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design a new standard pattern operating tent in an attempt to improve on the present admittedly unsatisfactory one.

It is recommended that the existing stocks of I.P. tents should be used in this way wherever tented operating accommodation is required in field ambulance, casualty clearing station, or elsewhere.

It is further suggested that these modified I.P. tents joined together in series should be used for hospital wards in standing camps of all kinds.

In conclusion, the writer would like to thank Major-General W. H. Hamilton, C.B., C.I.E., C.B.E., D.S.O., K.H.P., D.D.M.S., Northern Command, for permission to send this note for publication, and Major G. K. Fulton, R.A.M.C., for providing the photographs and for his help in writing up the descriptions of the tents.

SHORT WAVE THERAPY.

By the INSTRUCTIONAL STAFF OF THE MASSAGE DEPARTMENT,
ROYAL VICTORIA HOSPITAL, NETLEY.

This article is written with the object of stimulating interest in a comparatively new addition to the medical armamentarium.

As far back as 1888, D'Arsonval experimented with high frequency currents and later Tesla, Zeynck and others extended these experiments and produced the relatively sustained high frequency current called diathermy. To Dr. Schliephake falls the honour of introducing the science of short wave therapy and his book on the subject, published in 1935 after seven years of continuous research, first provoked world-wide interest in this form of therapy. It is fairly certain that treatment with the ultra short waves will entirely oust diathermy from the medical field in the near future and acceptance of its therapeutic value may be judged by the fact that several firms are producing short wave apparatus in this country and that machines are imported in large numbers from abroad.

PHYSICAL CONSIDERATIONS.

The average medical man has but little time in which to study the rather difficult technical side of such a subject, nevertheless an appreciation of the physical aspect is necessary to a clear understanding of the therapeutics. An attempt will be made under this heading to explain simply why this treatment is called short wave therapy and to show the relationship that exists between this treatment, medical high frequency, and diathermy.

It is first necessary to consider briefly the characteristics of the alternating current.

An alternating current is one which rises from zero to peak potential,
then falls to zero, to be followed by a similar current in the reverse direction. This can be shown graphically as follows:

![Diagram showing a cycle or period with arrows indicating the direction of current.](image)

Arrows indicate direction of current.

When passed through the living tissues this current has the power to stimulate muscles and nerves, resulting in muscular contraction and sensory stimulation—providing the rate of alternation does not exceed a certain value. When alternating with a rapidity greater than 30,000 per second, all power to stimulate muscles and nerves is lost, the current being now termed a high frequency current. There is still, however, a conversion of electrical energy in the tissues and this results in the production of heat through the path of the current.

For comparison of high frequency currents it is necessary to take into account whether or not the voltage (e.m.f.) is maintained and whether or not the oscillations are continuous. When voltage drops over a group of oscillations the current is said to be damped. When the oscillations occur in groups with a rest interval between, they are said to be unsustained. From this it will be readily seen that an undamped but sustained high frequency current will have the greatest energy in a given time, other factors being equal. The following graphs illustrate this point:

![Diagram showing time axis with different types of high frequency therapy.](image)

Note.—The correct relationship with time and amplitude is not shown.
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Medical High Frequency.—Damped and unsustained. The little heat generated is rapidly dissipated before the next group of oscillations occurs and so this current is useless for heating the tissues.

Diathermy.—Damped but relatively sustained. This accounts for heating powers of this current. The heat does not have time to dissipate between groups of oscillations and is continually superadded, the limit being set chiefly by convection losses due to the circulating fluids in the tissues. A good apparatus has a current oscillating as rapidly as one million times per second.

Short Wave Therapy.—(Undamped and sustained). The oscillations vary from 10 to a 100 million per second.

The number of oscillations per second or frequency has a definite relationship with wave-length. The waves set up by the oscillations travel with the speed of light, about 300 million metres per second. To determine the wave-length the frequency is divided into this figure and to determine the frequency the wave-length is divided into this figure. Thus a diathermy current with an oscillatory factor of one million per second has a wave-length of 300 metres. Short wave therapy with a frequency of 50 millions per second has a wave-length of 6 metres. Hence the reason for short wave as opposed to long wave (diathermy) therapy.

Many users of short wave apparatus still consider that this form of energy is a sort of super-diathermy. Although there are certain physical characteristics common to both forms of energy it should be realized that diathermy and short wave therapy are fundamentally different.

In diathermy the electrodes are applied directly to the surface and thus there is a conduction current which has the sole effect of heating the tissues through which it flows.

In short wave therapy an air gap is maintained between the electrodes and the skin surface, and the energy is transmitted across the gap as a condition of ether stress, obviously not as a conduction current. In addition to heat being generated in the path of this energy there are other changes which form the so-called specific effect, and of this there is abundant clinical evidence but, so far, incomplete theoretical explanation.

There are many observers who refuse to believe in a specific effect, preferring to attribute all of the short wave effects to heat until a specific
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effect is proved. No observer doubts the difference in effect of Röntgen rays and ultra-violet rays, although the only physical difference is in the wave-length. The specific effect should be accepted pending the absolute proof which only research can bring.

The Short Wave Apparatus.

Some time ago the daily newspapers published accounts of a new treatment given in Germany by means of "wireless," the implication being that the time was not far distant when the patient would sit at home and in some occult manner receive treatment over the ether! Although obvious journalese there was an element of truth in this statement.

The short wave apparatus is a transmitter of energy and the energy involves a wave motion of the ether—in most machines this wave-length being fixed at 6 metres as being the most useful for therapeutic purposes.

An analogy may be drawn between the radio transmitter and the radio receiver in the home, the short wave apparatus and the patient. In both cases there is a transmission and reception of energy. In both instances delicate tuning is a necessity; the radio receiver must be carefully tuned in so as to get the required transmitting station, the patient must be "tuned" in to get the maximum effect from the energy transmission of the short wave apparatus. When the patient is in tune in this way he is said to be in resonance and the importance of this will be made apparent when dealing with the effects on the tissues.

Effects of Short Wave Therapy.

It is not surprising that in this comparatively new field of research views should conflict and that the results of one observer should be negatived by another observer in many instances. There is, however, a fairly general agreement that there are two major effects, the heating effect and the specific effect.

The Heating Effect.—All observers agree that there is a penetrating and homogeneous heating of the tissues through which the energy is directed, and that this results in prolonged dilatation of capillaries with increased leucocytes and phagocytosis.

The Specific Effect.—Evidence as to this is conflicting; not so much that it does occur, but how it occurs. It has been shown experimentally that the oscillations bring about a pounding action on the tissue ions. This has been made to break up blood corpuscles, to destroy micro-organisms and to rupture tissue cells, all without the addition of heat. It has also been shown that this vibratory effect is greatest where viscosity is greatest (viscosity the opposition to change in molecular position) as in bone, fat, scar and other fibrous tissue. For details of experimental findings after research on animal and human tissues, micro-organisms, on sympa-
thetic and parasympathetic balance, changes in blood chemistry, etc., the reader is referred to the experimental section of Schliephake's "Short Wave Therapy."

In a further article it is hoped to present briefly the views of leading writers on the therapeutic field and a summary of results obtained at the Royal Victoria Hospital, Netley, with case notes where these are of more than ordinary interest.

A WARNING: DISSEMINATED FOCAL PNEUMONIA.

By Major F. J. O'Meara,
Royal Army Medical Corps.

Para. 522: Regulations for the Medical Services of the Army, 1932, amended by Army Order, April, 1936, reads: "Pulmonary Tuberculosis.—In order that soldiers suffering from tubercle of the lung may be afforded the earliest possible opportunity of obtaining suitable treatment, they will be discharged from the Army as soon as the diagnosis has become reasonably certain. In the presence of combined clinical and radiological evidence indicative of pulmonary tuberculosis, diagnosis will not be delayed merely because the presence of the causative organism has not been demonstrated." The wisdom of the wording "in the presence of combined clinical and radiological evidence of pulmonary tuberculosis" was well demonstrated in the two cases here reported.

A Gunner arrived in Meerut from England at the beginning of March, 1937. He felt ill on arrival in Meerut and reported sick two days later; he was admitted to hospital. In spite of rest in bed his fever increased and his illness progressed, signs of involvement of the left lung developed, and a few days later there was dullness and relative absence of breath sounds below the left clavicle; a few râles were present over this area. A radiogram of his thorax was now taken, the provisional diagnosis of influenzal pneumonia having been made. The radiologist reported that extensive mottling in the upper lobe of the left lung was present and made a very definite diagnosis of tubercular infiltration. In the opinion that the radiogram was a picture of tuberculosis I concurred. The clinical picture of pulmonary tuberculosis was not, however, present. The sputum was examined eighteen times for tubercle bacilli with negative results. The end of the Trooping Season was now approaching and this circumstance forced a diagnosis of tuberculosis pulmonary (clinical) to enable the patient to be invalided to England before the onset of the hot weather. Two days before he left Meerut for England a second radiogram was taken. All evidence of infiltration in the lungs had disappeared. In this opinion
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The Instructional Staff of the Massage Department

_J R Army Med Corps_ 1939 72: 48-52
doi: 10.1136/jramc-72-01-08

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