or occluded, then the damage has already been done and restoration of normal carotid blood flow is unlikely to achieve clinical improvement.

Summary

The clinical and radiological features of 47 patients with stroke are presented, of whom 24 had stenosis and 23 occlusion of the relevant internal carotid artery.

One patient died and two became hemiplegic after percutaneous carotid arteriography.

Thirty-three patients had only supportive treatment, five received anticoagulants for three to eight weeks, and hypertension was reduced in seven with methyldopa.

Two patients with carotid stenosis died of related and one of unrelated disease. The survivors were followed for between six months and eight years. Overall, neurological progress was highly satisfactory in 65% and unfavourable in 35%.

Five patients with carotid occlusion died of related and two of unrelated disease. The survivors were followed for between one and ten years. Overall, neurological progress was highly satisfactory in 45% and unfavourable in 55%.

The presence of marked irregularity in the calibre of the retinal arterioles and/or atheroma of limb vessels was usually associated with a poor prognosis.

ADDENDUM.—The progress of all survivors in this series has been followed up to 1 November 1966. One patient with carotid stenosis previously classified as having moderate disablement has improved and now has only slight disability, the remainder are unchanged.

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Glycosuria of Pregnancy

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The present communication is an inquiry into the incidence and significance of the glycosuria of pregnancy.

Though there have been many contributions to the literature of pregnancy glycosuria since the beginning of the century, a re-examination of the subject is desirable for a number of reasons. First, only recently have specific methods become available for the detection and estimation of glucose in urine, so that much of the older work has become invalidated. Secondly, a full appreciation of the incidence of pregnancy glycosuria is possible only by comparison with incidence studies carried out in the general population: no such comparative investigations have yet been attempted. Thirdly, though the consensus of opinion is at present against any relationship of the glycosuria to diabetes, formal proof of this is lacking, and there are still many clinicians who believe that it may have at least prediabetic significance. In this area hundreds of glucose-tolerance tests have been performed in the past few years on cases presenting glycosuria at the antenatal clinic to ensure that no diabetic is being overlooked, and long-term follow-ups of such cases are being planned. Josling *et al.* (1952) treated the finding of glycosuria with the utmost seriousness.

It might be asked—and it should be asked—how justified is this energetic approach to the problem in the present state of knowledge of the subject. It was in the hope of answering this and other questions in the field of pregnancy glycosuria that the investigations described below were undertaken.

Reports of Glycosuria Incidence

There is a considerable divergence of opinion about the extent of glycosuria in pregnancy. Payer (1899) found an

incidence of 50%, but much lower figures have been reported since. Brews (1963) found that 33% of urines of pregnant women gave reduction with Benedict's solution, while Peel (1963) states that approximately 30% show glycosuria on occasion: a figure of 20% is given by Johnstone and Kellar (1963), Cantarow and Trumper (1962) give a range of 15–25%, Harrison *et al.* (1962) 10–15%, and Williams (1925) 13.6%. A number of writers give much lower figures: 6.3% by Gross *et al.* (1956), 5.4% by Williams and Wills (1929), and 5% by Bodansky and Bodansky (1952). The lowest value reported is by Adair (1940), who found only 3%.

Preliminary Investigation

A series of 1,547 patients attending the antenatal clinic at the maternity department of the County Hospital, Griffithstown, Monmouthshire, were investigated by means of the conventional method of Clinistix combined with Benedict's qualitative test. On a first examination 145 cases (9.3%) were positive for urine glucose. When further specimens from a number of patients were tested the total showing glycosuria on one or other occasion rose to 251 (16.2%). It seemed reasonable to suppose that had all the cases been examined more than once a still higher percentage of those with glycosuria would have been obtained.

The above figures throw some light on the diversity of reports on glycosuria incidence: a combination of the intermittency of the glycosuria and a variation in the number of specimens per patient examined could partly explain it. Another factor is the nature of the method employed in urine-testing: thus

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Brews's (1963) total of 33% is based on Benedict's test and might well include urines containing non-glucose reducing substances only.

Study of Urine Glucose by Quantitative Methods

Dissatisfaction with the Clinistix method, due chiefly to its unreliability at the lower levels of glucose content, prompted the search for an accurate method of estimating glucose in urine. Several such methods were examined: a gaseous diffusion technique by Conway (1950), a chromatographic method by Apthorp (1957), and a glucose-oxidase one (Marks, 1959) based on the method of Huggett and Nixon (1957). The last-named test was chosen as being particularly suited to the study of large populations. The Clinistix method was retained, however, as a useful screening test.

Glucose Content of 700 Normal Urines

The new data which the estimation of glucose in pregnancy urines was expected to reveal required, for a proper interpretation of the findings, a preliminary study of the glucose content of normal urines. This was accordingly carried out (Fine, 1965), and the results of such a study of 700 urines are given in Fig. 1, which shows that (1) measurable amounts of glucose were present in all specimens, and (2) the population could be divided into two groups: the larger, comprising about 91%, had a normal distribution with a range of 1–15 mg./100 ml. and a mean of 7 mg., while the small group of 9% had a glucose content ranging from 15 to over 3,000 mg.

Though a very high incidence of glycosuria was found in the control group, the method used (glucose-oxidase) is, I believe, the most accurate available for the estimation of urinary glucose. It was also observed that while most of the specimens in the smaller group were Clinistix-positive a number were

FIG. 1.—Glucose content of urine in 700 adults.

FIG. 2.—Glucose content of urine in 1,000 cases of pregnancy.

negative, and at the same time a significant number of specimens with less than 15 mg. were Clinistix-positive.

Glucose Content of 1,000 Urines in Pregnancy

The results of a similar study in a pregnancy population are shown in Fig. 2. Comparison between the normal and pregnancy histograms shows a general resemblance in the division of the population into two groups, the larger of which presents a normal distribution curve in the range of 1–15 mg.

The following differences can be noted, however: (1) an increase in pregnancy in the percentage of urines with low glucose content, in the range of 0–1 mg.; (2) a reduction in pregnancy in the percentage of urines with modal values, in the range of 2–9 mg.; and (3) an increase in pregnancy in the percentage of urines with raised glucose values, over 15 mg. These differences are summarized in Table I.

TABLE I.—Percentage of Samples at Different Glucose Concentrations

Range of Glucose Content	Normal	Pregnancy
0–1 mg./100 ml.	0·3%	4·9%
2–9 "	68·4%	45·9%
Over 15 "	9·4%	25·6%

It may be concluded that in pregnancy there is a significant increase not only in urines of raised glucose content (hyperglycemic urines), but also in those of low glucose content (hypoglycemic urines), at the expense of urines of intermediate concentration. These changes are shown in Fig. 3.

FIG. 3.—Urine glucose in pregnancy and control populations compared.

Interpretation of the Glycosurias of Pregnancy

Blood-sugar curves were carried out in 374 cases of glycosuria: of these, 242 were cases found to be Clinistix-positive in the preliminary investigation of 1,547 antenatal patients: the blood-sugar method used for this series was that of Folin and Wu. The remaining 132 cases presented about half of the glycosurias of the second series of 1,000 patients, and the method employed in these was glucose oxidase.

Although the standards of normality differ in the two methods, when allowance is made for this in the interpretation the results of the two series show a fairly close agreement. The curves were classified according to the maximum blood-sugar values obtained: in cases of hyperglycaemia a separation was made into diabetic and non-diabetic, according to the other blood-sugar values in the curve.

Thus in the Folin and Wu cases, where the maximum normal is 180 mg. the curves were divided into the following groups:

- 1. Flat curve: maximum glucose up to 120 mg./100 ml.
- 2. Low normal: maximum glucose 120–130 mg./100 ml.
- 3. Normal: maximum glucose 130–180 mg./100 ml.
- 4. Hyperglycaemia non-diabetic: maximum over 180 mg. but return to normal over a period of 2½ hours.

5. Hyperglycaemia diabetic: maximum over 180 mg. but no return to normal over a period of 2½ hours.

In the glucose-oxidase cases a flat curve had a maximum of 100 mg.; a low normal curve, 100–110 mg.; a normal curve, 110–160 mg.; and a hyperglycaemic curve, over 160 mg.

The results of the analysis are indicated in Table II, which shows that 94% of the glycosurias are renal in type, 5% of the lag glycosuric type, while 1% are diabetic.

TABLE II.—Analysis of Blood-sugar Curves in Pregnancy Glycosuria

Type of Curve	Series 1 (242 Cases) Folin and Wu Estimation			Series 2 (132 Cases) Glucose-Oxidase Estimation			Mean of Series (%)	Interpretation
	Max. Blood Glucose, mg./100 ml.	No. of Cases	%	Max. Blood Glucose, mg./100 ml.	No. of Cases	%		
Flat	Up to 120	36	15	Up to 100	16	12	13	Renal glycosuria = 94%
Low	120–130	43	18	100–110	27	20	19	
Normal	130–180	156	64	110–160	77	59	62	
Hyperglycaemic	Over 180 and return to normal	5	2	Over 160 and return to normal	11	8	5	Lag glycosuria
	Over 180; no return to normal	2	1	Over 160; no return to normal	1	1	1	
								Diabetes

Comparison with a non-pregnant control population gave quite a different distribution: renal glycosurias were 54% of the total, lag glycosurias 27%, and diabetes 19%.

Incidence of Diabetes in Pregnancy

Several writers have remarked on the low incidence of diabetes in pregnancy. Williams (1961) estimates it at 0.5–1%, while Brews (1963) states that it occurs in one pregnancy in 1,000. Joslin *et al.* (1952) found that only 5% of his female patients of child-bearing age have had onset of diabetes during pregnancy, and concluded that pregnancy did not appear to be a commonly inciting factor in precipitating the disease.

In the two series of pregnancy cases investigated here, with a total population of 2,547, three (0.12%) cases of diabetes were revealed by glucose-tolerance tests, but there were in addition four (0.16%) known cases—an incidence of diabetes of 0.28%. This figure is only one-sixth of the incidence in a control population, as shown in Table III.

TABLE III.—Comparison Between Causes of Glycosuria in Pregnancy and Control Populations

Cause of Glycosuria	Pregnancy Cases (2,547)		Control Population (537)	
	% of Glycosurias	Incidence in Population	% of Glycosurias	Incidence in Population
Renal glycosuria ..	93.1	23	54	4.5
Lag glycosuria ..	5	2	27	2.3
Diabetes:				
Previously known ..	1.1	0.16	9	0.8
" unknown ..	0.8	0.12	19	0.8
Total ..	100%	25.28%	100%	8.4%

Temporary Nature of Glycosuria

It is often stated that the glycosuria of pregnancy comes to an end with the termination of the pregnancy, but this appears to be an oversimplification of the phenomenon when it is borne in mind that there is a significant incidence of glycosuria in the non-pregnant population which is not likely to disappear with the passing of the pregnant state.

Such persistence of hyperglucuria following confinement in 25% of the cases showing it was demonstrated in a study of urine glucose in pre- and post-delivery populations: in the latter group tests were carried out one to two weeks after

confinement. Hyperglucuria fell from 19.2% in the first group to 4.6% in the second; there was at the same time a fall in the hypoglucuric urines (0–1%) and an increase in the incidence of intermediate values. These changes are shown in Fig. 4.

FIG. 4.—Urine glucose before and after delivery.

Increased Incidence of Glycosuria on Repeated Testing : Study of Multiple Specimens over 24 hours

The increase in incidence when more than one urine per patient is tested has been recognized by a number of workers, and was confirmed in the preliminary investigation described earlier, when an incidence of 9.3% on single tests was raised to 16.2% on slightly increasing the number of tests.

In the expectation that a much higher incidence of glycosuria would be revealed by stepping up the frequency of testing, 30 cases of pregnancy were subjected to "round the clock" sampling; at the same time a control population of 30 adults were studied in a similar manner.

The total number of specimens per case in the pregnancy group varied from 3 to 16; altogether 229 specimens were collected. In the control group 3 to 13 specimens were collected per adult, the total being 208. The samples were screened by Clinistix, and the glucose was then determined quantitatively. A much higher level of glycosuria was revealed than in any previous investigations.

Thus in 16 of the pregnancy cases at least one urine specimen was Clinistix-positive—an incidence of 53%; the corresponding value for the control group was 10%.

A larger gap between the two groups was shown by the quantitative studies. Of the pregnancy group 22 (73%) yielded at least one hyperglucuric urine (over 15 mg./100 ml. of glucose) as against four (13%) cases in the control group. In addition to the difference in glycosuria incidence, other differences were found.

Estimation of the total glucose excreted in 24 hours showed that in the pregnancy group 23 (77%) cases excreted over 100 g. of glucose, while only six (20%) control cases exceeded this value; at the same time two pregnancy cases excreted very low values—19.8 and 3.9 mg. respectively—less than in any of the control cases.

A further difference was found when the rate of glucose excretion was studied. The mean rate of normal excretion is 4 mg. per hour (range 1–7 mg. per hour). Of the pregnancy group 80% had a rate higher than normal in at least one specimen, as against 16% in the control group; at the same time low rates of excretion were found more often in the pregnancy group. Thus in 10 cases at least one specimen had an excretion rate below 1 mg. per hour, and in three cases the rate was nil; in the control group only three cases produced specimens at a rate below 1 mg. per hour.

Variation in Glucose Excretion: Hypoglucuria and Aglucuria in Pregnancy

Fluctuations in the glucose content of urine were observed throughout the 24 hours, though this varied considerably from case to case: the pregnancy group not only showed more violent fluctuations but provided more examples of hypoglucuria; aglucuric specimens were found only in pregnancy.

Twenty-four-hour charts of glucose content in pregnancy urines usually show peak values related to food intake, though this relation may be obscured by the arbitrary manner in which the specimens were collected: the ideal method—strict organization of micturition in relation to food—was considered unattainable in practice. A few cases were encountered of persistent hypoglucuria with little response to food intake.

Maximum Incidence of Glucosuria by Oral Administration of Glucose

It is commonly stated that most pregnant women will exhibit glycosuria after the intake of 100 g. of glucose (Bell, 1957; Peel, 1963), and Frank and Nothmann (1920) state that the glycosuria is invariable. Experimental evidence supporting these views is scanty. Richardson and Bitter (1932), who have investigated this matter, estimated urine glucose by copper reduction before and after yeast fermentation and found gross glycosuria in 20% of cases, with traces of glucose in a further 70%. However, they did not carry out a parallel study on a control population, and thus failed to appreciate that one-third of their glycosurias comprised normal amounts of glucose (under 15 mg.).

It was thought desirable to conclude the present study by an examination of the incidence of glycosuria following a standard dose of oral glucose.

A series of 50 cases were investigated, and after the administration of 50 g. of glucose specimens were collected at half-hourly intervals in the same manner as in a glucose-tolerance test. Blood specimens were not collected, however, since sufficient data had already been obtained on blood-sugar curves in pregnancy.

A series of 50 controls were similarly investigated. All the specimens were tested with Clinistix, and the glucose was then determined quantitatively. The number of specimens actually collected fell short of the theoretical total (300, or six from each of 50 cases), as occasionally a patient failed to pass a specimen.

The results of the Clinistix tests (Fig. 5) show that the incidence of glycosuria in pregnancy rises from a minimum of 14% in the fasting specimen to 80% in one hour. In 45 cases, however, a positive result was obtained in one or other of the six specimens, so that the overall maximum incidence

FIG. 5.—Maximum glycosuria incidence following oral glucose: Clinistix tests.

is 90%. In the control group the incidence rises from 4% in the fasting specimen to 18% in half an hour, with an overall maximum incidence of 20%.

The result of the quantitative tests (Fig. 6) closely parallels that of the Clinistix tests. In the pregnancy group the incidence rises from a fasting value of 27% to a level of 80% one hour later; the maximum overall incidence is 92%. In the control group the incidence rises from a fasting 6% to a level of 22% in one hour; the overall maximum is 28%.

FIG. 6.—Maximum glycosuria incidence following oral glucose: quantitative tests.

Discussion

Variation in the reports of the incidence of glycosuria is due to a number of causes, of which the mode of sampling is probably the most important; care in ensuring a strict time-relationship to food will produce a higher incidence than when this factor is given insufficient attention.

In practice, even if patients are instructed to pass a specimen at a given interval after a meal, it is a matter of chance whether the timing of micturition is optimal for demonstration of glycosuria; even when numerous specimens are examined—as in “round the clock” investigations—the element of chance is not wholly eliminated, and some samples containing increased amounts of glucose could still be missed or be diluted by urine containing less glucose.

The detection of potential glycosuria with any degree of certainty can be achieved only by the examination of urine at short intervals after oral administration of glucose: in this way peak excretions of glucose can be discovered which would otherwise pass undetected. When tests are carried out in this way an incidence of 90% or over will regularly be obtained, and values lower than this are merely a reflection of the inadequacy of the method adopted.

The use of quantitative methods in glucose studies has revealed a new phenomenon in pregnancy—a reduction in the glucose output, and sometimes a total disappearance of glucose from the urine. Previous studies of a normal population had established the normal range of glucose output—1 to 15 mg./100 ml. for 90% of the population—and it now appeared that in pregnancy there was not only an increased incidence of hyperglucuria but also of hypoglucuria.

The explanation of these changes is a matter for speculation. Glycosuria of pregnancy is commonly ascribed to the production of increased amounts of A.C.T.H. As a number of authors have stated, the consequent increased activity of the adrenocortical hormones can readily explain the glycosuria by causing an impaired reabsorption of glucose by the renal tubules (Bourne, 1959; Peel, 1960; Cantarow and Schepartz, 1962; Thompson and King, 1964; Keele and Neil, 1965). If this explanation is correct, the hypoglucuria may be accounted

for by an opposite effect—an enhancement of tubular re-absorption due perhaps to a reduction in corticosteroid action—and it is tempting to assume that an increased output of insulin is responsible for this reduction.

Alternating phases of corticosteroid and insulin influence could readily account for some of the 24-hour charts of glucose excretion in pregnancy. In one chart corticosteroid effect appeared to be almost wholly neutralized.

The occurrence of an insulin phase would moreover explain the failure of the glycosuria incidence to reach 100%, since while this phase lasted urines were less likely to become hyperglucuric after glucose intake.

The occurrence of islet hyperactivity in pregnancy has been attested on clinical grounds. Thus Bowen and Heilbrun (1932), in a study of 43 pregnant diabetics, found that 28 required larger doses of insulin than before pregnancy, but in 10 cases the dose had to be reduced; the latter group can be accounted for only by an increase in autogenous insulin.

Cases of hypoglycaemia after confinement have been reported, a finding which is consistent with the fall in corticosteroids to be expected at this time and the consequent increased activity of unantagonized insulin.

In conclusion, it is of interest to examine the bearing of the findings discussed on the practical problem of how to deal with the case of pregnancy glycosuria. Many clinicians will find it difficult to think of this glycosuria as a near 100% phenomenon because the present methods of screening rarely produce more than a 10–20% incidence. When it is recognized, however, that under standard conditions of testing 90% of the cases will prove Clinistix-positive it will become difficult to escape from the logical conclusion that the test for urine glucose in pregnancy is a superfluous procedure, since the result is almost a foregone conclusion.

Equally illogical is the subjection of a patient to a glucose-tolerance test because of the chance finding of glucose in a more or less random sample of urine, and the denial of such a test in a case equally deserving but found to be Clinistix-negative by the operation of the same laws of chance as resulted in the glycosuria.

The real problem to be solved is to find a method of screening which will detect the rare case of diabetes developing in pregnancy, irrespective of urinary findings. The error so far has been to adopt the same procedure as with the general population—that is, a sorting-out of glycosurics into their respective classes according to blood-sugar levels.

In the general population, however, 1 in 50 are diabetics, as against 1 in 400 in pregnancy: furthermore, only one-half of these require detection as one-half are already known, both in pregnancy and in the general population.

Probably the best solution is to treat the search for the diabetic in pregnancy in the same way as the search for rhesus antibodies, and to combine the search for both with other investigations usually carried out at antenatal clinics—Hb and Kahn tests. Care, however, would have to be taken to ensure that the blood specimen for sugar estimation was taken one hour after a carbohydrate meal. Failure to ensure this might result in a useless test; it might therefore be preferable in most cases to give the patient a glucose drink an hour before the test.

Such a practice would lead to a great reduction in the number of glucose-tolerance tests, which would be required only in hyperglycaemic or borderline cases; the total number of blood-sugar estimations, however, would probably be much greater when this test became a routine investigation at antenatal clinics. The additional burden on pathological laboratories would, however, be readily borne in these days of automation, and the co-operation of the pathologist is more likely to be obtained when he is no longer requested to carry out an elaborate investigation on the grounds of a glycosuria which must now be regarded as almost universal in pregnancy.

In practice the screening of *all* cases of pregnancy might prove of academic value only, since it has been shown (Fitzgerald *et al.*, 1961) that the risk of diabetes, which increases with parity, is not significantly greater in primiparae than in the general population.

The tests could therefore be carried out routinely in multiparae, but only where clinically indicated in primiparae.

Summary

In a preliminary investigation 9.3% of 1,547 cases showed glycosuria: when some of the cases were further tested the figure rose to 16.2%. Owing to defects in the Clinistix method it was relegated to a screening role, and glucose was determined quantitatively.

Sugar was estimated in 700 normal urines and the features of the characteristic histogram were defined. For descriptive purposes new terms were adopted: “normoglucuric” for urines with 1–15 mg. of glucose/100 ml., “hyperglucuric” for urines with over 15 mg., and “hypoglucuric” for urines with under 1 mg.

One thousand pregnancy urines showed an increase incidence of both hyperglucuria and hypoglucuria. A study of pre- and post-delivery populations indicated the temporary nature of the glycosuria.

A series of 30 cases of pregnancy tested “round the clock” showed glycosuria in over 70%; the incidence in a control group was 13%.

Twenty-four hourly glucose excretion was studied: 77% of the cases excreted over 100 mg. as against 20% in the control group. Seventy per cent. of the cases showed an increase above the normal rate of glucose excretion.

Finally, 50 unselected cases of pregnancy were given 50 g. of oral glucose, and urine tests were carried out as in a glucose-tolerance test: 90% showed glycosuria by Clinistix-testing and 92% hyperglucuria by glucose estimation, the corresponding values for a control group were 22% and 28% respectively.

In view of the almost uniform finding of glycosuria in pregnancy if sought by efficient methods, and in view of the low incidence of diabetes in pregnancy (0.28% in the series studied), it is recommended that glucose-tolerance tests with blood-sugar curves be replaced by routine blood-sugar estimations one hour after a meal or better still after 50 g. of oral glucose. It should be done in all multiparae, whether found glycosuric or not, in conjunction with other tests usually required at antenatal clinics; in primiparae it should be done only where clinically indicated.

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Changes in Incidence and Aetiology of Bacteraemia Arising in Hospital Practice

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Since the introduction of antibiotic therapy many authors have recorded an increased incidence of bacteraemia arising in hospital practice. Emphasis has been placed on a marked rise in staphylococcal and Gram-negative bacteraemia, with a concomitant fall in potentially fatal infections due to the pneumococcus and *Streptococcus pyogenes* (Finland *et al.*, 1959; Rogers, 1959; Faber *et al.*, 1960). Factors other than antibiotics are involved in these changes; McHenry *et al.* (1962a) listed the ageing population, the widespread use of precipitating surgical and instrumental procedures, the prolongation of life in seriously ill patients with limited ability to resist infection, and the use of immune-suppressing drugs as factors in the increase of Gram-negative bacteraemia.

This report reviews the experience of bacteraemia at Hammersmith Hospital over the past eight years, and assesses some factors involved in an increasing incidence.

Methods and Limitation of Study

Bacteriological records for the period 1958 to 1965 were surveyed, and cases having potentially pathogenic organisms isolated from two or more consecutive blood cultures were accepted for further study. Solitary blood cultures were accepted as positive if a pure growth of a recognized pathogen was present in all bottles. Blood cultures were inoculated into two Castaneda bottles (Ruiz Castaneda, 1947) containing glucose broth with added "liquoid" and penicillinase, and into a bottle of cooked meat broth for the isolation of anaerobic organisms. Cultures were examined for a minimum period of 10 days.

Besides the limitations of a retrospective study some of our findings are biased by the numbers of patients referred to this centre with uraemia, blood dyscrasia, and malignant disease.

Results

During the period of this study there were 316 patients with positive blood cultures, Gram-negative rods accounting for 128 (40%) and *Staphylococcus aureus* for 73 (23%). Though the yearly number of hospital admissions rose from 12,100 in 1958 to 14,066 in 1965, cases of bacteraemia increased dispropor-

tionately from 19 in 1958 to 65 in 1965. Patients investigated for bacteraemia increased from 420 in 1958 to 660 in 1965, while the average number of blood cultures taken from a suspected case rose from 2.0 to 3.7.

Gram-negative Infection

Table I lists the annual number of positive blood cultures according to the causative organisms, and shows a progressive rise in all bacteraemia, with a sudden increase in the isolation of Gram-negative rods in 1960. During this period no particular species of Gram-negative bacterium has become predominant, nor has the average age of the infected patients risen.

TABLE I.—Organisms Isolated from Positive Blood Cultures 1958–65

	1958	1959	1960	1961	1962	1963	1964	1965	Total
Gram-negative rods ..	8	8	15	15	19	20	19	24	128
<i>Staph. aureus</i> ..	9	5	7	7	10	10	13	12	73
" <i>albus</i> ..	0	0	1	1	0	1	2	3	8
Haemolytic streptococci ..	0	1	1	2	1	3	4	2	11
Enterococci ..	1	2	3	2	3	4	6	3	24
<i>Str. viridans</i> ..	1	3	4	3	5	3	8	7	34
Pneumococci ..	0	1	0	0	0	1	2	4	8
<i>Bacteroides</i> ..	0	1	0	1	1	2	0	3	8
<i>Candida</i> ..	0	0	0	0	1	2	0	3	6
Miscellaneous*	0	1	1	0	2	3	2	4	13
Total ..	19	22	32	31	42	49	56	65	316

* *Clostridium welchii* 4; anaerobic streptococci 4; meningococci 3; haemophilus 1; *Listeria* 1.

In 47 of the 128 cases of Gram-negative bacteraemia organisms were isolated on one occasion only, and clinical features did not suggest septicaemia. In these patients, with transient bacteraemia occurring as a complication of urinary-tract manipulation and wound infections, no particular coliform was predominant.

Table II records the causative organisms in the 81 cases of Gram-negative septicaemia, together with the mortality rate. *Pseudomonas pyocyanea* was surprisingly common, accounting for 26 cases, with a mortality of 85%. In two-thirds of these the blood stream was invaded from the urinary tract, most commonly complicating terminal uraemia, carcinoma of the bladder, or obstructive uropathy. The remaining cases were associated with wound infection or extensive skin destruction, generalized malignant disease, agranulocytosis, and in four patients followed Gram-positive septicaemia.

Of the remaining 54 cases of Gram-negative septicaemia the urinary tract was the portal of entry in 20, 14 followed

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