

Epidemiological Significance of Sporadic Cases of Pneumocystosis

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Abstract. Our previous epidemiological studies of pneumocystis pneumonia revealed the importance of sporadic cases for the origin of epidemics. For these cases the same laws are valid which apply to cases of mass occurrence. As actual sporadic cases cannot be considered those individual instances which have a source in some epidemic occurring in another locality. The author specifies them as cases of seemingly sporadic character. Examples of the author's own experience are presented and the hitherto published sporadic cases are recapitulated from the epidemiological viewpoint.

The necessity of dealing with sporadic cases of pneumocystosis from the epidemiological viewpoint arose immediately after we—on the basis of an exact chronologic and local correlation used in our study of this disease—had drawn the conclusion (KUČERA 1966a, b) that cases initiating an epidemic of pneumocystosis are usually those which could be designed as sporadic because they are not linked with any other epidemic. It is rather strange that up till now sporadic cases of pneumocystosis have not been studied from the epidemiological viewpoint, although more than 240 of them have been described, together with cases of seemingly sporadic character. This article is meant to elucidate at least to a certain extent the forthcoming problem.

MATERIALS AND METHODS

As descriptions of "sporadic" cases of pneumocystosis are rather dispersed throughout the respective scientific literature, being presented mainly in the form of case reports, I considered it necessary to recapitulate them in table-form. Table 1 is of course meant to present not only a mere summarization of these cases, but also a critical evaluation of the data which could be used for epidemiological purposes. In studying pneumocystosis on a territory, the center of which in the years 1951—1955 was the town Gottwaldov in Czechoslovakia, we observed—next to the cases which had initiated the six investigated epidemics (KUČERA 1966a, b)—

also some cases of solitary occurrence, showing at their start no connection with the six epidemics studied and exhibiting by themselves no initiating influence on the origin of further epidemics. Most frequently they were detected only at autopsy, some of them even past the mentioned period. In studying these cases, we proceeded in the same way, using the "depistage" method described in the preceding paper of this series (KUČERA 1966b), to be able to determine whether the cases occurred were true sporadic pneumocystoses.

RESULTS

Table 1 recapitulates on the one hand cases presented by original papers accessible to us, on the other hand several sporadic cases the original descriptions of which remained unaccessible for us till today. As to the second group, it includes partly the cases which were not published by those who had come upon them, but by other authors who were informed on them only by personal communication (CAMPOS, HOOGSTATEN and McLAUNDERS, PARKER and TCHETTER) and partly those cases which we were unable to study from the original reports, because up till now we have not been in a position to provide the original papers (GARAVELI 1953, DONOHUE 1954, HOLLAND and WARD 1960, DE NICOLA 1946, IZAK and WOLMANN 1956, BENEVOLO and ELIA 1957, BIGNAMI and IOPPOLO 1957, PEPLER 1958, VAIL 1960). The short notions presented by authors referring to these original publications do not offer any possibility of evaluating the epidemiological data; this is why in Table 1 in some instances the respective data are missing.

As seen from the table, the fundamental epidemiological data are as a matter of fact missing also in the majority of other papers. Most of the sporadic cases can not even be localized as to the place of birth; it is impossible to differentiate the infants born in a maternity home from those born apart from a hospital, to determine the place of living of the infant or the adult in the period of the onset of pneumocystis pneumonia and in many instances there is no possibility of deriving the date of the onset of the disease, not to speak about social conditions of the family in which the patient was living. Notes of this kind are occurring very rarely in the respective publications (DAUZIER et al. 1956, KLEIN 1958, HOWARD and SHELDON 1958, SHELDON 1959, HENDRY and MYERS 1959, WILSON et al. 1960, PAVLICA 1962, KUČERA and VALOUŠEK 1966).

We studied 6 epidemics of pneumocystis pneumonia taking place in two institutes for healthy infants (so-called "well-baby" clinics) (KUČERA 1966a, b). The results of our studies revealed that all cases initiating the epidemics were of sporadic character, because the respective infants were born in country houses or were removed to them shortly after delivery in a maternity home. In the institutes or houses in question no other human affections with pneumocystis pneumonia were recorded. The hygienic conditions in country houses were very insufficient and the surroundings harboured a great number of small synanthropic and exo-anthropie rodents.

In this connection we must point out the sporadic character of the case which initiated the third epidemic in the well-baby clinic at Kyjov and which was described rather in detail in my previous paper (KUČERA 1966b) as an attempt of the mother to kill the infant immediately after delivery.

In 1951—1955 further cases of pneumocystosis occurred within the mentioned territory, without any connection to the epidemics described above; I shall give here in detail only one case with a post-mortem demonstration of the parasite.

J. S., a girl born on November 9th, 1954 in a maternity home at Gottwaldov; her birth weight was 2200 g. In an isolation ward of this maternity home the infant remained till November 16th, 1954; then she was brought to her home at Trnava near Slušovice (Moravia). This village is known in the given territory for its poor hygiene, the same as the village Kašava (Moravia) reported on in my previous article. At home a disorder starting with dyspnoea, pallor and tachypnoea was noted in the child on February 27th, 1955. On March 2nd, 1955 she was admitted to the department for sick children at Gottwaldov with a respiration frequency of 104/min., heavy dyspnoea and a typical X-ray picture, indicating interstitial pneumonia. In spite of an intensive treatment with oxygen, aureomycin, penicillin, cardiac remedies and Opticor, the infant died on March 8th, 1955. The autopsy No 143 (VANĚČEK) confirmed the clinical diagnosis of pneumocystis pneumonia. Due to a large number of histologically demonstrated pneumocysts the lungs were used for the production of antigen (pneumocystin).

At the time J. S. was born in the maternity home at Gottwaldov, the well-baby clinic was practically empty. In the department for sick children, at a distance of about 200 m from the maternity home and from the well-baby clinic, no sick infant was present that would have displayed the signs similar to pneumocystis or interstitial pneumonia. A depistage on March 9th, 1955 at Trnava (Moravia) revealed that after she had arrived home, J. S. got in very poor hygienic conditions. In autumn and during winter of the mentioned year numerous small rodents were observed in the village and in the vicinity of the house where the infant was living. On March 15—16th, 1955 when I was catching rodents there, I found *Pneumocystis carinii* in the lungs of a young mouse (*Mus musculus*).

Except the period 1951—1955 further sporadic cases occurred in the same territory, initiated however by sources coming from outside this territory. As an example I can present the following case:

R. J., a girl, was born on July 4th, 1958 at Zlaté Moravce in Slovakia in very poor hygienic conditions, namely in a caravan (type of a hay waggon) dwelt by a gypsy family. Her mother died during delivery, father was unknown. She was brought up by her aunt and was not breast-fed at all. To a health center she was brought for the first time on September 15th, 1958 by her aunt. The child displayed respiratory difficulties. On September 19th, 1958 she was admitted to the department for sick children at Kroměříž for interstitial pneumonia. In the treatment oxygen and antibiotics were applied, but the infant died on September 23rd, 1958. The autopsy (VANĚČEK rec. No. 423) revealed bilateral pneumonia, mucous bronchi-

Table 1. Sporadic cases of pneumocystosis

1	2	3	4	5	6
ARGENTINA					
Buenos Aires					
AUSTRALIA					
Sydney					
(Royal Alex. Hospit)	1948	—	1948	7 months	Sydney
Sydney					
(Royal Alex. Hospit)		—	—	2 1/2 years	—
AUSTRIA					
Vienna (Univ. Ped. Clin.)	1951 (I)	—	1950 (XII)	5 1/2 months	—
Vienna (Univ. Ped. Clin.)	1953 (III)	—	1953 (II)	5 1/2 months	—
Vienna (Univ. Ped. Clin.)	1953 (XI)	—	1953 (XI)	9 months	—
Vienna (St. Anna's Hosp.)	—	—	—	9 weeks	—
Vienna (Child. Hosp.)	1953 (VII)	—	1953 (VI)	8 weeks	—
Graz	—	—	—	68 years	—
BRAZIL					
Rio de Janeiro	1911	—	—	adult	—
Sao Paulo (Casa Mat. e					
Inf. "L. Mendes de Barr-		—	—	8 months	—
os")					
Salvador					
(Univ. Bahia Clin. Med.)	1963 (IV)	at home	1963 (III)	25 years	
Sao Paulo (Hosp. de Clin.)				4 months	Ribeirão
					Préto
					Sao Paulo
BULGARIA					
St. Karadža	1962 (VIII)	Varna	1962 (V)	3 1/2 months	
(Učastkova boln.)		okruž.			
		bolnica			
Varna (okruž. bolnica)	1962 (VI)	Varna	1962 (VI)	4 months	—
		okr. bol.			
Plovdiv	1963 (XII)	—	1963 (XI)	2 months	—
(Centre de Puericulture)				10 days	
CANADA					
Montreal					
(St. Justine's Hosp.)	1930 (V)	—	—	10 weeks	—
Montreal					
(St. Justine's Hosp.)	1930 (X)	—	—	10 weeks	—
Montreal (Child. Hosp.)	1934 (VIII)	—	—	12 weeks	—
Montreal					
(St. Justine's Hosp.)	1935 (VIII)	—	—	10 weeks	—
Montreal					
(St. Justine's Hosp.)	1936 (XI)	—	—	16 weeks	—
Montreal					
(St. Justine's Hosp.)	1941 (VII)	—	—	14 weeks	—
Montreal					
(St. Justine's Hosp.)	1947 (I)	—	—	10 weeks	—
Montreal					
(St. Justine's Hosp.)	1947 (IV)	—	—	12 weeks	—
Montreal					
(St. Justine's Hosp.)	1955 (VII)	—	—	8 weeks	—

7	8	9	10	11	12	13
.	.	.	.	.	Garaveli (cit. Prandi)	1959
—	—	—	—	—	Reye, Seldam	1956
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Herbich	1953
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Moritsch	1953
—	—	—	—	—	Zandanell	1955
—	—	—	—	—	Schmid	1964
—	—	—	—	—	Chagas	1911
—	—	—	—	—	Luisi	1960
.	.	.	.	.	Campos	—
worker	—	—	—	—	(cit. Brito, Enge)	—
(mestiço)	—	—	—	—	Silva et al.	1965
—	—	—	—	—	Albarelli	1965
—	—	—	—	—	Gardevski,	1962
—	—	—	—	—	Bakarjiev	—
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Vapcarov et al.	1965
—	—	—	—	—	Berdnikoff	1959
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem

1	2	3	4	5	6
Montreal (St. Justine's Hosp.)	1955 (VIII)	---	---	12 weeks	---
Montreal (Roy. Victoria H.)	1945 (VII)	---	1945 (IV)	60 years	Japan
Saskatoon (St. Paul's Hosp.)	1947 (III)	---	1947 (I)	7 months	Central Saskatchewan
Saskatoon (Univ. Hospital)	1956 (II)	---	---	6 months	Central Saskatchewan
Saskatoon	1952	---	---	---	South Saskatchewan
Toronto	1953	.	.	17 months	.
Ontario	1954	.	.	.	.
Quebec (Enf. Jesu Hosp.)	1953 (IV)	Hosp.	1953 (IV)	5 months	---
Quebec (Enf. Jesu Hosp.)	1954 (VII)	---	1954 (VII)	6 months	---
Quebec (Enf. Jesu Hosp.)	1954 (XI)	---	1954	3 months	---
Winnipeg	1957	.	.	.	.
Brandon (Gen. Hosp.)	1959 (II)	Brandon	1959 (II)	4 months	---
Toronto (Gen. Hospital)	1959 (I)	Hosp.	1958 (X)	36 years	Japan
Montreal (Roy. Victoria Hosp.)	1956 (XI)	Hosp.	1956 (XI)	105 days	---
CHINA					
Peking	1931	---	---	3 months	---
Peking	1937	---	---	3 months	---
CUBA					
Habana (Hosp. Docente Cde M. Fajardo)	1963 (XI)	---	1963 (3 X)	39 years	Habana (?)
CZECHOSLOVAKIA					
Plzeň	1951	---	---	60 years	---
Šahy	---	---	---	infant	---
Martin	---	---	---	infant	---
Levice	---	---	---	infant	---
Mikuláš Lipt.	---	---	---	infant	---
Žilina	---	---	---	infant	---
Trnava	---	---	---	infant	---
Trnava	---	---	---	infant	---
Nitra	---	---	---	infant	---
Nitra	---	---	---	infant	---
Nitra	---	---	---	infant	---
Plzeň	---	---	---	48 years	---
Nový Jičín	1952	---	1952	3 months	---
Nový Jičín	1952	---	1952	11 weeks	---
Havl. Brod	1952	---	1952	5 years	---
Bratislava	1957	---	---	67 years	---

Table 1. (Continued)

7	8	9	10	11	12	13
					Idem	Idem
			32 years in Canada		McMillan 1947, Hamperl 1956	
				siblings	Gerrard, Moore	1957
				siblings	Idem	Idem
					Gerrard	1958
					Donohue (cit. Gerrard)	1954
					Idem	Idem
			Creche St. Vincent de Paul		Gagne, Hould	1956
			Creche St. V. P.		Idem	Idem
			Creche St. V. P.		Idem	Idem
					Hoogstraten, McLandress (cit. Gerrard)	
		very poor	unsanitary	rats	Hendry, Myers	1959
					Anderson, Barrie	1960
					Junger, Wyllie	1959
			missionary st.		Jirovec	1959
			missionary st.		Idem	Idem
masson	10 years ill		Habana (?)		Paramio	1965
					Vaněk	1952, 1953
					Albrecht, Horka	1953
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Jirovec, Vaněk	1954
				twins	Buček	1953, 1954
				twins	Idem	Idem
					Pavlica	1955
					Klein	1958
Day labourer at the butchery in Bratislava	Now in reti- rement	Poor	Owens little house in the out- skirts of Bratislava			

1	2	3	4	5	6
Olomouc	1957	—	—	26 years	—
Praha (Ped. Clinic)	1959	—	1959	4 years	—
Praha (Ped. Clinic)	1958	—	1958	4 years	—
Praha (Ped. Clinic)	1958	—	1958	9 years	—
Praha (Ped. Clinic)	1952/55	—	—	1 y. 5 months	—
Praha (Ped. Clinic)	1956/57	—	—	1 y. 4 months	—
Opava	—	—	—	—	—
Kyjov (Maternity h.)	1961 (II)	in utero	transpla- centary	0 days	Kyjov
Praha (Univ. Med. Clin.)	1960	—	1960	30 years	—
Košice	1954 (III)	—	1954	4 months	at home
Šahy	1956 (XI)	—	1956 (XI)	3 1/2 months	—
Gottwaldov	1963 (IX)	Slavičín	1963 (VII)	3 months + 3 weeks	Slavičín Maternity home
Gottwaldov	0	Slavičín	1963 (VII)	2 months (begin)	Slavičín Maternity home
Frýdlant (Hospital)	1962 (X)	Liberec Ped. dept. of hospital	1962 (X)	4 1/2 months	at home
DENMARK					
Copenhagen	1950	—	—	infant	—
Odense (Child. Hosp.)	1953 (V)	—	—	3 months	—
Odense (Child. Hosp.)	1954 (IV)	—	—	2 months	—
FINLAND					
Turku (Child. Hosp.)	—	—	—	7 months	—
FRANCE					
Bordeaux	—	—	—	—	—
(„Maison maternelle“)	1950 (V)	—	1950	3 months	—
Strasbourg (Clin. Inf.)	1951 (II)	—	1951 (I)	3 months	—
Paris (Clin. Ped.)	1963 (VIII)	—	1963 (VIII)	8 months	—
GERMANY					
Hamburg—Eppendorf (Univ. Ch. Clin.)	1950/53	—	—	infant	at home
Hamburg—Eppendorf (Univ. Ch. C.)	1950/53	—	—	infant	at home
Hamburg—Eppendorf (Univ. Ch. C.)	1950/53	—	—	infant	at home
Dresden—Joh. (Child. Clin.)	1950/52	—	—	infant	at home
Dresden—Joh. (Child. Clin.)	1950/52	—	—	infant	at home
Dresden—Joh. (Child. Clin.)	1950/52	—	—	infant	at home
Dresden—Joh. (Child. Clin.)	1950/52	—	—	infant	at home

Table 1. (Continued)

7	8	9	10	11	12	13
—	—	—	—	—	Mür	1959
—	—	—	—	—	Klíma	1959
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Benešová, Houštěk	1957
—	—	—	—	—	Idem	1962
—	—	—	—	—	Lebeda	1961
Mother in agricult.	—	—	—	—	Pavlica	1962
—	—	—	—	—	Braun et al.	1961
—	—	—	—	—	Lukáči, Urbanský	1958
—	—	—	—	—	Gašek	1958
Mother had not a steady job. Last time she worked as a forest day labourer. Unmarried. Before giving birth to the twins she had three children.	Bad	Poor	Unsanita- ry	Rodents dogs twins	Kučera 1965, Kučera, Valoušek	1966
—	Bad	Poor	Unsanita- ry	Rodents dogs twins	Idem	Idem
—	—	—	—	—	Kolaczek, Gostof	1965
—	—	—	—	—	Gormsen (ex post)	1950
—	—	—	—	—	Laursen Helga	1955
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Hakulinen, Määttä	1965
—	—	—	—	—	Martin 1957, Traissac, Martin	1957
—	—	—	—	—	Sacrez et al.	1952
—	—	—	—	—	Le Tan Vinh, Cochard	1963
—	—	—	—	—	Harnack	1954
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Lorenz	1953
—	—	—	—	—	Idem	1953
—	—	—	—	—	Idem	1953
—	—	—	—	—	Idem	1935

1	2	3	4	5	6
Köln (Univ. Ped. Clin.)	1952/53	---	---	infant	at home
Köln (Univ. Ped. Clin.)	1952/53	---	---	infant	at home
Köln (Univ. Ped. Clin.)	1952/53	---	---	infant	at home
Köln (Univ. Ped. Clin.)	1948/49	Barracks	---	64 days	Maternity home
Münster (Univ. Ped. Clin.)	1942/52	---	---	infant	at home
Münster (Univ. Ped. Clin.)	1942/52	---	---	infant	at home
Münster (Univ. Ped. Clin.)	1942/52	---	---	infant	at home
Jena (Univ. Ped. Clin.)	1950/53	---	---	infant	at home
Jena (Univ. Ped. Clin.)	1950/53	---	---	infant	at home
Jena (Univ. Ped. Clin.)	1950/53	---	---	infant	at home
Bethel (Child. Hosp.)	1955	---	1955	3 months	---
Tübingen (Univ. Ped. Clin.)	1956 (XI)	---	1956 (IX)	9 1/2 months	---
Tübingen (Univ. Ped. Clin.)	1960 (XI)	---	1960 (IX)	2 3/4 years	---
Eberswalde (County Hosp.)	1956 (X)	County H.	1956	1 year	---
Hamburg—Davenstedt	1955 (III)	---	---	8 months	---
GREAT BRITAIN					
Birmingham (Child. Hosp.)	1950 (XII)	---	1950 (XII)	12 weeks	---
Glasgow (Roy. H. Sick Child.)	1950 (III)	---	1950 (III)	6 months	---
Glasgow (Roy. H. Sick Child.)	1955 (I)	---	1954 (XI)	20 months	---
Dundee (Royal Inf.)	1955 (VIII)	---	1955 (VII)	10 months	---
Dundee (Royal Inf.)	1956 (III)	---	1955 (XII)	13 months	---
Aberdeen (Roy. H. Sick Child.)	1958 (I)	---	1957 (XI)	11 1/2 months	---
Oxford (Radcliffe Inf.)	1958 (VI)	---	1958 (IV)	6 months	---
London (H. for Sick Child.)	1959 (VI)	---	1959 (VI)	6 m + 3 weeks	probab. at home
London (H. for Sick Child.)	1959 (VIII)	---	1959 (VII)	2 years	---
Pendlebury (Manchester Child H.)	---	---	---	8 months	at home
Manchester (Royal Inf.)	1959 (IX)	---	1959 (VIII)	26 years	---
Leeds (St. James' Hosp.)	1959 (IV)	---	1959 (IV)	9 months	---
London (Charing Cross H.)	1957 (IX)	---	1957 (VIII)	34 years	---
London (Charing Cross H.)	---	---	---	47 years	---
London (Charing Cross H.)	---	---	---	37 years	---
London (Westminster H.)	1960 (II)	---	1959 (XI)	57 years	---
London (Westminster H.)	1960 (II)	---	1959 (XI)	2 1/2 years	---
London (Westminster H.)	1960 (IV)	---	1960 (IV)	30 years	---
London (Westminster H.)	1960 (IX)	---	1960 (IX)	35 years	---
---	1963	---	1963 (verisimil.)	42 years	---

Table 1. (Continued)

7	8	9	10	11	12	13
					Bachmann	1954a
					Idem	Idem
					Idem	Idem
					Idem	1954b
					Kosenow	1954
					Idem	Idem
					Idem	Idem
					Essigke	1954
					Idem	Idem
					Idem	Idem
					Müller, Vietor	1954
					Kossel	1962
					Idem	Idem
				In contact with a case of pn. pn.	Conradi	1957
					Koecher	1956
					Baar	1955
		excellent home conditions		siblings	Hutchison	1955a, b
		Idem		siblings	Idem	1955
					Bird, Thompson	1957
					Idem	1957
					McKay, Richardson	1959
				siblings	Aherne	1960
				siblings	Marshall et al.	1964
					Idem	1964
					Russel	1959
					Williams et al.	1960
					Allibone et al.	1964
					Symmers	1960
					Idem	1960
					Idem	1960
					White et al.	1961
					Idem	1961
					Idem	1961
					Idem	1961
	12 years ill				Symmers	1965

1	2	3	4	5	6
GREECE Athens (Ped. Clinic Panepistemon)				6 months	Crete
IRELAND Dublin (Child. Hosp.) Ireland	1961 (XII)		1961 (XII)	2 months	
ISRAEL Haifa	1959 (VI)		1959	23 years	Bokhara
ITALY Bologna Bologna Roma Roma Roma Roma				3 months	
	1960 (I)		1960 (I)	4 1/2 months	Roma
NETHERLANDS Amsterdam (Inst. Trop. Med.) Amsterdam (Inst. Trop. Med.) Amsterdam (Inst. Trop. Med.)	1941			3 months 4 months 21 years	
NEW GUINEA Port Moresby (Gen. Hosp.) Port Moresby (Gen. Hosp.) Port Moresby (Gen. Hosp.)	1960 (X) 1960 (VII) 1961 (IV)?		1960 (VI) 1961 (IV)	13 months 5 years 6 months	Milne Bay Kikori
POLAND Warsaw (Ped. Clin.) Stetin (Ped. Clin.) Gdańsk (Danzig) Wrocław Warsaw (Ped. Clin.) Krakow (Klin. Ped.)	1954 (XI) 1954 (X) 1955 (IX) — — 1963 (XII)		1954 (IX) 1954 (X) — — — 1963 (III)	5 months 14 weeks 6 weeks 13 months 1 1/2 years 3 months	
ROUMANIA Cluj (Ped. Clin.)	1956			4 months	
SOVIET UNION Moscow Moscow	1957 (IV) 1958 (V)			4 months 4 1/2 months	
SWEDEN Lund (Ped. Clin.)	1946 (I)		1945 (XII)	3 months	

Table 1. (Continued)

7	8	9	10	11	12	13
					Vlachos et al.	1965
					Cahalane	1962
					Holland, Ward	1961
					(cit. Cahalane)	
					Kaftori et al.	1962
					Izak, Wolman	1955
					(cit. Jirovec)	
					De Nicola (cit. Martinelli)	1946
					Idem	Idem
					Benevolo, Elia	1957
					(cit. Martinelli)	
					Bignami, Ioppolo	
					(cit. Martinelli)	1957
					Idem	Idem
					Bosman	1965
					Meer, Brug	1942a, b
					Idem	Idem
					Idem	Idem
					Ryan	1962
					Idem	Idem
					Idem	Idem
					Brokman et al.	1955
					Dominiczak, Pro-	
					chorova	1956
					Żoltowska	1956
					Kozarska	1956
					Wojnarowski	1964
					Hornik et al.	1965
					Mihalca et al.	1959
					Ter Grigorova, Iva-	
					novskaya	1958
					Vail	1960
					Vishnevetsaya	1959
					Linell	1949

1	2	3	4	5	6
Örnsköldsvik (County Hosp)	1959 (V)		1959 (IV)	4 1/2 years	
Örnsköldsvik (County Hosp)	1960 (VI)		1960 (VI)	55 years	
SWITZERLAND					
Zürich (Ped. Clin.)	1956		1956	3 months	
Bern (Path. Inst.)				37 years	
Bern (Path. Inst.)				1 1/2 year	
Bern (Path. Inst.)				3 months	
TURKEY					
Istanbul (Child. Clin.)	1954			infant	
UNION OF SOUTH AFRICA					
U.S.A.					
Memphis (Tenn.) (Bapt. Mem. Hosp.)				54 years	
Memphis (Tenn.) (Bapt. M. H.)				28 years	
Milwaukee (County Gen. Hosp.)	1953 (IX)		1953 (VIII)	7 1/2 weeks	
Norwalk (Conn) (Norw. Hosp.)	(XI)			21 months	
Oklahoma City (Okl. Med. Sch. H.)	1954 (X)		1954 (X)	11 weeks	
Oklahoma City (Okl. Med. Sch. H.)	1956 (?)			13 months	
Atlanta (Georgia)	1957	Atlanta? Occas. visits of relat. 20 miles from A.		7 months	Atlanta
Syracuse (St. Jos. Hosp.)				15 years	
Syracuse (St. Jos. Hosp.)				23 years	
Tucson (Ariz.) St. Mary's H.)	1957 (III)		1957 (I)	6 months	Tucson
Enid (Okla.) (St. Mary's H.)	1954 (X)		1954 (IX)	5 months	
(Connecticut)					
(Connecticut)				9 months (approx)	

Table 1. (Continued)

7	8	9	10	11	12	13
					Nathorst-Windahl et al.	1964
					Idem	Idem
					Prandi F.	1957
					Roos, Keller	1960
					Idem	Idem
					Idem	Idem
			Poor-house in Istanbul		Unat	1955 a, b
					Pepler	1958
					Wyatt et al.	1953
					Hamperl	1956
					Idem (A problematic case)	Idem
					Lunseth et al.	1955
					(A problem. case)	
					Dauzier et al.	1956
			House at the edge of a marsh Two towns widely separated in Okla.	Mice	Russel, Nelson	1956
					Idem	Idem
			Atlanta	0	Howard, Sheldon	1958
		Said to have been clean				
		Two room appartm.	Residents of two outlying towns		Dick et al. (Diagnosed serologically by Plenk)	1957
					Idem	Idem
			Tucson		Eberling, Cohen	1958
					Shuttee	1958
				Siblings	Scruggs (Rindge)	1959
					(A problem. case)	
				Siblings	Idem	Idem
Nursing attendant in a State Tuberc. Sanat.	Now in retire- ment					

1	2	3	4	5	6
Atlanta (Georg.) (Emory Univ. Hosp.)	1958 (V)			10 years	Little town 15 miles from Atlanta
Atlanta (Georg.)	1958 (I)		1958 (I)	3 months	Atlanta, at home
Atlanta (Georg.)				4 months	
Atlanta (Georg.)				3 1/2 months	
Chicago (Northw. Univ.)	1960			4 months	Suburban or semirural areas within 200 miles from Chicago.
Chicago (Northw. Univ.)	1960			11 months	Idem
Chicago (Northw. Univ.)	1960			18 months	Idem
Chicago (Northw. Univ.)	1960			—	Idem
Chicago (Northw. Univ.)	1960			2 years	Idem
Birmingham (Ala) (Vet. Adm. H.)	1956 (V)		1956 (IV)	39 years	
Dallas (Tex) (St. Paul's H.)	1958 (III)		1958 (II)	30 years	
New York (Mount Sinai)	—	—	—	78 years	Austria
Sundown (Tex.)	1958 (X)	De Leon (Tex)	—	6 months	Leveland (Tex.)
New Orleans (Charity H.)	1958 (IX)	—	1958 (VII)	9 months	Place 25 miles north of N. O. near Mississippi
(California)				3 months	
Galveston (Tex) (J. Sealy II.)	1958 (X)		1958 (VIII)	7 months	
Minneapolis (Min. Hosp.)	—		—	1 year	
Minneapolis (Min. Hosp.)	—		—	6 weeks	
Lake City (Fla) (Vet. Adm. H.)	1959/60			38 years	
Lake City (Fla) (Vet. Adm. H.)	1959/60			37 years	
Minnesota (Variety Club Heart II.)	1959 (I)		1959 (I)	12 months	
Minnesota (Univ. Hosp.)	1959 (XI)		1959 (X)	7 months	
New York (Kings County H.)	1959 (VI)		1959 (III)	49 years	Haiti
Durham (N. Car.) (Duke Univ. Med. Center)	—		—	5 months	
Durham (N. Car.) (Duke U. M. C.)	—		—	6 months	
Durham (N. Car.) (Duke U.M.C.)	—		—	13 months	

Table 1. (Continued)

7	8	9	10	11	12	13
Father tool and day worker	—	—	Little town 15 miles from Atl.	—	Sheldon	1959
Father: steel mill, worker mother cotton mill worker	Poor	Poor	Outskirts of A. Little house in milltown type section.	Mice, rats roaches occasion. Dog, chickens in back-yard. Siblings Siblings	Idem	Idem
—	Negro	—	—	—	Idem	Idem
—	Negro	—	—	—	Idem	Idem
—	—	—	—	—	Rowley, Kidd	1961
—	—	—	—	—	Idem (Concern. the age also Cramer et al.)	Idem
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem
Farmer	—	—	—	—	Idem	Idem
—	—	—	—	—	Winslow, Hathaway	1959
—	—	—	—	—	Capers, Lee Dorothy	1960
—	—	—	—	—	Rubin, Zak	1960
—	—	—	Sundown	Mice	Wilson et al.	1960
—	—	—	25 miles from N. O.	—	McNeal, Yaeger 1960, McNeal, Grunt	1959
—	—	—	—	—	Parker, Tchetter 1958 (cit. Wilson et. al.)	1960
—	—	—	—	—	Rowe Caroline	1960
—	—	—	—	—	Feinberg et al.	1961
Longshoreman	—	Negro	Jacksonville	—	Idem	Idem
Labourer	—	Negro	Jacksonville	—	Robinson (A problem. case)	1961
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Burke Barbara et al.	1961
Shipping clerk	—	—	N. York	—	Idem	Idem
—	—	—	—	—	Hennigar et al.	1961
—	—	—	—	—	Hendry, Patrick	1962
—	—	—	—	—	Idem	Idem
—	—	—	—	—	Idem	Idem

1	2	3	4	5	6
Durham (N. Car) (Duke U.M.C.)				2 years	
Durham (N. Car) (Duke U.M.C.)				3 years	
Durham (N. Car) (Duke U.M.C.)				3 1/2 years	
Durham (N. Car) (Duke U.M.C.)				6 years	
Durham (N. Car) (Duke U.M.C.)				10 years	
Durham (N. Car) (Duke U.M.C.)				20 years	
Durham (N. Car) (Duke U.M.C.)				29 years	
Durham (N. Car) (Duke U.M.C.)				41 years	
Durham (N. Car) (Duke U.M.C.)				52 years	
Durham (N. Car) (Duke U.M.C.)				62 years	
Rochester (Min.) (Mayo Clin.)	1960 (III)		1960 (I)	5 1/2 months	
Sherman (Tex) (St. Mary's H.) (Gener. Hosp.)	1960 (X)		1960 (IX)	6 months	
Appleton (Wisc) (St. Elisabeth. H.)	1961 (II)		1960 (XII)	9 1/2 months	
Denver (Colo) (Vet. Adm. H.)				17 years	
Denver (Colo) (Vet. Adm. H.)	1963 (XI)		1963 (XI)	16 years	
St. Louis (Miss) (Child. Hosp.)	1962		1962	4 months	
St. Louis (Miss) (Child. Hosp.)	1962		1962	9 months	
St. Louis (Miss) (Child. Hosp.)	1962		1962	20 months	
St. Louis (Miss) (Child. Hosp.)	1962		1962	6 months	
(North Carolina)				5 1/2 months	
(North Carolina)	1963	Graham Duke Ped. Center	1963	46 years	
Gainesville (Fla.) (Unit. Teach. Hospital)	0		1964 (VII)	8 years	
Charleston (W. Va.) (Mem. Hosp.)	1964 (II)	Charleston B. Mem. Hosp. as out-patient	1964 (II)	8 years	
New York (Mem. Hosp. and Jones Ewing Hosp.)	1963 (V)		1963 (I)	53 years	
New Haven (Grace Com. Hosp.)	1963 (IV)	at home	1963	52 years	"Caucasus"
Rochester (Gen. Hospital)	1963 (IV)	at home	1963	38 years	"Caucasus"
Chicago (Ch. Univ. Hospital)	1958 (VI)			5 years	"Caucasus"

Table 1. (Continued)

7	8	9	10	11	12	13
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Burke E. et al.	1962
					Kramer et al.	1962
					Erchul et al.	1962
					Rifkind et al.	1964
					Idem	Idem
					Cohen et McAlister	1963
					Idem	Idem
					Idem	Idem
					Idem	Idem
					Huneycut et al.	1964
					Idem	Idem
					Robbins et al.	1965
			Charleston		Dotson, Kapcar	1965
	4 years ill				Nicastri, Hutter	1965
	6 months ill				Callerae Mary Lou, Nadel	1966
	4 years ill				Idem	Idem
	neoplasia				Esterly, Warner	1965

1	2	3	4	5	6
Chicago (Ch. Univ. Hospital)	1963 (II)			64 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1963 (IV)			4 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1963 (VI)			8 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1963 (VIII)			54 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1963 (XI)			3 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1963 (XI)			41 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1964 (I)			9 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1964 (II)			30 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1964 (IV)			9 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1964 (VI)			48 years	„Caucasus“
Chicago (Ch. Univ. Hospital)	1964 (XI)			81 years	„Caucasus“
VENEZUELA					
Merida (Hosp. Los Andes)	1955—63			4 months	Merida
Merida (Hosp. Los Andes)	1955—63			1 year	Merida
Merida (Hosp. Los Andes)	1955—63			3 months	Merida
Merida (Hosp. Los Andes)	1955—63			3 months	Sta Bárbara del Zulia
Merida (Hosp. Los Andes)	1955—63			6 months	—
YUGOSLAVIA					
Lublanja (Inst. Path.)	1955			infant	—
Novy Sad (Inst. Path.)	1963 (XII)	Novi Sad Ped. Clin.	1963 (XII)	5 months	—

- Paragraph 1 = Country and place of hospitalisation
 2 = The date of death
 3 = The residence 60 days prior the first symptoms
 4 = The date of initial symptoms
 5 = Age of the deceased patient
 6 = Place of birth
 7 = The occupation of the patient or of his parents

tis and bronchiolitis. Histological examination demonstrated—besides interstitial plasmacell infiltration—numerous pneumocysts in the alveoli.

In one of the preceding papers I described two sporadic cases (twins) from 1963 which—according to a positive intracutaneous test—originated from a single source, most probably from their mother (KUČERA and VALOUŠEK 1966).

Sometimes it is very difficult to decide with complete certainty, whether a case—which seems to be of sporadic character—is not in connection with an epidemic

Table 1. (Continued)

7	8	9	10	11	12	13
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	neoplasia	—	—	—	Idem	Idem
	—	—	—	—	Salfelder et al.	1966
	—	—	—	—	Idem	Idem
	—	—	—	—	Idem	Idem
	—	—	—	—	Idem	Idem
	—	—	—	—	Idem	Idem
	—	—	—	—	Likar, Kresnik (A problem. case)	1956
	—	—	—	—	Rogula et al.	1964

8 = Social condition

9 = Hygienic conditions

10 = Dwelling

11 = Rodents or other animals in the house. Correlation with other cases of pneumocystosis.

12 = The author evtl. from where the citation was quoted

13 = The date of publication.

of pneumocystis pneumonia. Another time it is relatively easy to class such a case in a group of seemingly sporadic pneumocystoses. An example of such a seemingly sporadic affection is given below:

M. N., a boy, was born on September 22nd, 1954 in the maternity home at Hranice nad Bečvou (Moravia); his birthweight was 2200 g. On September 24th, 1954 he was transferred to the center for immatures at Olomouc (Moravia). Herefrom he was discharged and sent home to Kamenec (Moravia) on December 7th, 1954. Still

on the same day, however, he had to be transferred from Kamenec to the department for sick children at Vsetín (Moravia) due to cyanosis which he displayed while drinking; tachypnoea amounted to 85 breaths per minute and a dyspnoea appeared. Temperature showed only subfebrile values. At Vsetín the boy was hospitalized till December 14th, 1954, therapy consisting of oxygen, Atebrin and streptomycin. On December 14th, 1954 when the symptoms aggravated, the infant was moved over to the department for sick children at Gottwaldov in a very serious state. Here the treatment with oxygen, paludrin and aureomycin was continued until December 22nd, 1954 when the infant died. Autopsy No. 761 (VANĚČEK) confirmed the clinical diagnosis of *pneumocystis pneumonia*. Microscopical examination revealed numerous pneumocysts.

The source of the infection can be searched for in the maternity home at Hranice, where, however, (the same as in the paediatric department) no affection with interstitial pneumonia was observed in the given period. On the other hand, in the well-baby clinic at Olomouc an epidemic took place in 1954 as can be seen from the respective publications from this territory (NESRSTA, DVOŘÁČEK, MINAŘÍKOVÁ 1959). As the occurrence of pneumocystosis in the health-institution for children at Olomouc in 1954 was proved, the source of contamination of the described case must be placed hereto. This case may serve as a good example how the displacement of infants may bring about the transmission of an infection from one territory to the other at a distance of more than 80 km.

No matter whether the infant was contaminated at the maternity home at Hranice or at the well-baby clinic at Olomouc, the case cannot be taken for sporadic, though from the viewpoint of the department for sick children at Gottwaldov, it manifested a sporadic character. It is therefore necessary to create, for epidemiological purposes, next to the category of true sporadic cases another category of "seemingly sporadic cases".

The question of sporadic cases is in close connection with the problem of the occurrence of *Pneumocystis carinii* outside the human organism, with the problem of the active and passive human carriers and at last, with the problem of a predisposition to pneumocystosis. In the present paper we have for the time being pointed only to some aspects of this phenomenon.

DISCUSSION

The sporadic or epidemic occurrence of any infectious disease is usually not a direct and exclusive result of the properties of the parasite, but also a consequence of intricate epidemiological predispositions. On a number of infectious diseases it can be concretely demonstrated which of the epidemiological predispositions are conditioning a mass occurrence of the disease, due to the fact that they are decisively influencing the way in which the infection is being spread. The problem is connected firstly with the accumulation of susceptible persons, secondly with the way of contamination in a given situation. A well known infectious disease as e.g. tuber-

culosis (spreading predominantly by the way of air and thus affecting — same as pneumocystosis — the lungs in the first place) can be used as a model with the aid of which we can design—in a very rough outline—an approximate conception of the epidemiological conditions in which the sporadic cases of pneumocystis pneumonia as well as those of its mass occurrence are originating, even though in pneumocystosis a number of rather specific epidemiological qualities has been observed.

As regards the incidence, pneumocystosis can be compared to lung tuberculosis occurring in strongly “infested” territories, but only in those, where tuberculosis is being intensively fought with all modern methods, including a systematic immunization by means of vaccination and where due to these measures epidemics of this disease are taking place exclusively among children and are, moreover, very rare. Nevertheless sporadic cases of tuberculosis in the same territories do occur simultaneously and constantly.

Pneumocystosis, contrary to tuberculosis, has up till now not been intensively fought in any country. This is the first fundamental difference. The degree of “infestation” with *Pneumocystis carinii* has not been ascertained till today. From the rather scant statistical data on the results of the pneumocystin test (KUČERA, JÍROVEC 1962) we can derive (for limited geographical areas) that the rate of infestation with pneumocystis — same as with *M. tuberculosis*—is growing with the increase of age. The mass occurrence of pneumocystosis as well as of tuberculosis has been noted in several geographical areas, exclusively among children. Contrary to tuberculosis which affects only school-children in the regions observed, a mass occurrence of pneumocystosis has been recorded exclusively in nurslings not exceeding the age of 6 months. Nevertheless even in these infants the incidence of pneumocystis pneumonia is not of a regular character; it occurs only when a sufficient number of particularly susceptible individuals is concentrated among the infants. Furthermore a mass incidence of pneumocystosis has been noted in geographical areas where epidemics of tuberculosis are rare (Central Europe) but only a sporadic incidence in those areas where more frequent epidemics of tuberculosis have been reported (USA).

The explanation of these epidemic limits in pneumocystosis is to be derived from factors different from those which apply to tuberculosis. When comparing the agents causing these two illnesses, it is evident that *Mycobacterium tuberculosis* can provoke a serious damage in any host whom it meets for the first time, *Pneumocystis carinii* on the contrary being not able to multiply except in the most helpless individuals. The conditions enabling the multiplication of *Pneumocystis carinii* in a host have remained unknown. We only can presume them from the known fact, viz. that a large number of hosts suffering from pneumocystis pneumonia are recruiting from premature nurslings up to the age of 6 months and from a further great number of those who—though being mature—suffer from various defects of resistance, identical with the defects which may induce sporadic pneumocystosis in older individuals. It is namely a known fact that pneumocystosis occurs sporadically not only among nurslings up to the age of 6 months, but also in

older children and in grown-up persons suffering from hypogammaglobulinaemia and neoplastic processes and in those who for a long time were receiving medicaments influencing unfavourably the resistance mechanisms (e.g. corticosteroids). I add to these facts another condition: if such individuals have an opportunity of coming in touch with the infection in their surroundings.

From the above-said it can be deduced that in the principle the predisposition of the host, respectively the individual nature of the features conditioning the origin of pneumocystosis are the same in nurslings as well as in adult persons.

That the occurrence of a mass incidence of pneumocystosis depends on the concentration of individuals displaying the mentioned predisposition is evident from the fact that epidemics of this disease as a rule do not occur in those places where for any reason such a concentration cannot take place, as it is the case with children aged more than 6 months and adult persons.

The fact that in some countries greater epidemics of pneumocystosis have not yet been observed, can be ascribed at least to three causes. Either there is not the possibility of a systematic histopathological examination of the lungs of the deceased infants (e.g. for religious, legal or special medical reasons), or there is no occasion for the concentration of susceptible individuals, e.g. because there are not sufficient disposable public means for a systematic, nation-wide sanitary action which would involve all premature infants and healthy nurslings from the discriminated social groups, or on the contrary, because the centres of such a concentration of infants are equipped so well from the hygienic and epidemiological aspects that a propagation of an infection in them has practically been made impossible. These results seem logical if we consider the conditions in which the fight against pneumocystosis is being realized, i.e. with a very unsufficient knowledge of the epidemiology of this disease and imperfect legal measures such as non-existence of a compulsory registration duty, isolation of sick infants etc.

The origin of sporadic cases of pneumocystosis seems mysterious in many instances, if we shut our eyes to the possibility of circulation of this disease between the human and animal sphere. This question will be discussed in another connection and in another paper.

CONCLUSIONS

With regard to the results which we obtained in studying epidemics of pneumocystis pneumonia I am of the opinion that sporadic cases cannot be considered separately from the epidemics, but on the contrary, they should be taken for very important sources of infection which are to be paid much more attention from the epidemiological point of view than it has been done till now.

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