

## MEDICINE TODAY

### Respiratory Disorders in Newborn Infants

"Medicine Today" is the television series for doctors produced by the B.B.C. Advice on the preparation of the programme is given by the Association for the Study of Medical Education.

The programme on B.B.C.2 on 23 April was on the subject of resuscitation of the newborn. Printed below is an article prepared with the help of expert contributors to complement the television programme which will be repeated on B.B.C.1 on 30 April at about 11.20 pm.

Most babies accomplish the transition from placental to pulmonary gas exchange without difficulty at birth. In some infants resuscitative measures may be required or it may become apparent that respiration is abnormal. Respiratory abnormalities in newborn infants are often loosely described as "respiratory distress," but this description is not a diagnosis, and it is important to establish as rapidly as possible the cause of the symptoms so that appropriate treatment can be undertaken.

#### Congenital Abnormalities

Congenital abnormalities which cause respiratory difficulties are rare, but sometimes prompt recognition of correctable lesions will result in the saving of a normal infant. For example, an infant with choanal atresia (imperforate posterior nares) may be cyanosed and fighting for breath but can be successfully managed by the insertion of an oral airway until he has learnt to breathe through his mouth. Diaphragmatic hernia may produce similar symptoms and may be difficult to detect on clinical grounds, but a chest radiograph will establish the diagnosis and surgery produces a cure in many cases. In congenital lobar emphysema a segment of bronchial cartilage is deficient and the unsupported bronchial wall acts as a check valve, causing gross over-inflation of a lobe. The physical signs are those of a pneumothorax, and a radiograph is required for diagnosis; early surgery is usually required. The Pierre Robin syndrome, a hypoplastic mandible together with a cleft palate, causes repeated cyanotic attacks, because the tongue obstructs the airway. Infants with this defect require very careful nursing if anoxic cerebral damage is to be avoided. An infant with a tracheo-oesophageal fistula usually regurgitates his first feed and may aspirate it with choking and coughing. Again, early surgery is needed.

#### Birth Asphyxia

Infants recovering from birth asphyxia or delayed onset of respiration are often tachypnoeic because they have developed a metabolic acidosis. When severe, the acidosis may cause pulmonary vasoconstriction and right-to-left shunting through the foramen ovale and ductus arteriosus. The pH of the blood should be measured and the metabolic acidosis corrected if the pH is less than about 7.25. If measurements of pH are not available it is reasonable to assume that a severely asphyxiated full-term infant will require at least 12 mEq (10 ml.) of 5% sodium bicarbonate intravenously. Oral administration of bicarbonate is not so successful, because it may take several hours to produce an effect and may also cause regurgitation and inhalation of vomit.

#### Meconium Aspiration

An infant asphyxiated before delivery may pass meconium and also gasp, so that meconium is inhaled into the airways.

A mildly affected infant will require nothing more than suction of the pharynx and possibly of the larynx and trachea under direct vision. Severely affected infants, in whom the trachea is often packed with meconium, need emergency treatment if they are to survive. Endotracheal intubation should be carried out, and if the tube blocks it must be immediately replaced. Suction should then be applied through a sterile catheter passed down the endotracheal tube, and the lungs should be washed out with 5 ml. or more of normal saline while the infant is held head down. It is of the utmost importance to avoid inflating the lungs, particularly with high pressures, until a clear airway has been established, so that the meconium is not pushed down into the smaller bronchi and bronchioles. These infants are often severely asphyxiated and require bicarbonate therapy. Subsequently the infants may have hyperinflated chests due to obstructive emphysema, and they sometimes develop pneumothoraces.

#### Pneumonia

Pneumonia can be acquired before, during, or after birth, and may be surprisingly difficult to detect on clinical grounds. The infant may have a tachypnoea with indrawing of the chest wall and cyanosis, but these signs are often not very obvious. Similarly, auscultation is often unhelpful. An infant with any infection appears lethargic, is difficult to feed, may vomit, and loses weight. He is frequently jaundiced, and the liver and spleen are often palpable. A chest radiograph should form part of the investigation of any such infant, and if blood cultures are performed the infecting organism may sometimes be isolated.

Prophylactic treatment is recommended for infants in all cases in which the membranes had been ruptured for more than 24 hours before delivery. Ampicillin 100 mg. and cloxacillin 50 mg. twice daily intramuscularly or orally for five days are in most cases adequate. If a diagnosis of pneumonia is established more vigorous therapy is needed. The responsible organism is often Gram-negative or may be a resistant staphylococcus. Kanamycin 10 mg./kg./24 hours in two doses 12-hourly and cloxacillin 50 mg. six-hourly will usually control the infection. Toxicity due to kanamycin has not been reported in this dosage, and in view of the danger of infections of this type in newborn infants it is currently an antibiotic of choice. Kanamycin should not, however, be continued for more than 10 days. Other antibiotics can be used, depending on the results of bacterial cultures, and it is important to note that kanamycin is not effective against *Pseudomonas pyocyanea*, for which colomycin or carbenicillin will be required.

#### Hyaline Membrane Disease

Infants with hyaline membrane disease (usually regarded as synonymous with the "idiopathic respiratory distress syndrome of the newborn") are almost always born at a gestation of less than 37 weeks, and the incidence increases with decreasing maturity. These infants can be seen to be abnormal at birth or within two hours of it, and have abnormal retraction of the chest wall, cyanosis, a tachypnoea of more than 60/min., and expiratory grunting. A chest radiograph shows a granular appearance of the lung fields and an "air-bronchogram." The physical signs and radiographic appearance are occasionally mimicked by other conditions, such as pneumonia or massive

pulmonary haemorrhage, so that the diagnosis may have to be made by exclusion. Hyaline membrane disease is the commonest cause of death in liveborn premature infants, and all affected infants should be admitted to hospital. Severely affected infants require monitoring of arterial blood-gas tensions and pH, careful regulation of inspired oxygen concentration, correction of metabolic abnormalities, and, if necessary, mechanical ventilation. With optimum treatment the mortality remains about 25%.

### Massive Pulmonary Haemorrhage

This condition is of unknown aetiology and occurs in at least two forms. In the first type the infant, often at full-term, is grossly asphyxiated at birth, and blood is seen pouring from the trachea as resuscitation is attempted. The other type of infant is usually small-for-dates or premature by gestation. On about the second day of life the infant is found collapsed with blood issuing from the trachea. At necropsy in both types of pulmonary haemorrhage the alveoli are full of blood. Clotting factors are usually normal and haemorrhage into other organs is unusual. Treatment is usually of no avail.

### "Apnoea of Prematurity"

Premature infants, particularly the most immature ones, may become apnoeic for a variety of reasons other than those already mentioned, including neuromuscular immaturity, hypoglycaemia, and aspiration of milk. For this reason it is of the greatest importance that these infants should be carefully watched. Unless there is some severe underlying cause for the apnoea, such as cerebral haemorrhage, the prognosis is good provided that rapid resuscitation is performed. These infants may respond to peripheral stimulation, but if not they should be intubated and the lungs inflated. Mechanical ventilation has a considerable chance of success.

### Pneumothorax

Spontaneous pneumothorax is particularly common in infants who have inhaled meconium but may also occur in the course of other respiratory illnesses. Occasionally no apparent predisposing cause is found. Infants who develop pneumothoraces are particularly at risk because of the mobility of the mediastinum, and severe respiratory embarrassment may ensue. In a severe case the physical signs are obvious, but if the pneumothorax is small all that may be apparent is dyspnoea, and a radiograph is required for diagnosis. A small pneumothorax does not need treatment. A large one may require aspiration with a needle and syringe followed by continuous drainage. Pneumothoraces in newborn infants almost always heal spontaneously.

### Conclusions

Respiratory disturbances in newborn infants often constitute an emergency in which not only may the infant's life be saved by prompt recognition and treatment of the abnormality present but irreversible anoxic cerebral damage may be prevented. For further reading and for discussion of the many other causes of respiratory difficulty, *The Lung and its Disorders in the Newborn Infant*, by M. E. Avery (W. B. Saunders Co., Philadelphia and London, 1964), is recommended.

## Approved Names

The third supplement to the November 1966 consolidated list of Approved Names is printed below. Communications relating to Approved Names should be addressed to the Secretary, British Pharmacopoeia Commission, General Medical Council, 44 Hallam Street, London W.1.

Approved Name	Other Names	Action and Use
Azidocillin .. ..	6-[D(-)- $\alpha$ -Azidophenylacetamido]-penicillanic acid BRL 2534; SPC 297D	Antibiotic
Bromhexine .. ..	N-(2-Amino-3,5-dibromobenzyl)-N-cyclohexylmethylamine	Bronchial mucolytic
Calcitonin .. ..	Calcium regulating thyroid hormone	Thyrocalcitonin
Carbenicillin .. ..	6-( $\alpha$ -Carboxyphenylacetamido)-penicillanic acid	Antibiotic
Cletoquine .. ..	Pyopen is the disodium salt 7-Chloro-4-[4-(2-hydroxyethyl-amino)-1-methylbutyl]aminoquinoline	Anti-inflammatory
Clophenthixol .. ..	1-[3-(2-Chlorothiaxanthene-9-ylidene)propyl]-4-(2-hydroxyethyl)piperazine	Psychotropic
Cyclofenil .. ..	Sordinol is the dihydrochloride 4,4-Diacetoxybenzhydrylidene-cyclohexane F 6066; I.C.I. 48,213; Sexovid	Treatment of infertility
Deprodone* .. ..	11 $\beta$ ,17 $\alpha$ -Hydroxypregna-1,4-diene-3,20-dione R.D. 20,000 is the 17 $\alpha$ -propionate	Corticoid
Gefarnate .. ..	A mixture of stereoisomers of 3,7-dimethylocta-2,6-dienyl 5,9,13-trimethyltetradeca-4,8,12-trienoate Geranyl farnesylacetate Gefarnyl	Treatment of peptic ulcers
Iprindole† .. ..	5-(3-Dimethylaminopropyl)-6,7,8,9,10,11-hexahydrocyclo-oct[ <i>b</i> ]indole Prondol and Wy-3263 are the hydrochloride	Antidepressant
Mesterolone .. ..	17 $\beta$ -Hydroxy-1 $\alpha$ -methyl-5 $\alpha$ -androstane-3-one SH 723; Proviron	Androgen
Noxiptiline .. ..	3-(2-Dimethylaminoethoxyimino)-1,2:4,5-dibenzocyclohepta-1,4-diene	Antidepressant
Pentacosactride .. ..	BAY 1521 is the hydrochloride D-Ser <sup>1</sup> -Nle <sup>4</sup> -(Val-NH <sub>2</sub> ) <sup>25</sup> - $\beta$ <sup>1-25</sup> -corticotrophin	Synthetic corticotrophin
Salbutamol .. ..	Norleusactide (I.N.N.) 2-t-Butylamino-1-(4-hydroxy-3-hydroxymethyl)phenylethanol	Bronchodilator

\* Deprodone replaces the Approved Name Desolone.  
† Iprindole replaces the Approved Name Pramindole.