wrong, and you need waste no further time in treating it as such. Moreover, the powerful effect of emetine on amoebic cases, compared with its uselessness in bacillary cases, may, I think, be taken as strong proof that amoebic dysentery is really a separate entity. That is why, in the earlier part of this address, I said that we might reject the view that intestinal amoebae play no part in the causation of this disease.

A Lecture ON MINERS' NYSTAGMUS.*

BY
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Miners' nystagmus is an occupational disease of the nervous system, and is only found among workers in coal mines. The first case was described in Belgium, by Decondé, in 1861; and among the earliest observers were C. Bell Taylor, Nieden, Gräfe, and Snell. Romée pointed out that the earliest recorded case was described in Belgium ten years after the safety lamp had been recommended for use in that country, and that it was only after the compulsory introduction of the Mueseler lamp in 1876 that he noticed an increase in the number of cases of the disease.

There have been two chief views as to the causation of the disease—the one that it is due to the position assumed by the miner at his work, and the other that it is due to deficient illumination. The first view was very ably and strongly advocated by Dransart, Nieden, and Snell, and the last named had several discussions with Dr. Court, who has the honour to be the first English observer to call attention to the importance of the light factor. Most English observers now hold that the chief factor is deficient light, but on the Continent there is still diversity of opinion.

SYMPTOMS.

The first symptom is failure of sight, especially at night time, or when the sufferer is called upon to perform the more skilled portion of his work. The man next complains that the lamps dazzle his eyes, and sooner or later that the lamps and all surrounding objects dance before him. Headache, varying from slight pain between the temples to attacks of extreme severity, giddiness on exertion and stooping, inability to see at night time, and dread of a bright light, are often present.

There are two distinct varieties of the disease. In the first the symptoms are absent or latent, and the man, suffering no disability, is unaware that he has nystagmus; in the second the disease is manifest, and the man is more or less incapacitated and aware that his eyes are affected. Among 750 consecutive cases 150 latent cases were observed.

The table shows the frequency of the various symptoms in the remaining 600 manifest cases.

TABLE I.—Symptoms in 600 Manifest Cases.

	Number.	Percentage.	Symptom Marked.	Very Marked.
Movements of objects ...	566	94.3	—	—
Headache	507	84.5	51	16
Giddiness	490	81.6	52	8
Night blindness	459	76.5	4	—
Dread of light	284	47.3	10	—

PHYSICAL SIGNS.

The signs of the disease are: Involuntary and irregular movements of the eyeballs, chiefly of a rotatory character, tremor of the eyelids, eyebrows, head, and, in some cases, even of the neck and shoulders. A backward inclination

of the head with drooping eyelids is characteristic and common. An attempt has been made lately to describe a condition in which the disease miners' nystagmus exists without the presence of the nystagmus proper, and in which the oscillation of the eyeballs is replaced by blinking of the eyelids. The question is at present under consideration by a Departmental Committee, and there is no time this afternoon to discuss the matter.

THE CAUSE OF NYSTAGMUS.

Owing to the deficient light in a coal mine, the images formed in the eyes are indefinite and inexact; this leads to indecision on the part of the controlling mechanism in the brain, with the result that irregular inco-ordinate movements of the eyeballs ensue. These irregular movements of the eyeballs are known as nystagmus.

FREQUENCY OF THE DISEASE.

Foreign authors estimate the frequency of the disease as being from 5 to 25 per cent. of all workmen employed underground. The following table will show the number of men disabled by the disease in this country. The figures are taken from the Blue Books on statistics of compensation.

TABLE II.—Frequency of Disablement.

Year.	Number of Certified Cases.	Percentage to Underground Workers.	Cost of All Industrial Diseases.
1908	460	0.057	£13,782
1909	1,011	0.23	£26,759
1910	1,618	0.19	£42,507
1911	2,559	0.29	£68,017

I have estimated the cost of the disease to the country in 1910 to have been over £100,000, and on the same basis to have been over £155,000 in 1911.

INCAPACITY.

With regard to the incapacity caused by the disease, I hold the following views: Slight cases can soon return to work underground; ordinary cases can return after an interval of surface work of three to twelve months. Although one attack of nystagmus predisposes to another, I think it only fair to allow a man to try to regain his income by working underground again if possible. The exceptional cases should not return to work underground, and by exceptional cases I mean the following: Men who have failed to work several times before; very young lads; old men with commencing cataract; men with high degree of refractive error, and those cases which have been of exceptional severity. The following table was taken from returns, extending over four years, from five large colliery companies employing over 28,000 men:

TABLE III.—Late Results.

Back at old work	152 or 45 %
Left employ or commuted	9
At surface work	105
Idle	73

It is at the present time much more difficult to persuade men to attempt to work underground.

A further question may be asked: Is it dangerous to employ a man underground who has once suffered from nystagmus? In the first place, is the man more liable to accident? It is very difficult to answer this question. Men are often sent out of the pits by managers from fear of this danger, but this is when they are about to fail on account of the disease. I think it probable that many slight accidents are due to nystagmus, but I have only once had a complaint from a man that his accident was directly due to his nystagmus. There is, however, the possibility of a greater danger—namely, that a catastrophe may result from the failure of a fireman or collier suffering from the disease to detect the presence of gas. The table given below shows the results of tests made on all the firemen of five large collieries. The tests were made on the surface with the help of an Oldham gas-testing chamber. The men were first examined for the presence of nystagmus and then tested independently for their ability to detect the cap given in the presence of gas.

* Delivered at the Mining Machinery Exhibition, London, on May 31st.

TABLE IV.—*Examination for Ability to see Gas Cap.*

	Number Tested.	Correct.	Trace.	Cap Shown.				
				1 Per Cent.		2 Per Cent.		3 Per Cent.
			Failed.	Failed.	Under-estimated.	Failed.	Under-estimated.	
Normal men	49	28	14	4	9	0	14	Seen by all, but frequently under-estimated.
Nystagmic cases	41	4	19	10	13	6	12	

It will be seen that all the men were able to detect the presence of gas when 3 per cent. was in the chamber. The nystagmic cases, however, certainly made more mistakes than the other men.

FACTORS DETERMINING THE OCCURRENCE OF THE DISEASE.

Age.

The mean age was 39.84 years and the mean years of underground life was 25.58 years.

Occupation.

The occupation of 685 cases is given; the remaining cases were all among under-officials who had been specially examined for the disease, and it was felt unfair to include them in the table. It will be seen that, although all classes of workmen are affected, the great majority of cases come from the coal face.

TABLE V.—*Occupation in 685 Cases.*

Colliers ...	525	} = 557, or 81.3 %
Collier lads (fillers or loaders) ...	32	
Timbermen and repairers ...	52	= 7.5 %
Hauliers and haulage men ...	40	= 5.8 %
Rippers ...	8	
Labourers ...	6	
Contractors ...	5	
Under officials ...	3	
Hitcher, engine driver, ostler, and mason ...	1 each.	

Method of Work.

The method of coal getting known as holing (under-cutting of the coal) is said by many authors to be the chief factor in the production of the disease. The following table was based on answers given by 580 nystagmus cases, who either were or had been colliers:

Much holing ...	177	} = 348, or 60 %
Some holing ...	171	
Little holing ...	40	} = 232, or 40 %
No holing ...	192	

Taking all the cases, 362, or nearly 50 per cent., had done no holing. Colliers in Somerset, Forest of Dean, and in the house coal pits of South Wales all get their coal by bottom-holing, yet nystagmus is very rare in these pits. The collier when holing is supposed to direct his eyes obliquely upwards, and the advocates of the old school say that nystagmus results from the strain produced by this unnatural position of the eyes, but does a collier look obliquely upwards when he holes? A collier looks upwards when engaged in top-holing, but not when he holes in the bottom. The eyes are then either directed straight-forward or a little downwards. A little consideration will show that the swing of the pick will be more powerful and complete when the blow is ended below the level of the eyes. The photographs handed round will show the position of the men at work.

Seams.

The thickness of the seams does not appear to be of very great importance, as shown by the following table:

TABLE VI.—*Thickness of Seams.*

Less than 2 feet ...	...	1
2 to 3 feet ...	...	47
3 to 4 feet ...	...	133
4 to 5 feet ...	...	148
5 to 6 feet ...	...	115
6 feet and over ...	...	141

Illumination.

In metalliferous mines candles or open lamps are used, while in a coal mine safety lamps are often necessary. The naked light coal mine comes midway between the safety-lamp coal pit and the metalliferous mine, having the general blackness of the former and the good light of the latter. Manifest nystagmus is common in the safety-lamp coal pit, rare in the open light coal pit, and unknown in the metalliferous mine. Nystagmus is practically unknown in the purely naked light districts of Somerset and the Forest of Dean, and is rare in the open light pits of South Wales. In South Wales most of the men had worked at one time or another with lamps, and it is common for the men to continue working in an open light pit after they have failed to work with lamps. Taking into consideration the number of men employed, England and Wales, using safety lamps three times more frequently than Scotland, had four times the number of cases of nystagmus in 1910.

In the present series 741 men had used safety lamps, 723 almost entirely, and only 9 had worked with candles alone. As a result of an investigation in South Wales the following figures were obtained. The number of men working in both classes of mines was known and the illumination at the coal face had been tested.

TABLE VII.—*Number of Cases and Average Illumination.*

	Relative Number of Certified Cases of Nystagmus to Men Employed.	Average Illumination at Coal Face in Foot-Candles.
Safety-lamp pits...	6.3	0.008, or 1
Candle pits ...	1	0.09, or 5

In the same district the incidence of nystagmus was found to vary inversely with the candle power of the lamps used.

TABLE VIII.—*Number of Cases and Candle Power.*

Pit.	Men.	Nystagmus.	Candle Power of Lamps.
A	450	9	0.235
B	1,400	22	0.27
C	1,500	10	0.33
D	2,500	14	0.4
E	1,900	8	0.42

The illumination at the coal face depends mainly on four factors: (1) The candle power of the source of light used; (2) the distance at which this light has to be placed from the coal face; (3) the character of the surroundings; (4) the composition of the air at the coal face.

1. The candle power of the wax candles used in mines is generally equal to one standard candle, but the tallow candle may be equal to two. The oil safety lamp rarely gives more than one-third of a candle power at the coal face when clean and much less when dirty. Some dirty lamps have only given one-tenth of a candle power.

2. The candle can be placed close to the coal face, but the lamp must be placed out of danger, and is always much further from the coal face. As the intensity of illumination varies inversely with the square of the distance the advantage of the candle is very great.

3. In the coal mine practically all the incident light is absorbed and the advantage of reflected light is lost. We do not realize how much of the lighting of interiors is due to this reflected light, but the difference between a room papered with light paper and one with a dark red paper is very obvious.

4. The light of a safety lamp diminishes rapidly when the oxygen percentage of the air falls and the presence of moisture has the same effect. The presence of gas up to 4 per cent. increases the luminosity of the flame. So accurately does the safety lamp answer to the various changes in the atmosphere that a rough estimate of the oxygen percentage might be calculated by taking photometric readings of a standard oil lamp first under normal conditions, and then in the different districts of the mine.

The actual amount of light falling on the coal face was measured in several collieries, and the average of a large number of observations is given below.

In five open light collieries the average illumination at the coal face was 0.09 of a foot-candle. In eight safety lamp collieries the average illumination was 0.018 of a foot-candle, or only one-fifth of that obtaining in an open light mine.

The questions of the influence of holing and illumination have been discussed separately, and the following table has been drawn up to show the relation they bear to one another.

TABLE IX.—*Holing and Illumination.*

District.	Holing.	Position at Work.	Thickness of Seam.	Light.	Incidence of Nystagmus.
Somerset ...	Much	On side	Feet. 1½-3½	Candles	Unknown
Forest of Dean ...	Much	On side	2-4	Candles	Unknown
Open light pits, South Wales	Much	Side or knees	2½-5	Candles	Rare
Safety lamp pits, South Wales	None	Knees or standing	3½-6	Safety lamps	Common
Midlands ...	Much	Side ...	5-7	Lamps	Common

The Personal Factor.

The personal factor remains to be considered, and it is now recognized by a large number of surgeons that ocular defects play an important part in determining whether a man should have nystagmus or not. The result of my investigations is given below:

Not examined	...	...	...	176
Latent	...	...	...	49
Too bad to test	...	...	...	225
Normal	...	...	...	95
Error of refraction present...	...	...	...	430*
Kind of error present—				
Hypermetropia	...	...	...	170
Myopia	...	...	...	57
Astigmatism	...	...	...	203

* = 81.9 per cent. of cases examined.

It must be remembered that a small error of refraction is common in normal people.

Accident and ill health are also determining factors. In 146 cases there was a history of an accident—in 73 cases to the eye, in 43 cases to the head, and in 30 cases the injury was general. In North Staffordshire accidents to the eye occur very frequently before the onset of nystagmus. In the first 600 cases seen there was a history of accident to the eyes in 36 cases; in the last 150 cases, all from North Stafford, there has been injury to the eyes in 37 cases.

PREVENTIVE TREATMENT.

It is in the first place necessary to improve the miners' lamp, and the mining engineer must no longer be content with an average illumination of one-fiftieth of a foot-candle at the coal face. The introduction of electric lamps into general use is probable, as it seems unlikely sufficient light can be obtained in any other way. The elimination of unfit workmen by medical examination before employment would also be of the greatest service. Efficient ventilation and any hygienic measures will also help.

AMINO-ACIDS AND SUGARS IN RECTAL FEEDING.*

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IN spite of its great drawbacks, "feeding" by nutrient enemata is in almost universal use at the present time. During the past few years, however, the advance in our knowledge of the ordinary processes of absorption from the bowel makes it necessary to review the experimental

* Part of the expenses of this research has been defrayed by a grant from the Colston Research Fund.

and clinical evidence on which the practice of rectal feeding is based. We hope to demonstrate that, as at present practised, it is nearly useless, but that it is possible considerably to enhance its value in most cases.

HISTORY OF RECTAL FEEDING.

An excellent summary of the older history is given by Gros. Galen and Celsus both practised it, and it was in fairly frequent use during the Middle Ages. Ramazini, in the seventeenth century, claims to have kept a girl alive by its means for seventy days.

The classical researches on the subject, on which the modern practice is based, are those of Ewald and Leube. In 1872 Leube kept a dog alive for months on injections of chopped meat and pancreas, claiming an absorption equivalent to 500 calories daily. Ewald in 1887 published tables purporting to show the results of administering egg and peptone enemata, which appear to demonstrate great absorption, but his experimental methods were unsatisfactory (for example, he used phenolphthalein as an indicator for ammonia) and the data inadequate. Later workers (Huber, Bial, Sharkey, Plantenga, Edsall and Miller, Mutch and Ryffel) all report a small but variable absorption of albumen and peptone.

All the above observations were made by the "wash-out" method, the enemata given one day being washed out next morning by rectal lavage, and it being assumed that what could not be recovered from the washing must have been absorbed.

Boyd and Robertson, whose tables we shall presently examine, appeared to have reposed confidence in the "wash-out" method, but they also analysed the nitrogen excretion in the urine. Langdon Brown criticized the "wash-out" method and trusted to the urinary analysis. He found practically no absorption of peptone.

The data for the absorption of sugar and fat will be discussed later.

THE ABSORPTION OF PROTEINS.

We have seen that many observers, trusting to the "wash-out" method, have reported a small, variable degree of absorption of albumen and peptone, the latter giving the better results. As a type of these observations we may examine the careful and detailed figures supplied by Boyd and Robertson, who also made urinary analyses for nitrogen by Kjeldahl's method. Seven young women suffering from gastric ulcer were fed entirely on nutrient enemata for six or seven days. They were kept in bed, and weighed before and after. All did well clinically. The enemata were given six-hourly, and consisted of two eggs or 200 c.cm. of milk and egg, dextrose, normal saline, and in one case cod-liver oil. The whole was pancreatized for twenty minutes. Every day the bowel was washed out, and the contents analysed.

Results of Analyses.

	Loss or Gain of Weight in Kilos.	Total N Disappeared from Bowel.	Total N in Urine.
		Grams.	Grams.
Case I (6 days) ...	- 2.27	9.26	19.66
Case II (6 days) ...	- 1.475	6.59	33.04
Case III (7 days) ...	- 2.837	11.93	18.81
Case IV (7 days) ...	- 3.632	4.33	41.21
Case V (7 days) ...	- 4.086	9.70	48.13
Case VI (7 days) ...	- 5.448	15.60	56.87
Case VII (6 days) ...	+ 0.227	- 0.17	42.19

It will be observed that in every case the amount of nitrogen absorbed from the bowel could not possibly account for that lost by the urine, even if we admit that disappearance from the bowel means absorption by the patient. As Langdon Brown has pointed out, this is very improbable. Patients who are having daily rectal washes may pass a huge putrid stool, which presumably came from the caecum and was not touched by the lavage. The physiological antiperistalsis of the colon may carry the remains of the nutrient enema up beyond the reach of the wash, and so it will disappear from the rectum and yet not be absorbed, but putrefy.