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AN OUTBREAK OF PSITTACOSIS AT THE LONDON ZOOLOGICAL GARDENS

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In all probability latent infection with psittacosis virus has always been present to a certain extent among the birds of the parrot house in the Zoological Gardens. We have in fact some evidence that this was so eight years ago, for Gordon (1930) was able to isolate the virus from two out of eight spleens removed from birds of the parrot family in the Zoological Society's collection, both positive spleens coming from apparently normal birds. Up to 1938, however, no cases of psittacosis had been recognized among the keepers of the parrot house. In February and March of last year a small outbreak occurred involving five members of the Zoological Society's staff, and since conditions allowed of a fairly complete investigation of this outbreak it was thought that it might be of interest to record the findings.

History of the Outbreak

On February 7, 1938, a collection of parrots from South America and the West Indies was received by the Zoological Society. These birds were transported from Southampton by the Zoological Society's staff. On arrival at Regent's Park the parrots were found to be in poor condition and were placed in the Society's sanatorium, there to be kept under observation. On February 11 it was thought that their condition had improved, so they were transferred to the sanatorium room of the parrot house, where they were isolated from the rest of the inmates. Five members of the staff of the parrot house (four keepers and an assistant curator) fed and looked after the birds in question. On February 20 one of the keepers went on holiday and subsequently became ill. He was first seen by one of us (R. A.) on March 1, and was found to be suffering from a bronchopneumonia. On February 21, a Monday, a second keeper was reported to be ill; he had been seen by one of us (R. A.) two days earlier. Five days later, February 26, a third keeper went sick, and on March 5 the assistant curator fell ill. Thus nine days after the birds had been transferred to the parrot house illness appeared among the attendant staff, and within thirteen days four out of five of the men concerned had gone down with a febrile illness accompanied by respiratory symptoms of varying severity. The fifth case was not among the immediate contacts, but occurred in a man who was temporarily employed on the staff of the sanatorium, and who had access to the room in which the suspected birds had been housed, though he was not

concerned with looking after them. He fell ill on February 26 and was admitted to Willesden Municipal Hospital on March 4. This illness ended fatally on the seventeenth day of the disease, and the clinical and post-mortem findings are recorded below by one of us (A. G. T.) in detail. The main epidemiological data are set out in Table I.

TABLE I

Person	Exposure to Infection			Date of Onset of Illness	Outcome of Illness	Laboratory Findings		
	Earliest Date	Degree	Nature of Work			Serum (C.F. Test)	Sputum	Tissues P.M.
J. B.	Feb. 7	Direct	Handled cages in transit from Southampton to London. R. fed and cleaned birds for 14 days	Well				
R.	"	"		"				
P.	"	"		"				
M.	"	"		"				
A.	Feb. 11	"	Parrot house staff who looked after birds in the parrot house sanatorium	"		-		
C.	"	"		Feb. 20	Recovery	+	+	
J. P.	"	"		" 21	"	+	-	
An.	"	"		" 26	"	+		
B.	"	"		Mar. 5	"	+		
H.	Mar. 9	"	Members of staff of "dead house." Handled living and dead infected birds	Well				
L.	"	"		"				
D. P.	"	"		"				
J.	"	"		"				
K.	"	"		"				
C. H.	Feb. 7	Remote	Sanatorium staff who had access to room in which the parrots were kept from Feb. 7 to 11 and possible contact with utensils used for these birds. The duties of S. included emptying into sanitary cart of bins containing the cage cleanings from the suspected birds	"				
T.	"	"		"				
W.	"	"		"				
N.	"	"		"				
Wh.	"	"		"				
D. D.	"	"		"				
D.	"	"		"				
He.	"	"		"				
Wa.	"	"		"				
S.	"	"		Feb. 26	Died	+		+

In view of this state of things Dr. G. M. Vevers, superintendent to the Zoological Society, and Colonel A. E. Hamerton, the society's pathologist, inspected the newly arrived birds in the parrot house sanatorium (March 9). The birds were found to be in poor condition, and one, a macaw, was obviously ill. The birds were moved back to the sanatorium, and the following day the macaw died and a second one, appearing very ill, was killed. A post-mortem examination of the former bird was suggestive of psittacosis, and the organs were sent to the London Hospital for further investigation. The second macaw also showed suggestive post-mortem findings, but microscopical examination of spleen smears (Colonel Hamerton, personal communication) failed to reveal any virus. A Cuban parrot which had been in the parrot house for over a year and which had been placed in isolation in the parrot house sanatorium because of feather-plucking, and had therefore been in contact with the suspected birds, was found on March 15 to be suffering from green diarrhoea and a watery discharge from the beak. When killed and examined the post-mortem appearances were those of psittacosis and spleen smears showed the presence of psittacosis virus (Colonel Hamerton, personal communication). A Guilding's parrot which had been in the Zoological Society's collection for about four years became acutely ill with severe diarrhoea on March 13 and died the next day; it had not been directly exposed to infection from the newly arrived batch of birds. Smears of the spleen of this bird showed the presence of virus (Colonel Hamerton, personal communication); the organs were sent to the London Hospital for a more complete examination. It is not known how infection was carried to this bird. All the remaining birds in the newly arrived batch, as well as the contacts of the Cuban parrot and Guilding's parrot, were then destroyed. The parrot house was closed to the public on March 14.

Clinical History of the Five Human Cases

Only three of the cases—J. P., C., and S.—were seen by the authors (R. A. and A. G. T.) responsible for this part of the paper. The details concerning the other two have been supplied by Colonel Hamerton.

Case An.—Fell ill February 26, fifteen days after first exposure to infection. Attended by panel doctor, who diagnosed the condition as influenza. Remained in bed one week. Returned to work on March 14. A specimen of blood was collected on March 15 for serological examination.

Case B.—Became ill on March 5, twenty-two days after first exposure to infection. Attended by private doctor, who made the diagnosis of influenza. Irregular temperature for a few days, with slight respiratory symptoms. Returned to work March 14. Blood collected for serological examination March 15.

Case J. P.—First seen by one of us (R. A.) on February 19, when he was complaining of headache, backache, abdominal discomfort, lack of appetite, and insomnia. His temperature was 102° F.; there was no sore throat, nor were there any signs in the chest. Little change occurred in the state of this patient until February 23, when sharp colicky pains developed, relieved only by morphine. On this day slight cough, with some dullness and a few moist sounds at the left base, was noted. His condition remained unchanged until February 28, when his temperature began to fall. By March 3 temperature was normal and he felt better, though there was still some cough. Convalescence was slow. Samples of blood and sputum were collected for examination on March 14.

Case C.—Was taken ill on February 20 whilst away on holiday. He returned home on February 28 and was first seen by one of us (R. A.) on March 1. He then had cough and some dyspnoea; the sputum was blood-stained. His temperature was 102° F. and labial herpes was present.

Scattered pneumonic patches were detected. The picture presented by the patient subsequently was that of broncho-pneumonia with copious blood-stained sputum. Insomnia was marked, and morphine was required for its relief. His temperature began to fall on March 10 and by the 15th it was normal. Convalescence was slow. Specimens of blood and sputum were collected for examination on March 15.

Case S.—As already stated, this man was a member of the sanatorium staff and had access to the room in which the suspected birds were housed from February 7 to 11, but it is not known whether he actually went into this room. His work was in the sanatorium yard, where one of his duties consisted in emptying into the sanitary cart the bins containing the droppings from the parrots. On February 22 he was transferred to the quarantine station, and he first fell ill on February 26, though he remained at work until March 1, when he went to see his doctor. He then complained of general aching pains and malaise, shivering, and some diarrhoea, and his doctor sent him home to bed. On March 4 he was admitted to the Willesden Municipal Hospital as a suspected case of enteric fever under the care of one of us

The Chart of Case S.

(A. G. T.). On admission to hospital he looked ill and exhausted. His temperature was 104° F., his pulse 112, and respirations 40. The spleen was not enlarged and there was no rash. The tongue was furred and the mouth dry. He was inclined to be somnolent and lethargic, and these symptoms got much more marked as the disease progressed. He could, however, be roused, and he answered questions in a rational manner until towards his death, when he became comatose. During most nights he was restless; on a few occasions he was violently excited and attempted to get out of bed, these symptoms alternating with delirium of a muttering type. Apart from the progressive lethargy there were no other nervous manifestations or localizing signs of involvement of the nervous system, and the fundi were normal. Headache has been described as a constant feature of this disease. It was, however, absent in this case. On March 7 a troublesome dry cough developed, and there were physical signs of congestion of the bases of both lungs with impaired resonance and a few crepitations. There was never any sputum. On the following

day it was noticed that the patient was slightly jaundiced. He complained on a few occasions of chilliness, but he never had a definite rigor. The urine showed the presence of albumin, but no other abnormality. The patient (whose chart we reproduce on the preceding page) died on March 14.

During the course of this patient's illness the following laboratory investigations were made at the Willesden Municipal Hospital.

Laboratory Investigations of Case S.

Blood Culture.—Culture made on March 5 (eighth day of disease) gave the growth of a Gram-negative diplococcus. This bacterium grew readily on agar and more readily at room temperature than at 37° C., and on blood agar it produced yellowish colonies. It fermented glucose with the production of acid, but was without action on lactose, saccharose, or maltose, and was not agglutinated by meningococcal antisera. It probably belonged to the *flavus* group of the *Neisseria*. A similar organism was isolated from the blood later in the disease.

Widal Reaction.—The presence of agglutinins for *Bact. typhosum* and *Bact. paratyphosum* A and B, and *Brucella abortus*, was tested for on March 6 (ninth day of disease) and March 13 (sixteenth day of disease). The patient was an ex-soldier, and had received prophylactic inoculation against enteric fever. The findings were as follows:

	Titre of serum	
	March 6	March 13
<i>Bact. typhosum</i> (H)	1 in 250	1 in 250
" " (O)	<1 in 25	<1 in 25
" <i>paratyphosum</i> A (H)	1 in 50	1 in 50
" " B (H)	1 in 50	1 in 50
" " (O)	<1 in 25	<1 in 25
<i>Br. abortus</i>	<1 in 25	<1 in 25

Blood Count (March 6).—Red blood cells, 5,000,000 per c.mm.; white cells, 21,600 per c.mm. *Differential count*: Polymorphonuclears, 80.5; lymphocytes, 15; eosinophils, 1; basophils, 0.5; large hyalines, 3 per cent.

Lumbar puncture was carried out on two occasions. On March 7 the total protein was 60 mg. per 100 c.cm., the chlorides 850 mg., and the sugar normal. The cells numbered 795 per c.mm.* Culture revealed no growth. On March 11 the total protein had fallen to 40 mg. and the chlorides to 790 mg. per 100 c.cm.; the sugar was normal. Cells numbered 35 per c.mm. No growth was found on culture.

Post-mortem Examination.—No evidence suggestive of enteric fever was found. The spleen was congested but not enlarged. The lower lobes of both lungs were of a dark purple colour, and on section the cut surface was deep red; blood and a few air bubbles could be expressed. Portions of the affected lobes failed to sink in water. There was no pleural effusion. The heart and kidneys appeared normal; the brain showed congestion and slight oedema.

Comments on Case S.

The result of the first Widal test gave rise to the view that the patient was possibly suffering from typhoid fever, but the absence of O antibodies, the fact that the patient had been inoculated against enteric fever, and the absence of any change in the titre of the antibodies when the Widal test was repeated a week later disposed of this view. The leucocytosis, with a relative and absolute increase of polymorphonuclears, was also against such a diagnosis. Later, when it was learned that the authorities of the Zoological Gardens suspected psittacosis infection

* Mainly polymorphonuclear.

among some of the keepers, the nature of the patient's illness became clear.

The infection of the blood stream was undoubtedly a secondary one. Whether it was of any pathological significance is difficult to say; most probably it was not. The changes in the cerebrospinal fluid are of interest because of the absence of any similar record in the literature. Polayes and Lederer (1932) state that in one of their cases the spinal fluid was under increased pressure and was opalescent owing to red blood corpuscles, but this is the only reference we have been able to find. The intense headache, often occipital, which is such a feature of psittacosis, and which may sometimes be associated with head retraction, suggests that in some cases the meninges may be involved. Whether the changes found in this case were due to the virus of psittacosis it is impossible to say, since no examination of the cerebrospinal fluid for virus was made.

Laboratory Investigations for Evidence of Psittacosis Infection. A: Human Material

The following material was sent to the laboratories of the London Hospital for investigation: *Serum* (for the complement-fixation test) from the patients, C., J.P., An., B., and S.; in addition serum from the parrot house keeper A., who had shown no illness, was included. *Sputum* from Cases C. and J. P. *Post-mortem Material*: portions of lung and spleen from Case S.

Complement-fixation Tests with Serum Samples.—These were carried out by the method, described elsewhere (Bedson, 1937), in which the antigen employed is a partially purified suspension of virus obtained from virulent mouse spleen, heated at 100° C. for thirty minutes. The results are given in Table II.

TABLE II.—Complement-fixation Test with Sera from Outbreak

Donor of Serum	Exposure to Infection	Day of Disease when Collected	Result of Test					
			Serum Dilution	Antigen + 2 M.H.D. Complement				
				Psittacosis	Control	Saline		
A.	Members of parrot house staff who looked after the suspected birds while in the parrot house sanatorium.	Not ill	1 in 4	=	=	=		
			1 in 8	=				
C.		23rd	1 in 4	++++	=	=		
			1 in 8	++++				
J. P.		23rd	1 in 4	++++	=	=		
			1 in 8	++++				
An.		17th	1 in 4	++++	=	=		
			1 in 8	++++				
B.		10th	1 in 4	++++	=	=		
			1 in 8	++++				
S.	Employed in quarantine station	P.M.(died 17th day)	1 in 4	++++	=	=		
			1 in 8	++++				
Controls : Known +			1 in 4	++++	=	=		
Known —			1 in 4	=	=	=		
Saline				=	=	=		

These results indicated quite clearly that the four cases of illness among the parrot house staff and the fatal illness which occurred in one of the sanatorium staff were due to infection with the virus of psittacosis. Keeper A., who provided the only serum to give a negative result, had

been employed on the staff of the parrot house for nearly thirty years and gave no history of having suffered from a disease like psittacosis. Whether his escape on this occasion is to be attributed to immunity as the result of prolonged employment in the parrot house it is impossible to say.

EXAMINATION OF SPUTUM FROM CASES C. AND J. P.

Smears of these two specimens were made and stained by Rivers's modification of Castañeda (Rivers and Berry, 1931) and by Giemsa. Nothing suggestive of virus was seen in these preparations. Suspensions of the sputum in M/50 phosphate buffer pH 7.6 were made, the concentration of sputum being approximately 1 in 10. The suspension of sputum from Case J. P. gave a copious growth of various bacteria and was filtered through a gradocol membrane of 0.5 μ A.P.D.; the other specimen contained fewer bacteria and was used unfiltered. Inoculation of mice with these suspensions resulted in the isolation of psittacosis virus from the sputum from Case C. The findings are given in detail in Table III, from which it will be seen that even in the positive case the result of primary inoculation was indefinite and that one further passage was required to establish the presence of virus.

TABLE III.—Results of Examination of Sputum by Mouse Inoculation

Case	Sputum		Primary Inoculation (1 in 10 Suspension of Sputum in Phosphate)		Passage from Primary Mice		
	Treatment	Dose	Mouse	Result	Inoculum	Mouse	Result
C.	Nil	0.5 c.cm. i.p.	A	? ill. Killed 19th day. P.M. find- ings in- definite	5 per cent. suspension of spleen A. 0.5 c.cm. i.p.	C	Ill. Killed 5th day. Virus present in peritoneal exudate and spleen
			B	Survived after indefinite illness		D	
J.P.	Filtered through gradocol membrane	0.5 c.cm. i.p.	A	? ill. Killed 12th day. P.M. find- ings in- definite	5 per cent. suspension of spleen A. 0.5 c.cm. i.p.	C	Neither showed definite symptoms. Killed 12th day. P.M. findings negative
			B	? ill. Killed 20th day. P.M. find- ings in- definite		E	Mice seemed ill. Killed 15th day. P.M. findings indefinite. Further passage with sus- pension of spleens of mice E and F gave a negative result

EXAMINATION OF POST-MORTEM MATERIAL FROM CASE S.

Portions of spleen and lung were sent for examination; these were investigated both for histological change and for the presence of virus.

Histological Examination.—"Impression" preparations were stained by the Castañeda and Giemsa methods and examined for the presence of virus; none was seen. Sections made from tissue fixed in Zenker formol were stained with haematoxylin and eosin and with toluidine-blue and eosin-orange; the latter method stains the virus of psittacosis in sections very well. The following changes were noted:

Spleen.—Extreme congestion of pulp; many haemorrhages. There was an increase in the large mononuclear phagocytes in the pulp, some of which contained red blood corpuscles or blood pigment. Although no definite areas of necrosis were seen many of the phagocytic cells of the pulp were vacuolated and some obviously degenerate. No virus was seen in any of these cells or free in the pulp sinuses; no bacteria were present.

Lung.—Two portions of lung were submitted for examination. One of these showed little change apart from some engorgement of vessels. The other, which macroscopically was dark red in colour, showed, on section, the appearances characteristic of a virus pneumonia. The alveoli contained serum, fibrin, desquamated alveolar cells, mononuclear phagocytes, and red blood corpuscles. Except for one or two small areas polymorphonuclear leucocytes were few in numbers. The make-up of the alveolar contents varied in different parts of the section. In some it consisted principally of serum, fibrin, and a few red corpuscles, whereas in others desquamation of alveolar cells and the presence of mononuclear phagocytes were an additional and prominent feature. In many instances the alveolar walls were difficult to make out, and here and there perivascular infiltration with mononuclear cells and plasma cells was noted. The bronchioles showed a similar change to that seen in the alveoli. In four mononuclear phagocytes colonies of virus were seen in sections stained with toluidine-blue and eosin-orange, and in those small areas where the polymorphonuclear leucocytes were numerous Gram-positive cocci arranged in irregular clusters were observed. Cultural examination of the lung tissue showed these to be *Staphylococcus aureus*.

Examination of Tissue by Animal Inoculation.—Portions of lung and spleen were ground up and suspended in phosphate buffer to give a 10 per cent. suspension. Since this suspension gave a copious growth of *Staph. aureus* a portion was filtered through a 0.5 μ gradocol membrane. Mice were inoculated intraperitoneally with both the filtered and the unfiltered suspension, and the presence of psittacosis virus demonstrated in this way. The details of this part of the investigation are given in Table IV.

TABLE IV.—Investigation of Tissue from the Fatal Case, S., by Mouse Inoculation

Primary Inoculation				Passage from Primary Mouse		
Inoculum	Dose	Mouse	Result	Inoculum	Mouse	Result
10 per cent. suspension of lung and spleen in phosphate buffer. Unfiltered	0.5 c.cm. i.p.	A	? ill 8th day. Killed. P.M. appearances indefinite. No virus seen in spleen smear	5 per cent. suspension of spleen A. 0.5 c.cm. i.p.	E	Ill 7th day. Killed. P.M. appearances positive. Virus present in smears made from spleen and peritoneal exudate
					F	Ill 11th day. Killed. Findings as in E
		B	? ill 11th day. Killed. P.M. findings indefinite. No virus seen in spleen smears			
Same suspension but filtered through 0.5 μ gradocol membrane	0.5 c.cm. i.p.	C	Remained in good health	5 per cent. suspension of spleen B. 0.5 c.cm. i.p.	G	Remained in good health
		D	Killed 26th day. P.M. findings negative		H	Killed 18th day. P.M. findings negative
		No passage made				

Laboratory Investigations. B: Bird Material

The following material was received for examination: (1) The organs of a macaw, one of the recently imported birds which died on March 10. (2) The body of a blue budgerigar, a recent addition to the Zoological Society's collection which was found dead on March 10. (3) The spleen and liver of a Guilding's parrot which had developed an acute enteritis ending fatally on March 14. This bird had been in the Society's collection for about four years.

A naked-eye examination of the organs was made, smears of the spleen were stained by the Castañeda method and examined microscopically for the presence of virus, and mice were inoculated intraperitoneally with suspensions made from the spleens. The findings are recorded in Table V, from which it will be seen that psittacosis virus was isolated from the macaw and the Guilding's parrot, but not from the budgerigar.

TABLE V.—Investigation of the Tissues from Three Birds whose Deaths were Suspected of being due to Psittacosis

Nature of Examination	Source of Material		
	Macaw	Budgerigar	Guilding's Parrot
Naked-eye appearance of organs	Liver normal. Duodenum normal. Spleen enlarged, soft, and deep purple in colour	Nothing abnormal noted	Liver shows many small irregular necrotic foci. Spleen enlarged, soft, and dark red in colour
Spleen smears (Castañeda)	No virus seen	No virus seen	Psittacosis virus present in small amount
Mouse inoculation (0.5 c.cm. of 5 per cent. spleen suspension injected i.p. into each of two mice)	Both mice very ill by 7th day. P.M. appearances typical; virus demonstrated microscopically	Mice remained well. One further passage in mice negative	7 days after inoculation one mouse was very ill and the other moribund. P.M. appearances typical; virus demonstrated microscopically

Comment

The evidence produced in this paper leaves no doubt as to either the nature of this illness among the Zoo employees or its source. The investigation of the outbreak might have been more complete had a serological survey been made of all those exposed to infection (see Table I), for it is possible that some of these individuals, although showing no clinical signs of illness, were none the less infected, and these silent infections might have revealed themselves by the development of complement-fixing antibodies. Thus we do not know the extent of the infection among the personnel at risk. There was also a history of "influenza" having developed among some of the crew of the vessel in which this consignment of parrots was brought from South America. An effort was made to trace these individuals with a view to obtaining specimens of serum from them, but they had been paid off and lost track of. It is probable, therefore, that the five human cases at the Zoo were only a portion of the actual cases for which this consignment of birds was responsible.

It should be pointed out that the regulations of the Ministry of Health relating to the importation of birds of the parrot family do not apply to birds intended for the Zoological Society's collection. According to the Ministry's regulations parrots and parrakeets can only be brought into this country under licence, and in this way the importation of these birds is controlled and supervised. Although these regulations have not abolished the risk of human cases of psittacosis developing in this country—because, of course, the home stocks of parrots and parrakeets are infected—they may have protected the country to some extent against widespread outbreaks such as we experienced in 1929–30. If, however, the full measure of benefit is to be derived from the present regulations, any consignment of parrots or parrakeets should be destroyed if, for any reason, active psittacosis infection is suspected. To transmit to the importer birds which are obviously out of condition or the survivors of a batch in which deaths have occurred is simply to court disaster. The alternative to this policy of what some people might consider ruthless slaughter would be to impose a period of quarantine on the incoming birds. Although, of course,

this would not enable one to exclude the entry of healthy carriers, it would at any rate give time for a heavy infection of the birds with psittacosis virus to declare itself.

In the case of the batch of birds responsible for the human cases at the Zoological Gardens the period of quarantine imposed was much too short to be effective. Had they been kept in the sanatorium for a longer period, however, the disease would have declared itself, the birds could have been destroyed forthwith, and the spread of infection restricted. Since the occurrence of this outbreak it has been decided, after consultation between the authorities of the Zoological Society and representatives of the Ministry of Health, to impose three months' quarantine on all newly acquired parrots—that is, psittaciformes—arriving at the Zoological Gardens. The care of these birds and the investigation of any illness occurring among them will be under expert supervision. In addition rigorous sanitary measures for the collection and disposal of the birds' excreta have been adopted. It should be pointed out, however, that in all probability the principal portal of entry of psittacosis infection in man is the respiratory tract, and that attendants looking after birds suspected of being infected should be protected against this mode of infection. Such precautionary measures as the wearing of rubber gloves when feeding the birds and cleaning out their cages, and treating the cage floors and cleaning utensils with antiseptics, though very necessary, are probably the least important. In addition masks and goggles should be worn, for then only would adequate protection be given.

Summary

The history of an outbreak of psittacosis at the London Zoological Gardens is given, together with a short account of a fatal case.

The results of laboratory investigations of material from the five human cases and from infected birds are recorded.

Precautionary measures against infection by psittacosis are discussed.

We wish to express our sincere thanks to Dr. G. M. Vevers, superintendent to the Zoological Society, and to Colonel A. E. Hamerton, pathologist to the Zoological Society, for supplying us with information concerning this outbreak and for permission to incorporate it in this paper.

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J. R. Rinker (*Urol. cutan. Rev.*, 1938, **42**, 874), who records two fatal cases in men, both aged 43, illustrates the rarity of primary carcinoma of the male urethra by the fact that Goldstein and Abeshouse found only 112 cases in the literature up to 1936. The growth may originate in any portion of the urethra, but 63 per cent. are estimated to occur in the perineal portion. The fossa navicularis comes next in frequency, and only occasionally does a carcinoma arise in the cavernous urethra; 70 per cent. of the tumours are of the squamous-cell type, irrespective of the part of the urethra from which they arise. The course is slow; metastasis, which occurs late, is by the lymphatics to the regional lymphatic glands. Urethral discharge and bleeding may be present; the early symptoms may simulate stricture. There may be local pain, and painful ejaculation and priapism may occur. Treatment consists in complete or partial amputation of the penis. X-ray therapy, which was tried in Rinker's cases, is disappointing.