"BACTERIOLOGIC STUDY OF NORMAL THROATS, PATHOLOGICAL THROATS AND TONSILS REMOVED AT OPERATION IN PORTO RICO".*

(A PRELIMINARY REPORT.)

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Due to the increasing interest concerning the etiology of influenza, the common cold and other allied conditions, the definite establishment of the normal flora of the throat in different regions of the world has been made a scientific necessity. Detailed and extensive studies of this kind have been conducted in many countries by different investigators; but so far we have not been able to find any reference to systematic studies of this sort in the tropics. We are omitting a detailed discussion of the already established flora of the normal throat in different parts of the world or a review of the literature on the subject. Instead we shall refer to the literature, in the course of the discussion, for purposes of comparison.

This work is intended only as an introduction to more complete studies of the same subject. Our principal aim has been to ascertain which are the most predominant bacteria inhabiting the normal throat in this Island. A morphological study of the bacteria found in several pathological throats and in sixty-five pairs of excised tonsils has also been attempted. This is a preliminary report and studies are being continued on the same subject.

NORMAL THROATS

One hundred individuals whose throats were without clinical signs of disease and with no history of sore throat for at least two years were studied. Of these about ninety were patients coming to the clinic of the Presbyterian Hospital at San Juan. The remainder include several nurses and two members of the medical staff.

Ages range from five to sixty years as follows: From five to ten years, four cases; from ten to twenty, twenty; from twenty to thirty, forty; from thirty to forty, nineteen, and from forty to sixty, seventeen.

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Cultures were taken during the months of February, March, April and May. Most of them, about fifty per cent, were taken during the month of April.

Four swabs were taken from each case: one from each tonsil, one from the pharynx (always avoiding the region of the tonsils), and one from both tonsils and pharynx. Swabs were kept in sterile test tubes labelled accordingly. Seedings were made in all cases from five to ten minutes after collecting material.

Plain blood agar (1 c.c. of blood to 10 c.c. of agar), plain agar, glucose broth and Löffler's blood serum were the media used.

We used human blood for the first thirty cases, but in the rest of the series defibrinated rabbit blood was employed. In the first ten cases we used plain broth, but due to poor chain formation in this medium we changed to glucose broth which proved to be much more efficient in this respect.

Plain and blood agar plates were divided with a wax pencil into three equal sections. These were labelled *left tonsil, right tonsil* and *pharynx;* and streaks were carefully made on the surface of the medium with the swabs taken from right tonsil, left tonsil and pharynx, respectively. Cultures on blood agar were made first and then, using the same swab, streaks were made on plain agar. With the material on the fourth swab (that from both tonsils and pharynx), Löffler's blood serum and glucose broth were inoculated in the order mentioned.

Only aerobic cultures were made. They were incubated at 37° C and examined at the end of twenty-four hours, chiefly for the production of hemolysis. At this time a Gram stain and a methylene blue stain were made from the growth on Löffler's in the majority of cases. At the end of forty-eight hours a Gram stain was made of all the different types of colonies on plain agar, blood agar, Löffler's, and of the growth in broth. In several cases in which blood agar plates exhibited hemolysis by direct examination of the cultures we could not ascertain which was the hemolytic organism. The following method was employed to determine if a hemolytic streptococcus was present: The growth on glucose broth was stained by Gram's method. If chains were present a small drop of the broth was placed in the center of a blood agar plate and spread over the entire surface of the medium with a sterile glass rod bent at a convenient angle. The same was done using an emulsion in saline of the growth on the plate. In this way we could easily get isolated colonies. By adopting this measure we detected in four instances the presence of

hemolytic streptococci which otherwise might have been overlooked. This is one of the great objections to the streak method because when growth is abundant often isolated colonies are not obtained. Pour plates are much better. In several cases identification of organisms was attempted, based upon their sugar reactions, motility, etc.

As to the classification of the different organisms encountered we wish to make the following remarks: All the Gram-negative cocci were considered as a group. Streptococci were classified as viridans (definite greenish zone around colonies on blood agar), hemolytic and non-hemolytic. Staphylococci were classified as hemolytic or non-hemolytic and according to their pigment formation. All the different strains of diphtheroids were also considered as a group. Large Gram-positive cocci and small Gram-positive cocci were designated as Gram-positive cocci. Pneumococci were only occasionally found. We attribute this, in part at least, to the fact that we used the streak method Nevertheless, that type, we are inclined to believe are not common in the normal throat in Porto Rico and if they do occur they must be present in relatively small numbers. All non-hemolytic hemoglobinophilic Gram-negative bacilli were designated as B. influenzae. Hemoglobinophilic Gram-negative bacilli producing hemolysis were grouped as Bacillus "X" according to the description of Pritchett and Stillman(1).

The following table shows the organisms encountered in the order that they predominated in our series. The number of cases in which they were found and the number of cases in which they predominated are also recorded.

Organism*	Number of cases in which it was found	Number of cases in which it predominated
Gram negative cocci	97	52
Non-hemolytic streptococci	92	24
Gram positive cocci	58	6
Staphylococcus aureus	43	7
Hemolytic streptococci	26	3
Diphtheroids	14	2
Gram-negative bacilli (unidentified)	13	0
Streptococcus viridans	10	0
Staphylococcus albus	10	1
B. influenzae	7	0
B. friedlanderi	6	3
Pneumococci	6	0
Staphylococcus citreus	5	0
Micrococcus tetragenus	4	0
Sarcinae	4	0
Bacillus "X"	4	0
Gram-positive bacilli (unidentified)	3	0
B. proteus	2	2

*Findings in 100 individuals.

Gram-negative cocci and non-hemolytic streptococci were found in practically every case. Gram negative cocci were absent in two cases in which pure cultures of B. proteus were obtained and one case from which we obtained a pure culture of B. friedlanderi. They were the predominating organisms in more than fifty per cent of cases. The non-hemolytic streptococcus was the second predominating organism. We are fairly convinced that Gram negative cocci and non-hemolytic streptococci constitute the normal basic throat flora. This is in accordance with the findings of Bloomfield(2) and Shibley, Hanger and Dochez(3) in the United States. W. C. Noble(4) found the average flora to consist of green streptococci and Gram-negative cocci. He states that only green streptococci were basic for all subjects. Staphylococcus aureus and Gram-positive cocci are common transients. We found Gram-positive cocci in fifty-eight per cent of cases. Some strains produced slight hemolysis on blood agar.

Staphylococcus aureus was present in forty-three per cent of cases. In nineteen it was hemolytic and in twenty-four non-hemolytic. This organism predominated in seven cases. In three it was hemolytic and in four non-hemolytic. The different hemolytic strains encountered, varied in the amount of hemolysis produced. Taking this as a basis we can designate them as slightly hemolytic, hemolytic, and decidedly hemolytic. Some variation was also observed in the size of the colonies and in the intensity of color. In the majority of cases hemolytic staphylococcus aureus was limited to the region of the tonsils. Bloomfield(5) does not consider this organism as a normal inhabitant of the upper air passages. He encountered it under two conditions: "First as a transient in nose or throat; and secondly, associated with chronic focal infections".

Hudson(6) in an attempt to classify the staphylococci in the throat of normal persons and of persons with common cold, found staphylococcus aureus to be the most active in producing biochemical changes.

We would emphasize the fact that hemolytic staphylococcus aureus is very common in this country. We have isolated it repeatedly from normal and pathological throats, from furuncles, the blood stream, sputum, nose, etc. Out of the sixteen plates exposed in different parts of the hospital we obtained this organism in one; thus showing that it is also present in the air.

Hemolytic streptococci were found in twenty-six cases. They

predominated in three. Real beta hemolytic streptococci were encountered but once. In the majority of cases hemolytic streptococci were limited to the region of the tonsils.

From the Journal of Laboratory and Clinical Medicine (vol. 5, page 135) we take the following table showing the incidence of hemolytic streptococci in apparently normal throats according to different investigators:

Author	Per cent of cases harboring hem. strep.
Spooner	61.71
Cuming, Sprunt, and Lynch	6
Nichols	75
Opie, Freeman, and Blake	22.4
Blaudon, Burhous, and Hunter	90
Smillie	50
Ruediguer	59

Smillie([7]), studying the flora of the normal throat and nasal pharynx of the inhabitants of an isolated region in Alabama, did not find hemolytic streptococci. In similar investigations by the same worker carried on in Labrador hemolytic streptococci were found to be exceedingly rare. The same investigator, in studies conducted elsewhere([8]), found hemolytic streptococci in fifty per cent of the normal throats examined, but beta hemolytic streptococci were found only once; and Bloomfield could not find them in any case in a detailed study of the throat flora of six healthy persons from whom serial cultures were made.

A. L. Bloomfield and A. R. Felty([9]) studying the hemolytic streptococcus parasitism in the upper air passages find that the hemolytic streptococcus is less frequently found in the throats of those whose tonsils have been removed. They conclude "that the hemolytic streptococcus under average conditions is strictly adapted to a local growth in foci of lymphadenoid tissue in the upper air passages, especially the tonsils". Pilot and Davis reach similar conclusions. Davis([10]) finds that "cultures taken at short intervals sooner or later reveal the presence of hemolytic streptococci in the throat of practically all normal persons".

Diphtheroids were found in fourteen per cent of the throats examined by us. Although they predominated only twice, they occurred in comparatively large numbers in most of the cases.

Among the unidentified Gram-negative bacilli there was one which showed all the characteristics of B. coli except that it gave a negative indol test (paradimethylamidobenzaldehyde method). It was the second predominating organism in the cultures.

Staphylococcus albus was not common. It was hemolytic in one case. In several cases we suspected staphylococcus colonies on blood agar to be the albus type, but when transplanted to plain agar slants and growth exposed to light at room temperature during twenty-four hours or more, a definite pigment formation resulted. Pneumococci were rarely encountered. Longscope, Warfield and Fox[11] and Park and Williams[12] report finding typical pneumococci in a large percentage of the throats of normal individuals, especially during the winter months. Many investigators have obtained similar results. B. influenzae was present in seven cases and predominated in none. It must be taken into consideration that the method and media employed were not ideal for the detection of this organism, and we might have overlooked it in some instances. Bacillus "X" was present in four cases. Although it never predominated it always occurred in relatively large numbers, especially in the region of the pharynx.

J. H. Dible[13] in a study of the hemophilic bacteria of one hundred individuals found bacilli morphologically identical with B. influenzae in forty-seven. Thirty of these he considered true influenza bacilli. Some of hemophilic hemolytic Gram-negative bacilli (Bacillus "X") were also encountered. Other investigators get more or less similar results.

Wollstein, M.[14] and Bloomfield, A. L.[15] did not find B. influenzae in the throat of healthy children. Bloomfield also reports that besides B. influenzae he also was unable to find either pneumococci or hemolytic streptococci; organisms which are relatively frequent in adults. He calls attention to the fact that non-hemolytic streptococci were found constantly in large numbers beginning with a few hours after birth.

We obtained streptococcus viridans in ten cases. It predominated in none, but occurred in comparatively large numbers in all ten cases.

B. friedlanderi was isolated in six cases and predominated in three. It was always found in large numbers, and in four out of six cases the organism was limited to the region of the tonsils.

Staphylococcus citreus, although frequently found as a contaminating organism, was encountered only in five cases and in sparse numbers.

B. proteus was found twice and in both cases in pure culture.

PATHOLOGICAL THROATS

Seventy-five pathological cases were examined. Fifty were cases of tonsillitis. Of the remaining twenty-five, fifteen were more or less typical cases of diphtheria in which the bacteriological findings corroborated the clinical diagnosis. The findings in the other ten cases are copied here as they appear in our original records because they illustrate certain important points. The number of cases, however, is so small that we cannot reach at the present time any definite conclusions.

In the case of individuals with diseased tonsils we proceeded to collect material as in the case of normal throats. In the other twenty-five cases cultures were taken only from the part affected. Direct smears were made in each case and stained with Giemsa's and by Gram's method for the detection of spirochetes and the organism of Vincent's angina.

In the following table we group the bacteria found in the throats of the fifty cases of tonsillitis. The organisms are listed in the order in which they predominated in the series.

Organism	Number of cases in which it was found	Number of cases in which it predominated
Gram-negative cocci	40	15
Non-hemolytic streptococci	30	4
Staphylococcus aureus	30	12
Gram-positive cocci	25	5
Hemolytic streptococci	16	6
Streptococcus viridans	13	5
Staphylococcus albus	7	0
Diphtheroids	5	2
Pneumococci	5	0
Gram-positive bacilli (unidentified)	5	0
Sarcinae	3	0
B. friedlanderi	2	1
Gram-negative bacilli (unidentified)	1	0
B. proteus	1	0

The findings in the ten cases referred to above are listed as follows:

Description of Condition.	Bacteriological findings (Organism listed in order in which they predominate).	Remarks
1–Extensive ulceration of pharynx and soft palate. Five months' duration.	1–Slightly hemolytic Gram-positive cocci in practically pure culture.	Smears: spirochetes morphologically like Vincent's. Few isolated fusiform bacilli seen.
2–Congestion of anterior pillars. Chronic granular pharyngitis.	1–Non-hemolytic strep. 2–B. proteus. 3–A. diphtheroid.	B. proteus, altho not predominating, was present in relatively larger numbers.
3–Congestion of anterior pillars, Sore throat.	1–Gram-positive cocci. 2–Gram-negative cocci. 3–Non-hem. strep. 4–Non-hem. staph. aureus.	Direct smears: negative.
4–Mucous patches of both tonsils and pillars bi-lateral cervical adenitis. Two weeks' duration. Swabs sent to Laboratory for culture.	1–Non-hem. strep. 2–Non-hem. staph. aureus. 3–Gram-positive cocci. 4–Gram-negative cocci.	Dark field examination and direct smears (Giemsa's) showed spirochetes very suspicious for T. pallidum.. Kahn test–4. 3. 2.
5–Pseudo-membrane, grayish, bleeding easily, extending from both tonsillar pillars to posterior nares. Child very toxic. Twelve days duration.	Beta hemolytic streptococci and B. diphtheriae in about equal numbers.	Report from another laboratory read: "B. diphtheriae in pure culture" D phtheria antitoxin given. No improvement. Child died two days later.
6–Mucous patches in posterior-pharynx. Ulceration of surface of left tonsil. Bi-lateral cervical adenitis.	1–Gram negative cocci. 2–Slightly hem. staph. aureus.	Directs mears and dark field negative for spirochetes. No fusiform bacilli found. Kahn test 4. 3. 2.
7–Congestion of posterior pharynx Mild sore throat.	1–Strep. viridans (?) in pure culture.	This culture was brought to us by Dr. A. F. Coburn. By the appearance of the colonies on blood agar and the "long" chain formation in glucose broth we thought that the organism was strep. viridans and not a pneumococcus. Nevertheless it fermented inulia, but was insoluble in a ten per cent sodium taurocholate in physiological salt.
8–Extensive membranous patches scattered all over the mouth and pharynx with areas of inflammation. Lesions have a spongy appearance.	1–B. proteus. 2–Gram-positive cocci.	Direct smears negative.
9–Diseased hypertrophic tonsils. Mild sore throat.	1–Diphtheria-like bacilli. 2–Non-hemolytic streptococci.	Virulence test–negative.
10–Tonsils enlarged and covered with grayish membranes which did not extend to the pillars or to the soft or hard palate. Some difficulty in swallowing. Two days duration.	1–Beta hemolytic streptococci. 2–B. friedlanderi.	Swabs were sent to laboratory for B. diphtheriae.

Gram-negative cocci and non-hemolytic streptococci were the organisms most commonly encountered as in the case of normal throats.

Staphylococcus aureus was the third predominating organism. Out of the thirty cases in which it was cultured in fourteen it was hemolytic. It was found to predominate in twelve and out of these twelve it was hemolytic in nine.

In normal throats staphylococcus aureus was found to predominate in seven per cent while in the case of pathological throats it predominated in twenty-four per cent of cases, in the vast majority of which the organism was hemolytic.

We do not attach any etiological significance, in the case of diseased tonsils, to the non-hemolytic staphylococcus aureus or even to the slightly hemolytic strains; but we think that decidedly hemolytic staphylococcus aureus is a very important organism in this connection. We believe that when by careful swabbing of the surface of the tonsils a pure or practically pure culture (or even large numbers) of decidedly hemolytic staphylococcus aureus is obtained, the organism, as in the case of beta type hemolytic streptococci, has a diagnostic significance.

The hemolytic streptococcus is undoubtedly the most important organism in connection with diseased tonsils; especially the beat type of Smith and Brown.

In the case of normal throats we got hemolytic streptococci in twenty-six per cent of cases and they predominated in three per cent. Beta type hemolytic streptococci were encountered only once. Out of the fifty cases of diseased tonsils cultured we obtained hemolytic streptococci in thirty-two per cent, they predominated in twelve per cent and the beta type was isolated in fourteen per cent.

The literature dealing with this particular organism is voluminous. Time and facilities have not permitted us to go into it in detail, but merely to point out some prominent facts established by the work of many investigators.

Pilot and Davis([15]) recovered hemolytic streptococci by swab cultures in sparse numbers from the pharynx and tonsillar surfaces in sixty-one per cent of throats. The individuals examined were mostly children with hypertrophic tonsils. From the crypts of the excised tonsils of the same cases he got the organism in ninety-seven per cent, usually in predominating numbers. They conclude that swab cultures are unreliable in determining the incidence of this organism in the respiratory tract.

Valentine and Mishulow([17]), studying "the cultural and serological relationships of hemolytic streptococci isolated from inflammatory conditions of the respiratory tract", concluded that the dif-

ferent strains fall into many cultural groups and subgroups, and they found so few similarities among them that "the probability of a dominant strain seemed remote". They did not consider any of the strains isolated by them to be of "primary etiological importance".

"Otteraaen([18]), after similar studies, concludes that hemolytic streptococci are frequent inhabitants of the throats of normal subjects and of persons suffering from acute infectious diseases. He found these streptococci not to be virulent, based on results obtained by animal inoculations and phagocytoses experiments.

Fox and Stone([19]) come to the conclusion that "the streptococcal contents of the human throat maintains a constant standard as regards both quantity and type; the only important change associated with local pathological conditions is an invasion by hemolytic streptococci".

The tendency of hemolytic streptococci to be confined to local lymphadenoid foci has already been pointed out, but investigations by different workers tend to show that "when streptococcal disease is highly epidemic, a different type of parasitism may exist". Bloomfield states that under those conditions, in the army camps practically every man, sick and well, was found to be a streptococcus carrier. In such cases the streptococci were not confined to local lymphadenoid foci and they grew freely, generally on the mucous membranes of the throat.

Bloomfield and Felty([2]) consider that "a culture showing no beta hemolytic streptococci, if properly made, would be strong evidence against acute follicular tonsillitis and in favor of some other infections such as diphtheria or Vincent's angina." Here, again, the decidedly hemolytic staphylococcus aureus must be taken seriously into consideration.

They also agree "that beta hemolytic streptococci may persist in the tonsil for an indefinite length of time after acute tonsillitis, but die out rapidly, after tonsillectomy, on the free mucous membranes of the throat".

These investigators examined a group of individuals for beta hemolytic streptococci. Then they observed this experimental group as to whether those that were found carriers or those that were not, developed tonsillitis. When cases of tonsillitis began to appear it was observed that the infection occurred in those that were found previously not to be carriers of beta hemolytic streptococci. The carriers, with only one exception, did not develop tonsillitis. They

conclude that "tonsillitis was distinctly not an autogenous infection, but resulted from invasion of an outside strain".

The work of these and many other investigators shows that beta hemolytic streptococcus is etiologically related to septic sore throat and acute follicular tonsillitis. Undoubtedly as Young and Crooks point out, when hemolytic streptococci are obtained in pure or practically pure culture they have a diagnostic significance.

The number of cases showing other pathological conditions is so small that we cannot reach any conclusion. Nevertheless we want to point out the great practical value of the direct smear and the blood agar plate in such cases.

Young and Crooks([21]) found the organism of Vincent's angina in many cases clinically confused with diphtheria.

Morales Otero([22]) in a study of one hundred cases clinically diagnosed as diphtheria, encountered diphtheria bacilli only in fifty-two. Hemolytic streptococci were obtained in nineteen cases, hemolytic staphylococci in six and the organism of Vincent's angina in two.

TONSILS

During the eight months from January 1929 to September 1929, cultures were made from the crypts and from the interior of sixty-five pairs of tonsils removed at operation from patients with a history of repeated attacks of tonsillitis. In some instances cultures were taken before operation to find out if simple swabbing of the tonsils was a reliable index of the predominating organism in the crypts. Our main purpose, in conducting these preliminary investigations, was to ascertain which were the predominating organisms in the crypts and the interior of diseased tonsils in Porto Rico.

The tonsils were received in the laboratory in sterile specimen bottles. The pits of the tonsillar crypts were carefully seared with a chromel wire inoculating loop. The loop was introduced into the crypts and streak cultures were made on blood and palin agar plates with the material obtained. Löffler's blood serum and glucose broth were also inoculated. Then, after searing the outer surface, of the tonsil, an incision was made with a sharp sterile knife. The inoculating loop was introduced through the incision and material obtained cultured, as in the case of that from crypts. Many of the tonsils received were badly macerated. We cultured only those that were intact. In several cases the crypts were not cultured. In one case no growth was obtained.

The following table shows the findings in the sixty-five pairs of tonsils examined. Percentages are included for convenience:

Organism	Number of times encountered, and percentage		Numbers of times it predominated, and percentage		In both crypts and inside	Number times obtain in pure culture and percentage		
	Crypts	Inside	In crypts	Inside		Crypts (only)	Inside (only)	Both crypts and inside
Hemolytic Staphylococcus aureus	34 times (.52)	33 times (.51)	7 times (.11)	7 times	18 times (28)	6 times (.9)	4 times (.6)	12 times (.18)
Beta Hemolytic Streptococcus	17 times (.26)	22 times (.34)	1 time	7 times	11 times (.17)		7 times	5 times (7.6)
Gram-negative cocci	8 times (.12)	8 times		2	2		1 times	
Streptococcus veridans	6 times	6 times	1 time	1 time	2		1 time	
Gram-positive cocci	7 times	5 times			1 time			
B. influenzae	5 times	7 times	1 time	1 time	3 times	1 time	1 time	1 time
Non-hemolytic streptococcus	4 times	4 times	1 time	1 time			1 time	
Slightly hemolytic streptococcus	3 times (4.5)	3 times		1 time		1 time		
Non- hemolytic staphylococcus aureus	3 times	3 times	1 time			1 time	1 time	
Pneumococci	2	2	1 time			1 time		
Bacillus "X"	2	2						
Diphtheroids	2 (.3)	1	1		1	1	1	1 (1.5)
Gram-negative bacilli	1	2		1			1	
Hemolytic staphylococcus albus	2	1				1		
Gram-negative bacilli (unidentified)		1						

As shown in the preceding table hemolytic staphylococcus aureus was the predominating organism. Hemolytic streptococci ranked second.

Among the streptococci producing decided hemolysis two different types of colonies were observed: 1. Punctiform, white, slightly transparent. 2. Opaque, size and shape like the head of a pin, dirty greasy appearance. The latter was much more common than the former.

Polvogt and Crove[23] found hemolytic streptococci to be the predominating organism in a series of one hundred excised tonsils examined. Staphylococci were encountered in eight per cent.

Pilot and Pearlman[24] isolated hemolytic streptococci in ninety-five per cent of the tonsils cultured.

Kilduffe and Hersohn[25] found staphylococci in thirty-three per cent of four hundred pairs of tonsils examined.

None of these authors mention hemolytic staphylococci.

Streptococcus viridans was found to predominate once in the crypts, once in the interior of the tonsil and once in both crypts and inside.

Pneumococci were cultured twice from the crypts, twice from inside, and it predominated once in both crypts and inside.

Diphtheroids were encountered twice in the crypts and once in the interior. They were obtained in pure culture from the crypts in one case and in another case it was found in pure culture in both crypts and inside.

B. influenzae was found five times in the crypts, seven times in the interior and was obtained in pure culture once from inside, once from the crypts and once from both crypts and inside.

B. influenzae was found five times in the crypts, seven times in the interior and was obtained in pure culture once from inside, once from the crypts and once from both crypts and inside.

In a detailed study of the bacteriology of tonsils and adenoids Pilot and Pearlman (26–29) found Streptococcus viridans, pneumococci, B. influenzae and diphtheroids in relatively larger numbers. They conclude that the tonsils and adenoids are foci in which B. influenzae, Streptococcus viridans and pneumococci commonly flourish.

They found diphtheroids to be "decidedly more numerous in the pharyngeal vegetations than in the tonsillar crypts". This is in accordance with our findings.

It must be noted that the hemolytic staphylococcus aureus was

much more commonly encountered in those tonsils cultured during the months of June, July, August and September than in those cultured during the four preceding months.

In sixteen cases cultures were taken from the surface of the tonsils before operation. In six of them the predominating organism in the surface was also the predominating organism in the crypts. Out of the remaining ten cases the predominating organism in the crypts was the second predominating organism on the surface in six. In the other four the predominating organism in the crypts was found only in sparse numbers on the surface cultures.

We believe that simple swabbing of the tonsils, even if carefully done, is not a very reliable index of the predominating organism in the crypts.

SUMMARY AND CONCLUSIONS

The bacteriological findings in one hundred normal throats, seventy-five pathological throats and sixty-five pairs of excised tonsils are reported.

Gram-negative cocci and non-hemolytic streptococci were found to constitute the normal basic throat flora during the months from February to May.

Staphylococcus aureus and Gram-positive cocci were common transients. Pneumococci were only occasionally encountered. Hemolytic streptococci were isolated from twenty-six per cent of the normal throats, but real beta hemolytic streptococci were isolated but once. Both hemolytic streptococci and hemolytic staphylococci aureus were found to be limited to the region of the tonsils in the majority of cases.

Hemolytic staphylococcus aureus was isolated from pathological throats (cases of tonsillitis) in fourteen out of fifty examined. Hemolytic streptococcus were cultured in thirty-two per cent. In fourteen per cent they were of the beta type.

Hemolytic staphylococcus aureus was the predominating organism in the crypts and the interior in a series of sixty-five pairs of tonsils examined. Beta hemolytic streptococci ranked second.

Simple swabbing of the surface of the tonsils, even if carefully done, is not a very reliable index of the organism predominating in the crypts.

Decidedly the hemolytic staphylococcus aureus is a very common and important organism in this island. We think that when decidedly hemolytic staphylococcus aureus is isolated in pure culture,

practically pure culture or even in large numbers from the surface of diseased tonsils, it has the same diagnostic significances as in the case of the beta hemoyltic streptococcus.

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