BACTERIAL FLORA OF THE HUMAN CONJUNCTIVA AFTER DEATH*

BY

J. J. KANSKI

Ophthalmic Department, The London Hospital

THE bacterial flora of the human conjunctiva both during life and after death has been the subject of several studies in the past. With the increasing incidence of keratoplasty and vitreous implants the study of the behaviour of the conjunctival flora after death in particular is becoming increasingly important.

Some of the first recorded findings date from 1887, when Fick examined the bacterial flora of 49 normal conjunctival sacs during life and found that 79·6 per cent. gave positive cultures. More recently, Barfoed (1953) reported on 501 normal conjunctivae and observed positive cultures in 55·5 per cent. On the other hand, Boberg-Ans, Badsberg, and Rasmussen (1962) demonstrated the presence of positive cultures in 87·3 per cent. of a series of 63 eyes examined between 9 and 23 hours after death, and suggested that the higher incidence of positive cultures noted after death might be due to the particularly favourable conditions for bacterial growth which then prevail.

The purpose of this investigation was to determine the interval between death and the cultures becoming positive, and to determine how long it was safe to leave donor eyes before enucleation. A comparison was therefore made between cultures taken 1 to 2 and 9 to 11 hours after death.

Material

The subjects were all patients who had died in the wards of The London Hospital between July and November, 1964. It was thought desirable to utilize subjects dying from a variety of causes, and also of various ages. Patients known to have ocular disease were excluded from this series.

The first cultures were taken within 1 to 2 hours of death after the cadaver had been routinely cleaned by the nursing staff.

After the first cultures were taken, the eyes were closed and the cadaver transferred to the mortuary, where it was stored at a temperature of 40°F., and cultures were again taken from the same eyes 9 to 11 hours after death.

* Received for publication December 14, 1964.

Method

Cultures were taken using a platinum loop from the inferior fornices and lower limbal regions of both eyes before being plated on blood agar plates.

In all cases the blood agar plates were incubated aerobically for 24 hours and then examined and reported on by the staff of the clinical laboratories. Altogether eighty conjunctival sacs were examined in this way.

Results

The number and percentage of positive cultures, the organisms grown, and the Gram-negative bacilli are set out in the Table.

TABLE
RESULTS 1 TO 2 AND 9 TO 11 HOURS AFTER DEATH

Interval after Death (hrs)		1-2	9-11
Cultures	Sterile	29 (36.2%)	38 (47.5%)
	Positive	51 (63.8%)	42 (52.5%)
Total		80	80
Organisms Cultured	<i>Staph. albus</i> and <i>citreus</i>	28	20
	<i>Staph. pyogenes</i>	11	5
	Diphtheroids	8	5
	<i>Neisseria catarrhalis</i>	4	1
	Pneumococcus	2	2
	<i>Strep. viridans</i>	2	1
	Gram-positive bacilli	1	1
	Total	56	35
Gram-negative Bacilli	<i>E. coli</i>	5	9
	<i>Ps. pyocyanea</i>	2	2
	<i>Proteus vulgaris</i>	—	2
	Total	7	13

Discussion

The Table shows a higher incidence of positive cultures in the first group; of cultures taken 1 to 2 hours after death 63.8 per cent. were positive but of those taken 9 to 11 hours after death only 52.5 per cent. were positive. In eighteen cases (22 per cent.) the cultures became sterile after being originally positive, and only in nine cases (11 per cent.) did they become positive after being originally sterile. A closer analysis of the eighteen cultures which became sterile shows that fifteen were Gram-positive cocci, and three Gram-negative cocci. Of the 9 which became positive three were due to Gram-negative bacilli.

It is interesting to note that the incidence of intestinal Gram-negative bacilli, especially *E. coli*, was appreciably higher in the second group (9 to 11 hours after death). The reason for this may be the existence of conditions favourable for the promotion of growth of Gram-negative bacilli following death. It is well known that Gram-negative intestinal bacilli colonize many tissues of the body, such as liver and spleen, following death. The exact mechanism by which this occurs is unknown,

but it has been postulated that there may be a bacteraemia at the time of death or that there is a direct migration of organisms from the large bowel to adjacent tissues. This latter explanation, however, seems unlikely to be responsible for the presence of Gram-negative bacilli in the eye after death.

The lower incidence of Gram-positive cocci in the later group is more difficult to explain; it seems unlikely that a temperature of 40°F. could contribute to the relative disappearance of these organisms from the conjunctival sac, for it is known that bacteria are relatively resistant to low temperatures.

No correlation was found between the incidence of positive cultures and the age of the patient or between the incidence of positive cultures and the administration of systemic antibiotics before death.

These findings demonstrate that, if donor eyes are to be left for any length of time so that permission for enucleation may be obtained from the relatives, they should be treated with antibiotics such as polymyxin to which most Gram-negative intestinal bacilli are known to be sensitive.

Summary

Cultures were taken from eighty conjunctival sacs at 1 to 2 hours and then at 9 to 11 hours after death after the cadaver had been stored at 40°F. It was found that, although the overall incidence of positive cultures was higher in the first group, the incidence of Gram-negative bacilli, especially *E. coli*, was higher in the later group. The practical implications of these findings are discussed.

I should like to acknowledge the help of Mr. A. Lister, Mr. J. E. M. Ayoub, Mr. I. M. Duguid, and Mr. B. Jay, and the valuable assistance of Mr. Jarvis of the Clinical Laboratories, during the preparation of this paper.

REFERENCES

- BARFOED, P. (1953). "Conjunctivas Bakterieflores". Thesis. Munksgaard, Copenhagen.
BOBERG-ANS, J., BADSBERG, E., and RASMUSSEN, J. (1962). *Brit. J. Ophthalm.*, **46**, 365.
FICK, A. E. (1887). "Über Microorganismen in Conjunctivalsack". Bergmann, Wiesbaden.