final titres are calculated with reference to the J. C. F. control serum. For example, if slight variation in experimental conditions had caused the J. C. F. titre of D₂ to be 1/80 instead of the normal 1/160, the patient's titre is calculated thus:

$$\frac{\text{J. C. F. titre}}{\text{Patient's titre}} \times 160 = \text{corrected titre.}$$

Anti-staphylokinase Test

MATERIALS

(1) Plasminogen, prepared from human fraction III, containing, when activated, 36×10^{-3} optical density units per mg. (2) Bovine fibrinogen (Armour) 1% W/V in 0.85% NaCl in distilled water. These two are mixed in the proportion 0.82 ml. plasminogen + 9.18 ml. bovine fibrinogen solution. (3) Thrombin (Maw) 100 units/ml. in 50% glycerol saline. (4) Staphylokinase—prepared as described by Davidson (1960). (5) Streptokinase ("dornokinase"). (6) Serum—serially diluted in saline.

METHOD

A preliminary staphylokinase assay must be performed to determine the dilution to be used in the antibody titration. Doubling dilutions of staphylokinase in saline in 0.1-ml. volumes are made from neat to 1/128 with one control tube containing saline only. 0.1 ml. saline, 0.1 ml. bovine-fibrinogen-plasminogen solution, and 1 drop thrombin are added to all tubes, which are well mixed and incubated at 37° C. for 30 minutes in the waterbath. The end-point is the last tube showing clot lysis. This dilution of staphylokinase is then made up for use in the anti-staphylokinase test on patients' serum. A similar assay is made with streptokinase, the end-point being usually of the order of 0.06 Christiansen unit.

Assay of Anti-staphylokinase and Anti-streptokinase.—A 1/10 dilution of patients' inactivated serum is made in saline. From this, doubling dilutions are made in saline from 1/10 to 1/320 in 0.1-ml. volumes. 0.1 ml. of the optimum dilution staphylokinase is added to each tube. A control tube is set up containing saline and staphylokinase only. The tubes are mixed and left to stand at 37° C. in the waterbath for 30 minutes to allow antigen-antibody combination. 0.1 ml. bovine-fibrinogen-plasminogen solution is then added to all tubes; the mixture is well shaken, then clotted by adding 1 drop of thrombin to all tubes. The tubes are incubated at 37° C. in the waterbath until the control tubes show clot lysis, which should be in 30 minutes, as predetermined by the preliminary tests without sera. The end-point of antibody is taken to be in the last tube showing a solid clot, and has been recorded as this dilution of the patient's serum.

REFERENCES

- Bergman, S. (1957). *Acta path. microbiol. scand.*, **41**, 537.
Davidson, F. M. (1960). *Biochem. J.*, **76**, 56.
Duthie, E. S., and Haughton, G. (1958). *Ibid.*, **70**, 125.
Harrison, K. J. (1961). "Coagulase Toxoid in Chronic Furunculosis." M.D. thesis, Bristol University.
Lack, C. H. (1957). *Proc. roy. Soc. Med.*, **50**, 625.
— and Shelswell, J. H. (1955). *J. Bone Jt Surg.*, **37B**, 135.
Rogers, H. J. (1956). *Ann. N.Y. Acad. Sci.*, **65**, 132.
Towers, A. G. (1961). *J. clin. Path.*, **14**, 161.
— and Gladstone, G. P. (1958). *Lancet*, **2**, 1192.
Woodin, A. M. (1959). *Biochem. J.*, **73**, 225.
— (1961). *J. Path. Bact.*, **81**, 63.

After detailed study of the state of public health in Africa at present W.H.O.'s Regional Committee for Africa has passed a resolution stressing the necessity for closer co-ordination and co-operation between all members in public health and preventive medicine. The same resolution also stressed the urgent need to undertake the training of medical and paramedical personnel in sufficient numbers to fulfil the present and future needs of all countries in the Region. In the course of informal discussions on planning for the training of doctors and health workers in Africa the following figures were quoted to show the magnitude of the problem. The Region has an average of one physician per 20,000 inhabitants. Taking as a modest target for the coming 20 years a ratio of one physician per 10,000 inhabitants, Africa would have to be already producing 1,200 medical graduates every year to reach this figure. The output of existing medical schools is 450. (W.H.O./39.)

CLINICAL USE OF PEAK FLOW METER

BY

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The peak flow meter was designed by Wright and McKerrow (1959) as a simple portable instrument for measuring the maximum forced expiratory flow. They found that it could measure obstruction of the airways as efficiently as the more elaborate and bulky machines. Thus the peak flow can be measured as quickly as the blood-pressure.

It is the object of this paper to assess the value of the peak flow meter as an objective clinical test of dyspnoea, and to record the readings obtained from a sample of the healthy population of Sheffield.

Method of Investigation

The subject was asked to take a really deep breath and then to blow as hard and as fast as possible into the meter through a disposable cardboard mouthpiece. The recorded peak flow rate in each case was the highest of at least three attempts; the test was repeated until it was clear that the maximum had been reached. When it was obvious that co-operation was lacking, as in the case of frail old women or confused patients, the attempt to obtain readings was abandoned. Nearly all the readings were made by the same observer (M. O. K.).

A sample of the healthy adult population was drawn from hospital administrative, clerical, maintenance, nursing, and professional staff, hospital out-patients with no evidence of cardiac or respiratory disease, employees of a large steel works, and ambulant elderly people living in part III hostel accommodation. Those with a chronic cough or with known cardiac or respiratory disease were excluded.

The second part of the study concerned the measurement of the peak flow of patients with chronic bronchitis and patients with heart disease. The bronchitic group included hospital patients and persons from the general survey who, on questioning, admitted to a chronic cough during the winter months or throughout the year. The readings obtained from bronchitic subjects were then correlated with the degree of disability, which ranged from dyspnoea on slight effort to frank heart failure; and, within each grade of disability, the bronchitic group was then compared with a group of patients with various forms of heart disease other than cor pulmonale. Before measuring the peak flow, each person was asked the following questions by the same observer: Do you get breathless on walking up hills or stairs? Do you get breathless walking on the flat? Do you get breathless when sitting down or at night?

The healthy group comprised 622 men and 430 women. The bronchitic group comprised 121 men and the cardiac group 51 men; owing to the relative rarity of chronic bronchitis in women, in the last two groups, only the figures for males are presented.

Results

Normal Values.—The mean readings of the peak flow of the healthy population expressed by age and sex are presented in Table I. Men gave much higher readings than women. There was a slight fall with each advancing decade up to the sixth; then, in men, a sharp drop. There was a relatively wide scatter in all age-groups.

Chronic Bronchitis.—Table II describes the readings of peak flow in male patients with bronchitis according to age and degree of disability. In the "mild grade," signifying dyspnoea experienced only on hills or stairs, the mean readings for the three age-groups were respectively, 80%, 66%, and 70% of the mean value for the healthy population. In the "moderate grade," signifying dyspnoea when walking on the level, there were only two age-groups, as the number of younger patients with significant dyspnoea was limited; the mean readings were 64% and 77%, respectively, of the mean for the healthy population. In the "severe grade," signifying breathlessness at rest, central cyanosis, or past or present cor pulmonale, there was a marked fall in the peak flow; the mean figure was 28% of the mean for the healthy population in the middle-aged and 50% in the elderly. These figures comparing bronchitics with the healthy population, based on the data in Tables I and II, have been tested by the "t" test for the difference

TABLE I.—Peak Flow in a Sample of the Healthy Population of Sheffield

Age	No. of Subjects	Mean Peak Flow (l./min.)	Standard Deviation
Males			
17-29	221	557	72
30-39	123	545	80
40-49	97	513	81
50-59	78	483	84
60-69	32	375	102
70-79	26	307	77
80-89	45	289	60
Females			
17-29	174	413	57
30-39	41	387	67
40-49	43	330	61
50-59	51	319	63
60-69	15	265	63
70-79	43	234	66
80-89	63	208	57

TABLE II.—Peak Flow in Heart Disease and Chronic Bronchitis—Males Only

Grade	Category	Age	No. of Cases	Mean Peak Flow (l. min.)	Standard Deviation
Mild grade	Respiratory Cardiac	17-49	18	434	119
		17-49	10	501	94
	Respiratory Cardiac	50-69	30	300	114
		50-69	6	343	122
Moderate grade	Respiratory Cardiac	70-89	29	207	89
		70-89	5	260	93
	Respiratory Cardiac	50-69	9	290	139
		50-69	8	399	107
Severe grade	Respiratory Cardiac	70-89	5	230	57
		70-89	5	274	157
	Respiratory Cardiac	50-69	21*	126	62
		50-69	7	370	119
	Respiratory Cardiac	70-89	9†	162	64
		70-89	10	288	111

Cardiac=Intrinsic heart disease.

Respiratory=Chronic bronchitis.

Mild grade=Dyspnoea minimal, only on hills or stairs.

Moderate grade=Dyspnoea on walking on the level.

Severe grade=Dyspnoea at rest, with or without cardiac failure. (All cardiac patients in "severe grade" exhibited congestive heart failure.)

* Includes 10 patients with cor pulmonale.

† Includes 6 patients with cor pulmonale.

of means. With the exception of the mild grade of bronchitics aged 50-69, where the probability is 5%, the probability that any of the differences is due to chance is less than 1%.

Heart Disease.—The bronchitic subjects are compared with a group of patients with heart disease other than cor pulmonale, graded by age and severity as described above (Table II). This second group, henceforth designated "cardiacs," included patients with valvular, hypertensive, and ischaemic heart disease; all those in the severe grade exhibited congestive heart failure. The "severe grade" of bronchitics included 16 patients with cyanosis or cor pulmonale in congestive failure. In contrast to the bronchitics, the cardiacs, even in congestive failure, gave a peak flow close to the average for the healthy population. In cor pulmonale the mean reading was 140 litres per minute, in contrast to the other cardiacs, in whom a figure approaching the normal average was the rule. For the reasons stated, the data in Table II apply only to men.

Discussion

The normal values in our study were slightly below those of Higgins (1957) and of Tinker (1961) but slightly higher than those of the College of General Practitioners (1961). The differences are probably due to the study of different types of population, which in Higgins's survey consisted of agricultural workers and in Tinker's comprised London Transport executives. In our survey of an industrial city the figures were probably reduced by including some undetected bronchitics. In all series the readings were lower in women than in men.

The peak flow meter is a useful instrument for excluding the presence of severe airways obstruction as a cause of dyspnoea. Our figures show that it can usually distinguish the dyspnoea of bronchitis from the dyspnoea of intrinsic heart disease in severe cases, especially those with heart failure; a low reading cannot be attributed to heart failure alone, but indicates some form of bronchial obstruction. It must be stressed, however, that when dyspnoea is due to alveolar-capillary block or to restrictive forms of ventilatory impairment, tests of ventilatory function are not necessarily impaired. The observer must be aware of a highly fallacious low reading if the patient does not blow really hard; this is often difficult to achieve in women.

We believe that, in spite of the wide variations encountered in different groups, both in health and in disease, the peak flow meter is a clinical instrument which in relevant conditions is as valuable and convenient as the sphygmomanometer. It obviously has wider uses than those described here, especially with serial readings in differentiating reversible from irreversible airways obstruction.

Summary

The peak flow of 1,052 healthy men and women in Sheffield was measured with the Wright peak flow meter. The findings for age and sex are recorded.

The peak flow in 121 bronchitics and 51 cardiacs were also measured; it was found to be a good method of assessing the degree of disability in severe bronchitis and of distinguishing respiratory from cardiac dyspnoea.

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REFERENCES

- College of General Practitioners (1961). *Brit. med. J.*, 2, 973.
Higgins, I. T. T. (1957). *Ibid.*, 2, 1198.
Tinker, C. M. (1961). *Ibid.*, 1, 1365.
Wright, B. M., and McKerrow, C. B. (1959). *Ibid.*, 2, 1041.

Preliminary Communications

"Polythene" Coverings in Dermatological Treatment

Sulzberger and Witten (1961) and Scholtz (1961) report on the use of thin flexible plastic films as a covering dressing for topical applications in the management of selected diseases of the skin. The method was originally used by Garb (1960) for keeping podophyllin ointment in place in the management of certain hyperkeratotic naevi. Overton (1962) was apparently the first dermatologist to employ this technique extensively in the U.K., using fluocinolone acetonide ("synalar") cream and "polythene" dressing in the treatment of various recalcitrant dermatoses such as psoriasis, chronic eczemas, and lichen simplex chronicus.

TECHNIQUE AND MATERIALS USED

Polythene sheeting, 150 gauge, can be bought in rolls 10 ft. (3 m.) long and 3 ft. (91 cm.) wide. Most multiple stores and hardware merchants stock it. Polythene "layflat" tubing in various widths and gauges (degrees of thickness) has been found suitable for arm and leg dressings and is sold by the roll direct from the manufacturers. Polythene disposable gloves are sold by many chemists and are suitable for hand and wrist lesions. Large polythene disposable bags with holes cut out for the head and arms have been used for widespread lesions of the trunk. More convenient, though more costly, are a range of garments advertised as a method for slimming. These include a plastic-type "siren-suit," pants, vests, armlets, etc., which act as a form of ambulant turkish bath.

The local medicaments used were fluocinolone cream (synalar) and triamcinolone acetonide cream or ointment ("ledercort" acetonide cream, "ad Cortyl-A" ointment). On the grounds of economy, and for widespread areas, fluocinolone cream diluted 1 in 10 with ung. aquosum (B.P.) was used as an alternative to the full-strength preparation.

A liberal application of the cream or ointment is applied to the lesion and the polythene dressings are kept in place and made airtight around the edges with "cellophane" tape (scotch tape). Ideally, and in in-patients, the dressings are left untouched for 48 hours unless the patient complains of discomfort. Ambulant patients tend to keep their dressings on throughout the night only, especially if widespread areas of the body are involved and the weather is warm.

RESULTS

In the past three months 72 cases have been treated using this technique. All these were dermatoses which

are generally regarded as chronic and recalcitrant and which in most cases had received a multiplicity of treatments over many years. These cases included psoriasis, chronic fissured eczema or pompholyx of hands, lichen simplex chronicus, atopic eczema, pustular bacterid (recalcitrant pustular eruption of palms and soles), and a miscellaneous group. The results achieved are summarized in the Table.

Summary of Results

Diagnosis	No. of Cases	Cases Showing Rapid Improvement and Preferring Polythene Treatment to Previous Regimes	Un-changed	Deterioration or Treatment not Tolerated
Psoriasis	35	26	2	7
Chronic fissured eczema and pompholyx of hands	12	7	1	4
Atopic dermatitis	7	6	—	1
Lichen simplex chronicus	5	5	—	—
Pustular bacterid soles of feet	5	4	1	—
Miscellaneous group	8	8	—	—
Total	72	56	4	12

Psoriasis.—All varieties of psoriasis were among the 35 cases treated. Those with circumscribed thin plaques did best and complete though temporary involution could be anticipated in these cases. A dramatic disappearance of the lesion sometimes occurred within four to five days of the commencement of this treatment. Gradual creeping back of the eruption in the form of small papules or scaly patches could be expected two to four weeks after the treatment had been discontinued. Four patients with generalized erythrodermic psoriasis received in-patient care. A contralateral comparison was carried out using standard fluocinolone cream on one arm or leg, and the same cream diluted 1 in 10 with ung. aquosum on the other arm or leg. Both sides improved at the same rate, though other areas which were treated with ung. aquosum alone showed no improvement. It was possible to confirm the observation of Sulzberger and Witten (1961) that a 75–90% improvement can be seen within a few days to two weeks in cases of this type. The rapidity and degree of response was equal to and possibly better than that which would be expected from systemic steroid therapy. Complete cessation of treatment led to relapse within a fortnight. All these four patients, however, were continuing treatment at home and remained comfortable and at work by wearing a polythene siren-type suit a few nights each week. A case of flexural psoriasis resistant to local triamcinolone cleared in 48 hours with the same ointment used in conjunction with an outsize pair of plastic pants.

On the grounds of economy, in widespread eruptions the one-tenth strength fluocinolone cream in ung. aquosum was used as a local application. A contralateral comparison in a generalized guttate psoriasis showed clearance on the side using standard fluocinolone cream and a florid erythema multiforme-like eruption on the side using the one-tenth strength. Apart from this striking untoward reaction which subsided within a few days of removing the polythene, three cases developed boils or a folliculitis beneath the dressings, and two of the patients found the treatment more trouble than it was worth. Four patients developed miliaria rubra or "prickly heat" but in only one case did it necessitate treatment being stopped. It is likely that, in really hot weather, this type of reaction may