SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY

March, 1934

President—MUSGRAVE WOODMAN, M.S.

Nasal Ciliated Epithelium with Special Reference to Infection and Treatment

The opening papers read by Mr. ARTHUR W. PROETZ, Mr. V. E. NEGUS and Mr. A. R. TWEEDIE are published in this issue of the *Journal of Laryngology and Otology*, Vol. XLIX, No. 9, pp. 557-89.

DISCUSSION.

THE PRESIDENT remarked that to-day the Section had had presented to it three papers of fundamental importance, giving ocular demonstration of the influence, not only of heat and cold, but also the effect of the drugs which laryngologists were accustomed to use, and their effect on the mucous membrane. Mr. Tweedie's paper was especially concerned with the reaction of the nose, a matter which had interested him, the President, for some time. He was glad to know the practical method by which, in ordinary clinical ways, one could test the reaction of the nose and its contents and apply suitable reagents to correct abnormalities.

Sir ST CLAIR THOMSON said that, as a student, his attention was directed to the subject of these papers by the observations of the great Lister. Lister drew attention to the fact that in simple fracture of the ribs, if the lung were punctured by a fragment, the blood effused into the pleural cavity, though freely mixed with inspired air, undergoes no decomposition. The air sucked in through the wounded lung is sometimes so abundant that surgical emphysema takes place. Yet, in a *post mortem* in such a case, ten days after the injury, Lister found the distended pleura " free from inflammation ". This observation was explained by the atmosphere being filtered from germs during inspiration through the air passages. Where did this filtration take place ?

The speaker did a tracheotomy on all animals killed in the Lister Institute and found the mucus in the wind-pipe to be invariably sterile. The pharynx is well known to be a septic area. Coming, therefore, to the nose he investigated its bacteriology. Up to that date (1895) the view had been generally adopted that it was, as the

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Germans said, " selbstverständlich " that the nose would be full of organisms. His researches, with Professor Hewlett, showed that while this applied to the vibrissae of the vestibule, the interior of the nose was sterile in normal conditions.*

The experiments which his colleague and he made to see what the air was like at the back of the nose had a different result from that which seemed to emerge from Mr. Negus's work. He fixed up an arrangement by which a tube was passed into the post-nasal space, and that led the air to a culture of gelatine. It was found that the air so directed was sterile. Therefore it seemed clear that, in average conditions of health, the nose could adequately deal with it. Then they passed to their little investigation on the ciliated epithelium, a very primitive attempt. They pithed a frog, and put a piece of charcoal on the epithelium, and measured the pace of the movement. The frog seemed to carry out this job quicker than the human being, as he moved the charcoal along at the rate of an inch a minute. That was followed up by Sir St Clair planting in Dr. Hewlett's nose *B. Prodigiosus*, and it disappeared rapidly, so that in an hour's time there was no trace left. The conclusion of Hewlett and himself was that " the removal of the intruding organisms from the Schneiderian membrane is probably chiefly due to the action of the ciliated epithelium, assisted by the trickling of mucus and the lachrymal secretion ".

After forty years it had been a great pleasure to see, so to speak, the cilia in action. All members must feel greatly indebted to these gentlemen who had shown how wonderfully, if not fearfully, we were made. It would increase our regard and respect more and more for the less and less.

A. LOWNDES YATES had studied the penetration of drugs into the ciliated epithelium and found that the degree of penetration was increased if solutions were used which dropped the surface tension, such as bile salts or sodium oleate, and that, clinically, results could in this way be achieved which could not be obtained in any other way. In some cases the ciliated epithelium was able to work very quickly. When he was studying this in a simple way he found that one could put material opaque to X-rays into the antrum and in half an hour it had moved out of view. The cases he tried it on were those who had suppurative conditions. This action of the cilia could be so rapid in these conditions that the inflammation readily spread to the larynx, and even to the trachea. The method of studying these things now shown was a wonderful one.

J. F. O'MALLEY: In his opening remarks Dr. Proetz spoke of the insufficient attention which had been given to the subject.

* " Micro-Organisms in the Healthy Nose," *Medico Chi. Trans.*, 78, 1895. " The Fate of Micro-Organisms in Inspired Air," *Lancet*, 1896, Jan. 11th.

https://doi.org/10.1017/S0022215100040639 Published online by Cambridge University Press

The physiologists went vigorously to work on discovery of cilia, but they appeared to have made little advance in the last hundred years since Sharpey wrote his monumental work on it, which covered a good deal of the ground now being investigated from the point of view of the activity of the cilia and their reaction to certain conditions, such as heat and cold, and to the use of acids and alkalies; but now the process and the reactions had been scientifically presented.

He drew the inference from Dr. Proetz that he regarded this activity of the cilia as practically the sole defensive means or mechanism for maintaining the physiological cleanliness of the nose and the sinuses. The speaker had looked up his old notebooks, and found in one of them the words, "Is the ciliary function capable of responding to and meeting all the needs of the physiological cleansing of the nose under all the circumstances of life?" He could visualize that it could do so if we lived under ideal conditions under which the strain on the mucous membrane was reduced to a minimum; but under the circumstances of everyday life to-day it was difficult to credit the cilia with ability, even with their full activity, to deal efficiently with all the mucous waste and foreign matter in the air passages. There were three points at least which prevented him from being able to concede that amount of efficiency to cilia. The first was their rate of movement and their activity and, therefore, their power to move solid particles from one point to another. That speed had been measured and was known. The second was a clinical point which had always puzzled him, the effect in atrophic rhinitis of Lautenschläger's operation. Before the operation there was crusting, but not afterwards, though nothing had happened in the meantime which could be attributed to cilia; there had only been an alteration in the size of the airway. The third point was one which Dr. Proetz had emphasized to-day, namely, that the cilia worked actively in the presence of gross sepsis. When an antrum was infected, opening and draining that antrum led, in the vast majority of cases, to the clearing of the antrum, but the surgeon had not altered the activity of the cilia, he had merely improved the drainage and ventilation of the antrum.

P. Watson-Williams: The scientific acumen of Dr. Proetz has led him to look beyond the enquiry of the moment, and to warn us that what is really of most importance clinically is not that which was on the surface, but what takes place in the sub-mucosa when the toxins or organisms penetrate and gain entrance to the lymphatics. Though that remark is made parenthetically, it is a very important point.

Dr. Proetz, in reply, thanked members of the Section for their remarks, and especially Sir St Clair Thomson for the account of the interesting experiments he carried out long ago. Those took place

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when the speaker was two years old, and that fact kept the years during which the investigation had been carried on still in Dr. Proetz' lifetime.

He agreed with Mr. Lowndes Yates about changes in surface tension, but that subject would open up another long discussion.

In answer to Mr. O'Malley, he did not wish to give the impression that the cilia and the surface mechanism were the entire defence agency but that they were of major importance. There was, for instance, all the work which had been done on the reticulo-endothelial system, work which in this contribution he had not touched upon. The cilia must be looked upon as the first line of defence, and so they were of the utmost importance.

The nose did not depend on the cilia alone for cleansing itself, as was shown by Hilding, who sewed a rabbit's nostril and left it so closed for six weeks. When he re-opened it he found that the effect of ventilation on the open side was to destroy the cilia and bring about a change in the surface which amounted to squamous epithelium, and greatly increased the number of what appeared to be goblet cells, i.e. the nose had thrown out an excessive amount of mucus. Where the nose had been kept closed, there were no further cilia, simply stumps. The cells were not destroyed, but the cilia were not functioning. After the nostril was opened again, the cells became normal. The wide side corresponded from a functional standpoint to what was seen in atrophic rhinitis.

Perhaps his intensity of purpose had made some think his idea was that the nose was made of cilia, but such was not the case; still, he thought the part played by cilia had generally been underestimated.

V. E. NEGUS, replying to Dr. Jobson, said that menthol had been tried by Professor Leonard Hill in an oily solution. He found that it had no harmful effect on the cilia.

AUSTRIAN OTOLOGICAL SOCIETY

Meeting May 29th, 1933

Abstract of Proceedings from Monatsschrift für Ohrenheilkunde, August, 1933

By ALEX. R. TWEEDIE

CASES

Recurrent Mastoiditis. Thrombosis of Sinus and Bulb. Operation. Recovery.—M. BARWICH.

A girl, aged 10, was admitted to Hospital on *April 26th*, with the history that in *December*, 1931, mastoidectomy had been performed for relief of right sided acute otitis media, and a peri-sinus abscess

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