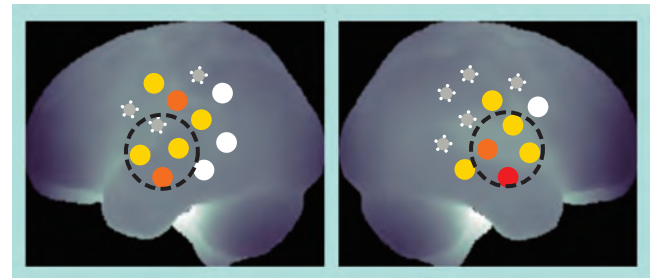


Figure 1 When babies hear changes in intonation, they exhibit a brain response with right cerebral hemisphere dominance.

(Extracted from literatures 7 and 8 and revised.)

The portion enclosed by dotted lines shows the auditory area neighborhood. The brain response is strong in the order of red - yellow - white. It is understood that the color of the auditory area neighborhood of the right cerebral hemisphere is close to red when compared to the left cerebral hemisphere, and this shows that the brain response is strong.

Conclusion

The developmental care environment with sounds is a very natural state when all concerned people have a warm and caring attitude toward babies. We tend to be preoccupied with treatment and care in front of our eyes, however, we ask everyone concerned to have a warm and caring attitude toward infants. In addition, to prevent unexpected negative consequences of actions we take that are assumed to be good for babies, it is necessary to become aware of the scientific basis, meanings, and mechanisms of developmental care with sounds.

The following extracts are part of "Practice and "Why?" of the sound environment adjustment" that were written by Mr. Arimitsu and Mr. Ota in an article featured in NEONATAL CARE November , 2016 (Medical Publisher). The article has been introduced here

after obtaining reprinting permission from the publisher. We hope the article is useful for you when practicing developmental care with sounds.

● Be careful not to generate any sound in the incubator. [Reference: Atom Medical Corporation V-2100G]

a) About snap-open access port



When the snap-open access port of the incubator is a hook slider type that holds the access port using the slider that is opened or closed by the spring, a sound is generated when the spring returns. The hook slider type snap-open access port closing sound level is 70 dB, which is similar to that of a noisy street. To reduce the sound level, make the following changes.



No loud noise is generated when the snap-open access port is being opened. A structure in which no loud noise is generated even when the snap-open access port hits the hood main body.



When closing the snap-open access port, a snapping noise may be generated depending on the degree of wear of the hook slider. The snap-open access port needs to be closed while the hook slider is held with the other hand.

b) About admittance panel



When opening the admittance panel, the panel may hit the main body and a loud noise will be generated if you do not hold the panel with both hands until the end of the process. Hold the panel and gradually lower it.



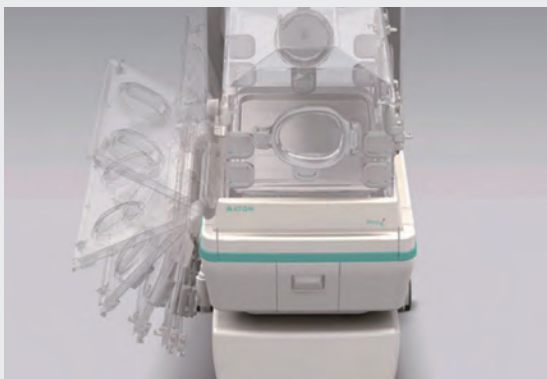
This shows the fully open status.



Even when closing the admittance panel, gradually close it while pushing the lock lever.



The latch-type snap-open access port [reference: Atom Medical Corporation Dual Incu i] has a structure that inhibits the generation of a loud noise when the snap-open access port is closed.



The admittance panel with a mechanism called a rotary damper [photo provided by Atom Medical Corporation] falls down naturally and gradually when you release your hands during the opening process.

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