BACTERIAL FLORA OF NORMAL SKIN

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It has been a problem fascinating many workers to investigate the flora of normal skin (Price, 1938; Arnold, 1942; Pillsbury & Nichols, 1946; Evans et. al., 1950), but there are differences of opinion regarding the size and type of bacterial flora. Perusal of Indian literature does not reveal any such report on normal skin flora. In this paper an attempt has been made to find out the flora of skin in apparently healthy individuals.

MATERIAL AND METHODS:

Fifteen apparently normal individuals without any skin, nasal or throat infection were the subjects of this study. First three subjects were the postgraduate medical students.

Evans et. al.'s method (1950), slightly modified, was used in this study. Skin area over the scapular region was used. The area to be tested was not prepared in any way. It was scraped with a sterilized scalpel of 3 cms. blade. Twenty-five downward strokes were made using even pressure as far as possible. The scrapings were placed in a sterile mortar. The scales adherent to the scalpel were washed off with 1 c. c. of sterile distilled water. The area scraped was measured. Six to eight sterile glass beads were put in mortar and the scrapings ground with a pestle for a period of five minutes (Evans et. al. used Alundum mesh). To the content was then added 9 c. c. of sterile distilled water and the material again ground. The mixture so prepared was taken as of 1 in 10 dilution. Ten fold dilutions (1 in 100) and (1 in 1000) were prepared in sterile test tubes.

Material was mixed with a sterile pipette and then two aliquots of 0.1 c. c. each (one for aerobic and the other for anaerobic culture) were withdrawn and poured into sterile petri dishes and melted agar was poured in. The petri dishes were rotated clockwise and anticlockwise. The media having set the plates were then incubated at 37°c for 48 hours. The material was also inoculated on blood agar plates in aerobic and anaerobic conditions for identification of bacteria.

Parallel lines in horizontal and vertical directions were drawn on the bottom of dishes to form squares to facilitate counting. A hand lens was used to make

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differentiation between minute colonies, air bubbles and debris material. By facing a window each colony of both plates was counted. One colony usually represents one bacterium from which it has grown. By this we know the number of bacteria in 0.1 c. c. and multiplying by the dilution factor and calculating the average we find the total number of bacteria from the area scraped and then the number of bacteria per square centimeter was calculated.

The organisms growing on blood agar plates were identified.

RESULTS

The results obtained by Evans et. al.'s technique of fifteen subjects are given in table I.

S. No.	Age	Time since bath	Oaganisms per square centimeter			
			Aerobic		Anaerobic	
			Quality	Quantity	Quality	Quantity
1	25	18 hrs	Staph. coag – ive*	93	Staph. coag – ive	7
2	24	6 hrs	Staph. coag – ive E. Coli & Candida	1,622	Diphtheroids	259
3	25	6 hrs	Staph. coag – ive	211	Staph. coag – ive	123
4	30	49 hrs	Staph. coag – ive Staph. coag + ive**	11,667	Diphtheroids	300
5	22	8 hrs	Staph. coag – ive	1,431	Staph. coag – ive Diphtheroids	500
6	29	10 hrs	Staph. coag – ive Strept. beta haem.	8,207	Strept. beta haem.	1,727
7	26	8 hrs	Staph. coag – ive	68	—	—
8	28	20 hrs	Staph. coag – ive Proteus vulgaris	3,473	Diphtheroids	993
9	24	7 hrs	Staph. coag – ive	1,459	—	—
10	27	8 hrs	Staph. coag – ive Strept. Viridans	9,747	Diphtheroids	580
11	29	9 hrs	Staph. coag – ive	1,451	Staph. coag – ive Diphtheroids	365
12	26	10 hrs	Staph. coag – ive Staph. coag + ive	4,933	—	—
13	28	9 hrs	Staph. coag – ive Spore bearers	3,518	Diphtheroids	26
14	27	10 hrs	Staph. coag – ive	1,097	—	—
15	30	19 hrs	Staph. coag – ive Staph. coag + ive	12,667	Staph. coag – ive Staph. coag + ive	1,846

Table I :- Number and type of organisms obtained from scrapings of skin of scapular region of fifteen youngmen.

* Staphylococcus albus coagulase negative.

** Staphylococcus aureus coagulase positive.

No attempt was made to find out the number of different types of bacteria separately. It is apparent from Table I that Staphylococcus albus coagulass–ive

was encountered in all the cases. The next common organism was anaerobic diphtheroid, found in seven cases. Other organisms found were Staphylococcus aureus coagulase + ive in three cases; Streptococcus beta hemolyticus, Streptococcus viridans, Escherichia coli, Proteus vulgaris, Aerobic spore bearers and Candida spy each in one case.

There had been variations in both the type of organisms and their total number in different individuals e.g the total counts were very high in cases No. 4,10 and 15 and very low in cases No. 1 and 7.

The average number of aerobic and anaerobic organisms found in the present series was, 4,110 per square centimeter and 477 per square centimeter respectively.

In four cases no anaerobes were isolated. The number of anaerobes (whenever found) were less than aerobes in that case.

The time elepsing between the bath taken and the test done was between 6 to 10 hours in 11 cases. In other four cases, it was 18,19,20 and 49 hours respectively. One of the two lowest counts was present in a person who had taken bath 18 hours earlier. In another case in which the time since bath was 20 hours, the count was a little below the average calculated. In the other two cases the count was much above the average and in one of these it was maximum of the series. Only three cases out of eleven in which the time since bath was 6 to 10 hours had a count above average.

DISCUSISON

The method of Price (1938) to find the bacterial flora was not used as by a single scrubbing, it does not give us any quantitative information. Again as the skin of hands and forearms from which the flora is obtained is constantly exposed to external environment and so gives variable results. For this reason Evans et. al.'s (1950) technique with slight modification was used. In order to avoid variation in flora due to differences in structure of skin in different sites, all specimens were taken from the skin of scapular region.

QUALITATIVE STUDY :

The type of organisms obtained varied but one organism (i.e. Staphylococcus albus coagulase–ive) was present in all the cases studied.

Staphylococcus aureus (coagulase + ive) was present in 20% of the cases. Incidence of this organism has been reported from 0 to 70% (Pillsbury & Nichols, 1946; Smith, 1941; Martin, 1942; Gillaspie et. al., 1939; Williams, 1946).

Streptococci have not been isolated from normal skin by most workers (Pillsbury, Livingood and Nichols, 1942, Evans et. al. 1950). We, however, found Streptococcus beta haemolyticus and Streptococcus viridans in one case each. Such a rare occurrence of streptococci can be explained by Burtenshaw's view (1942)

that some of the naturally occurring fatty acids in the sebum have antistreptococcal effect and so these can remain on the skin only for a limited time.

Gram negative rods were present on two occasions only. The main factor which causes the disappearance of this is a physical one i.e. desiccation. This factor, however, is also important to some extent in degerming the skin of pathogenic Staphylococci (Noton & Novy, 1931). This partly explains the high incidence (64.5%) of Coliform bacilli in food handlers as reported by Harwood and Minch (1951). Candida (spy. unidentified) and aerobic spore bearers were present in one case each.

In fact any organism can appear on the normal skin as it is always exposed to the external environment, though it may remain there for a short time onlybecause of the intrinsic factors playing their role in degerming the skin and enabling it get rid of pathogenic organisms

Anaerobic diphtheroids were present in seven out of fifteen cases. These are usually situated in the sebaceous follicles and are more common on face where sebaceous glands are in plenty.

QUANTITATIVE STUDY:

There have been great variations in number of bacteria isolated in different reports. Bacterial counts of areas adjacent to each other may be extraordinarily divergent (Evans et. al., 1950). There are also marked variations in the count of different bacteria by the same method in different individuals. Evans et. al. (1950). in one case found only 6 bacteria per square centimeter while the highest count in another person was 865, 000 per square centimeter.

In the present work, a minimum count of 68 aerobic organisms per square centimeter (case No. 7) and a maximum of 12,667 (case No. 15) has been found. The maximum number of anaerobic organisms was 1, 727 per square centimeter (case No. 6). It is also observed from table I that the cases in which more aerobic organisms were isolated had also a higher count of anaerobic organisms as compared to other cases. Further, anaerobes have been consistently low as compared to aerobes. In no case anaerobes outnumbered aerobes. This finding is in contrast to Evans et.al. (1950) results, who found anaerobic organisms (average 55,384 per square centimeter) to be much more than aerobic organisms (average 552 per square centimeter).

This diversity of results can be explained by the fact that the anaerobic organisms grow in the sebaceous glands, because the penetration of Oxygen into the centre of a mass of sebaceous secretions must be very low. Again quite a number of bacteria must be lying inside the pilo-sebaceious apparatus and could be removed by deeper scrapings. Regular higher counts of anaerobes in Evans et.al.'s series may be due to relatively more force applied by them during scraping than by us.

It is thus seen that certain persons may unquestionably be characterised as having high counts while others show much lower counts. This depends upon many ecological factors, which are not yet understood but may include, among others, amount of sweating, amount of sebaceous secretion, cutaneous texture of different individuals in health and diseases and hygienic state of clothing. The cleanliness of an individual has definitely some influence on the number of bacteria on skin (Price, 1938) but the time elapsed since last bath appears to have no influence on the bactorial count as reported by Evans et.al. (1950). Two out of four cases in which the time elapsed since last bath was long, the count was hight, but in one of these cases the count was very low (93 per square centimeter). The high count in two cases may be due to many other factors, some of which are enumerated above, which might be operating in them.

Thus we see that the type of organism and an average count of these as a whole on normal skin cannot be generalised, though atleast this is very certain that Staphylococcus albus coagulase–Ive is always present on normal skin.

SUMMARY

Bacterial flora of normal skin of fifteen healthy youngmen was studied by Evans et. al.'s technique. The results are discussed and compared with those of other workers. The effect of time elapsing between the test done and bath taken on the number of organisms is discussed.

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