On submitting this scarlet cruorine to deoxidising agents to a moderate extent, the cruorine becomes the deoxidised or purple cruorine, and then the solution is light or deep purple, according to its degree of concentration. On examination by the spectroscope in this condition, only one deep broad band of absorption is found, which commences about the solar or sodium line D, and then passes onwards to the green, absorbing the whole of the yellow and part of the green bands of the spectrum. It is remarkable that, upon shaking up a dilute solution of scarlet cruorine with an atmosphere of carbonic acid, the fluid does not exhibit the appearance or spectrum of venous blood. It is evident, therefore, that the blue colour of venous blood is not produced by the presence of carbonic acid in solution, but by a *reducing action* in the capillaries analogous to that of other reagents; whilst the influence of sulphide of ammonium, sulphuretted hydrogen, or the hydrated protoxide of iron, or the protochloride of tin, or the peculiar deoxidation of arterial blood due to the changes going on in the systemic circulation, are all instances in which such a deoxidation or reduction has been in action. A dilute solution of scarlet cruorine set aside in a full closely corked phial, or with very little air, will shortly pass by spontaneous deoxidation to the purple cruorine; and will then exhibit all the optical phenomena of this peculiar substance, but resumes its scarlet colour on agitation with air.

Professor Stokes says that of all reducing agents an ammoniacal solution of protochloride of tin (previously treated with sufficient tartaric acid to prevent the precipitation of oxide of tin) is the most efficient reducing agent; and, as it is colourless, it does not interfere with the spectroscopic appearances. He says that, when a few drops of this solution are added to a solution of scarlet cruorine, the latter is presently reduced, and we have the spectrum of purple cruorine. If the solution be now shaken up with air, the cruorine is reoxidised to the scarlet form; on standing a few minutes it again becomes reduced, and the solution may be made to go through these changes repeatedly until all the tin has passed to complete oxidation.

But when blood or scarlet cruorine is treated with an *excess* of deoxidising material, or has become changed by long exposure to air, or by drying, or by the effect of sulphurous and some other acids, the colouring matter becomes brown and more insoluble in water; it is, in fact, then changed into *brown hæmatine*, which has very different optical properties from those of either scarlet or purple cruorine. The two dark bands of absorption are still found, but have become very faint and much less sharp in outline, whilst a third dark band is seen in the red ray; of course, on the less refrangible side of the solar or sodium line D.

This change, when produced by age and exposure, is sometimes months in being fully accomplished, and is only well-marked on the appearance of the dark band in the red ray. Now, just as cruorine can exist in two different forms, so can hæmatine; and we have either the brown or the red hæmatine, the latter being produced by deoxidising the brown hæmatine by some reducing agents, as hydrated protoxide of iron. Then two bands of absorption occur as in scarlet cruorine, but are capable of being readily distinguished from those by their position and different degrees of intensity. In red hæmatine an interval exists between the sodium or solar line D and the margin of the first band of absorption; which in red hæmatine is less distinct or sharp than in scarlet cruorine, or than its fellow in the same spectrum: both of these, therefore, are in red hæmatine found in the green rays. Most chemical re-agents convert scarlet cruorine into brown hæmatine, without any previous passage through the stage and properties of purple cruorine. The effects of reduction on brown hæmatine are evanescent, and the solution rapidly becomes deficient in optical power; it does not assume the former properties of brown hæmatine. The absorption bands fade away and disappear—the one nearer to the sodium line D being the more persistent and remaining sharp during several days; this takes place even if the bottle be airtight. Re-treatment with protoxide of iron will again re-produce the two absorption bands as before.

It is brown hæmatine which is generally discovered in old blood-stains; but red hæmatine in dry and more recent blood-clots. A specimen on the table, six months old, still shews the two bands of red hæmatine, whilst one of two years old shews the spectrum of brown hæmatine. It may be as well to state that these specimens of dried blood have been kept in a moderately dry room, powdered and in a paper pill-box, for some portion of the time; but during the major part of the period on cloths exposed to the air, without any care, and in the ordinary atmosphere of an inhabited room with gas burning nightly. Solutions of these specimens of blood in distilled water, after having been kept closely corked for some days, underwent a peculiar change. Both the brown and the red hæmatine were *spontaneously changed* into purple cruorine; and now shew only the one broad band of absorption due to that colouring matter. This effect is probably due to reduction by sulphuretted hydrogen.

There are also on the table many preparations of blood exhibiting the

actions of various re-agents on cruorine and hæmatine; but in no specimen would it be possible to detect any corpuscles by the microscope, as the colouring matters have all been dissolved in distilled water and the corpuscles destroyed. The microscope would, therefore, fail in detecting blood in all of them, whilst the chemist might probably recognise it in most of the fluids, and so will the spectroscope. When an old blood-stain has been so changed by exposure to air that the hæmatine gives but very faint and indistinct absorptive bands, it is possible, by deoxidising the solution of hæmatine by means of a little recently precipitated hydrated protoxide of iron, to reproduce the bands in nearly the same intensity, though slightly differing in position, as in blood-stains of very recent formation, in which scarlet cruorine would be, of course, the colouring material.

This experiment is readily made by adding a few drops of a weak solution of protosulphate or protochloride of iron, and then a little liquor ammoniæ. The green hydrated protoxide of iron resulting has a great affinity for oxygen, and at once reduces the hæmatine and restores its colour and optical properties. It is essential that putrefaction should not have actually destroyed the hæmatine.

[To be continued.]

OBSERVATIONS ON PLEURITIC ACCUMULATIONS.

By WILLIAM V. BIRD, M.D.,

Physician to the Bootle Dispensary.

THERE are, I find, many medical men who consider that the results of the operation of Paracentesis Thoracis are as yet very discouraging; indeed, I may say that the operation is regarded with suspicion and dislike. By some it has been considered as so dangerous a proceeding, on account of the risk of admitting air into the cavity of the thorax, that it has not been resorted to in a sufficiently early stage of disease to have afforded a fair prospect of success. Not many years ago, more than one eminent writer held that the chest should never be punctured unless for

1.—Trocár, cannula, and tap. 2.—Cannula and tap. 3.—Trocár.

the evacuation of pus; and not even then, unless the life of the patient were in immediate danger from its presence; and, up to this time, the operation has been too often resorted to merely as a palliative measure

calculated to afford temporary relief. I believe, however, that the success of the operation depends very considerably upon its early performance; and I am satisfied that many simple cases of pleuritic accumulation have been converted into very formidable ones by long continued irritation and pressure. With the hope of rendering this operation some what less formidable, I have had an instrument made (see illustration) that provides against the entrance of air by means of a tap, and that will enable the operator to draw off the fluid gradually, at intervals, and by a very small wound.

"The more slowly the fluid is evacuated, the less chance there will be of the admission of air, and of the renewed effusion of fluid." (*Physician's Vade Mecum*, 7th edit., page 543.) It is adapted for the evacuation of serum, and especially for those cases of true empyema in which, by removing a portion of pus, the remainder is disposed of by absorption; for, notwithstanding the smallness of the cannula, pus can readily be drawn through it by means of the syringe that screws into it. By the way, an interesting case occurred at the Westminster Hospital some years ago, in which there was manifest bulging with increased measurement of the chest, yet absorption took place, and the patient recovered, after the evacuation of an ounce of pus.

For the following reasons I consider that, whenever absorbent treatment seems steadily resisted, the operation should be at once performed.

1. The effusion, when thin and small in quantity, can be evacuated by a very small cannula.

2. Provided adhesions do not exist, or exist to only a small extent, or perhaps laterally, the success may be considerable and the danger slight, in proof of which I may mention that there is a case recorded of a man who, in one of the London hospitals, was tapped five or six times, and in the intervals pursued arduous labour.

3. Cases are often met with of true empyema in persons of a scrofulous habit, or who have been debilitated by mercury or previous disease, and are not likely to be benefited by delay.

4. Patients bear the operation better in the earlier stages of the disease.

In conclusion, I may remark that, after examining various recorded cases, I am satisfied that the success of paracentesis thoracis, though not hitherto as great as could have been wished, is much greater than is generally supposed; and, while I confess to having met with cases that ought to have succeeded but did not, I am happy to add that I have met with several others that must have surpassed all expectation.

"And that which is can never not have been;
Facts are solid as the pyramids."

For some recent cases and interesting observations on this subject, see *BRITISH MEDICAL JOURNAL* for 1866, vol. i, pages 95 and 644, and vol. ii, page 671; for 1867, vol. i, page 535, and vol. ii, page 80; also *Lancet* for 1866, vol. ii, page 693, and for 1867, vol. i, page 599.

The operation is performed in the usual way, as proposed by Trousseau, and the instrument is made in various sizes.

Fig. 4.—Trocar, cannula, and tap, with syringe screwed into cannula.

EMBOLISM OF THE MESENTERIC ARTERIES.—The symptoms, Dr. Moos says, are: 1. The manifestation of some source of embolism, as endocarditis, etc. 2. The occurrence of profuse, and frequently exhaustive hæmorrhage from the intestines, which may be explained either by active lesion of the intestinal mucous membrane itself, or by an obstruction in the portal circulation. 3. Rapid and considerable lowering of the temperature of the body. 4. Abdominal pains, which may be very severe and similar in character to those of colic. 5. The abdomen becomes tense and tympanitic, and symptoms of peritoneal effusion are presented. 6. Symptoms of embolism in other arteries frequently precede or come on at the same time with the special symptoms just described. 7. The existence of large blood cysts between the layers of the mesenteric may sometimes be made by external examination of the abdomen.—*Virchow's Archiv*, bd. 41, 1867.

ON DRUGS: THEIR ACTIONS AND THEIR DOSES.*

By HENRY WM. FULLER, M.D. Cantab., F.R.C.P.,

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IN proposing "Drugs: their Actions and their Doses", as the subject for discussion this evening, I had three objects principally in view: the first, to trace the causes of the distrust of medicine so prevalent in the present day; the second, to call attention to our utter want of precise knowledge respecting the action of drugs, and of the doses in which they may be safely administered, and to the wide differences in practice consequent thereupon; the third, to suggest that the Harveian Society should appoint a committee to undertake the investigation of therapeutical subjects.

Scepticism as to the curative value of drugs is the besetting fault of the profession at the present time. It pervades all classes; but is most common amongst those whose mental training ought to have preserved them from being so ensnared. In part, doubtless, it has arisen as a natural reaction from the blind and overweening confidence in drugs which obtained at the commencement of the present century; but this alone will not explain the change which has taken place. Brandy and beef-tea, as all-efficient remedies in pneumonia; and mint-water, as a specific for acute rheumatism, are simply exponents of a wide-spread superstition to which many causes have contributed. The rapid strides which have been made of late years in pathology, and in our means of detecting and diagnosing disease in the living body, have tended greatly towards this unfortunate result. Carried away by his enthusiasm in tracing the ravages of disease, the student has too often neglected to investigate the indications for treatment, or to pay much heed to remedies. Medicines, consequently, are prescribed which, either in their nature or mode of administration, are ill adapted to the exigencies of the case; failure necessarily follows their use, and scepticism as to their curative value is the logical result.

In another class of minds, the same distrust is brought about by other means. Our knowledge on many subjects is so precise, that a similar precision is sought for and expected in regard to the operation of medicine; consequently, each remedy is administered alone, and definite effects invariably follow its administration; and where any uncertainty or failure in this respect is observed, the conclusion is drawn that the remedy is not trustworthy, and, if useless, is probably mischievous. Constitutional peculiarities are ignored; the necessity for regulating the secretions and for strictly adapting the dose of the medicine to the exigencies of the case is overlooked; and the bald fact that the remedy cannot be trusted to produce a definite effect, under all circumstances, however dissimilar, is cited as conclusive evidence, that it possesses little virtue as a curative agent.

Again, we know little respecting the natural course of many diseases, and consequently we are in the dark as to what may be effected by the *vis medicatrix nature*: but observing, as we often do, that patients recover under various, and the most opposite, modes of treatment, and even when no medicine is administered, we are naturally inclined to ask whether drugs are of any use, and whether they may not be harmful? The question is a philosophical one, and deserves attention; but it is the reverse of philosophy to return an answer without careful investigation, and to ignore or endeavour to explain away all facts which serve to show that remedies are useful. It does not follow, because an object can be attained by different means, that therefore those means did not contribute to its attainment. Modern observation is directly opposed to any such supposition. Who can doubt that, when the nutrition of any part is interfered with, and so-called inflammation is set up, the morbid action may be modified or controlled by measures apparently the most opposite? Nay, more; who would hesitate to affirm that it is their very contrariety of action which enables remedies manifestly so dissimilar to compass the same object? Local depletion, for instance, by unloading the vessels, oftentimes tends to the restoration of the circulation; heat and cold, stimulants and sedatives—each in their turn, and under various circumstances, contribute to the same result. And, if this be admitted, what ground is there for doubting the efficacy of a remedy simply because another drug or another mode of treatment, most opposite in its nature, apparently effects the same object? What are we to think of the contest which has so fiercely raged between the respective advocates of the purgative and the astringent treatments of cholera—each side straining facts to suit their own views, and each unwilling to admit even a modicum of truth in the statements of their opponents? For my own part, I can readily conceive that each method

* Read before the Harveian Society, February 6th, 1868.