There is a greater tendency for the diabetic to develop late pregnancy toxæmia than the non-diabetic, and the relative incidence varies with the standard of severity of the toxæmia taken for comparison.

The maternal prognosis is good, and pregnancy does not make the diabetes worse provided that it is well treated.

The late foetal mortality was 55% in a first series of 43 pregnancies. In a second series of 15 pregnancies in which oestrogens were given there were only three deaths. The cause of the foetal mortality is discussed, and it is suggested that the factor affecting the viability of the foetus probably arises in the maternal anterior pituitary lobe. The incidence of abortion does not appear to differ from that for non-diabetic pregnancies, and suggests, first, that diabetes mellitus is not a cause of abortion, and, secondly, that the factor which reduces foetal viability exerts its strongest influence towards the end of pregnancy.

Congenital deformities, gigantism, and hypoglycaemia of the newborn are briefly discussed, and it is suggested that the tendency to gigantism is due to an excess of the growth hormone from the maternal pituitary gland.

We should like to express our gratitude to Professor W. C. W. Nixon, Director of the Obstetric Unit, for his encouragement and permission to make use of the case records of the Obstetric Unit; to Professor H. P. Himsforth, Director of the Medical Unit, for permission to make use of the records of the Diabetic Clinic and for helpful advice; and to Organon Laboratories for the generous supply of stilboestrol dipropionate.

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Another step towards closing the wartime gap in the issue of vital statistics by the Registrar-General has been taken with the publication of Part II of the *Statistical Review for 1943*. During that year in England and Wales the improvement in the birth rate following the record low figure in 1941 was maintained, the fall in the still-birth rate continued, and the number of marriages was the lowest for seventeen years. There were 684,334 live births during 1943, representing a birth rate of 16.2 per 1,000 total population. This maintained the improvement seen in 1942, when the corresponding figures were 651,503 and 15.6, and compared favourably with the record low figures of 579,091 and 13.9 for 1941. The birth rate for 1943 was the highest since 1930, when the corresponding figure was 16.3. Later figures showed that the birth rate further increased to 17.7 in 1944, fell to 15.9 in 1945, and again increased to 19.2 in 1946 and 20.6 (provisional) in 1947. Of the live births in 1943, 43,709 or 6.4% were illegitimate compared with 36,467 and 5.6% in 1942 and an average of 4.3% for the ten years 1930-9. In 1945 this proportion was 9.3%; in 1946 it was 6.6%, and in 1947 it was 5.3%.

THE RELATION OF STAPH. PYOGENES TO DENTAL CARIES

BY

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Appleton (1944), in his review of the bacteria occurring in dental caries, mentioned several workers who have isolated *Staphylococcus aureus* from carious cavities. Among them were Miller, Goadby, Kantorowicz, and Niedergesaeß, but although they had established the presence of this organism in both the superficial and the deep layers of carious cavities it was only rarely and then in small numbers.

Nord (1946) stated that Gottlieb, in a private communication, said he had "discovered the micro-organism causing dental caries to be *Staph. aureus*, and that a perfectly sound tooth in a pure culture of this organism will in two months show caries which cannot be distinguished from true caries."

Gottlieb (1947) headed a paragraph of his book "*Staphylococcus aureus* produces dental caries," and referred to the work of Crawford (1946), who stated that *Staph. aureus* was isolated from carious cavities and that sterile extracted teeth, when placed in a culture of that organism, developed yellow spots and real cavities within two months. Ground sections of these teeth revealed exactly the same picture as that found in naturally carious teeth.

This paper reports the results of a collaborative investigation to test the claims of Gottlieb and Crawford and to find out if the presence of *Staph. aureus* in the mouth could be correlated with caries.

Bacteriological Technique

Material to be examined was incubated for twenty-four hours in a salt-meat medium specially selective for staphylococcus.* A loopful of this culture was spread on a horse-blood agar plate, incubated for twenty-four hours, and then allowed to age on the bench for two or three days so that colonies would have ample time to develop pigment. All varieties of colonies suspected of being staphylococcus were picked off and tested for the production of coagulase. Only "coagulase-positive" strains—i.e., *Staph. pyogenes*—were considered in the results which follow. These strains were all haemolytic. Most of them produced golden-yellow pigment (*Staph. aureus*), but some had white or nearly white colonies (*Staph. albus*). It has been well established that *Staph. pyogenes* nearly always liquefies gelatin and produces toxin and is potentially pathogenic for man. *Staph. pyogenes* should be regarded as including virtually all the strains which, on the basis of colour of colony, were formerly classed as *Staph. aureus*.

It has been shown that by the technique adopted it was usually possible to obtain a nearly pure plate culture of staphylococci when 300 staphylococci were mixed with 1,000,000 other bacteria in 1 ml. of a prepared mixture used as original inoculum. It follows that this method of culture gives no information about the presence or absence

*A full account of work on selective media for staphylococci is being published from the Department of Bacteriology.

of other bacteria, and that the results recorded in this paper refer only to staphylococci.

Experimental

1. *Exposure of Teeth to Cultures of Staph. pyogenes in vitro.*—Sound recently extracted teeth were macroscopically examined to confirm the absence of caries. They were boiled for half an hour and placed in a broth culture of *Staph. pyogenes*. This culture was renewed every two days and maintained at 37° C. Eleven teeth were treated in this way and exposed to the organisms for periods ranging from fifteen days to four months. None of the teeth showed any macroscopical change resembling caries, nor did there appear to be any reduction in the surface hardness of the enamel. Samples of the broth were tested at intervals for the presence of calcium, but none gave a positive result. Ground sections of the teeth made after exposure to the organisms did not reveal any microscopical change resembling caries.

2. *Attempts to Isolate Staph. pyogenes from Carious Cavities.*—Grossly carious teeth were extracted and a swab taken from the surface of the cavity was inoculated into the selective medium. The soft carious material was removed from the cavity with sterile excavators and a little of the carious material from the deep layers was inoculated similarly. Eleven teeth were examined; only one culture (from the surface) yielded *Staph. pyogenes*.

3. *Isolation of Staph. pyogenes from Mouth-washings and Attempts to Correlate its Presence with Caries.*—About 5 ml. of sterile nutrient broth was poured from a test-tube into the patient's mouth and instructions were given to let it wash round all the teeth for about 30 seconds. The broth was then run out of the mouth, through a sterile thistle funnel, back into the original test-tube, and 1 ml. was inoculated without delay into the selective medium. A careful "mirror and probe" examination of the mouth was made to ascertain the existence or absence of clinical caries.

The results of examining a group of 86 school-children aged 5–12 years are summarized in the accompanying Table. In 52 (27%) of 194 examinations caries was present when *Staph. pyogenes* was absent, thus constituting a frank disagreement.

Table Showing Results of Correlating Dental Caries with *Staph. pyogenes* in Mouth-washings

Date of Examination	No. of Children Examined	No. of Children with			
		Caries — <i>Staph.</i> —	Caries — <i>Staph.</i> +	Caries + <i>Staph.</i> —	Caries + <i>Staph.</i> +
16/7/47 ..	86	24	21	22	19
30 7/47 ..	7	—	1	1	5
10 10/47 ..	24	—	3	11	6
17 10/47 ..	28	4	10	4	10
24 10/47 ..	32	4	7	9	12
27 11/47 ..	17	—	—	5	12
Totals ..	194	36	42	52	64

The remainder may be said to have agreed. There is obvious agreement in 64 examinations (33%) where both were positive and in 36 (19%) where both were negative. There is some doubt in the 42 instances (21%) where caries was absent but staphylococci were present, but it could be argued that these were not in disagreement because the presence of *Staph. pyogenes* might be an indicator of early caries, undetected by the examination employed, which would appear later. Some such cases were in fact demonstrated.

All the children were examined on the first date and as many as possible were re-examined at intervals to test the constancy of findings in individuals and to note any onset of caries. On the whole the results were inconstant. Of 50 children twice examined 20 gave consistent findings, and of 20 examined three times only four were alike on each occasion. The disagreements were nearly always attributable to the bacteriological results; in only a few cases had caries developed during the

interval between examinations. Among the children there were 10 with obvious caries who failed repeatedly to yield *Staph. pyogenes*. Nine children, however, who had no caries at the start but who harboured this organism did develop clinical carious lesions before their final examination.

In view of this last finding and the possibility that the presence of *Staph. pyogenes* in the mouth might be an indicator of incipient or early caries, examination was made of a further series of 17 selected patients who had a small pit or fissure which showed early clinical signs of caries. Nine also had gross carious lesions. Mouth-washings were cultured as before. A sterile probe was pressed firmly into the tiny cavity of the early lesions, care being taken to avoid contact with other tissues, and then used to inoculate the selective medium. Cultures from the deep layers of the gross lesions were also made. The results can be summarized as follows:

	Early Lesions	Gross Lesions	Mouth-washings
No. of examinations ..	17	9	17
<i>Staph. pyogenes</i> isolated	0	1	12

4. *Control.*—In order to test the possibility that *Staph. pyogenes* found in the mouth-washings might have come from sources other than the inside of the mouth, swabs were taken as indicated below and inoculated into the selective medium. Thirteen of the children referred to in Section 3 were examined, with the following results: (a) Swabs wiped over the lips and adjoining skin: none yielded *Staph. pyogenes*. (b) Swabs taken from the nostrils: three were positive. (c) Of the swabs from the tooth surfaces and gums, those that were positive coincided substantially with the positive mouth-washings.

Discussion

These investigations do not support the view that *Staph. pyogenes* causes dental caries or that its presence in the mouth is an indicator of active or incipient caries.

Exposing boiled teeth to cultures (Section 1) is an arbitrary procedure, under conditions very different from those occurring naturally in the mouth, and a negative result therefore may be regarded as having less significance than a positive one. Nevertheless, teeth were not attacked *in vitro* by *Staph. pyogenes*.

The failure to recover this organism from the lesions in early caries and also from the great majority of cavities in advanced caries using a sensitive selective culture medium is a point of considerable importance (Sections 2 and 4).

The evidence from culturing mouth-washings (Section 3) likewise does not support the association of *Staph. pyogenes* with caries. This organism is often present in the mouth irrespective of the existence of caries. In assessing the results shown in the Table a considerable percentage of examinations may be noted in which there was agreement between clinical findings and results of culture. There were also instances where the presence of *Staph. pyogenes* could be regarded as indicating the impending onset of caries. Against this, however, should be set the instances of frank disagreement, the inconstancy of recovery of *Staph. pyogenes* from individuals on repeated examination, and the number of those who had caries but repeatedly failed to yield *Staph. pyogenes*.

In an earlier series of 25 dental students examined similarly there was possibly suggestive evidence for the idea that *Staph. pyogenes* in the mouth might correlate with the existence of caries, but the further evidence presented here showed that this could not be substantiated.

If *Staph. pyogenes* does not produce caries it is unlikely that other staphylococci will do so. As indicated earlier in this paper, the strains known as *Staph. aureus* would

practically all be included in those designated *pyogenes*. Other staphylococci are less proteolytic and saccharolytic on substrates usually tested in culture, and are less haemolytic and toxigenic. They would therefore be less likely than *Staph. pyogenes* to be concerned in the aetiology of caries.

Conclusion

A combined clinical and bacteriological investigation using a highly sensitive and selective medium for the isolation of *Staph. pyogenes* has failed to reveal an aetiological relationship between this organism and dental caries.

We desire to express our thanks to Mr. R. Bradbury, school dental officer, Borough of Stretford, for arranging and assisting with the examination of the children. We also acknowledge our indebtedness to Professor H. B. Maitland, Director of the Department of Bacteriology.

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SENILE DETERIORATION OF THE CENTRAL NERVOUS SYSTEM

A CLINICAL STUDY

BY

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Comparatively little has been written about the clinical aspects of neurology in the aged. Even textbooks dealing with old age, such as those of Thewlis (1946) and Stieglitz (1943), are unsatisfactory. The best account at present is that of Macdonald Critchley (1931). He notes the frequent occurrence of several clinical changes. Diminution of objective pain sensation is mentioned, while complaints of subjective pains are said to be common. Progressive loss of vibration sense is stated to be customary, while sluggish pupils, missing superficial reflexes, and weak or absent tendon-jerks are said to be the usual findings. No indication is given, however, of the frequency of these signs or of the age at which they may be expected.

Since the absence of reflexes and alterations of sensation might give rise to the misdiagnosis of neurological lesions, it seemed expedient to examine a series of healthy old people to ascertain what variations are normal. I therefore examined 200 Chelsea pensioners. Most of these men were known to me both personally and professionally, so that considerably more co-operation was forthcoming than might otherwise have been the case. This should add to the credibility of the clinical findings. Among the pensioners examined a small number were found to have neurological lesions previously unrecognized: these were omitted from the series. The results of the clinical examination of the nervous system are described below.

Motor Changes

Tendon Reflexes.—Each case was tested for supinator, triceps, biceps, knee, and ankle jerks. Only 7% of those examined had every reflex present, these being in the younger age groups. The arm-jerks were normal in all men under 70, but the ankle-jerks were not elicited in over half the cases even at this age. In those over 70 there was a definite drop in frequency of all reflexes, but no

further decrease until the age of 85 except in the ankle-jerks (Table I).

TABLE I.—Percentage of Tendon Reflexes Obtained

Age	No.	Supinator		Biceps		Triceps		Knee		Ankle	
		R.	L.	R.	L.	R.	L.	R.	L.	R.	L.
65-69	16	100	100	100	100	100	100	87	87	43	38
70-74	57	67	65	88	88	70	72	79	77	32	35
75-79	72	69	68	84	85	84	84	76	76	32	35
80-84	31	68	65	90	90	87	80	80	80	12	12
85-91	9	33	33	66	66	44	55	44	44	22	22
Mean values	..	69	63	86	87	79	79	77	77	29	31

Superficial Reflexes.—Contrary to expectation, the vast majority of plantar responses were normal. Age did not seem to have any bearing on the frequency of abnormality, which was 5%, mainly scattered in the age groups between 70 and 84. There was no difference between the two sides of the body, except in three pensioners. The abdominals, however, were elicited less regularly. The upper quadrants always responded more easily than the lower ones, but there was no constant difference between right and left sides of the belly. The average for all the men was less than 50%, with a drop at 70 years of age and another drop after 85, similar to that found in the deep reflexes (see Table II).

TABLE II.—Superficial Reflexes

Age	No.	Abdominals		Plantars	
		R.	L.	R.	L.
65-69	16	100%	100%	100%	95%
70-74	57	63%	75%	96%	94%
75-79	72	54%	49%	96%	96%
80-84	31	51%	52%	89%	87%
85-91	9	47%	45%	100%	100%
		36%	40%		
		61%	48%		
		42%	35%		
		22%	22%		
		0%	0%		

Power.—Power was assessed only roughly in the absence of a dynamometer. The pensioners were graded by strength of grip and by power of flexion and extension at elbow and knee. The results were classified as very good, good, fair, and poor. Loss of strength seemed to develop with increase of age, but this was not universally true in the cases examined, as may be seen in Table III.

TABLE III.—Power in Limbs

Age	No.	Very Good	Good	Fair	Poor
65-69	15	40%	33%	27%	0%
70-74	54	13%	62%	20%	5%
75-79	66	8%	39%	45%	8%
80-84	31	16%	29%	32%	23%
85-91	8	0%	37%	50%	13%
Means :		13%	44%	34%	9%

Sensory Changes

Vibration Sense.—As changes in vibration sense were among the positive findings noted by earlier observers considerable care was taken in testing for this form of sensation. Bony points on both wrists, elbows, shoulders, ankles, knees, shins, and the sacrum were tested. The percentage registering on the sacrum was uniformly small in every age group. More than 90% appreciated vibration on the bones of the upper extremity. Ankles and shins showed perception in over 70% of cases, but the knees appreciated the sensation in just over 50%. The results are shown in Table IV.