3. Irradiation of rabbits with an identical technique, after infection with virulent staphylococcus, gives no protection.

4. Experiments indicate that the results are not due to the production of vitamins (A or D).

This research was carried out in Professor Leonard Hill's laboratory at the National Institute for Medical Research, Hampstead. I am greatly indebted for his kindness, constant advice, and help during the progress of these experiments.

REFERENCES.

- ¹ Rhode and Hase: Quoted from E. Mayer and M. Dworski, *Amer. Rev. Tuberc.*, vol. 10, 1924, p. 157.
- ² Mayer, E.: *Amer. Rev. Tuberc.*, vol. 10, 1924, p. 157.
- ³ Hill, C. M., and Clarke, J. H.: *Amer. Journ. of Hygiene*, vol. 7, No. 4, July, 1927, pp. 448-463.
- ⁴ Wright, A. E., Colebrook, L., and Storer, E. J.: *Lancet*, 1923, i, 365, 417, 473.
- ⁵ Eidinow, A.: *Lancet*, November 5th, 1927, p. 963.
- ⁶ Hartley, P.: *Brit. Journ. Exper. Path.*, vol. 5, 1924, p. 306.
- ⁷ Hardy, M.: *Amer. Journ. of Hygiene*, vol. 7, No. 6, November, 1927, pp. 811-837.
- ⁸ Tranggott, K.: *Munch. med. Woch.*, i, 17, 1920, p. 344.
- ⁹ Aschenheim, E., and Meyer, S.: *Zeit. f. Exper. Path. u. Ther.*, 22, No. 22, 1921.
- ¹⁰ Cramer, W., and Drew, A. H.: *Brit. Journ. Exper. Path.*, vol. 4, 1923, p. 271.
- ¹¹ Laurens, H., and Sooy, J. W., *Proc. Soc. Exper. Biol. and Med.*, 22, 1924, p. 114.
- ¹² Gunn, F. D.: *Proc. Soc. Exper. Biol. and Med.*, 24, 1926, p. 120.
- ¹³ Sooy, J. W., and Morse, T. S.: *Journ. Amer. Med. Assoc.*, 87, 1926, p. 94.
- ¹⁴ Eidinow, A.: *British Medical Journal*, April 13th, 1929, p. 680.
- ¹⁵ Maughan, G. H., and Smiley, D. F.: *Journ. of Preventive Med.*, 2, 1928, p. 69.
- ¹⁶ Green, H. N., and Mellanby, E.: *British Medical Journal*, October 20th, 1928, p. 691.

THE RELATION OF EAR CONDITIONS TO BATHING.

BY

W. I. DAGGETT, M.A., AND R. COVE-SMITH, M.A.,
M.B., F.R.C.S., M.B., M.R.C.P.,
JUNIOR NOSE AND EAR SURGEON, MEDICAL REGISTRAR,
KING'S COLLEGE HOSPITAL.

As the bathing season is now at its height, it does not seem out of place to set down some of the dangers which are liable to beset the community at this time of year. The daily papers are taking an increasing interest in the health of the populace, yet insufficient attention has been drawn to the precautions necessary for those who wish to avoid the inconveniences which may result from careless indulgence in swimming. Many medical men allow their patients too much licence in this direction, and fail to pay attention to small details which would increase the comfort of all.

It is obvious to those who attend out-patients in any large ear, nose, and throat clinic that a great number of acute aural conditions develop as the result of bathing. Moreover, such conditions may have dangerous sequels. For a long time at King's College Hospital we have had a notice placed in the out-patients' department which warns patients against bathing without leave from the surgeon.

From the point of view of the ear, nose, and throat surgeon the bathing community can be divided into (1) healthy persons; (2) those with septic nasal conditions (including the common cold); (3) those with a perforation of the tympanic membrane; (4) those with recurrent dermatitis or furunculosis of the external auditory meatus.

As regards persons in normal health, the public has a vague idea that water introduced into the meatus may be dangerous, and cotton-wool and other substances are used to prevent this. In such persons the entry of water does no harm, though it may give rise to several unpleasant symptoms. Among these are deafness and tinnitus following immersion. This is due to the swelling of wax and occlusion of the meatus, or to water collecting behind an accumulation of wax, where it may remain for some time. Another cause is the foolish practice of drying the ears with the rolled-up corner of a towel, thus pressing down against the drum any wax that may be in the meatus. Some may complain of a transitory earache due to cold water impinging on the drum, but this symptom should not be "passed off" without thorough examination lest acute otitis media be the cause. We have not yet met a case of vertigo; in fact, this is hardly to be expected, as

cold water enters each meatus with equal caloric stimulus to both labyrinths, so that the labyrinthine equilibrium remains undisturbed. The possibility of the occurrence of such a symptom must, however, not be overlooked, for it could occur if one meatus was occluded and the other patent.

Too often acute otitis media, with or without dangerous complications, occurs in the healthy swimmer. This is due to the entrance of infected water into the Eustachian tube and middle-ear tract. Public swimming baths and "town" rivers are great sources of danger. Those who bathe in the sea or in mountain streams are usually exempt from trouble. The healthy Englishman is fond of swimming, and in the large towns public baths afford the only facility. There is therefore a crying need for those in authority to render the public baths as safe as possible. It is essential that constant inspections should be undertaken. The problem is a difficult one, for disinfectants cannot be introduced in sufficient concentration without rendering bathing irksome. Calcium chloride is used in many places; it imparts a somewhat unpleasant taste to the water, and usually gives rise to a mild conjunctivitis. Naturally water is not rendered safe by this means, but if continuous filtration is carried out as well the risk is minimized. It is interesting to note that we have not been able to trace more than an isolated case of ear trouble attributable to bathing in the Camberwell baths, where this method is practised. In far too great a proportion of public baths the water is not changed often enough, whilst scouring of the empty bath is inefficiently carried out. It should be made compulsory for bathers to wash with soap before entering; in Germany this is an almost universal practice. Again, it is a bad principle that bathers should be allowed to come in straight from the streets and tramp along the sides of the bath in their grimed boots. All this filth must sooner or later find its way into the water.

The present facilities for bathing will not be revolutionized for some time, so we must consider what type of swimmer tends to develop acute otitis media and how the risk may be minimized. As a rule it is the badly taught, inexperienced swimmer who suffers most and becomes the victim of an "acute ear." Correct breathing is essential to prevent the entry of infected water into the Eustachian tubes, and it is here that the tyro fails. The practised swimmer fills his lungs at regular intervals through the widely opened mouth, keeping the soft palate raised and thus shutting off the nasopharynx. In fact, many swimmers of repute continually have the mouth open, even under water, gradually blowing air out until they need a fresh inspiration, when the head is turned clear of the water and air taken in through the mouth. The inexperienced swimmer fails to regulate his breathing properly, draws the water into his nose, chokes, and swallows; this last action opens up the Eustachian tubes and water is allowed to enter. For the same reason it is unwise to "duck" suddenly or to push a friend in unawares; proper inspiration is difficult in such crises. Jumping in from a high board should not be practised without holding the nose, as the sudden inrush of water into the nostrils may force some into the sinuses or into the Eustachian tubes.

It will be argued that thousands of people in normal health bathe regularly without precautions and come to no harm; nevertheless, the risk is there, and correct breathing should be taught.

The second class, those suffering from septic nasal conditions (including the common cold), should not be allowed in public baths. Not only do they spread infection, but any water entering the nose may carry infection backwards into the nasal accessory sinuses or Eustachian tubes. Swimming is dangerous in the same way as the pernicious habit of sniffing salt and water up the nose to relieve the common cold.

Patients who have a perforated tympanic membrane often ask whether bathing is permissible. Whether or not there is discharge the answer should be an emphatic "No." Those in whom the discharge has ceased will almost certainly become reinfected, with consequent exacerbation of old trouble; whereas those with an active discharge will contaminate the water and lay themselves

open to the risk of added virulent infection and acute symptoms supervening on the chronic. The professional or expert swimmer may possibly be excepted if the ear has been dry for two years or more, although the perforation has not healed, but every precaution must be taken as regards breathing and against the entry of water into the meatus. No form of precaution is "foolproof," though a small piece of wool impregnated with vaseline and laid in the meatus may serve a useful purpose. Better still, a thin piece of wool may be laid over this and kept in place with collodion. A successful radical operation, one year after complete healing, places the patient in Class 1 (healthy persons) as regards bathing. Patients with acute or chronic meatal eczema or recurrent attacks of meatal furunculosis are best advised not to bathe, for exacerbations are only too common.

Many swimmers who make a practice of diving into deep water complain that when they go beyond a certain depth they get a violent ringing in the ears. This is as a rule temporary; it is partially due to prolonged holding of the breath and partially to increased pressure on the tympanic membrane and stapes. Should it persist it will probably be found that there is some degree of Eustachian obstruction and retraction of the tympanic membrane and that politizerization will relieve the noises.

Conclusions.

1. There should be regular and frequent inspections of all public baths, and the water should be maintained as pure as possible.
2. All swimmers should be compelled to wash with soap under a shower before entering a public bath.
3. The public should be educated as regards correct breathing in the water.
4. "Ducking" and pushing people in should be discouraged.
5. Those persons with colds, septic nasal conditions, perforated ear drums, or recurrent inflammatory conditions of the external auditory meatus should not be allowed in public baths without leave from an aural surgeon.

ARSENICAL POISONING:

WITH SPECIAL REFERENCE TO TREATMENT WITH THE GALVANIC CURRENT.

BY

C. H. C. DALTON, M.A., M.D., D.M.R.E.,

MEDICAL OFFICER IN CHARGE OF X-RAY AND THERAPEUTIC DEPARTMENT,
EAST SUFFOLK AND IPSWICH HOSPITAL.

THE following case is of exceptional interest both scientifically and also from the practical aspect. It suggests strongly that the continuous galvanic current should be used in cases of arsenical poisoning, and also in other cases in which it is found that the toxic factor carries a positive or negative charge.

Mr. X, aged 40, had been an arsenical worker from 1919 until September, 1928; during this period he had a number of attacks of "indigestion" and colic following exposures to arsenic, and also various sensory changes from time to time. On April 6th, 1929, a sudden "foot-drop" occurred, and he attended for treatment on April 10th.

On physical examination, voluntary movement involving the anterior tibial and peroneal groups of muscles was absent; the skin over the middle third of the right leg in front showed diminished sensation. The muscles were tested, and the electrical reactions showed a normal response to the faradic current with the exception of the extensor longus digitorum, which, however, reacted briskly to the galvanic current.

Treatment was carried out three times a week, the affected muscles being stimulated by interrupted galvanism. In addition, the continuous galvanic current was applied by means of foot-baths, and a pad was placed reaching up the shin of the right leg; the negative pole was attached to the bath, which contained the right foot. The idea of this was that arsenic would be likely to be present in the form of the hydrochloride, and that the alkalioid would be extracted by this means.

After about a fortnight it was noticed that the skin on the right leg was becoming markedly scaly, and as this was most unusual I suggested that arsenic was being extracted. In consequence of this I collected some of the fluid from the pad at the end of one treatment, and also a sample of scales which were brushed off the skin of the leg. Both these samples were tested by an expert analytical chemist, and arsenic was reported to be definitely present by Marsh's reaction.

After three weeks' treatment, voluntary movement of the peronei began to return, and was followed a fortnight later by the tibialis anticus. Treatment was terminated on May 30th, when the condition had almost approached the normal; the extensor longus digitorum would contract to galvanic stimuli, but not to the faradic current. A further test, on June 6th, revealed that all the muscles would contract to the faradic current. On June 20th the affected muscles had completely recovered, and normal sensation of the skin on the front of the right leg was found to be present.

The continuous galvanic current is known to have an attractive or repulsive action to all substances which carry a negative or positive charge. Medical electro-therapeutists are frequently criticized because they are unable to give proof of how their methods act, and it is always satisfactory when it is possible to do so without question or doubt.

Similar work to the above has been carried out, I believe, in cases of lead poisoning, and also in the treatment of gout, but I can find no case on record in which arsenic has definitely been proved to be present chemically following treatment by the galvanic current. There can be no doubt that a considerable quantity of arsenic was extracted in the course of treatment, and the rapid recovery of the patient suggests, further, that this is the correct procedure in these cases.

The Section.

SUMMARY OF PROCEEDINGS.

(Concluded from page 263.)

SECTION OF MEDICINE.

Friday, July 26th.

ASTHMA.

DR. F. PARKES WEBER occupied the chair on the third morning of this Section, and called upon Dr. ARTHUR F. HURST to open a discussion on asthma. Dr. Hurst began by remarking that the oft-repeated hopes of a panacea were still far from realization. He drew attention to the importance of studying the constitution or diatheses of sufferers from asthma. There must be a lack of balance, due to some chemical cause, between the vagus and the sympathetic system, in asthmatic persons, resulting in a preponderant activity of that part of the vagal nuclei that regulated the contraction of the bronchial unstriated muscle. He further discussed the subject of abnormal sensitiveness to proteins and other chemical substances; the nasal and other conditions that might give rise to reflex asthma; and the psychological factors that might bring on asthma in any asthmatic subject. As for treatment, the only cure should be a change in the constitution or in the chemistry of the blood of the asthmatic person; the diet must always be a matter of great importance, and so must altitude. The skin tests he described as valueless in asthma, though in hay fever they were often valuable. Nasal treatment he thought was often most useful in selected cases. Asthma powders he condemned; but the use of adrenaline was commended on physiological grounds. In status asthmaticus the continuous injection of adrenaline in small quantities (up to even a drachm in half an hour) was the only cure. Dr. JAMES ADAM (Glasgow) said that for thirty years he had held that there was a toxic basis in asthma and that in most cases the nasal condition was a most important factor. This toxæmia, which originated in the intestine and the tissues, was partly due to the absorption of nitrogenous poisons and partly to an error in nitrogenous metabolism, the result of imperfect oxidation or enzyme action. The toxæmia tended to show itself first as a catarrh and