

Treatise
on
Oleum Securis Aselli
by
George Harley.
Edinburgh

1850.

Oleum Morrhuae.

History. — Although it is not many years since Medical men began to use extensively Cod liver oil in this country, and still a shorter period has elapsed since it was permitted to hold a place in our Dispensatories, it has long been a popular remedy in those countries lying to the north west of Europe. It was always considered the best domestic medicine for curing a decline, and was given in many other diseases to be afterwards mentioned. The first Medical man who noticed it seems to have been Percival, in his Medical Essays in the year 1782, afterwards in 1807 it is mentioned by Bradsley, and in 1822 it is strongly recommended as a cure for chronic rheumatism by Schner. This remedy however did not come into extensive use in Great Britain, until Dr Bennett published a treatise on its uses in 1841. This small volume was not slow to call the attention of the profession to the subject, and as great benefit was derived from its administration, its effects were soon tried in a great number of diseases, in some of which the improvement was so rapid, that many persons considered it a specific, while in others it was found

of little or no use, which is not to be wondered at, when we look at the complaints, in which it was employed.

The diseases in which it is now commonly given, are, phthisis pulmonalis, tabes mesenterica, chronic rheumatism, gout, serofula, strumous ophthalmia, & abscesses, chronic diseases of the joints, caries, rachitis, enlargement of the glands, and some other complaints.

The admirers of Cod liver oil, have in a number of these obstinate affections, exaggerated its efficacy, but there is not the smallest shadow of doubt, that it is of the first importance in some of these diseases, such as phthisis pulmonalis, which is so deadly, that a fourth of the deaths which occur in Great Britain, are said to be caused by this disease. Cod liver oil seems not only to alleviate its symptoms, but even a number of cures have been reported to have followed its use. In serofula, and chronic rheumatism its beneficial effects are now undoubted. We must not look lightly on Cod liver oil, because it does not cure every case in which it is employed, what remedy have we in the pharmacopœia the good effects of which are invariable? in our whole catalogue of medicines, which amount to near 1000, we have only one specific, which is, quina in ague.

X of mint

When we think of this, it makes us judge the merits of the oil more cautiously, and it must be left to future enquirers, to form a just, & proper estimate of its value, for its admirers on the one hand, and opposi-
 =ments on the other, are not in a proper frame at present, to come to any agreeable conclusion, we must wait till some calm but acute observer, strikes the oscillating balance, and brings the weight to its proper level, then, and not till then, will we judge its respective merits impartially.

But to return to its history, I may notice that in a letter from M^r Darbey, of the Manchester Infirmary, published in Percival's Essays, it is stated that Dr Kay one of the Physicians to that Charity, was the first Medical man, who prescribed Cod liver oil for the cure of disease, and that his attention was first drawn to it, by an accidental circum-
 =stance, namely, "A woman who laboured under most excruciating rheumatism, and was an out-patient of this Infirmary being advised to rub her joints with the oil, was induced to take it at the same time internally, a few weeks restored her to the use of her limbs, and she was cured. However little attention was paid to this case as the cure was imputed to the other medicines

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which she had taken, and the alteration of the weather, about a year afterwards her complaints returned with double violence, and the same remedy restored her again to health." Dr May prescribed the oil in other cases, and found it remarkably useful. After this the other physicians to the Institution, gave it to their patients with the greatest success. The oil used by these gentlemen was brought from Newfoundland, and in consequence of its faulty preparation, was of a very offensive taste, & smell, so much so, that patients in the better classes of society, would not take it at all, it was plentifully dispensed in the Infirmary however, for according to Mr Darbey 50 to 60 gall.^{ns} were annually prescribed, & Dr Bennett mentions in his book, that this was about the average quantity for 30 years. Upon making inquiry at the different public Institutions in this, and some other towns in Scotland where Cod liver oil is dispensed, I find the quantity to be as follows.

In the Royal Infirmary Edinburgh.
During the last three years 150 gallons were dispensed, which on an average makes 50 gallons per. An.^{ns} The number of patients in the house last year was 4,006.

Royal Public Dispensary West Richmond Street.

In 1845, of Oleum Jecoris aselli 105 lb were dispensed.

1846 " " " 120 lb " "

1847 " " " 129 lb " "

Thus shewing a great increase during these three years. The average number of patients who are supplied with medicines being nearly 6000.

Royal Infirmary Glasgow.

Last year there were dispensed between 8 and 10 gall-

In the letter I had from Dr Steel he says, "The dark coloured oil is here generally preferred to the purified, in fact we never use the latter, except where the stomach is so irritable, that it will not retain the former."

Royal Infirmary Aberdeen.

The quantity used is particularly small, being only from 3 to 4 gallons annually.

Dr Rattray from a calculation which he was kind enough to make for me, thinks that there may have been dispensed in Aberdeen, above 200 gallons yearly for the last 2 or 3 years.

Northern Infirmary Inverness.

Last year, from 5 to 6 gall^{rs}. were used. ~~But~~ The number of patients admitted in that period was 200. Dr Wilson says, that "The late Dr Nicol of this town, was of opinion that the properties of cod liver oil depended, in a great measure on the presence of an essential oil in it, and always chose that of a deep brown colour for his patients".

Infirmary Dumfries.

Last year the amount was unusually small, being only 6 gall^{rs}. The average amount however is about 12 gall^{rs}. No consumptive patients are admitted into this institution.

Royal Infirmary Dundee.

As the medicines dispensed to the out door patients, are not kept separate from those given to the in door ones, it is nearly impossible to state exactly the quantity of oil used in the house, but Dr Campbell thinks it will amount to about 50 gallons yearly.

County & City Infirmary Perth.

During the last 17 months there has been 54 gallons of cod liver oil dispensed to out and in door patients. The medicines like those in Dundee are not kept separate.

As yet, I have been unable to ascertain the quantity of *Oleum Morrhue*, used in the Montrose Infirmary. But I was favoured with the following statement. In the manufactory of Somerville & Co Montrose; From 9th Feb^y to 1st June 1849. — 1100 gallons of Cod liver oil were made. In the same time 250 " " Skate oil. total 1350 ^{gals} all sold.

From Oct 6th to Dec^r 21st sold 626 gallons cod oil
Dec 22nd on hand 206 gallons
832

This shews that in six months, Mr Somerville manufactured 2182 gallons of oil, which I suppose was principally, if not entirely for medicinal purposes.

The greatest manufacturer of *Oleum Jecoris aselli* in this country, is Parker Lith walk — who makes tons of it at a time, and of remarkably fine quality. Much of the oil which is consumed in Edinburgh, and London is imported from Newfoundland, where ^{it is} they are now prepared ~~of a~~ in a much more careful manner than formerly. Until last year, they were in the habit of throwing the livers into a heap, and allowing them to putrify in the open air, collecting into receivers, the oil which drained off from the corrupting mass. This as one may readily suppose, was rancid, of a very nauseous taste, and smell, and of a brown colour.

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The oil which is now sent home for medicinal use, is carefully prepared from the fresh livers, is not at all disagreeable to the taste, and in colour resembles pure Castor oil. The specimen which I got at Mr McFarlan's, Druggist, was slightly muddy, but I find it is now perfectly clear, and has a slight deposit at the bottom of the vial, which when shaken does not readily diffuse itself throughout the oil. The wholesale price of the Newfoundland oil, is 16/- per gal^r. I have got a specimen of oil very like that which I have just been mentioning, but rather more muddy, it was prepared by a fisherwoman at Dunbar. Her method is to take fresh livers, cut them in pieces, put them into a covered dish, which is placed into a pot, boiling water, kept over a slow fire till all the livers are melted, they are then put into a cloth, and the oil is strained through. This oil gives a most beautiful purple colour with Sulphuric acid; on standing it deposits much more stearine than that imported from Newfoundland. I have before me two specimens of Parker's oil, one the refined light coloured oil, which is sold in bottles ~~which is sold~~ at a little less than 2/- per ounce, and the other of the colour of sherry wine, both kinds are very clear, and neither have any deposit on standing, the latter is 6/- per gal^r wholesale price. A specimen of Cod liver oil which I have from Hull,

is much darker than any of the preceding, has a very nauseous taste, and smell; with sulphuric acid it gives a dark brown colour, much similar to whale oil, it has a slight deposit, and seems of very inferior quality.

I am informed by a person from the Island of Lewis, that the people there, are constantly in the habit of taking cod liver oil for the cure of all sorts of diseases connected with a decline of bodily strength, for coughs &c. They also apply it to external sores. It is there prepared by melting the fresh livers in a pan, over a slow fire, they then put the contents of the pan into a cloth, the ends of which are twisted in opposite directions by two persons, and the exuding oil collected, which is quite pure. They also use oil, prepared in the same manner from the blubber of the seal, it is not so much approved of as the cod liver oil. A very strange substance which they give to consumptive patients, is prepared by taking a sheep or part of one, allowing it to become putrid, and then melting it in a pan, and collecting the oil which comes away. This they drink two or three times a-day for some length of time, and it is said with great benefit.

Having spoken thus shortly of the history of oleum morrhue, it may now be proper to mention a few of the processes by which it is obtained, I need not

recapitulate what has been said, in the various treatises on this subject regarding the different kinds of fish, from the livers of which, this remedy is obtained, indeed it would be more than useless, as the manufacturer of Cod liver oil takes promiscuously the livers, of all the large white fish of the species of Cod or ling, if they are of sufficient size. At certain seasons of the year the livers are much larger, and contain more oil than at others, this is the case about the months of December, January, & February, when the fish are in best condition.

The first process I will give, is that described by Mr. Honour, Consul at Bergen, in a letter addressed to to de Jough, he says "As soon as the fish are brought to land the livers are cut out, and thrown into vessels where they ultimately remain. If this is done at irregular times the pale oil is not so clear, and pure, as when the fishery is concluded at once. When the fishery is ended (for which there is no fixed time) the clear oil which comes of in these vessels is skimmed, poured off, and put into barrels. This is the pale oil. The residue is then boiled, and thence is produced the brown oil. The light brown oil is the impaired pale oil; partly because the livers have lain too long, and partly because the pale oil is old, and has remained in warehouses where it has been exposed to damp. The clearness of the pale oil

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depends particularly on the fatness of the liver, and on the method of preparation. This is known to connoisseurs, for when the pale oil runs off liquid as fine oil, it will keep, which is not the case when it is thick. He also says the real cod oil should be quite clear, and somewhat green. — At some of the fishing stations on the coast of Berwickshire, I ascertained that they prepared good medicinal oil, by putting the fresh livers cut in pieces, on baskets made of willow twigs. The baskets are about three feet long, two broad, and three or four inches deep, these being placed near a fire, the heat melts the livers, and the oil drains through the baskets into receivers. The oil which is thus collected is then strained through cloth bags, and is the pale clear oil. The residue in the baskets is now boiled on a slow fire, and more oil is got but of a darker colour, this is the brown variety. There is another method, namely to take the fresh livers cut them in small pieces, put them into a pot along with water, and boil them for some length of time, then pour off the liquid, and allow it to stand until it becomes quite cold, when the oil will be found floating on the surface of the water. The upper stratum is to be skimmed off, and put away as containing dust, and other matters. You next draw the oil from the water by means of a siphon, and if it is not very clear you may wash it well with cold water, allow it again to

stand till the oil comes to the top, and draw it off by the siphon as before, it will now be found clear, and of a very fine quality. To preserve it from becoming rancid it should be put up in well corked bottles, a little salt having been previously added.

At Eyemouth, the cod liver oil is prepared on quite a different plan from any of those which I have mentioned. The process is somewhat as follows. They have a large tank, into which the livers are put having been previously washed, and cut in pieces of about two inches square, there is a boiler to generate steam, which is conducted through pipes into the tank amongst the livers, which are melted by the heat of the steam, the oil runs through ~~the~~ holes in the bottom of the tank, and is received into vessels placed below. Steam is again passed through the oil to purify it, last of all the oil is filtered through bags, and is then ready for use.

On filtering the oil which has a sediment of stearine through paper I find it comes away quite clear, therefore all that is required to make the Newfoundland oil as fine as Parkers best is an extra filtration.

Mode of Operation. — I think this will be the proper place for me, to give a brief sketch of the different theories, held regarding the mode in which Cod liver oil acts on the system. There has existed, and still exists a great difference of opinion as to which of its constituents, its curative power is to be attributed. Those who hold that its therapeutic effects depend upon the iodine which it contains, I believe to be the most numerous class, so I will take up the consideration of that theory first. We know that those who advocate the iodine theory, do so on account of finding Cod liver oil useful in the same complaints as that of iodine, and we think they have good grounds for this view, as by giving a short sketch of the diseases in which iodine may be given with service will shew. The actions however of this remedy are still but imperfectly understood, one thing is certain, namely, that it is particularly beneficial in scrofulous diseases, chronic enlargement of the glands, as in bronchocele, in many cutaneous affections, in enlarged spleen, & liver, frequently causing an increased discharge of bile. It stimulates the mucous membranes, and absorbent glands, some say even diseased mesenteric glands. Gendrin thinks it serviceable in gout, especially in the acute forms. It has occasionally been found useful in caries. In chorea Manson is said to have found it particularly beneficial, curing six-sevenths of his patients. Sir James Murray

strongly recommended the inhalation of iodine vapour in phthisis pulmonalis. Iodine frequently causes an increased flow of urine, in which secretion it may be found shortly after being swallowed. It will be seen from what we have here said in regard to the virtues of iodine, that its action on the human economy very much resembles that of cod liver oil, for in every one of these affections it (the latter) has been found more or less useful. Again in cases where iodine is contraindicated, so is cod liver oil, for example, when there is a disposition to plethora, congestion, inflammation or any local irritation of the alimentary canal, as in indigestion, diarrhoea, &c. Meligan mentions that many have noticed an increased appetite, & deposition of fat to follow the prolonged administration of iodine, which may depend on its stimulating effect on the absorbent glands in the intestines. The same unpleasant taste which is felt after taking iodine, is felt after a dose of cod liver oil. When the oil is continued for some time, Haas mentions that he has detected iodine in the urine. The quantity of Iodine in cod liver oil is very small, according to the analysis of de Jough, brown oil contains .0295. Light brown .0406. Pale oil .0374 in the 100 parts. This quantity may be quite sufficient to act on the system, for we know that very small doses of some medicines when frequently repeated, act as

quickly as large, as for instance $\frac{1}{2}$ of a grain of Calomel given three times a day, will salivate the patient as quickly, if not quicker than two grain doses. I saw an example of this in the Clinical Wards this winter, to a woman who had ~~the~~ venereal sores, Dr Bennett prescribed the $\frac{1}{2}$ of a grain of Calomel thrice a day, and in less than two days salivation came on, when the remedy was discontinued.

Now before the mercury shewed its action on the gums the system must have been thoroughly impregnated with it, therefore there can be no doubt but that more minute doses would act on the different organs, although there was not enough to affect the system to salivation. The same may be the case with cod liver oil the minute quantity of iodine in which may perform its action although not strong enough to cause iodism, which when it occurs shews that the remedy has been pushed to the utmost.

We cannot say, ~~but~~, that if we could give an unlimited quantity of oleum Morhuæ iodism would be produced, or that it would not; but this we know that when Cod liver oil is given in too large a quantity, or too often, or too long continued, the patients complain of headache, loss of appetite, sickness, oppression about the heart, a disagreeable feeling about the region of the stomach, foul tongue, thirst &c. And are these not similar to the symptoms which characterise that disordered state of the system called iodism?

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Dr Christian enumerates them as follows "headache, giddiness, nausea, languor, loss of appetite, and inaptitude for exertion." Here we see these symptoms exactly resemble those produced by the cod liver oil when pushed too far. Why should we not impute them both to the same cause? I do not mean to say that the iodine in the oil is the sole cause of these symptoms, all that I wish to shew is the probability that the iodine may have some share, in producing those beneficial results which arise from the proper use of cod liver oil. Some deny that it can have the very slightest effect, the quantity they say being too small. I may mention a few more actions which these drugs possess in common. Both are tonic, diaphoretic & diuretic.

Tonic because their continued administration imparts vigour, and strength to debilitated constitutions without producing any sudden excitement to the nervous, and vascular systems, restoring the secretions of the various organs when deficient, and bringing them into a healthy condition. If we may so express it, by rousing the vital powers from the lethargic state into which they have fallen, and imparting to them renewed energy of action.

They act as diaphoretics when the obstructed perspiration is dependent on a slow, and languid state of the circulation, by increasing the muscular

action, which is known to have a most powerful effect in the production of diaphoresis. Neither of these remedies are ever used for this special purpose, as we have so many powerful diaphoretics. The same may be said in regard to their diuretic properties, their affect being produced in both cases indirectly.

Having said thus much in regard to the iodine theory I will now try, and say a few words in regard to the view that the whole benefit of the oil, depends on the nutritive power of the fatty matter which it contains.

According to de Jough, in 100 parts of oil there is

	brown oil	light brown	Pale
Oleic acid with brown substance	69.785	71.757	74.033
Margaric acid	16.145	15.421	11.757
Glycerine	<u>9.711</u>	<u>9.073</u>	<u>10.177</u>
Total of the principles cont ^d fat	95.641	96.251	95.967

By this we see that the fatty principles form a very great proportion of the oil, and it may be useful in nourishing the body by reason of the fat it contains. The functions of animal life cannot be carried on without fat, in as much as, the animal heat is almost entirely dependent on the fat taken into the system. And without this heat no animal can live, as all the chemical changes going on in the body are in a great measure dependent on it. Fat nourishes every organ & tissue of the body.

Dr Carpenter in his Physiology (p 430) ~~also~~ states, that
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The substance peculiar to the nervous tissue may be formed from fatty matter, rather than from a protein-compound. Margarine is the principal constituent of the human fat, and stearine^{differs} from it, only in a single atom of water, indeed margaric acid, can be procured from stearic acid by dry distillation. And glycerine is the base of all fats. Seeing that cod liver oil contains so many of the requisite elements, as it were already prepared to enter into the formation of the animal tissues, we may naturally suppose that it will contain much more nourishment, in proportion to the quantity taken, than either vegetable, or animal substances. It is well known that cod liver oil is very serviceable in diseases attended with emaciation, as in phthisis, tabes mesenterica &c. In the advanced stages of these diseases the digestive functions are so much impaired, that should strong nourishing food be given, such as beefsteaks, and porter, the patient would very probably get sick at the sight of them, and even if they got the length of the stomach, they must remain there for a longer or shorter period, as that organ would be but imperfectly able to digest them. The elements which are required to support the system are clasped under four heads, albuminous, oleaginous, saccharine, & gelatinous, if any of these are in too great excess, or altogether wanting, disease is induced, none

of them separately, is able to support life. In phthisis we find the oleaginous principles in very small quantity, and if by any means we can put this most requisite element into the tissues, the patient will recover. There was formerly a Doctor on the banks of Clyde, who got great fame for treating phthisical patients. His method was to put the patients on full diet, make them take plenty of exercise in the fresh air, either on horse back, or in a carriage, and a great number of them got well. Phthisis always commences at first with some derangement of the digestive functions, whereby the system is imperfectly nourished, we must therefore try, to keep the waste counterbalanced by the repair. And this we can do in a great measure by Cod liver oil, which is as it were already prepared to be taken up by the lacteals, and put at once to the support of the animal frame, without undergoing so many changes as what a beefsteak, or other diet would require to undergo, before it would be ready to be taken up by the absorbents of the alimentary canal. We may therefore conclude, that the substances which require the least expenditure of animal power, in preparing them for entering the blood, will be the most serviceable in strengthening the body.

In ancient times the fat of various animals was held in great.

esteem as a most valuable remedy for the cure of disease. In one of the London Pharmacopaeias published about the year 1600, the fat of dogs, and even serpents, is highly lauded as being most useful in the treatment of many affections. In the present day we smile at these remedies, but we must remember that there is a fashion in medicine, as well as in all other things, and a remedy which has been highly extolled by one generation, may be thrown aside as useless by the succeeding. The aspect of diseases also change, so that a drug which was of the first importance in one epidemic may be hurtful in the next. We have a good illustration of this in epidemic fevers.

About thirty ^{years ago} cases of fever were treated by the lancet with great success, now we never dream of bleeding our patients, as fever as it now appears among us requires stimulating treatment instead of depletion.

Medicines often fall into disuse not because they lose their virtue over certain complaints, but because another is found of service, we leave the old, and seize the new in the expectation of finding it best.

Many old remedies are restored to favour by accidental circumstances, and after having again acted their part on the stage of medicine ~~they~~ disappear as they did in former years, and are soon entirely forgotten.

Another view, is that the virtues of Cod liver oil depend on the gum resin which it contains, people adopted this view simply because it was used for several complaints in which resinous substances, such as quaiacum, asafoetida, myrrh &c, had been considered beneficial. Percival I believe was the first to hold this view; & as I am not inclined to favour this opinion I will say no more of it.

The action of the oil has been attempted to be explained in another manner by Dr Ascherson of Berlin. (Vide Bennett, page 53) He accounts for its action in this way. It is known that when oil, and albumen are brought together, the latter forms a layer round the globules of the former, which looks exactly like a cell, and cell wall. Then reflecting that the chyle was nothing more than an emulsion, or mixture of fat, and albumen. He thought that by their acting on each other in the body, they would form cells as he saw them do under the field of the microscope. In scrofula the albuminous principles predominate over the fatty, "and this predominance at last becomes so great, that the contents of the whole intestinal canal are found to be acid, and the albuminous fluid runs into hard masses, which lose their property of becoming organized. This then is the material which is received into the lymphatics, instead of the normal

emulsion formerly alluded to, and, on joining, the blood necessarily tends to deteriorate that fluid. At length the blood itself contains albumen in excess, on account of its non-mixture with the other element, oil, which enabled it to become adapted to the organism, and after a time it is effused into the cellular tissue of the external or internal membranes, or into the parenchymas of the organs constituting the different kinds of tuberculous disease."

x x x x. "We can understand that, from the views previously explained regarding the operation of fluid fat on albumen, and that of the bile on the chyme, the mode of action of oil in scrofula may be deduced. The particles of this fluid, by combining with the albumen, would first correct the excess of the latter substance, and induce a better formation of lymph. The general strength of the system would thus be increased, and the functions of the small intestines gradually restored to their former activity. By a continued administration of the oil, also, this fluid may at length be more than proportionate to correct the albumen found in the stomach, and its molecules will then combine with those of the morbid products which have become deposited. Thus, not only is the original derangement in the digestive organs corrected, but the useless and injurious results it may have occasioned also removed. This theory has

been supported by Dr Bauer, who has given several instances when the scrofulous disposition has been removed by rubbing in externally different kinds of oil."

Some of the practitioners in this town who I have spoken to on this subject, seem to have the opinion that any animal oil would have the same beneficial effect as Cod liver oil, this I do not think can be the case as I will afterwards shew. It has been noticed by some that men employed working daily amongst oil or fatty matters are particularly robust, and they say this depends on the oily particles being absorbed into the bodies of these men while at work. This perhaps may be partly the reason but we must take into account that none of these men have sedentary occupations, and that some of them such as butchers, are also in contact both outwardly, and inwardly with muscular fibre, which may greatly contribute in giving them that portly appearance, which they so often possess.

Dr Pereira thinks that the active principle may possibly depend on the bromine. I do not know the exact quantity which Cod liver oil contains, but according to de Lough, the chlorine, & bromine together, in 100 parts of oil, is between 3 & 4 times more than that of iodine. Its action on the body is similar to the latter for which it is sometimes substituted in medicine.

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Mr. John Savory is not astonished at its producing fatness seeing that its principal ingredient consists of Carbon, which he says "offers a very valuable aid in cachectic cases, & others of diminished power and general weakness."

Dr. Williams thinks that its efficacy depends on the biliary principle which the oil contains, and that the functions of the intestines are stimulated thereby. He is convinced that it has not only the power of causing a deposition of fat in the adipose texture, but improving the muscular strength and activity, whilst the improved colour of the cheeks, & lips he says "implies a filling of the vessels with more and better blood." — In the Medical-Chirurgical Review 1848. The same author remarks of cod liver oil, "assuredly the most efficacious of all medicinal agents in the treatment of cacoplastic, and aplastic deposits, and one which, after two years' constant experience in its use, is still frequently surprising me, by the wonders that it occasionally works, even in aggravated and advanced cases of scrofula, mesenteric disease, pulmonary consumption, chronic pneumonia and pleurisy, and chronic rheumatism."

I might go on quoting a great many interesting notices which have at sundry times appeared in the various Medical periodicals, but these I think are sufficient to show in what esteem this remedy is held.

I cannot go on any further, without remarking that Dr Williams has claimed the honour of introducing this therapeutical agent into London. How he makes this out I cannot understand, as he took no notice of it until nearly seven years after, the appearance of Dr Bennett's admirable treatise, and then he confesses that he had only used it for the two previous years. Making as his excuse for not adopting the remedy sooner, that the manner in which it was prepared rendered it unfit for medicinal use.

About 1846 he got his druggist to prepare a refined sort which sold at about 2/ per ounce, and this he says is the only kind that he could get his patients to swallow. Dr Williams might have known that the Parkers in Edinburgh, years before his discovery of his druggist, had been in the habit of preparing an oil, as good as that used at present, the best quality of which costs only about 1 1/2 per ounce, of this oil they send hogheads to London yearly.

Having given this short sketch of the views which others hold in regard to the operation of oleum morrhuae on the human economy; perhaps I may now be permitted to say a few words respecting what I consider to be

The active principles of this remedy. In treating disease we are constantly in the habit of combining various drugs, and at the same time either withholding or increasing the diet of our patients, so as to be able more effectively to cope with the various symptoms which present themselves to our attention. For example in prescribing for simple bronchitis we give anodynes, antispasmodics, expectorants &c, each to act at the same time in its own peculiar manner. By this union of remedies we find the sufferer much sooner relieved than if we were giving any one of these agents separately. In diseases accompanied with emaciation we give nourishing diet in addition to our medicines, which might have been taken in vain unless combined with better food. How often do our best endeavours fail (in Dispensary practice) to remove disease on account of our patients being imperfectly nourished & &ad. ? And how much sooner do these patients get well when removed to an Hospital (even when the air is sometimes more impure) although the treatment is the same except being combined with better nourishment? In Cod liver oil we have a most excellent prescription, for in it we have both diet and medicine combined, and what more could we desire for the treatment of disease

connected with debility. First we have oleaginous matters almost in a state ready for absorption into the system, next substances peculiar to the bile to assist in the preparation of the former; Then we have iodine, bromine, & chlorine to stimulate, and give ~~to~~ tone to the intestinal absorbents, thereby enabling them better to take up and assimilate the nutrient material. Again we have phosphoric, & sulphuric acids, which are given in cases of debility being tonic, astringent, & refrigerant. And lastly magnesia, lime phosphorus, and soda for the bones and other textures. When we look at this we cannot be surprised at its wonderful effects on the human body. I do not think that any of these elements separately could ever have such a powerful effect. The great value of Cod liver oil over other oils ^{is} ~~is~~ ^{due} ~~is~~ ^{to} ~~is~~ ^{on account} ~~is~~ ^{of} this beautiful combination of remedies, which no other oil possesses in the same degree.

Chemical Composition. Being unable to give

any original analysis of Cod liver oil, I have fixed on that given by Dr de Lough believing it to be the best of those published. To enter into the details however would be foreign to the purpose of this essay so I will only copy out the general summary which he has given at page 65.

100 parts of Cod Liver Oil contain,

	Brown.	Light Brown.	Pale.
Oleic acid with brown substance, (Gaduline & two peculiar bodies)	69.78500	71.75700	74.03300.
Margaric acid	16.14500	15.42100	11.75700
Glycerine	9.71100	9.07300	10.17700
Butyric acid	0.15875	---	0.07436
Acetic acid	0.12506	---	0.04571
Fellie & cholic acids with some oleine, margarine, & bilifulrin	0.29900	0.06200	0.04300
Bilifulrin & bilifellinic acid & two peculiar substances	0.87600	0.44500	0.26800
A peculiar substance soluble in alcohol of 30°	0.03800	0.01300	0.00600
A peculiar substance insoluble in alcohol, water, & ether	0.00500	0.00200	0.00100
Iodine	0.02950	0.04060	0.03740
Chlorine with some bromine	0.08400	0.15880	0.14880
Phosphoric acid	0.05365	0.07890	0.09135

	Brown	Light brown	Pale
Sulphuric acid	0.01010	0.08595	0.07100
Phosphorus	0.00754	0.01136	0.02125
Lime	0.08170	0.16780	0.15150
Magnesia	0.00380	0.01230	0.00880
Soda	0.01790	0.06810	0.05340
Iron	a trace	---	---
Loss	<u>2.56900</u>	<u>2.60319</u>	<u>3.00943.</u>
	<u>100.00000.</u>	<u>100.00000.</u>	<u>100.00000.</u>

Since I have given the analysis of de Lough it may be as well to give that of Marder also, and then compare the two.

	Pale	Brown
Green soft resin	0.052	0.065
Brown hard resin	0.013	0.078
Gelatine	0.136	0.468
Oleic acid	55.917	47.500
Marganic acid	10.312	4.000
Glycerine	8.416	9.000
Colouring matter	5.750	12.500
Muriate of Lime	0.052	0.105
Muriate of Soda	0.059	0.094
Sulphate of Potash	0.018	0.031

No notice of iodine is made in this analysis, indeed Marder denied its existence altogether because he could not find it. Others state that it exists only in the brown oil (St. Buij-Hebergerke)

Iodine can only be detected after the oil has been saponified, and not in a mere ethereal, alcoholic or watery solution.

Dr de Soubh. detects it by the following process, The oil is saponified with pure potash, or soda in excess, by long boiling evaporated to dryness; the soap is carbonised in a platinum crucible, and then saturated with carbonate of ammonia, and dissolved in water or alcohol. In the latter case, after the evaporation of the solution, there remains a pretty nearly pure hydriodate of potash or soda, which may serve for the quantitative analysis. In the qualitative analysis the iodine is best discovered by putting the evaporated watery or spirituous solution of the carbonised soap which contains the salt mass, in the bottom of a glass tube, with some concentrated sulphuric acid poured on it; then placing in the opening of the tube some starch paste, it should be gently warmed. The ascending vapour of iodine will show a deep violet colour. The salt can also be dissolved in a solution of chlorine, and mixed with starch; or instead of sulphuric, nitric acid may be used!

Mardel mentions that in a cold temperature the pale oil deposits a somewhat consistent fat, consisting of oleic, and marganic acids, and glycerine, which the brown oil does not. This must have depended on some fault in the preparation of the oil on which he experimented, as the

refined oil sold in Edinburgh has no such deposit, neither has the brown.

On comparing the analysis of Marden with that of de Lough we observe a very great difference, both as regards the components and their quantities. The one recognises bile, acetic, & butyric acids, & gaudine, the other green soft resin, brown hard resin &c. The latter author explains these discrepancies by stating that Marden's "soft resin is nothing more than a mixture of the substances of the bile with some oil and margarum; and the hard resin soluble in alcohol consists simply of bilifulvin & bilifellinic acids" Again he says that the colouring matter consists principally of gaudine. And that his nondetection of iodine was either because he employed a wrong process, or an impure oil. And that he must never have looked for phosphorus, and phosphoric acid. If these statements are correct we can easily account for the seeming difference in the analysis of these authors.

On reading the analysis of de Lough I was much surprised to find that contrary to ^{the} general opinion, he makes out that the pale and light brown oils, agree almost in every respect, and that they are richer in inorganic substances (including iodine) than the dark brown kinds, the latter being the richest in bile, butyric and acetic acids. His explanation is that "the richest oil when flowing off quickly

takes up and dissolves the smallest quantity of these substances (inorganic) contained in the livers; while on the other hand the last oil which comes off with the assistance of heat, appears to dissolve the substance of the bile more copiously". I cannot altogether agree with this explanation 1st Because the pale oil flows out readily without either much pressure or heat, while the dark brown does not come away until a considerable degree of both has been applied, which one is naturally led to suppose would favor the solubility of the inorganic constituents, and therefore allow the oil to take them up more easily. We know, mostly all inorganic substances are more soluble in hot than cold water, & for this reason I think it more probable that the dark brown oil which flows away while warm, will carry away the greatest amount of salts &c. 2nd The very colour of the oil would lead us to suppose that the pale would hold less inorganic substances in solution than the dark. 3rd That in the filtering &c of the refined oil it would lose a part of the substances which it held in solution. This however is merely a conjecture and being unable by experiment to observe for myself I must consider, what Dr De Lough says on this point, to be correct.

Mode of Prescribing. — It is not requisite for me to say much on the method of administering Cod liver oil, as it is of little importance in what vehicle the patient takes the remedy, so long as he gets it swallowed, and it remains on the stomach. In general patients at first feel a great dislike, and are often very unwilling to try the medicine because of its nauseous taste, but more on account (I think) of its being oil, the very idea of taking oil seems enough to sicken them, even although it was void of taste. This I have found to be the case with some people to whom I have prescribed the remedy, I remember one in particular, a lady of about 70, who would take the most nauseous drugs without the slightest reluctance, yet would scarcely be induced to try *Oleum Jecoris Aselli* for no other reason than because of its being oil. In this case a teaspoonful only, was given three times a-day, and in about a month the lady who before was very thin, and weak, became quite plump, and gained considerable strength. She had however to give up taking it on account of an intolerable itching which she felt over the whole body, yet no eruption appeared. On giving over taking the oil this disagreeable feeling left her in a few days.

She recommenced taking the oil in about three

weeks, when in less than eight days the itching returned worse than before. Every thing that could be thought of, was tried to remove this morbid feeling but without avail, nothing was left for her but to discontinue the use of the oil, which had proven of so much benefit, and at the same time so much uneasiness.

A fellow student who has been taking Cod liver oil for more than a month, the other day mentioned to me, that it had brought out an eruption on his legs and arms, which gave him great uneasiness from the itching it occasioned, so he had left off taking the remedy.

The most common method of prescribing Cod liver oil is to give, a table spoonful three a-day in milk or coffee, about half an hour after a meal is the best time to take it, as then it is less liable to produce sickness than when taken on an empty stomach. In patients having an irritable stomach it is best to give the first dose at bed-time, and not more than a teaspoonful, which can be easily increased to a table spoonful three a-day. Some practitioners give as much as ℥vj at a time, but this practice cannot be commended as so great a quantity of oil is likely to remain heavy on the stomach, and if often repeated cause dyspepsia, which when it

occurs forbids the continuance of the remedy. To cover the taste of the oil there has been a great variety of things recommended, such as the essential oils, lemon juice, wine &c, but I think the patient should be allowed to take it in any vehicle which may ~~best~~ suit his taste best, as none of the things that have yet been recommended are able entirely to cover its flavour, which I think resembles somewhat the taste of anchovies or salt herring both of these articles being in daily use, one among the higher, the other among the lower classes of society; we need not wonder that patients after a time begin to like the flavour of the oil, as mostly all tastes are acquired.

It is a strange fact that children take the oil much more readily than adults, and many of them get particularly fond of it. It is worthy of observation that the younger the patient the sooner does the oil produce its good effects, which would favour the idea that the virtues of the oil depend on its nutritive powers. As in childhood the assimilative powers are greater than in mature age, when the frame requires only to be repaired without being increased in size, therefore we observe more quickly the change for the better in a young than an old person.

Some give the oil made into an emulsion, with

a solution of potash, and some aromatic water, this form however does not hide the taste, and if its virtues depend on the oily principles must render it totally useless. Others give it with the white of an egg. Dr. We recommends patients to take instead of the oil the Cod livers cooked in the following manner to prevent the dissipation of the oil during preparation. The livers are to be immersed in boiling water to which salt has been previously added, so as to raise the boiling point to 220° F., after remaining sufficiently long in the water the livers are to be sliced, and the oil which exudes on cutting them, is to be eaten with mashed potato. Copeland recommends a more novel mode of cookery, something like a Scotch haggis. "The stomach of the fish is well washed, two parts filled with fresh liver, and firmly tied at each end, so as not to allow any of the oil to escape whilst being boiled. This is eaten quite warm, with a little salt, and spice, in which state he says it is very palatable". These two methods of administration are only recommended to be employed when from any cause the patient is unable to take, or keep the oil on the stomach.

The way in which the oil is given to patients in the Northern Infirmary Durness is one of the best and

simplest modes, namely to give a table spoonful in a glass of table beer, or salt, and water, which last is said to give the oil a fishy taste, and render it more palatable.

As illustrative of what I have been saying in the foregoing part of this dissertation, with regard to the benefit derived from the use of Cod liver oil, I will enumerate one or two of the most marked cases which have come under my own observation, whether during my attendance in the Hospital wards, or on some of the patients who I had under my charge while a pupil at the Royal Public Dispensary, West Richmond Street. Before doing so however it might be as well ~~for~~ to copy a few notes from the report of the London Hospital for Consumption, on the benefit derived from the employment of Cod liver oil in Phthisis. It was administered to 542 patients and found highly beneficial. "293 of these cases were in the first stage of the disease, 249 in the second and third, or those stages subsequent to softening. Of those in the first stage 190 were males 103 females, 72 per cent of the males, and 62 per cent of the females had their symptoms materially improved. In about 18 per cent of the males, and 28 of the females the disease was arrested. In 10 per cent of both sexes the disease was unchecked. Of the 249 patients

in the second stage of the disease 139 were males, 110 females. In 53 per cent of the males the symptoms were materially improved, and in nearly 61 per cent of the females. In 14 per cent of males, and nearly 14 per cent of females the disease was arrested. In a little more than 32 per cent of males, and 25½ of the females the disease was not arrested. Viewing these results collectively we find in about 63 per cent the symptoms improved, in 18 per cent the disease arrested, and in 19 per cent it went on unchecked. When it is recollected that of the whole number treated in this Hospital, the disease was arrested in only 5 per cent, the value of this remedy, under the use of which the disease appears to have been arrested in 18 per cent of the cases, must be considered very great."

In this institution the different qualities of oil were tried, without exhibiting any marked difference in their remedial effects. The oil they now use is straw-coloured, transparent, and free from offensive smell. They begin with giving ℥j three times a day, and increasing the dose to ℥iſs. It is given in any agreeable fluid such as camphor water or milk. In cases where there is much irritability of the stomach the oil is given in mucilage with a few drops of hydrocyanic acid. In cases of anaemia, and debility the preparations of quina, and iron are conjoined with advantage.

"From these facts, and a more extended experience since the period at which this report terminates, no other conclusion can be drawn than that Cod liver oil possesses the property of controlling the symptoms of pulmonary consumption, if not of arresting the disease, to a greater extent than any other agent hitherto tried."

(L. G. M. S. 1 Jan'y 1850.)

Royal Infirmary Edin^g.

(Copied from Clerks Journal).

Ward 11.

Jane Hamilton aet 18. admitted Sep 12th 1849.

History. Had sore throat in last Dec: from which she recovered, but in the end of April was attacked with cough and spit, and on account of weakness was soon after confined to bed, at the same time she lost her appetite, and became thin. The catamenia also ceased. At times she had cold sweating of the face, hands, and feet. Has been sometimes able to rise from bed, but is now much weaker, and has been very feverish for several days previous to admission.

On admission. Her appearance is pale and emaciated complains of pain in her head, and epigastrium. Is unable to sit up for more than a few minutes.

Respiratory System. Has much cough - no pain of chest, sputa viscid, yellow, and slightly frothy.

On Percussion. No dullness to be observed under either clavicle.
Auscultation. The respiratory murmur is puerile in the left infra-clavicular region, suppressed in the right, and in same region coarse mucous râles are heard on cough or full inspiration, vocal resonance not increased.

Pulse 116. Heart natural.

Digestive system. Has much thirst, tongue furred, and brown, appetite capricious, bowels open every other day.

Catamenia suppressed since last April.

Urine loaded with lithates. S. G. 1028.

She took some cough mixture, and on 26th had considerably improved.

Oct 4th. Rj Plei Morrhua ʒij - Plei Cinimon: gtt IV ~~Rx~~

A desert spoonful night, and morning.

Oct 24th. Pectoral symptoms much improved.

27th. Had been sitting up too long yesterday, & got cold.

Slept ill through the night; sonorous & sibilant râles are heard over the upper part of both lungs anteriorly - $\frac{2}{3}$ of right & $\frac{1}{2}$ of left posterior. Those in upper part of right lung more of a coarse mucous character. A blister was applied under right clavicle.

Nov 1st. Bronchitis gone. Of Cod liver oil ʒj three a-day

Dec 6th. General health improved, cough less but still mucopurulent expectoration, still dullness

beneath right clavicle, with hard blowing inspiration, and mucous rale on expiration. Expiration prolonged on both sides, resonance of voice still increased on right side posteriorly.

February She is now dismissed from hospital as cured. So long as she took a desert spoonful three times a-day her symptoms seemed only to be kept in check, but no sooner was the quantity of Cod liver oil doubled than she began to get fat, and strong, it seemed as if her system just required an increased amount of nutriment to overcome the disease, and restore her to health.

Patrick Barclay, aet 15.

Admitted 25th June 1849. Ward 1.

Of scrofulous habit from infancy, was able to go to school until a week ago, could not take much exercise on account of sore leg which he had for 12 months, his diet for a long time past has been very poor.

On 18 June was attacked with cough, also some dyspnoea on exertion.

Old admission. Complains of cough which is sometimes greatly prolonged, has no pain or difficulty of breathing.

Respiratory System. Cough easily excited, and occasionally severe. Sputa viscid, frothy, and tinged with blood.

Percussion. Great dullness on right side, especially under clavicle, the left side is also dull to a slight extent.

Auscultation. Distinct vocal resonance, loud friction, and mucous râles approaching cavernous are heard in the upper right side in front, and these become more faint towards the lower part of lung. Behind on right side vocal resonance not so distinct, but râles the same.

Pulse 114. Strong and sharp. Apex of heart beats below 6th rib, impulse increased. A chirping murmur is heard over the apex, at the end of first sound, fainter towards the base. To the left of sternum a bellows murmur takes the place of second sound. This murmur is quite concealed by loud friction râles when breathing.

Digestive system. Tongue furred, appetite good some thirst. Bowels regular.

Urine. Natural. S. G. 1020.

Has had necrosis of femur.

Diagnosis. Phthisis with chronic pleurisy. Disease of mitral and aortic valves of heart.

Was ordered Cough mixture. & a desert spoonful of

. Cod liver oil thrice a-day.

30th June. Friction r le less, gurgling r le on right side quite distinct. Chest to be rubbed with Unguen. tart. antim.

2nd July. Chirping murmur has become less. Has vomited his meals several times. ʒij of Naptia to be added to mixture.

8th. Coughing severe causing vomiting. Inflation from ointment painful.

16th. Physical signs cardiac and pulmonary the same.

21st. To-day a seton was introduced beneath right clavicle.

23rd. Sound of cavity on right side of a dry character, Cough diminished.

7th Sept. Appearance much improved, right cavity quite dry, heart sounds as before.

28 Oct. He is now becoming quite fat no cough or expectoration. No pain. No palpitation on exertion. The right infra-clavicular region becoming flat. Ordered to omit the cod liver oil which he has taken regularly since admission.

16th Nov. Cough has returned with slight mucous expectoration. Has pain, and sense of oppression over sternum. Mucous, and sibilant r les are heard all over the chest. Ordered to commence oil again.

26th Nov. Cough more severe especially at night. Expectoration mucous. Physical signs the same.

7th Dec^r. The sounds are now quite dry. On right side of chest vocal resonance still increased. No pectoriloquy.

23rd. Cough still troublesome especially at night.
13 Jan. 1850. On percussion, distinct crack pot sound. Very marked in the right infra-clavicular region faintly heard on left side. On right chipping sound. Prolonged expiration no moist sounds. Sleeps well, very little troubled with cough, appetite good. With second sound of heart still bellows murmur.

12 March. He is now dismissed from the Hospital his symptoms have all been materially improved, cough not very troublesome, he sleeps well at night, appetite pretty good, and on the whole he has been very much benefitted by the above treatment.

One reason why it is so difficult to cure ~~them~~ thoroughly consumptive patients, is because as soon as ~~to~~ their symptoms become improved they imagine they are quite well, and will not continued the treatment, if they happen to be in the hospital they insist on going out notwithstanding the remonstrance of the physician.

Materine Jones act 30.

Seen first time on

12th Dec^r 1849.

Of slender habit of body, appears weak and emaciated, living in a small attic, close, dirty, and badly ventilated, little clothing, and ill fed. States that she first suffered from rheumatism a year ago & has never got properly well since, complains most of pain in right knee which is much swollen, and the cuticle abraded by a blister which she applied a day or two ago. Has tried various remedies without any benefit. Appetite not good, thirsty, and does not sleep well, Catamenia regul-
-lar, bowels constive.

Rj Olei Scoris aselli ℥vj.

A table spoon-

-ful to be taken three times a day.

15th Dec. Feels better and stronger, pain not so severe.

20 Dec. To-day I found her in a neighbours room sitting. can walk, but lamely.

18 Jan^y. 1850. She has gradually got better the swelling of knee is gone almost, and ^{she} is nearly as well as ever.

14 Feb^y. In consequence of her not taking the oil regularly, the cure has not been so rapid as might have been expected. She is now able to follow her usual employ-
-ment.

As it is of great importance to give a genuine article in administering cod liver oil, it may not be improper for me to mention a few of the means which we possess, of distinguishing the real from the spurious oils which are sometimes sold under the name of cod liver oil. It is known by its peculiar fishy taste & odour, and clear transparent colour the best sorts being like fine Castor oil, the next variety like sherry wine. When a little of the oil is put on a white plate, and a few drops of sulphuric acid added thereto, a beautiful deep purple hue is produced gradually extending over the whole oil. ~~and~~ The colour on standing gets by degrees darker, and darker until it assumes almost a brownish black tint. I have tried the action on various kinds of oils, and it produces the purple colour with none but those made from the cod liver, although it causes a dark brown or other hue with both vegetable, and animal oils. The coloration has been supposed by some to depend on the biliary principle, and by others on the iodine, I incline in favour of the latter view on account of having noticed the effect of the following experiments. On putting some bile on a white plate and adding a few drops of sulphuric acid a dark rose colour appeared, and on mixing a little bile with olive oil, and then adding sulphuric acid a brownish red colour was obtained, but nothing at all like the hue given with the
 * of sulphuric acid

same acid and Cod liver oil. I next added a few drops of bile to genuine cod liver oil, which on the addition of the acid gave the usual purple but a little masked from the colour given by the bile which is rather brownish.

On adding a little sulphuric acid to iodide of potassium effervescence takes place, and a light brown colour forms gradually increasing in depth of colour. To a mixture of Florence oil and iodide of potassium sulphuric acid gave a darker brown than the former. I obtained the nearest colour to that of cod liver oil, by mixing iodine and oil, which with sulphuric acid gives a purple or violet colour, ⁱⁿ none of these experiments however could I obtain anything like the beautiful hue which is produced by the genuine cod liver oil, it seems to be altogether peculiar to itself, and therefore when on the addition of sulphuric acid to an oil we get this fine tint we may be pretty certain that we have no spurious article in our hands.

Before concluding this essay I may as well observe that I have used cod liver oil in the treatment of burns with the most happy results, and am convinced that it is the one of the best, if not the best application which we can employ in the treatment of these sores. It is now nearly five years since I saw the oil put to this purpose, and since then I have tried it in

a considerable number of cases in every one of which the cure was both rapid and satisfactory. In proof of this statement I subjoin the following case as it is the last which I have had under my care.

Mary Hay aet 13 months 22 Carnegie Street Edin.

12th Feby 1850. She was burnt 12 days ago by the upsetting of a kettle of boiling water. On the right leg immediately below the knee there is an ulcerated surface extending more than half way round the limb and 2 1/2 inches down. On the arm between the shoulder, and elbow an ulcer 3 1/2 inches long, and 1 1/2 broad. The treatment has been poultices and simple ointment, ordered Cod liver oil to be applied.

14 Feby. sore on shoulder looks much better and if anything smaller, no improvement in the one on the leg.

13 March. The shoulder is now almost all healed over with very little puckering of the surrounding skin; The sore on leg is one half the size and the granulations are much higher than the skin, so I rubbed it over with nitrate of silver.

I might have cited a much better case than this but as I have no memorandum of it, I prefer giving the above of which I took notes.

The application of Cod liver oil to burns I think is to be preferred to that of other oils on account

of its stimulant properties.

I would also recommend it to be applied to scrofulous sores, and at the same time given internally. Mr Spence was kind enough to favour me with the following case, in which it was so employed.

Mrs F. Lath in 1844 had amputation of ankle joint performed for caries of bones of the foot, & the stump did well. In 1846 two years afterwards she again applied for treatment, the bones in the remaining foot having become affected, with ulceration of the cartilages, after trying various things without any benefit she applied cod liver oil, the ulcers healed, and she got quite well.

I have noticed in giving cod liver oil to children labouring under bronchitis with deficient expectoration, a great improvement takes place after a very few doses of the remedy, and that the expectoration ~~became~~ became much more easy.
having

In some of the late numbers of the Medical periodicals I observed the report of a case of Tertiary syphilis which had been treated with Cod liver oil successfully.

The reporter gave it as his opinion that the good effects of this remedy in treating venereal disease was all

together dependent on the iodine contained in the oil, which acted as an alterative in the same manner as iodide of potassium. The latter medicine is the best which we ~~perhaps~~ can possibly employ in the treatment of secondary or tertiary symptoms, but we must not refuse to give the cod liver oil a fair trial, as many medicines which have at first sight appeared ridiculous, have afterwards been found of great service.

P.S. Since this dissertation was written I have been informed that Dr Bennett has again published his views on this subject, but as I have never had an opportunity of reading them I am sorry that I cannot now give any quotations from that authors last work. In conclusion I beg to acknowledge the great kindness of those gentlemen who favoured me with a statement of the quantity of Cod liver oil used in the various institutions ^{with} which they are connected.