*Acta Paediatrica Academiae Scientiarum Hungaricae Vol. 9 (3—4), pp. 293—303 (1968)*

# Klebsiella pneumoniae Pneumonia in Prematures and Young Infants

By

G. Korányi, Eva Pesti and Györgyi Somogyi

Section of Paediatrics and Central Laboratory, Péterffy Sándor Municipal Hospital, Budapest

Received April 7, 1968

The incidence among infants of pneumonia due to *Klebsiella pneumoniae* is low as reflected by literature. Description of the disease is incidental in textbooks where the cases reported are quoted as being exceptional in childhood. In a report on four cases in infants [18], the pathogenetic role of Klebsiella could be confirmed in one instance only, where recovery was achieved with streptomycin; in the rest, the role of other agents could not be excluded. In a series of 41 infants who had died of respiratory complication of measles, from the lungs of two a pure growth of *Klebsiella pneumoniae* was obtained, while 41 infants who had recovered from pneumonia yielded Klebsiella in 5 cases, of which four in a pure culture [4]. In a premature ward, Klebsiella pneumonia appeared in epidemic form, coinciding with a fulminant epidemic of Klebsiella enteritis in another ward of the same hospital. In both groups aureomycin proved to be effective and only one of four severely affected infants died [16].

The first cumulative review in the literature presented 30 cases of Klebsiella pneumonia in 1950 [15], while a total of 36 cases was reported in 1962 [21]. This is a surprisingly low number if one considers the increasing use of new antibiotics, a fact favouring the growing incidence of uncommon pathogens. Development of the diagnostic procedures should also have added to the number of recognized Klebsiella pneumonia. Recent data from Uruguay [2] suggest a more frequent positive bacteriological finding among infants with respiratory infections. Thirtysix out of 58 infants yielded Klebsiella; part of the patients suffered from pneumonia, others from asthmatic bronchitis.

While Klebsiella infections have been increasingly encountered during epidemic or sporadic enteritis [3, 8, 13, 14, 15, 22, 23] or food poisoning [8], several data suggest a similar increase in the incidence of Klebsiella pneumonia. Our data support this view, and underline the necessity of bacteriological examination in pneumonias of prematures and infants.

## Bacteriological Methods

The genus Klebsiella pertains to the family Enterobacteriaceae. *Klebsiella pneumoniae* used to be known as Friedländer's

bacillus, or *B. mucosus capsulatus*. Several members of the genus are pathogenic. A further subdivision of the strain became possible on the basis of the antigenic structure. There are 5 groups differing in the O antigen, and 72 types differing in the K antigen. The pathologic significance of the different Klebsiella strains can be ascertained by serologic methods. More recently, the demonstration of specific phages has attained a diagnostic significance. Specific phages may play a role in turning potential pathogens into actually pathogenic agents 10].

For the identification of *Klebsiella pneumoniae*, chocolate agar, blood agar or Endo medium was inoculated with pharyngeal or subglottic secretion. After 24 hours incubation one of the isolated mucous colonies was transferred to Lányi and Szita's liquid medium to differentiate the strains on the grounds of indol production and urea splitting. In addition, the methyl-red and the Voges-Proskauer tests were carried out, and hydrogen sulphide production was examined. In some cases motility of the organism was observed and phage typing was performed. Selective sensitivity to antibiotics was determined by the disc method and in the case of cefaloridine by the dilution method. The results of these additional examinations confirmed the bacteriological diagnosis in all cases.

## Results

During the period February 10, 1966, to December 31, 1966, a total of 670 bacteriological examinations of pharyngeal and subglottic mucus was performed. Klebsiella was cultured 67 times, from 46 patients. A pure culture grew in the case of seven infants with pneumonia, and in eleven cases with spastic bronchitis. In the case of additional four patients with pneumonia, Klebsiella grew in a mixed culture, and clinically the pneumonia did not meet the criteria of Klebsiella origin. Klebsiella was isolated from further four infants with otitis and from 28 cases without any pathological manifestation.

During the same period pharyngeal secretion of the medical and nursing staff was repeatedly examined. Klebsiella was isolated on three *occasions* from two nurses. Cultures obtained from beds and furniture were always negative.

During the period January 1 to May 10, 1967, 31 out of 400 cultures yielded Klebsiella, but only one of the positive patients developed pneumonia. No positive cultures were obtained from faeces.

Table I demonstrates the antibiotic sensitivity of the Klebsiella strains. Practically all strains were resistant to sulphadimidine and to oxytetracyclin. Three out of four cases were resistant to streptomycin, and about every second to chloramphenicol. Neomycin and polymyxin proved to be the most effective drugs. Table I also demonstrates the sensitivity of the strains originating from patients with pneumonia. Sensitivity to cefaloridine was examined in two cases. One proved to be sensitive to 5 $\mu$g/ml, while the other only to 50 $\mu$g/ml. In spite of this, the latter patient responded well to cefaloridine treatment.

## Diagnosis

There is no agreement in the literature on the exact diagnostic criteria of Klebsiella pneumonia. Those suggested

TABLE I

Sensitivity of *Klebsiella pneumoniae* strains

| Antibiotic | 67 strains from 46 different patients | | | | | | 17 strains from patients with Klebsiella pneumonia | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sensitive | | Relatively sensitive | | Resistant | | Sensitive | | Relatively sensitive | | Resistant | |
| | No. | per cent | No. | per cent | No. | per cent | No. | per cent | No. | per cent | No. | per cent |
| Oxytetracyclin | 2 | 3 | — | — | 65 | 97 | — | — | — | — | 17 | 100 |
| Streptomycin | 11 | 16 | 4 | 5.8 | 52 | 78 | 3 | 18 | — | — | 14 | 82 |
| Chloramphenicol | 30 | 45 | 4 | 5.8 | 33 | 49 | 3 | 18 | 1 | 6 | 13 | 76 |
| Neomycin | 56 | 84 | 4 | 5.8 | 7 | 10 | 15 | 88 | — | — | 2 | 12 |
| Polymyxin | 47 | 70 | 4 | 5.8 | 16 | 24 | 16 | 94 | — | — | 1 | 6 |
| Sulphadimidine | — | — | — | — | 67 | 100 | — | — | — | — | 17 | 100 |
| Cefaloridine | — | — | — | — | — | — | 1* | — | 1* | — | — | — |

* = two tests only.

by PERLMAN and BULLOWA [16] i.e. pulmonary infiltration demonstrated clinically and radiographically; repeated pure cultures of Klebsiella from blood or pharyngeal secretion; demonstration of specific polysaccharides and antibodies in blood, cannot be expected to gain general acceptance on account of the limited laboratory facilities in many hospitals. The criteria set by OBRINSKY *et al.* [11], namely, resistance to penicillin and sensibility to streptomycin, are more easy to meet, but since 78% of our cases were resistant to streptomycin, these criteria are insufficient to rely upon. Therefore, we have accepted the criteria of ANDERSON [1], who regards Klebsiella as the pathogenic agent, when (i) after death Klebsiella can be cultured from the lungs; (ii) the presence of Klebsiella can be demonstrated in the acute phase, but not any more during convalescence; and (iii) Klebsiella can be isolated in the acute phase and the patient recovers on adequate antibiotic treatment.

On the other hand, Klebsiella cannot be held responsible for the pneumonia if (i) the organism persists after clinical recovery; (ii) Klebsiella can be demonstrated transitorily during some other disease, but without causing clinical symptoms; (iii) Klebsiella can be isolated only from sputum or a throat swab and the pneumonia responds well to antibiotics to which Klebsiella has been resistant; (iv) after death other pathogenic agents can only be isolated; and (v) there is no well defined disease.

## CASE REPORTS

Seven patients; five prematures and two young infants, suffering from Klebsiella pneumonia have been ob-

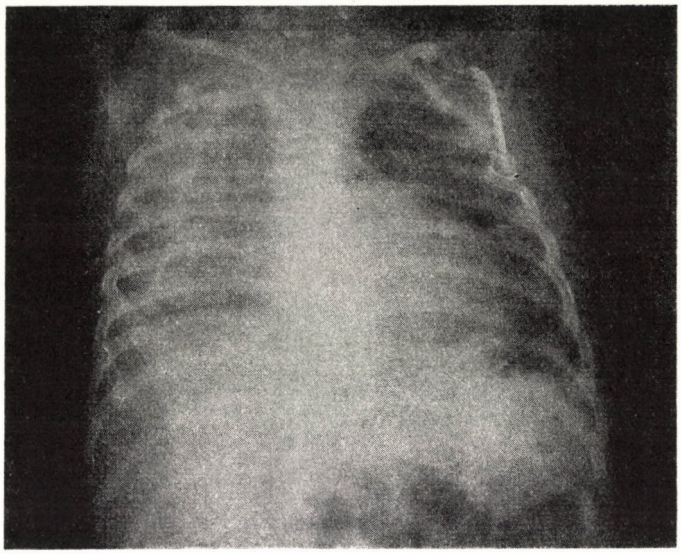

FIG. 1

served in the year 1966. The case of four patients will be reported in some detail, while of three, in brief.

*Case 1.* N. M., a 4-months old infant was admitted on February 17, 1966. History revealed a birth weight of 2500 g, and asphyxia after delivery. Three days prior to admission he had developed fever and cough, X-rays had revealed bronchopneumonia in the right inferior lobe. At admission the infant was wasted, moderately cyanosed, displaying tachycardia, rales over both lungs, harsh breathing over the right inferior lobe, and an enlarged liver. Strophanthin, penicillin, streptomycin and oxygen were administered. The throat swab yielded a pure culture of Klebsiella, but the result took four days to arrive. Since the condition was deteriorating and the pneumonia affected further areas of the lung, the possibility of staphylococcal pneumonia was considered, and meticillin and Sigmamycin were prescribed. However, the clinical state deteriorated further, the cough became productive, with an abundant mucous, foamy discharge, and dulness to percussion appeared over the right lung. Four days later X-rays revealed an increased density over the right inferior and middle lobes, and pleural fluid along the lateral wall of the thorax, reaching up to the apex and compressing the infiltrated right lung (Fig. 1).

A pleural tap resulted in a small amount of serous, sterile fluid. The result of the throat swab was obtained, According to the result of the throat swab, Sigmamycin was discontinued, and streptomycin and kanamycin treatment was instituted. On the sixth day following admission the condition began to improve; temperature, dyspnoea and heart rate decreased, cyanosis disappeared, while the dullness, the auscultatory and radiological findings were unchanged. The laboratory findings were a slightly increased sedimentation rate (27 mm/h), and leukocytosis with a shift to the left. A second throat swab yielded a pure Klebsiella culture, which proved to be sensitive to chloramphenicol and to streptomycin.

On this treatment temperature, discharge and dulness soon decreased. By the

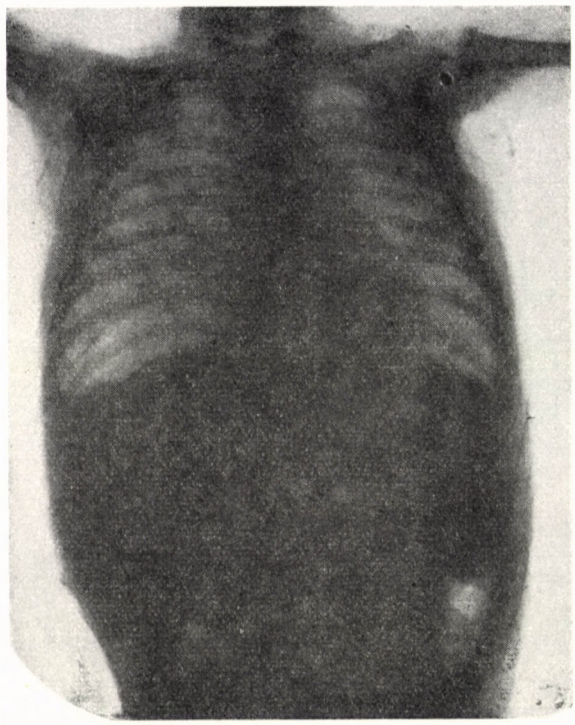

FIG. 2

fourteenth day temperature became normal, the cough stopped and the antibiotics were discontinued. At this time the X-rays revealed a significantly reduced density over the lungs, but the signs of pleural involvement persisted. Four weeks after admission recovery was complete and the baby was discharged.

*Case 2.* M. G. was a premature infant with a birth weight of 2250 g, and with a history of perinatal asphyxia. There had been no incompatibility but owing to hyperbilirubinaemia an exchange transfusion had been carried out. Later, umbilical septicaemia had developed which responded well to antibiotic treatment. Subsequently, anaemia, hepatosplenomegaly and signs of liver damage due to haemolytic disease had been noted. Recovery had been gradual, but at the age of ten weeks the infant was well and weighed 3200 g.

It was then that the patient developed a temperature, cough, hyperpnoea, with an abundant, mucous, foamy discharge. Bubbling rales were heard over both lungs. Despite streptomycin and Sigmamycin treatment, the condition was deteriorating, crepitan rales appeared over the bases. Cultures taken previously yielded Klebsiella and Pneumococcus. According to their sensitivity, kanamycin (20 mg/kg body weight) was prescribed. This resulted in a gradual improvement.

The chest X-ray revealed initial infiltration of the right upper and middle lobe, with the subsequent development of pleural density and microabscesses (Fig. 2). Radiological regression was observed in a month's time.

Laboratory data: sedimentation rate, 115 mm/h; moderate leukocytosis with a shift to the left.

*Case 3.* V. I., a severely damaged five-month-old premature infant with perinatal

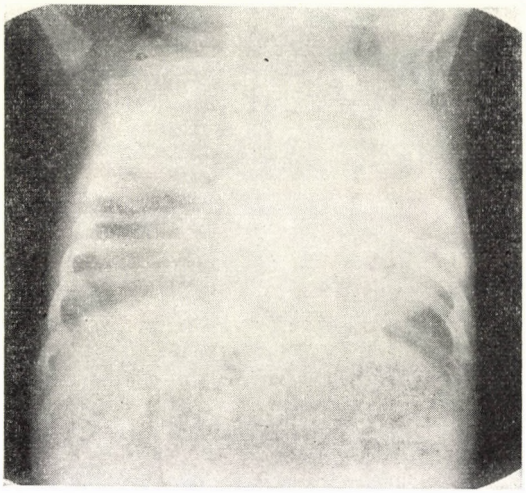

FIG. 3

intracranial haemorrhage was admitted with pneumonia. The course of the pneumonia was atypical and protracted. Throat cultures repeatedly yielded pure Klebsiella, even at the end of the second week. As the condition improved, the Klebsiella disappeared from the throat, to reappear two weeks later in a mixed culture obtained from the auditory meatus during an episode of suppurative otitis. The pneumonia failed to respond to Sigmamycin, but additional corticosteroid treatment resulted in recovery. The otitis was effectively treated with Sigmamycin.

*Case 4.* Á. E., a premature twin (B) was admitted on the first day of his life, with respiratory distress. The right ear was lacking, the auditory meatus was closed and there was a cavernous haemangioma on the left leg. The lower extremities were oedematous. Cyanosis and tachypnoea disappeared on treatment with glucose and bicarbonate, the oedema after four days treatment with hydrochlorothiazide, 2 mg/kg body weight. The infant began to gain weight, his appetite was good. At the age of two months, anaemia (haemoglobin, 7.0 g per 100 ml) was effectively treated with blood transfusions and with oral iron.

At ten weeks of age tachypnoea with a temperature of 38° C and a respiratory rate of 90 developed. Two days later X-rays revealed small, focal infiltrations in the inferior lobes of both lungs. On the fifth day the throat culture yielded a pure Klebsiella growth. Since oxytetracyclin failed to prevent the gradual deterioration, Sigmamycin and cefaloridine (40 mg/kg body weight) were added. On the ninth day the throat swab again yielded Klebsiella, which was sensitive to neomycin and polymyxin only. The condition became worse: irritability, forced cough, and an abundant mucous discharge were noted. A severe shock-like state developed, which was successfully treated with prednisone. On the fourteenth day a pure Klebsiella culture was again obtained from subglottic secretion. Although the combined administration of prednisone and antibiotics led to some clinical improvement, X-rays showed a progression of the pulmonary process; a confluent density was observed over the upper and lower lobes of both lungs (Fig. 3).

The multiple small, focal infiltrates at the bases raised the suspicion of staphylococcal pneumonia, which was justified by the simultaneous presence of other cases

with staphylococcal infection in the department. Accordingly, oxacillin was started. On the seventeenth day a pure Klebsiella culture was obtained again. Then the clinical and radiological state improved and the cultures began to be mixed with *E. coli*. The patient gained weight, rales were no more to be heard over the lungs. It was on the 34th day that the first negative culture was obtained. Four days later the throat culture yielded a normal flora.

Sedimentation rate was within the normal range throughout; leukocytosis with a shift to the left was recorded only initially.

*Case 5.* Á. B., the twin of Case No. 4, was admitted as a premature infant with a birth weight of 1400 g. After overcoming oedema and respiratory distress, she developed normally and attained a body weight of 2500 g. She then contracted a mild bronchopneumonia, simultaneously with his twin sister. Throat cultures repeatedly revealed a pure Klebsiella growth, which had the same sensitivity as that of her twin's. Although the pneumonia responded well to oxytetracyclin and erythromycin, throat cultures became negative only on neomycin treatment.

*Case 6.* H. M., a premature infant with a birth weight of 1200 g, developed well despite recurrent Proteus pneumonias. With one of the relapses, Klebsiella had become to dominate in the throat at a time when a case of Klebsiella pneumonia was being treated in the department. Subsequently, Candida was repeatedly cultured, giving place to Proteus again, two weeks prior to death. In this case Klebsiella was isolated on a single occasion and in mixed growth but on epidemiologic and clinical grounds this case may nevertheless be regarded as one due to Klebsiella.

*Case 7.* N. E., a premature infant with a birth weight of 1400 g was admitted with oedema and respiratory distress. After he had recovered, and at ten weeks of age attained 2000 g he suddenly developed a pneumonia, with a small infiltrate in the right perihilar area. The pharyngeal secretion yielded Klebsiella and *Ps. pyocyanea*, which were sensitive to cefaloridine and neomycin. These were prescribed together with prednisolone. Improvement was gradual, complete recovery took ten days.

## Discussion

All of our seven patients were premature or young infants, with a low birth weight. In addition, they all had had some previous disease such as pneumonia, haemolytic disease of newborns (2 cases), intracranial haemorrhage (1 case), or umbilical septicaemia (1 case). This seemed to represent a predisposing factor to Klebsiella pneumonia, as emphasized also by others [20]. It is well-known that Klebsiella pneumonia is more frequent in adults than in children, with an overall incidence of 0.5 to 4% and that chronic alcoholists, sick and old people are much more inclined to contract Klebsiella pneumonia than healthy persons [9].

Among our patients, a contact infection occurred only once, in the case of the premature twins, and it was remarkable that one of them developed a mild, while the other a very severe, pneumonia. A similar phenomenon was reported by Ferguson and Tower [5] who also observed Klebsiella pneumonia in twins; one of them died of the disease while the other had only slight enteritic symptoms.

All but one of our patients had fever, with no characteristic course. Some had temperatures as high as 39—40° C, while in the less severe case only a slight increase could be

observed. The duration of fever ran parallel with the severity of the case. It usually lasted two weeks, and its disappearance was a reliable sign of improvement.

Cough and expectoration were fairly specific. During the first week a short, irritated cough was observed, with a characteristically mucous, foamy and sticky discharge, often by vomiting. This bronchial secretion, though suggestive also of interstitial pneumonitis, was more voluminous and dense than in the case of the latter disease. Fever, cough and expectoration ceased by the end of the second week, parallel with the clinical improvement.

All of our patients displayed dyspnoea and cyanosis during the first ten days of the disease. The cyanosis was characteristic of pneumonia. A most remarkable feature was its early onset and its failure to respond to oxygen inhalation until clinical improvement had become manifest. An increase in the respiratory rate to 75—90 per minute could be observed even before the onset of dyspnoea, showing further elevation on some occasions, and returning to normal simultaneously with recovery.

The special type of cough and the early tachypnoea were the signs drawing attention to the possibility of a Klebsiella pneumonia especially in cases, where the auscultatory and the radiological findings were not corresponding to the severity of the condition.

The auscultatory findings did not differ much from those observed in other types of pneumonias. As our patients developed Klebsiella pneumonia in the hospital, we had the opportunity to observe the early signs. During the first few days only a harsh breathing was noted. This was followed by medium and fine rales on the third or fourth day. Crepitant rales could be noticed only from the fourth or fifth day on.

The area affected by the pneumonia was variable. Pleural complications intervened in two cases. Fluid collection was slight in both patients, despite the marked pleural involvement in the first one. The pneumonia extended to several lobes.

The radiological signs were of equal diagnostic value, revealing the presence of small abscesses and focal infiltrations. The clinical course of the disease corresponded to the X-ray findings. In addition to the focal infiltrations some were extending to a whole lobe. Our findings corresponded to the morphological classification of Gefferth [7] and of Ritvo and Martin [17]. Radiological changes improved parallel with clinical improvement, but disappeared only about ten days after clinical recovery.

Of the laboratory tests, sedimentation rate was normal or about 20 to 30 mm/hour with the exception of one case, where it attained 115 mm/h. WBC counts ranged between 16,000 and 21,000 during the acute phase, but in some mild cases and in an infant with a grave nervous damage, the count was normal. The differential count always revealed a shift to the left.

## Treatment

Antibiotics were immediately started as the first clinical symptoms had appeared (Table I). Once the culture had revealed the antibiotic sensitivity of the Klebsiella strain, the adequate antibiotic was introduced. Improvement was attained by kanamycin (15—20 mg/kg) in two cases, by neomycin (10—15 mg/kg) in further two patients, and by cefaloridine (30—50 mg/kg) in the remaining three cases. Kanamycin was the most effective of the drugs. Complete recovery was achieved with neomycin in a mild case.

In view of the serious condition in four of the patients, intravenous prednisone or prednisolone was prescribed, which resulted in an immediate improvement. In Table II, data for antibiotic treatment are summarized.

In addition, strophanthin, oxygen, gamma globulin and vitamins were

Table II

Antibiotic treatment of seven patients with *Klebsiella pneumoniae*

| No. of case | Treatment applied before sensitivity test | Condition improved on | Duration of treatment days |
|---|---|---|---|
| 1 | penicillin | streptomycin 26 mg/kg/day | 5 |
| N. M. | streptomycin | kanamycin 15 mg/kg/day | 5 |
| | meticillin | chloramphenicol 15 mg/kg/day | 5 |
| | Sigmamycin, 20 mg/kg/day | | |
| 2 | streptomycin | kanamycin 20 mg/kg/day | 7 |
| M. G. | Sigmamycin, 20 mg/kg/day | | |
| 3 | penicillin | Sigmamycin 25/mg/kg/day | 10 |
| V. I. | streptomycin, 25 mg/kg/day | prednisone 10 mg/day | 2 |
| | | prednisolone 5 mg/day | 10 |
| 4 | Sigmamycin, 20 mg/kg/day | cefaloridine 50—30 mg/kg/day | 13 |
| Á. É. | oxacillin, 100 mg/kg/day | neomycin 10 mg/kg/day | 5 |
| | | prednisone + prednisolone | 9 |
| 5 | chloramphenicol 25 mg/kg/day | neomycin, 10 mg/kg/day | 5 |
| Á. B. | erythromycin 5 mg/kg/day | | |
| 6 | tetracyclin 40 mg/kg/day | cefaloridine 30 mg/kg/day | 14 |
| H. M. | cefaloridine 30 mg/kg/day | chloramphenicol 50 mg/kg/day | 4 |
| | erythromycin 50 mg/kg/day | prednisone + prednisolone | 11 |
| | neomycin 40 mg/kg/day | | |
| 7 | erythromycin | cefaloridine 25 mg/kg/day | 14 |
| N. É. | | chloramphenicol 50 mg/kg/day | 7 |
| | | prednisolone | 11 |

given. In cases yielding a positive throat culture without clinical symptoms, a 0.5—1% neomycin solution was applied locally during three or four days. This measure was followed by bacteriological negativity.


## Summary

Five premature and two young infants with *Klebsiella aerobacter* pneumonia have been observed in the year 1966. All but one patient had previously suffered from some severe illness. Pneumonia was mostly grave, but all the patients recovered. One of the premature infants died later of a Proteus pneumonia. The clinical symptoms and course of, and the radiological signs and laboratory data in Klebsiella pneumonia have been discussed.

Since, according to literature, Klebsiella pneumonia is frequently fatal, the importance of a combined antibiotic treatment has been stressed. In four patients, only the additional use of corticosteroids led to an improvement.


*

We are indebted to Dr. H. Milch, head of the phage and bacteriological laboratory, of the State Institute of Public Health and to the Section of Medicine «A» of our hospital for antibiotic sensitivity tests.

## REFERENCES


1. Anderson, T.: Annual report on the work of infectious diseases hospitals. Glasgow 1965.
2. Ballardini de Morere, S., Werner de Garcia, Q., Gazzo de Mariano, N.: Klebsiella pneumoniae in acute respiratory processes in infants. Arch. Pediat. Urug. **36,** 531 (1965).
3. Benedikt, A., Czappán P., Kalmár, Zs.: Klebsiella törzsek által okozott megbetegedések csecsemőosztályon. Orv. Hetil. **105,** 463 (1964).
4. Dudás P., Augusztin V.: Különféle kórokozók szerepe a kanyarós tüdőszövődményekben. Gyermekgyógyászat. **15,** 80 (1964).
5. Ferguson, J. A., Tower, A. A.: Pneumonia in infants due to Bacillus mucosus capsulatus. Amer. J. Dis. Child. **46,** 59 (1933).
6. Gefferth, K.: Röntgendiagnostik der Säuglingspneumonie. Akademischer Verlag, Budapest 1962, P. 133.
7. Gergely, K., Benedikt, A., Czappán, P., Kneiszl, F., Milch, H., Deák, Zs., Báthory, P.: Klebsiella okozta enteritis járvány koraszülött osztályon. Gyermekgyógyászat **14,** 111 (1963).
8. Horváth, I., Hanny, I., Pethes, A.: Klebsiellák okozta ételmérgezés. Orv. Hetil. **106,** 1417 (1965).
9. Lampe, W. T.: Klebsiella pneumoniae. A review of forty-five and re-evaluation of the incidence and antibiotic sensitivities. Dis. Chest. **46,** 599 (1964).
10. Milch, H., Deák, S.: Studies on Klebsiella infections by phage detection and phage typing. Acta microbiol. Acad. Sci. hung. **11,** 251 (1964—65).
11. Obrinsky, W. K., Dormont, R. E., Fowler, R. E. L., Ruhstaller, F.: Friedländer aerogenes infection in infancy. Amer. J. Dis. Child. **80,** 621 (1950).
12. Očko-Cetčovič, S., Vesenjak-Zmijanak, J.: Outbreak of Aerobacter aerogenes infection in premature and newborn wards. Ann. Paediat. (Basel) **181,** 17 (1953).
13. Orskov, I.: Serological investigation in the Klebsiella group. Acta path. microbiol. scand. **36,** 461 (1955).
14. Orskov, F., Orskov, I., Paerregaard, P.: Nosocomial intestinal infection with Escherichia coli and Klebsiella. Acta path. microbiol. scand. **39,** 67 (1956).
15. Páll, G., Somogyi, Gy., Széchenyi-Nagy, L., Valentinyi P.: Klebsiella szürővizsgálat csecsemő és gyermekosztályon. Orv. Hetil. **108,** 1835 (1967).
16. Perlman, E., Bullowa, J. G. M.: Primary Friedländer (Klebsiella pneu-

moniae) pneumonia: Therapy of B. Friedländer pneumonia. Arch. intern. Med. **67,** 907 (1941).
17. Ritvo, M., Martin, F.: The clinical and roentgen manifestations of pneumonia due to Bacillus mucosus capsulatus. Amer. J. Roentgenol. **62,** 211 (1949).
18. Steiner, B., Putnoky, Gy.: Klebsiella pneumoniae (Friedländer's bacillus) infections in infancy. Arch. Dis. Childh. **31,** 96 (1956).
19. Steiner, B.: Klebsiella pneumoniae pneumonia. Acta med. Acad. Sci. hung. **9,** 381 (1956).
20. Steiner, B., Kovács, K., Székely, O.: Adatok a koraszülöttek és csecsemők tüdőgyulladásának kezeléséhez antibiotikumok kapcsolásával. Gyermekgyógyászat **5,** 169 (1954).
21. Thaler, M. M.: Klebsiella aerobacter pneumonia in infants. Pediatrics **30,** 206 (1962).
22. Ujváry Gy.: Über die Serologie der Klebsiella-Gruppe und das Vorkommen der Serotypen in klinischem Material. Zbl. Bakt. I. Abt. Orig. **176,** 481 (1959).
23. Ujváry, Gy., Angyal, T., Vörös, S., Lányi, B., Gregács, M., Páll, G.: Beobachtungen über die Ätiologie der Gastroenterocoliten des Säuglings- und Kindesalters. Acta microbiol. Acad. Sci. hung. **10,** 240 (1963).

Dr. G. Korányi
Péterffy Kórház
Budapest VII., Hungary