considerable advantage under carefully controlled conditions such as the measurement of radiation flux with the thermoradiometer and of skin temperature. In similar fashion, tolerance limits for various pathological conditions in which the tolerance is likely to be reduced (peripheral vascular disorders, nerve lesions, large avascular scars) could be defined, and appropriate conditions established (including dosage in measured quantitative units) for radiant-heat therapy in a wide variety of diseases.

Summary

The tolerance limit to local irradiation by visible and infrared rays has been measured in terms of radiation flux and skin temperature in 40 experimental volunteers.

There is a sharp and well-defined transition from a feeling of heat which is comfortable to a sensation of burning. The skin temperature at which this change of sensation takes place is about 45° C. (113° F.) and the tolerated radiation is of the order of 2.5 gramme-calories per square centimetre per minute. This figure is well above the usual therapeutic intensity, and we suggest that under well-defined conditions considerably higher intensities of radiant heat can be applied clinically than has been customary so far.

We should like to thank Prof. L. J. Witts for his suggestions and advice in all phases of this work. We are much indebted to Miss MacDonald, of the Dorset House School of Occupational Therapy, and to the students at the school who were such willing volunteers. Mrs. Lloyd-Smith greatly assisted in recording the experimental work.

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SUDDEN DEATH AFTER INTRAVENOUS SODIUM BISMUTH TARTRATE

BY

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Bismuth, in the form of sodium tartrate ("sobita"), is widely used in the Tropics for the treatment of yaws. The dosage varies from $\frac{1}{2}$ to 3 gr. (32 to 200 mg.), according to weight and age, given intramuscularly in aqueous solution. A series of from three to six injections at weekly intervals constitutes the usual course, and towards the end of such courses mild bismuth poisoning, as demonstrated by blue gums and gingivitis, is occasionally seen, but untoward results are very rare.

Manson-Bahr (1940) states that in Tanganyika over a million cases have been treated with this drug since 1924, and he mentions no fatalities. During the period 1933 to 1942 almost a quarter of a ton, representing more than one and a half million adult doses, has been administered in the Gold Coast, with no recorded fatalities. Dowds (1936), in Rhodesia, has reported three deaths following subcutaneous injection of sobita, but in these cases the quantities administered were very much larger than the usual dose (25, 13, and 25 gr. (1.65, 0.85, and 1.65 g.) respectively), and death occurred from six to fourteen days afterwards, renal damage being a prominent feature.

The toxicity of bismuth is stated by Smith (1934) to be ten to twenty times greater by the intravenous than by the intramuscular route. Cushny (1947) states that in mammals large doses of sodium bismuth tartrate act chiefly upon the central nervous system, causing accelerated respiration, violent convulsions, and slowing of the heart, with temporary cessation of the beat. He quotes Masson as describing a direct depressant action upon the heart with irregularities of which heart-block is the commonest.

Klauder (1923) demonstrated that in the rabbit the maximum single tolerated dose of sodium and potassium bismuth tartrates in aqueous solution by the intravenous route was 0.125 g. per kg. of body weight. There appears to be little record of the toxic effects of intravenous bismuth salts in man, although Fischer (1926) describes a case of severe bismuth poisoning, with recovery, following a course of intravenous bismuth-diasporal.

As long ago as 1925 Harrison pointed out that the technique of intramuscular injection which is commonly employed may easily result in the remedy entering a vein unless precautions are taken to prevent this, such as the separate insertion of the needle and a preliminary pull on the piston before injecting; and Chenoy (1926) records a case in which he assumes that the fatal issue was due to the accidental intravenous injection of an insoluble bismuth preparation in this manner; but perusal of this report leaves considerable doubt whether the injection was as stated, and, if it was, the effects might well have been due to embolism.

The only other case of sudden death from intravenous bismuth that I have been able to trace is that of Magnus (1924), but as I have access to only an abstract of this it is not clear to me what salt or dosage was given. The following cases may therefore be of interest.

Case Reports

Three adult female Africans each inadvertently received intravenously 10 gr. (650 mg.) of sodium bismuth tartrate in aqueous solution. Two of the women collapsed and died within

Sir George Henderson, Secretary of the Department of Health for Scotland, spoke on March 30 to the Edinburgh City Business Club on the hospital service under the N.H.S. Act. He said that the transfer to the State had been necessary in order to weld together a miscellaneous collection of hospital organizations in the interest of progress in treatment, medical education, and research; but there would be no startling changes immediately. The hospitals to be transferred were all public hospitals. Everyone in the country would be entitled to free hospital treatment as necessary, but the patient might accept parts of the Service and reject others—for example, a patient might go to a private nursing-home in a State ambulance. Progress was bound to be gradual. Building would remain difficult for some time, but at some date they would have to undertake the building of new hospitals to replace out-of-date ones. Buildings were less important than the spirit of the staff who worked in them. They confidently hoped that the great professions whose task was to heal and tend the sick and injured would co-operate freely and whole-heartedly in that important venture. It was sometimes said that they would not retain any of the spirit of voluntarism; that they would lose a lot of the kind of service so freely given to-day by public-spirited men and women. They hoped not. There were numerous ways in which voluntary effort could help the Service. There was one point on which he might correct a common misapprehension—the substantial endowment funds of many of the voluntary hospitals. In the main these funds were not being taken over by the Government. They would go to the new boards of management, who would hold them on trust and use them for purposes similar to those for which they were now held.

two minutes, whilst the third collapsed after about six minutes and then appeared unconscious, cold, and with a barely perceptible and irregular radial pulse. No convulsions were observed in any of the patients. The survivor was given 1 ml. of nikethamide subcutaneously, and artificial respiration was applied. She recovered consciousness and was detained for observation.

Post-mortem examinations were performed upon the two fatal cases, but nothing of note was discovered except a remarkable and quite unusual degree of flaccidity of the heart, the musculature appearing otherwise normal. In both cases the lungs were extremely congested. At this time the true nature of the accident was not realized and the livers were sent to the Government analyst, who subsequently reported the presence of bismuth therein.

Because of this report, the survivor was treated with "ametoxy" and intravenous salines, but signs of bismuth poisoning rapidly appeared and a blue line was visible on the gums on the third day. Diminution of urinary output occurred almost at once, and complete anuria resulted on the fifth day. Intravenous sodium sulphate solution caused excretion to recommence and increase daily until 16 oz. (450 ml.) was passed on the tenth day, when death occurred. All urine passed after admission contained albumin, red blood corpuscles, and casts. The blood-urea estimations showed a rapid rise to a maximum of 240 mg. per 100 ml. on the seventh day, falling to 208 mg. on the day of death.

Post-mortem examination disclosed marked blue gingivitis. The abdomen contained about a litre of clear pale amber fluid. The liver was enlarged, soft, and covered with recent fibrinous adhesions which anchored it to the surrounding viscera. The kidneys were both very pale and swollen, with fine punctate haemorrhages on the surface. The lower colon and rectum were inflamed, with small haemorrhagic spots. No other finding of note was discovered. Microscopy of the kidneys revealed almost complete destruction of the tubular epithelium, with many granular and fatty casts. The liver showed little histological change, but both kidneys and liver contained quantities of extremely finely divided fat throughout the tissue.

The relative quantities of bismuth given and demonstrated by the analyst were as follows :

	Mg. Sobita per kg. Body Weight	Mg. Bi per kg. Liver
Case 1 (immediate death)	13	40
Case 2 (" ")	10	30
Case 3 (delayed death)	11	23

I wish to record my thanks to the medical officers concerned for the courtesy of access to Case 3 and the clinical notes, to the Government analyst for the chemical estimations, and to the late Director of Medical Services, Gold Coast Colony, for his permission to publish this report.

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"The National Assistance Bill provides ample scope for the two classes of administrators—voluntary and governmental—to plan and work together," Mr. John Edwards, Parliamentary Secretary to the Ministry of Health, told the Lancashire County Citizens' Advice Bureau Conference at Manchester recently. He pointed out that after July 5 it would for the first time be possible to put up old folks' homes not to receive the destitute only but to house and provide care and attention to persons, whatever their financial resources, whose age, infirmity, or other circumstances required it. Under the Bill local authorities would also have to provide temporary accommodation for those in urgent need. "In these days of evictions, and with recent memories of flood, storms, and enemy action, I need not define this duty more precisely." The new Bill explicitly laid down that a local authority could contribute to the fund of any voluntary organization providing recreation or meals for old people.

A CASE OF MURINE TYPHUS IN LONDON

By:

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In recent years there have been a small number of recorded cases of typhus fever in Britain, but all appear to have developed on board ship or within a few days of returning from an area of endemic typhus (Beach and Rennie, 1945 ; Agnew and Kyles, 1944). The following case is of interest as the patient had not been out of this country for over thirty years.

Case Report

The patient, a Russian-born Jew aged 61, was admitted to the Metropolitan Hospital under the care of Dr. Norman Hill on June 14, 1947, the ninth day of his illness. While at a cinema he had complained of sudden headache and was shivering. Next day he was confined to bed with fever, slight cough with scanty sputum, and severe headache, which remained the dominant symptom throughout his illness. He was treated at home with sulphadiazine, but the fever continued and he became delirious and prostrated. His breathing seemed to be "short" and difficult at times. On the seventh day a rash appeared, being first noticed on the arms.

On admission the patient presented a picture highly suggestive of typhus fever despite the fact that careful examination showed no signs of louse or flea infestation, flea-bites, or excoriations. He was in low delirium, from which he could be roused, but could give no history and complained only of severe headache. He had a vivid and profuse maculo-papular rash on limbs and trunk, but not on the face, palms, or soles. The rash at first faded on pressure, though later it did not. The conjunctivae were suffused. He was dehydrated, had a dry skin and a dry tongue with thick blackish fur, and passed a small quantity of highly concentrated urine. The pulse was rapid and feeble. B.P. 90/70, P. 110, T. 101° F. (38.3° C.). There was passive congestion of the lungs, with a poor percussion note and fine crepitations at both bases. There was slight stiffness of the neck and back, but no other C.N.S. signs were found.

The cerebrospinal fluid contained 17 cells per c.mm., mostly lymphocytes; protein, 40 mg. per 100 ml.; chlorides, 700 mg. per 100 ml. A blood count showed 11,000 white cells per c.mm. (polymorphs 71%). The blood urea amounted to 50 mg. per 100 ml. on the tenth day. A radiograph of the chest confirmed the passive lung congestion. The Weil-Felix reaction on the eleventh day of the illness showed agglutination with *Proteus OX* 19 at a dilution of 1 in 125. Three days later the titre had risen to 1 in 500, thus confirming the diagnosis. No agglutination was obtained against *OX* 2, and against *OX K* the titre remained at 1 in 25.

On the twelfth day the temperature fell by crisis to 96° F. (35.6° C.), and remained at that level for three days before returning slowly to normal. He vomited many times on the day of the crisis and became incontinent of urine and faeces. For two days he remained very ill and collapsed, but thereafter his general condition improved steadily. His mental state improved slowly, but one week after the crisis his cerebation was still very slow.

He was later transferred to the Park Hospital, Hither Green, under the care of Dr. H. S. Banks, at whose request an investigation of the patient's serological reactions was made by Dr. Janet S. F. Niven at the National Institute for Medical Research. Using rickettsial suspensions as antigens, a positive reaction for murine (flea-borne) typhus was obtained, the antibody titre against the murine rickettsiae being 1 in 2,560, against louse-borne (epidemic) rickettsiae 1 in 640. Sera taken at later stages during and after convalescence showed a steady fall in agglutinating antibody with approximation of homologous and heterologous titres. The complete results of these and tests with similar South African sera will be published later by Drs. Gear and Niven.

The patient had left Western Russia 36 years ago. He did not admit to having had typhus fever or any febrile illness while