so uncommon as only to be seen once are not likely to be seen again.

Thirdly, *Don't be in a hurry.* Wait till you have all the facts, remembering that a laboratory report (for example) may at the last moment upset all your calculations. Reserve your decision, therefore, in a difficult case; take it, as the Scotch lawyers say, "to avizandum." If you come to a premature conclusion it is difficult to alter it afterwards, not only because it involves awkward explanations to the patient, but because, by the mere fact of having made a diagnosis, you become insensibly biased and more impervious to the reception of fresh evidence. It is for this reason that all "snap-shot" diagnosis is to be condemned. It is impressive but perilous. "Life," as Dr. Johnson said, "is not to be sacrificed to an affectation of quick discernment, or of crowded practice, but may be required, if trifled away, at the hand of the physician."

Fourthly, *Don't be faddy.* This is the besetting sin of the specialist. He sees only what he is always seeing and what he wants to see. To the cardiologist few hearts are healthy; to the tuberculosis expert no lung is sound. The syphilographer sees disease only in terms of syphilis; the psycho-analyst only in those of sex. Beware, therefore, when you find yourself always diagnosing the same thing; beware also of the "stunt" of the moment—"avitaminosis," "focal sepsis," "disturbance of endocrine balance," or what not. Try to see the case steadily and see it whole.

Fifthly, *Don't mistake a label for a diagnosis.* Such "diagnoses" as "gastritis," "neuritis," "influenza," "neurasthenia," are, more often than not, mere labels; they have no essential relation to reality. It may be necessary in the exigencies of practice, and in order to satisfy the patient's mind, to use such labels for a time, but don't let them deceive you into thinking that you understand the nature of the case. Be mentally honest.

Sixthly, *Don't diagnose two diseases simultaneously in the same patient.* Remember the law of "paucity of causation." Don't, for example, explain some features of a case by a diagnosis of cancer and others by assuming the presence of tuberculosis. There is, of course, no reason why patients should not run two diseases simultaneously, but as a matter of fact they rarely do. Make it a rule, then, if you possibly can, to account for all the clinical features of the case by assuming the presence of only one pathological process.

Seventhly, *Don't be too cock-sure.* "Think it possible," as Cromwell said to the Scotch bigots, "that you may be mistaken." On the other hand, don't hesitate too long between two alternative diagnoses, like the proverbial ass between two bundles of hay. Cock-sureness in diagnosis is the vice of the inexperienced; excessive caution that of the man who has seen too much.

Eighthly, *Don't be biased.* Avoid preconceptions. Approach every case with an open mind, and don't listen to the opinion of others, even that of the relations or nurse, till you have formed your own. This is the main reason for consultations: the consultant approaches the case, or should do so, with an open mind. It is also the justification for the layman's desire for "an independent opinion"—that is, for the opinion of one who is approaching the case fresh and without any preconceived ideas about it.

Finally, *Don't hesitate to revise your diagnosis from time to time in a chronic case.* Things may change, new signs may appear which put a totally different complexion on the matter, and the original and provisional diagnosis may no longer be able to stand. I was once told by a shrewd and experienced practitioner that he made it a rule always to re-examine his patient on the morning of a consultation. On the one occasion when he omitted to do this he was badly caught out.

In conclusion, let me say that it is quite impossible that you should always be right in your diagnosis, if only for the reason that disease does not always play the game. It is better, however, to be wrong on sound principles than right by chance. Guessing is to be avoided at all costs; for if you once get into the habit of guessing you are diagnostically damned.

RAIN-BEARING WINDS AND EARLY PHTHISIS IN DERBYSHIRE.

BY

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THE county of Derby provides a remarkable proof of the effect of strong prevalent rain-bearing winds upon the course of early phthisis, amply confirming the recent evidence from Devonshire and West Shropshire. Incidentally it also furnishes interesting indications of an effect of subsoil on the course of phthisis which will not surprise those who have followed the work already published regarding the effect of subsoil on the prevalence of the disease. We shall set forth our findings as briefly as we can.

We have dealt with 306 first-stage cases, which had been treated at the County Sanatorium (near Chesterfield), and followed at their homes for four years after their discharge, as was done with the cases in Devonshire and West Shropshire. The results for the whole county of Derby, taken as a unit, are as follows: in respect of south-west, west, and north-west winds—

Mortalities.

Sheltered cases	6.96%
Exposed cases	14.13%

or, confining attention only to the indisputable cases—that is, deaths certified as due to phthisis and living cases in which tubercle bacilli had been discovered in the sputum:

Sheltered cases	14.05%
Exposed cases	28.72%

Arrests.

Sheltered cases	68.69%
Exposed cases	63.87%

or, considering only indisputable cases, as above:

Sheltered cases	61.39%
Exposed cases	41.49%

These figures, significant as they are, do not, however, show the real extent of the contrast, because of certain peculiarities of the geology, configuration, and rainfall of the county, which we shall now explain.

Access of Westerly Winds.

Derbyshire lies a little to the north of the centre of England, and so receives its westerly (chief rain-bearing) winds as follows.

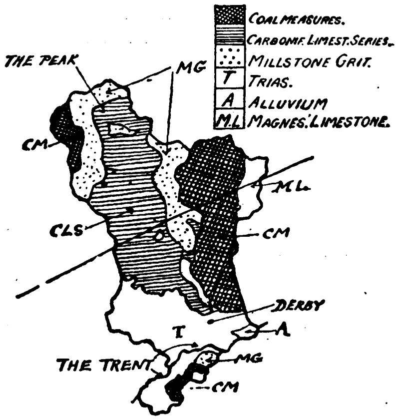
The north-west wind arrives directly from the sea, with no outside intervening heights to break its force or abstract its rain. The west wind is also a direct sea wind for the extreme north of the county, but for the greater part of its surface comes across the mountains of Wales. The south-west wind, for the entire county, has crossed the Welsh mountains. Of these winds the south-west is the commonest, and the wind which most often blows as gales. Next in frequency, and in gale-frequency, is the north-west. At Buxton the west and south-west winds are rainier than the north-west.

Natural Divisions of the County.

The geological formations of Derbyshire divide it naturally into three great areas, indicated on the accompanying sketch-map, and these areas differ conspicuously in respect of altitude, configuration, and rainfall. They comprise:

1. *A north-western area*, of high ground, highest in the north (where it culminates in the Peak—2,088 feet high), having a main plateau running nearly north and south, mostly over 1,000 feet in altitude, the whole area presenting pronounced contrasts of exposure and shelter. It has

a rainfall of from over 40 inches in the north (50 inches at Buxton) to 35 inches in the south. The subsoils are mainly millstone grit, carboniferous limestone, and carboniferous limestone shale, but there is a patch of coalmeasures at the extreme north-west.



2. *A north-eastern area*, of much lower altitude, with an undulating surface, which slopes from west to east and from north to south, with much less decided shelters (so much so, indeed, that the assessment of some of them is doubtful), having a considerably lower rainfall than the north-western area—namely, generally between 30 and 25 inches. The subsoil consists mostly of coalmeasures, but there is also a considerable stretch of magnesian limestone in the north-east.

3. *A southern area*, which contrasts strikingly with both of the former. Nearly all of it is relatively low-lying, much of it below 200 feet above sea-level, and a little of it along the Trent even under the 100 feet level. There is hardly any actual shelter, but all winds reaching it do so across much higher country. It has a low rainfall, mostly rather over 25 inches, but, along the north of the Trent valley, slightly under 25 inches. The area consists almost wholly of trias, a subsoil which former work by one of us showed to be associated with some of the lowest phthisis death rates in England. There is some alluvium along the Trent, a small patch of millstone grit at Melbourne, and a larger patch of coalmeasures in the south-east.

The Elimination of Subsoil as a Conflicting Influence.

To judge fairly, therefore, of the relations of phthisis and rain-bearing winds we must disentangle the influence of subsoil. This can easily be done by considering the effect of the rain-bearing winds over each geological formation separately. The same procedure also eliminates the influence of differences of rainfall and exposure; for millstone grit and the carboniferous limestone series (formations upon which phthisis mortality in England is relatively high) have here the heaviest rainfall, and the most pronounced exposure; whilst trias (on which phthisis prevalence in England is relatively low) has here the lowest rainfall and lies in a sort of hollow. The coalmeasures have been divided by us into north and south, on account of the different heights and rainfalls; we do not think that grouping the very small patch of north-western coalmeasures with the large area of north-eastern can lead to any error. The trias and coalmeasures of the southern area are considered separately. Melbourne, the only millstone grit locality in the south, must be taken with millstone grit generally, as it must not be confused with localities on the contrasting soil of trias. Most of the cases on alluvium are in the southern area; the exceptions are only a little to the north of it under very slightly heavier rains; they may therefore fairly be considered together.

We have satisfied ourselves that no other conflicting influences exist.

Results.

Taking, then, the effect of these winds over each subsoil separately, we reach the striking results shown in the following tables.

SUMMARY I.

Percentages of Mortalities on Different Subsoils.

	(1) All Cases.		(2) All Deaths, but only Positive A and L Cases.	
	Sheltered.	Exposed.	Sheltered.	Exposed.
Millstone grit	3.45	21.10	5.0	30.80
Carboniferous limestone series	8.33	33.33	16.0	50.0
Northern coalmeasures ...	13.65	16.06	27.27	43.34
Magnesian limestone ...	0	25.0	No cases	No cases
Trias	No cases	9.10	,,	17.66
Southern coalmeasures ...	,,	4.35	,,	5.56
Alluvium	,,	5.55	,,	12.50

Note.—Throughout these tables A=arrested; L=living, but not arrested and D=dead, certified from phthisis.

SUMMARY II.

Percentages of Arrests on Different Subsoils.

	(1) All Cases.		(2) All Deaths, but only Positive A and L Cases.	
	Sheltered.	Exposed.	Sheltered.	Exposed.
Millstone grit	82.76	36.84	80.0	30.8
Carboniferous limestone series	58.34	33.33	52.0	16.7
Northern coalmeasures ...	68.15	65.42	45.46	33.33
Magnesian limestone ...	66.64	62.50	No cases	No cases
Trias	No cases	69.7	,,	41.17
Southern coalmeasures ...	,,	73.90	,,	72.22
Alluvium	,,	77.78	,,	50.0

SUMMARY III.

Totals.

	Sheltered.			Exposed.		
	A.	L.	D.	A.	L.	D.
(1) *All Cases.*						
Millstone grit	24	4	1	7	8	4
Carboniferous limestone series	28	16	4	3	3	3
Northern coalmeasures ...	15	4	3	53	15	13
Magnesian limestone ...	8	4		5	1	2
Trias	4			23	7	3
Southern coalmeasures ...				17	5	1
Alluvium				14	3	1
Totals	79	28	8	122	42	27
Percentages	68.69	24.35	6.96	63.87	22.0	14.13
(2) *All Deaths, but only Positive A and L Cases.*						
Millstone grit	16	3	1	4	5	4
Carboniferous limestone series	13	8	4	1	2	3
Northern coalmeasures ...	5	3	3	10	7	13
Magnesian limestone ...					-	2
Trias	1			7	7	3
Southern coalmeasures ...				13	4	1
Alluvium				4	3	1
Totals	35	14	8	39	28	27
Percentages	61.39	24.56	14.05	41.49	29.79	28.72

Thus in Derbyshire, as in Devonshire and West Shropshire, there is a remarkable body of evidence showing that patients with early phthisis die more often and recover more rarely when residing in exposure to strong prevalent rain-bearing winds than when residing in shelter from them, and this to a degree which cannot be considered negligible.

It is obviously important that phthisis sanatoriums should be located in shelter from these winds, and even more important that phthisis patients, on leaving their sanatoriums, should be advised to reside for some years in such shelter.

ON IRRADIATED ERGOSTEROL AS A DRESSING FOR WOUNDS:

WITH SUGGESTIONS AS TO ITS MODE OF ACTION.

BY

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AN inquiry undertaken four years ago into the effect exercised by irradiated and non-irradiated cholesterol and some other unsaturated fatty substances on the cellular constituents of the blood (recorded in a communication to the Physiological Section of the British Association last September) had previously demonstrated the fact that blood incubated in a closed cell on a film of cholesterol crystals deposited from ether on a slide showed increased leucocytic activity and also agglutination, followed by haemolysis of the red cells, and that these changes were much more marked in the irradiated than in the non-irradiated film. It was this fact which led to the use of cholesterol, dissolved to saturation point (about 3½ per cent.) in liquid paraffin, as a dressing for ulcers and granulating wounds.

In 1925 a very extensive wound of the upper limb, in which, as the result of a machine strap accident, the entire skin surrounding the elbow had been stripped from the limb, and in which two unsuccessful attempts at autogenous skin grafting had been previously made, was dressed daily for some weeks with this cholesterol paraffin mixture, and later, when the sloughs had separated and granulations began to appear, the surface of the wound was irradiated through the cholesterol paraffin coating every other day with the ultra-violet rays from a mercury vapour lamp. After nearly six months of this treatment the wound eventually healed without cicatricial contraction, and the lad recovered with a functionally useful arm.

Following the discovery by Rosenheim and Webster in England, and Windaus and Hess in Germany, that irradiated ergosterol contained a much higher content of antirachitic or vitamin D substance than irradiated cholesterol, irradiated ergosterol, dissolved in the same way in liquid paraffin, was used in the place of the cholesterol as a dressing for varicose ulcers and for infected and granulating wounds. Good results were obtained both in the reduction of infection and in the promotion of healing.

Latterly "radiostol" in oil, diluted with liquid paraffin and soaked in gauze, has been found to be a convenient form of dressing. In two cases in which healing had been delayed by *B. pyocyaneus* infection it was noticed that the infective process was arrested in the part of the wound in contact with the irradiated ergosterol dressing, although it was still present in the area dressed by liquid paraffin, used as a control.

These observations showed that irradiated ergosterol so applied to wounds not only reduces infection and promotes healthy granulations; it also stimulates the ingrowth of epithelial cells from the margin, and so favours the healing process.

Experiments have also been carried out to test the bactericidal effect of irradiated as compared with non-irradiated ergosterol. Films of ergosterol were spread on the under surface of glass slips, some of which were irradiated and the remainder used as controls. The irradiated and the non-irradiated films were then inoculated with a suspension of *Staphylococcus aureus* in normal saline and placed film downwards on agar or blood serum jelly, and incubated in Petri dishes. The colonies were found to be more numerous and larger on the non-irradiated than on the irradiated films.

These experiments require, however, to be repeated with other types of organisms, both aerobic and anaerobic.

Mode of Action.

The first suggestion I wish to make is that the beneficial effect of irradiated ergosterol, when used in solution in liquid paraffin as a dressing for wounds, may be due to a further continued irradiation effect on the wound tissues after the primary irradiation of the sterol by the ultra-violet rays from the mercury vapour lamp has ceased. The question of the physical and chemical action of the irradiated substance still remains.

In the BRITISH MEDICAL JOURNAL of October 8th, 1927 (p. 637), I described a colour test for distinguishing irradiated from non-irradiated ergosterol, which depends on the oxidation of potassium iodide by liberated oxygen, and the formation of a pink or a blue coloured iodide of starch when a solution of boiled starch dissolved in potassium iodide solution is applied to such an irradiated film. This and similar colour tests with ammonium ferrous sulphate and potassium thiocyanate solutions, and the haemolytic effect of the irradiated sterol on a suspension of washed red cells previously described, and the fact that ergosterol can be activated by ozonized air, all suggest that the taking up of oxygen during irradiation and the subsequent liberation of the oxygen may be the mechanism by which the irradiated sterol acts upon the blood and tissue cells and epithelial cells in the wound.

According, however, to Rosenheim and Webster (*Lancet*, September 17th, 1927) the conversion of ergosterol and the formation of vitamin D is brought about equally well in an atmosphere of nitrogen, the supposition perhaps being that the change consists in a molecular rearrangement only.

Experiments carried out by myself, in which thinly spread ergosterol films were irradiated through water covering the film, and also with films spread on the under surface of quartz slips, placed film downwards on mercury, and then irradiated through the quartz (atmospheric oxygen being thus excluded), showed that no activated substance had been formed capable of liberating iodine when tested by the starch potassium iodide and other colour tests.

These and other observations suggest the conclusion, either that ergosterol when treated by ultra-violet radiation takes up oxygen which can be subsequently liberated and is itself vitamin D, or that *two* substances are formed from the sterol during radiation—one a vitamin, which does not take up and subsequently liberate oxygen, and the other a substance of a peroxide character, which does take up oxygen and gives the starch potassium iodide colour reaction, and which haemolyses the red cells. If two substances are formed then the further question arises which of these substances exercises the stimulating and healing effect on wounds.

The fact that the activated substance which forms during irradiation is a fat-soluble material is of considerable importance; for, unlike a water-soluble material, a fat-soluble substance can transmit oxygen through the lipoid coatings of the cell and its nucleus, and if it is also an oxygen carrier, soluble in fats, it may exert its influence on red cells, leucocytes, and tissue cells in the way described.

In support of this view it is interesting to find that when large and well-formed crystals of ergosterol, deposited slowly from solution in tetrachlorethane (Westron) on a slide, are viewed with polarized light after irradiation only the very small crystals become completely isotropic or non-polarizing. The larger crystals still contain a luminous core surrounded by a non-luminous non-polarizing layer of resinous material, which appears to protect the central core from further change.

If we assume that only one fat-soluble oxygen-absorbing and oxygen-discharging substance is formed during irradiation, then such an assumption seems also to imply that it is in virtue of this fat-soluble character, in conjunction with its capacity for liberating oxygen, that vitamin D exerts