

## THE ROLE OF NASAL AND MOUTH BREATHING IN CHILDHOOD

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There are two natural upper respiratory passages in man: the nasal and the oral one. Only the nasal passage is regarded as the physiological one. Adult individuals use habitually either the nasal or the oral passage. In children however, since the birth and in relation to their somatic and mental development the nasal or the oral passage are used with periodic selectivity which is due to the fact that in all children a continuous development of the breathing through the upper respiratory passages occurs but alternately: through the nasal and through the oral passage.

The nasal breathing had been regarded until recently as the primary mode of breathing in newborns. This view is questionable, however, since it is known that many newborns with bilateral choanal atresia can survive despite this anomaly although they would be expected to suffocate if the nasal breathing were really the primary mode of breathing. This observation induced us to study the development of breathing through the upper respiratory passages in newborns. We studied the beginning of breathing in labour wards in 79 normal newborns and in 11 newborns after a pathological labour.

The results of observations of breathing in normal newborns born in cephalic presentation surprised us somewhat. In the first place, all newborns (with only one exception) began — after primary apnoea lasting 22 seconds on the average — to breathe through the mouth crying. In the second place, in 61% of cases the breathing started with an expiration and cry, while in only 30% of children inspiration started the function of breathing. In 9% of cases we could not establish which was the primary phase of respiration.

Crying, shrieking or squeaking which set in after a more or less long apnoea are familiar to the obstetricians and until our observations we had been prone to explain this behaviour of the newborns as a reaction to pain caused by the labour trauma and not as a mode of breathing. We were then not aware of the fact that respiration starts as oral breathing as a rule in all cases and is accompanied by crying and that the oral breathing is the primary mode of respiration in man. Only later, when we observed how the mode of breathing changes in relation to the disappearance of the cyanotic hue of the skin which is replaced by a reddish colour, the purposefulness of the oral route of breathing became evident to us. We observed namely that the cyanotic newborn with asphyxia acquires a lively reddish hue of the skin the quicker the more loudly it cries and the more deeply it is breathing while crying. The oral breathing associated with crying lasts from 5 to 15 minutes, on the

average 3 minutes and 50 seconds. After that time period the colour of the skin changes from cyanotic to reddish and nasal breathing appears. The nasal passage offers a greater resistance to breathing than the wider oral cavity. In the period of apparently established nasal breathing the newborn frequently begins again to cry, probably to increase the inadequate oxygen supply to its lungs. Often this recurrent crying is prolonged over a longer time period. These observations led us to regard the onset of nasal breathing as an important sign evidencing that the oxygen supply to the organism of the newborn is adequate.

The onset of breathing through the mouth together with crying, the breaking-up of the mouth breathing with the onset of nasal breathing occur in the newborn automatically and are, probably, an unconditioned reflex triggered by the chemoreceptors sensitive to changes in oxygen and carbon dioxide concentrations. Since the oral breathing associated with crying supplies many times greater volumes of air to the lungs than nasal breathing, it has become clear to us that in the newborn the breathing through the wide oral cavity is much more advantageous and more purposeful in view of the considerably inadequate oxygen supply during labour.

The second phenomenon observed by us — the onset of breathing with crying, that is with expiration — was initially unexplained. We could not understand how it is possible that in the newborn the first respiration begins by expiration with a cry and not by active breathing with inspiration. The following observations of normal and pathological labours permitted us to gain a better insight into this mechanism. During a normal labour the head appears as the presenting part in the genital canal, followed closely by the thorax which lies in the narrowest part of the canal and is compressed excessively while passing through this part. The compression of the thorax causes outflow of the amniotic fluid from the mouth and nose of the fetus. We could observe frequently this mechanism of emptying of the airways. When the thorax leaves the genital canal it is released from the pressure exerted on it by the walls of the genital canal and it resumes again its normal shape. In this moment the air penetrates into the empty airways in the expanded thorax before the beginning of active respiration. This air is used, probably, by the newborn in its first act of breathing, i.e. the cry which is a kind of expiration. During this cry the remaining amniotic fluid is removed from the lower airways.

The observations made by us suggest that a normal labour fulfills two important tasks: the expulsion of the fetus and the preparation of the respiratory tract of the fetus for respiration.

In pathological labour disturbances of breathing are observed more frequently, recurrent periods of apnoea occur, the newborn coughs, groans, or other signs appear.

Since all newborns experience oxygen hunger during labour and since they all breathe through the mouth while crying, we regard this mode of breathing in the newborns as a primary and physiological type of respiratory activity. After the postnatal period when the supply of oxygen becomes adequate the second developmental phase of breathing appears in which breathing occurs almost exclusively through the nose. This mode of breathing is called

enforced nasal breathing, since it is associated with enforced closing of the mouth. The duration of this second phase is usually several weeks or longer. The specific character of this mode of breathing depends — apart from the anatomical factors — on the fact that the baby is sleeping almost continuously, in daytime as well as during the night, the demands for oxygen being then smaller than during labour or during the further period of an ever increasing motor activity of the baby.

In infancy and in early childhood cooing and then the first trials of uttering words and talking require efficient oral breathing and because of that the child begins ever more frequently and longer to breathe through the mouth. In cases with recurrent and prolonged rhinitis the possibility of using the nasal passage for breathing becomes limited and the child gets accustomed to easier free breathing through the mouth. In this way, as time goes by, the child learns to use oral breathing as an easier and more efficient mode of breathing in case of narrowing of the nasal passage, which leads frequently to abuse of this mode of breathing.

During certain necessary activities, e.g. while talking or running, a healthy child at preschool age breathes already for long time periods through the nose. During such activities as running, talking or singing, e.g. in kindergartens, the child breathes through the mouth for from 20% to 80% of all the time. The nasal breathing prevails at rest, especially during the night in sleep with closed or only half-open mouth.

At school age the child is breathing mainly through the nose during lessons, while in playtime the breathing is almost exclusively oral. During sports, such as cycling, skiing or skating, the child is breathing through the mouth for long time periods. In swimming life records are set up often at the age of 16 years, but it should be kept in mind that they are preceded by many years of exercises in oral breathing. A child that breathes frequently for long time periods through the mouth during games and other physical efforts without having any pathological stenoses of the nasal passage becomes a normal and physically efficient adult individual.

Observations of healthy children from their birth until puberty permitted us to recognize three developmental phases of the mode of breathing through the nasal and oral respiratory passage: the first phase is that at birth, with exclusively oral breathing associated with crying, the second phase is that of early infancy, with enforced nasal breathing, the third phase develops in early childhood and is characterized by an ever more progressing development of breathing alternately through the nose or through the mouth depending on the actual demands of the situation.

Oral breathing — a frequent sign of narrowing of the airways, or of respiratory or circulatory insufficiency — is regarded as a pathological phenomenon although, actually, it is only the second possible airway which is often used by healthy and by ill children to increase the oxygen supply depending on the demands of a given situation.

In various activities and also in numerous physiological reflexes, e.g. coughing, sneezing etc., the individual is forced to breathe through the mouth. In the modern intellectuals oral breathing is associated usually with speaking, the

working men and sportsmen use oral breathing mainly during hard work or exercises. The oral breathing is used very frequently by waking children and adults, mainly during speaking. On the other hand nasal breathing prevails mainly in sleep and at rest.

### RÉSUMÉ

Les auteurs discutent les deux modes de respiration chez l'enfant: par voie nasale et par voie buccale. Se basant sur les observations de 90 nouveaux-nés, ils distinguent trois étapes dans le développement de la respiration par voies aériennes supérieures depuis la naissance de l'enfant et au cours de son enfance.

La première étape concerne les premiers moments de la vie, où le nouveau-né en pleurant respire par la bouche. Cette voie buccale, qui aide à faire sortir l'enfant de l'état d'asphyxie, dans lequel il se trouvait aussitôt après l'accouchement, doit être considérée comme primaire. L'expiration comme première phase de l'action respiratoire a été observée plus souvent que l'inspiration. La première étape dure en général quelques minutes.

La seconde étape, l'étape de la respiration nasale obligatoire dure quelques semaines jusqu'à quelques mois; c'est la période où l'enfant reste endormi pendant la plus grande partie de la journée et sa demande d'oxygène reste assez limitée.

La troisième étape — celle de la respiration alternative, plus tard volontaire et consciente — par le nez ou par la bouche, vient à la suite d'une activité motrice croissante ainsi que du développement de l'usage de la voix pour parler. Les infections de la muqueuse nasale assez fréquentes chez les petits enfants nécessitent aussi l'usage de la voie buccale. La respiration nasale reste cependant dominante pendant le repos et le sommeil.

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