protoplasmic surface is restored. This injurious effect of contact with foreign material which cannot be ingested plays an important part in wounds. Living phagocytes which come in contact with a dressing remain adherent to it. Hence the injury produced by frequently removed dressings in a healing granulating wound.

The Influence of Infection on Return Immigration.

In the living body the return immigration of wandering cells is complicated by the presence of a blood and lymph circulation, but here also the pigment-laden cells which re-enter the tissues are comparatively few in number and the inward flow is frequently limited to definite areas on the granulating surface.

Organisms are present in few or in large numbers in or on the granulation tissue of practically all open wounds. This also will influence the movements of the leucocytes, because where organisms are present in large numbers there large numbers of the emigrating cells also perish and are thrown off as pus cells, much tryptic digestion goes on, and few phagocytes survive and return to the tissues.

The complicating element of the organisms and their toxins is, however, eliminated in the case of a blood clot incubated in pigmented serum under aseptic conditions. Here, therefore, we find that a larger proportion of cells take up the return journey. In general terms the relative number of phagocytes which re-enter the tissues after emigration on to the surface of a granulating wound depends largely on the virulence of the infective process, or in other words on the efficiency of the defensive mechanism, that is on the healthiness of the wound.

If the surface of a piece of granulation tissue excised from a moderately infected wound be washed in normal saline and then incubated for a few hours, careful examination with the lens will show collections of pus cells at certain points on the surface. Suppuration, in fact, continues during incubation in the absence of a blood and lymph circulation. Under these conditions, however, there is no uniform secretion of pus over the whole surface. The leucocytes emigrate in certain areas, partly determined by the presence of organisms and partly by ease of transit. In the same way the pigment-laden phagocytes, or as many of them as are not thrown off as dead pus cells, re-enter the tissues in certain areas also.

The Effect of Chemical Reagents on Return Immigration.

The effect of different reagents applied to the surface of the incubated tissue or blood clot during incubation varies considerably, and requires further investigation by the *in vitro* method. A coating of liquid paraffin, or the immersion of the tissue in a bath of liquid paraffin during incubation gives better results than normal saline as far as the activities of leucocytes are concerned. Fewer cells are thrown off as pus cells, a larger number take up the pigment and re-enter the tissues. Gum solutions act somewhat in the same way, but less favourably. These inert substances seem to favour return immigration more than the active antiseptics. I hope to record further observations on the effect of liquid paraffin on the movements of leucocytes later.

The Ultimate Fate of the Phagocytes which Re-enter the Tissues.

In the BRITISH MEDICAL JOURNAL, December 23rd, 1916, I suggested that pigment-laden phagocytes may under certain conditions discharge their pigment loads (possibly by the cytolysis of the cells) and that the pigment granules so liberated may be taken up by the fibroblasts, endothelial and other connective tissue cells. Careful examination of a blood clot in which return immigration of pigment-laden leucocytes is going on will sometimes show little collections of pigment grains lying free in the fibrin network, as though liberated by some cell which had undergone cytolysis. The blood clot, however, contains no tissue cells capable of taking up the liberated pigment. In granulation tissue, on the other hand, pigment granules may sometimes be observed in cells which look like connective tissue cells at some distance from the surface. Since the blood and lymph circulation is absent these carbon granules must have been carried to these situations by wandering cells. These facts bear on the problem of the spread and

the recrudescence of infection, and on the mode of action of the defensive mechanism.

The Importance of the Problem.

Having now shown that a process of "return immigration" of pigment-laden phagocytes occurs under certain conditions in wounds, and probably also on free mucous surfaces, the next step is to show that phagocytes containing ingested organisms behave in the same manner.

If this occurs, as we have every reason to believe, then the importance of the "return immigration" of phagocytes becomes at once apparent. Evidence accumulates (see observations by Peyton and Rous, Kyes, Bull, and others) which tends to show that pathogenic organisms when ingested by phagocytes are not always killed by intracellular digestion. I have previously (see BRITISH MEDICAL JOURNAL, December 23rd, 1916) drawn attention to the association between the spread of infection in certain diseases, the recrudescence of local sepsis in wounds, and the return immigration of phagocytes. The fact now established that return immigration can take place apart from the blood or lymph circulation affords further corroboration of this view.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, June 3rd, 1916; December 23rd, 1916; February 3rd, 1917.

MUSCULO-SPIRAL NERVE DISABILITIES.

BY

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As many and various appliances are now in use for cases of wrist-drop, each presumably with the object of ensuring "complete and continuous relaxation of all the affected muscles over long periods," it seems desirable that precise and definite information should be obtained, anatomically as well as clinically, of the value of the various positions in which the hand is retained by the apparatus.

The positions met with among soldiers and pensioners with this disability may be classified into the six shown in these sketches:

FIG. 1. Complete wrist-drop. No appliance.

FIG. 2. Flat straight splint extending to the palm of hand.

FIG. 3. Flat splint to finger tips. Generally not including thumb.

FIG. 4. Small metal "cock up" splint. (Fingers and thumb free for use.)

FIG. 5. Long "cock up," to support first phalanges, often also thumb.

FIG. 6. Extra long, which supports terminal phalanges and also thumb.

To test these positions anatomically in relation to each individual "muscle relaxation," we have made observations and measurements on adult male cadavera.

The procedure we adopted to estimate quantitatively the amount of "muscle relaxation" in each muscle affected by musculo-spiral disability was:

1. The tendons and muscle bodies on the dorsum of the forearm were exposed and differentiated.

2. A narrow band of annular ligament was left *in situ* to form a "fixed point."

3. The hand was placed in complete wrist-drop (Fig. 1), and in this position a small stitch was placed

through each tendon under the fixed point, to give the "moving point."

4. Measurement was made, in millimetres, of the distance the "moving point" could be retracted from the "fixed point"—no force being used—in each position of the hand. This gives the average "muscle relaxation" value for each muscle shown in the following table:

Muscle Relaxation Length (in mm.).

	Position—				
	2	3	4	5	6
Ext. carpi radialis longior	6	6	25	25	25
Ext. carpi radialis brevis	13	13	28	28	28
Ext. carpi ulnaris	3	3	6	6	6
Ext. communis digitorum, including ext. indicis and ext. minimi digiti	3	15	15	28	28
Ext. longus pollicis	0	6	13	32	32
Ext. ossis metacarpi pollicis and ext. brevis pollicis	0	0	0	0	0

It will be noticed that muscle relaxation is not promoted in extensor ossis metacarpi pollicis or extensor brevis pollicis by any of these positions. To provide this it would be necessary to abduct the hand at the same time as the thumb was extended. As abduction of the hand can only take place to any extent when the hand is in position 3, there are great difficulties in providing muscle relaxation in these muscles.

Taking the positions *seriatim*—

Position 1 is totally bad; such neglected cases should not be met with, and should not be allowed to remain so when discovered.

Positions 2 and 3 (the straight splint series) provide only a small percentage (25 to 50) of the total muscle relaxation possible, and are therefore inadequate.

Position 4: The splints maintaining this are the small "cock up," usually metal, and therefore light and easy to wear, and are comfortable to sleep in. They are not disliked by patients who can do remedial work and exercises in them. We have noticed in these cases that the wrist extensors nearly always appear to show improvement before the long extensors of the fingers; this is probably accounted for by the facts as shown in the table, that the former are approximately in position of 100 per cent. of muscle relaxation, whereas the latter have only approximately 50 per cent. muscle relaxation.

Positions 5 and 6, which provide equally well the total muscle relaxation possible, are very infrequently adopted for any long period. They can be obtained only by broad and cumbersome splints, which the patients find irksome, particularly when otherwise well, and consequently, if they are out-patients, they frequently rid themselves of the apparatus between their visits. Position 6 has no advantage over position 5, and has the disadvantage that the phalangeal joints are liable to become stiff.

We have found that cases which have got to a standstill in position 4 have rapidly improved by putting them up for a limited period in position 5, and as there seems valid reason for this, the importance of this line of treatment should not be lost sight of, for 100 per cent. greater muscle relaxation is obtained for the long common extensor, and also for the long thumb extensor, by this means.

To sum up: position 4 seems to offer the most all-round advantage as a daytime position for prolonged treatment with occasional temporary resort to position 5 for a limited time; if the value is plainly stated to the patient and he is willing to put up with the disadvantages of it, he should adopt position 5 when sleeping, and so gain advantages for the long extensors.

THE United States Public Health Service offers anti-typhoid inoculation free of charge to all who apply to any of its hospitals or field offices. Many of these offices are in zones surrounding military cantonments, and stress is laid on the fact that the prevention of typhoid fever in these zones is one of the most important means of preventing the interchange of the disease between the military and the civil population.

AN EPIDEMIC OF FIFTY CASES OF INFLUENZA AMONG THE PERSONNEL OF A BASE HOSPITAL, B.E.F., FRANCE.

BY

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For the medical details in the following report I am indebted to my comrades Major T. J. T. McHattie, R.A.M.C.(T.), and Major F. S. Jackson, R.A.M.C.(T.).

EPIDEMIOLOGY.

On June 15th, 1918, in the afternoon, twenty orderlies reported sick with fever, headache, and backache. During the following three days, 5, 10, and 6 similar cases respectively occurred, including the staff of the pathological laboratory (who had been taking blood cultures from the patients), all the servants of the officers' mess, seven medical officers, and four sisters, three of whom had nursed some of the earlier cases.

Three further cases occurred amongst the sisters during the next few days. Finally, the sister who had charge of the sick nurses fell a victim, and the epidemic terminated.

SYMPTOMS.

In every case there was headache, backache, and general malaise. The temperature reached 102° F. on the first or second evening, and in one case rose to 104° F. The duration of the fever was—

In 1 case ...	7 days	In 26 cases...	3 days
In 2 cases ...	6 "	In 7 " ...	2 "
In 3 " ...	5 "	In 5 " ...	1 day
In 6 " ...	4 "		

Pain in the back of the eyes and some tenderness of the globe was general. The eyes were suffused in 14 cases, photophobia was present in 5. In 4 cases there was vomiting during the first day, and this was accompanied by diarrhoea in one instance. A feeling of rawness over the trachea was commonly experienced. An irritating cough occurred in 25 cases. There was little or no expectoration, as a rule, during the first few days, and when any sputum was obtained, it was composed of thin, frothy mucus. In most cases the cough disappeared with the fall of temperature, but in 12 instances it persisted with mucopurulent expectorations for some days.

CONVALESCENCE.

The temperature generally fell quickly to normal, or nearly normal, but it was not unusual for a subsequent rise to 99° to 100° F. to occur next day for a few hours, after which it remained normal. Patients were allowed up on the second day on which the temperature remained normal, and generally expressed themselves as fit for work on the following day. In cases in which the fever lasted for five days or upwards, and in two in which a cough persisted for a week or more after the fall of temperature, convalescence was delayed.

BACTERIOLOGICAL INVESTIGATIONS.

A. Blood Culture.

Ten c.cm. of blood was drawn into 70 c.cm. citrated broth during the acute stage of the illness (first or second day) from twenty-four patients. Apart from a few instances in which contamination had occurred, the flasks remained sterile.

B. Investigation of Sputa.

This was undertaken in twenty patients. In the early stage of the illness few of the men could produce sputum suitable for investigation. Although many had a worrying cough, the amount of expectoration that came from the trachea was minimal. It was generally thin clear mucus full of bubbles, and its contents indicated that most of it was derived from the back of the throat. It was full of microbes of all sorts, and I rarely succeeded in recovering anything resembling the influenza bacillus from it. As mucopurulent tracheal expectoration became increasingly available I was more successful, and the following observations refer more particularly to the sputum of this kind