three, four or five months. Her laſt complaint was generally relieved by a few ſaponaceous pills.

I am,

SIR,

Your obedient humble Servant,

Leiceſter, Feb. 19, 1766.

Robert Smith.

---

Received March, 1766.

## XIV. *Experiments on the* Peruvian *Bark, by* Arthur Lee, *M. D.*

Read May 1, 1766.

THE great object of experiments is to eſtabliſh principles, on which practice may be conducted in the moſt expeditious and unerring manner. The intention, therefore, with which the following experiments on the Peruvian bark were made, was to confirm the pharmaceutic treatment of this medicine where it was juſt, to correct it where it was erroneous, or to improve it where it was defective.

### Experiment I.

In the firſt experiment, I infuſed two ounces of the powder of Peruvian bark, in a pound and a half of diſtilled water; after 24 hours, it was filtered, and the filtered

filtered liquor ſubjected to diſtillation in B. M. till about half came over, which was limpid and of a diſagreeable ſlightly aromatic flavour: what remained in the retort depoſited, on cooling, half a dram of a reſinous ſubſtance, perfectly diſſoluble in rectified ſpirit of wine: the liquor being then evaporated in B. M. left about three drams of a gummy ſubſtance intenſely bitter and acerb.

Ob. It ſeems to appear from this, that the aqueous infuſion contains the aromatic part of the bark, with a little of the reſinous and a conſiderable quantity of the gummy ſubſtance.

## Experiment II.

The reſiduum of bark, from the former experiment, after extraction for two hours, in B. M. with eight ounces of rectified ſpirit of wine, produced a tincture, which, when decompoſed with water, left three drams and eighteen grains and a half of reſinous matter. The water that was filtered from it was ſlightly bitter.

Ob. The bark therefore ſeems to contain three ſoluble parts, namely, the aromatic part, to be extracted by cold watery infuſion, a gummy part, chiefly diſſoluble in water, and a reſinous part diſſolved plentifully by ſpirit of wine. The quantity of diſſolved matter obtained in the above experiments is in much greater proportion than in the experiments of Mr. Boulduc and Mr. Neumann. Dr. Lewis obſerves, in his notes upon Neumann, that different ſorts of Peruvian bark differ conſiderably in their yield of extract, which, together with the heat uſed in making the ſpiritous extract, may account for this diſparity in

in my experiments and thoſe of the gentlemen juſt mentioned.

Experiment III.

Two drams of a tincture obtained from one ounce of powdered Peruvian bark, with four ounces of rectified ſpirit, and filtered without preſſure, gave two grains of reſinous matter; but the ſame, when the filtration was finiſhed, with preſſure on the top, gave ſix grains of the ſame ſubſtance.

Ob. It may therefore ſeem adviſable to uſe preſſure always in filtering this tincture; and perhaps all the other tinctures would be rendered ſtronger by the ſame means.

Experiment IV.

Two drams of the powder of the external lamina of the bark, digeſted in the cold with rectified ſpirit of wine, afforded two grains of reſinous matter.

Experiment V.

Two drams of the internal lamina, treated as above, gave a grain and half of reſinous matter.

Ob. Though this ſingle trial cannot determine the comparative quantity of reſinous matter in each lamina; yet it may ſhew, that each of them contains it, which, as far as I know, has not yet been proved by experiment.

Experiment VI.

Two tinctures were prepared from the ſame quantities of the ſame bark, and of the ſame rectified ſpirit of wine; but the one was digeſted two hours, in B. M. the other 24 hours in the cold: a dram of the former yielded three grains, and the ſame quantity of the latter one grain of reſinous ſubſtance.

Ob. Were this experiment ſufficiently authenticated, it would eſtabliſh a great preference in favour of the method of extracting tinctures in B. M. not only from its producing them more ſtrong, but from the much greater expedition with which the proceſs is executed.

Experiment VII.

Half a dram of the powder of bark was infuſed for 24 hours in cauſtic volatile alkali; and the tincture produced did not effervesce with acids, but retained a volatile-alkaline ſmell.

Ob. Is it therefore probable that the cauſtic volatile-alkali does not attract fixable air from the bark?

Experiment VIII.

When ſome of an aqueous infuſion of the bark was poured to ſome cauſtic volatile-alkali; a white cloud appeared at the bottom of the phial, which ſoon diſappeared, and the liquor became of a high reddiſh colour, without ſhewing any effervescence with acids.

Experiment IX.

Lime water and powdered bark, being macerated in the proportion of ten ounces of the former to one of the latter, in a well ſtopped phial, and then filtered; neither affected the colour of violet paper, nor precipitated the corroſive ſublimate from its ſolution in water.

Ob. This experiment was made a year before Mr. McBride had publiſhed his very ingenious eſſay on the diſſolving power of quick lime. The view with which it was made, was to determine, whether, after infuſion,

infuſion, the lime water remained unaltered in its alkaline properties. And though I then conceived the reduction of the quick-lime to ariſe from the attraction of fixable air, yet it was by no means with that clearneſs and certainty, which ariſe from Mr. M^cBride's experiments. This experiment was repeated ſeveral times, with the ſame event.

## Experiment X.

Lime water being poured to a watery infuſion of the bark, gave it a high colour, and they remained pellucid; they tinged violet, green; and were diſtinctly alcaline and bitter. Theſe things were obſervable for ſome hours after the mixing them.

Ob. This experiment ſeems to ſhew, that the air of the bark in ſubſtance, which reduces the quick-lime, does not enter into the infuſion, or elſe adheres to it ſo firmly, that it cannot be ſimilarly attracted by the quick-lime.

## Experiment XI.

A cold infuſion in common water produced no change on the ſyrup of violets.

Ob. I have ſomewhere ſeen it aſſerted, that the infuſion turned violet, green; from whence an alkaline quality was inferred; to examine the truth of which, this experiment was made.

## Experiment XII.

Half an ounce of powdered Peruvian bark was infuſed for 24 hours, in ſix ounces of a ſolution of ſal ammoniac; when the menſtruum had received a ſlight colour, but ſtill remained clear and ſaline as before.

Experiment XIII.

Six ounces of a ſolution of common ſalt, infuſed for 24 hours, with half an ounce of the powder of bark, received from it a deep red colour, but retained its ſaltiſh taſte.

Ob. It was intended, that the two above experiments ſhould ſhew, whether the ſalt was precipitated from the water, during the ſolution of the bark.

Experiment XIV.

A well-ſaturated tincture of bark, with rectified ſpirit of wine, being added to lime water in the proportion of one third, ſuffered an immediate decompoſition of its reſin, as by common water; and in an hour, it made no change on the colour of violet paper.

I was in doubt here, whether the decompoſition might not ariſe from an affinity between lime water and ſpirit of wine, as in common water; to determine which, I made the following experiment.

Experiment XV.

The pure reſinous ſubſtance of the bark, put into lime water, was immediately diſſolved, and the lime water reduced.

Ob. There ſeems therefore to have been a double elective attraction in the fourteenth Experiment. That is, the quick-lime, attracting fixable air, was reduced; and the water, uniting with the ſpirit, the reſin was precipitated. Yet it is an objection to this ſuppoſition, that Mr. M^cBride's experiments prove the ſolution of reſins to be attended with the loſs of their fixable air.

Expe-

Experiment XVI.

Vitriolic acid dropped into the ſolution (Exp. 15.) precipitated its reſin.

Experiment XVII.

Common water dropped into the ſolution (Exp. 15.) united with it uniformly.

Experiment XVIII.

Five grains of the reſinous part were agitated with one ounce of water, and one grain was diſſolved.

Experiment XIX.

Five grains of the reſinous part, being rubbed with an equal quantity of freſh quick-lime, and agitated with an ounce of water, were all diſſolved to one grain.

Ob. The very ingenious diſcovery of Mr. M^cBride, regarding the abſtraction of fixable air in the ſolution of reſinous bodies, ſufficiently explains theſe experiments.

Experiment XX.

A dram of bark was infuſed for 24 hours in an ounce and an half of ſpirit of wine, then filtered, and the tincture decompoſed with water, and again filtered, ſo as to leave the reſinous part in the filtre; the gummy part which paſſed the filtre, turned a ſolution of green vitriol, black. The reſinous part was agitated with water, to purify it from any adhering gum; and what paſſed the filtre a ſecond time, gave a very light tinge of black to the ſolution of vitriol.

Experiment XXI.

The reſin, obtained as above, was rubbed with quick-lime, and then diſſolved in water, which ſolution, when

when filtered, gave a manifeſt black tinge to the ſolution of vitriol.

### Exreriment XXII.

The officinal decoction, when cold, gives an evident black colour to the ſolution of vitriol.

Ob. Dr. Lewis obſerves, that the decoctions of the bark affect the ſolution of vitriol in a much ſlighter manner than the cold infuſion; from whence he infers, that the latter is more fully impregnated with the vegetable gummy matter than the former. I cannot ſay that I have obſerved any difference in the colour they ſtrike with the ſolution of vitriol, and am inclined to think, the reſinous as well as the gummy part poſſeſſes this power.

### Experiment XXIII.

The matter, which had ſubſided from an officinal decoction, and which appeared to be purely reſinous, diſſolved in rectified ſpirit of wine, changed the ſolution of vitriol to a black colour.

Ob. The ſpirit of wine alone produced no change in the ſolution of vitriol.

### Experiment XXIV.

Three parcels of bark, of half an ounce each, were infuſed in equal quantities of the proof ſpirit of the ſhops; after 24 hours one portion was filtered; another after 48 hours; and the third after 72 hours, or three days. The ſame quantity of each filtered liquor was united with equal quantities of the ſolution of vitriol; and after the decompoſed matter had perfectly ſubſided, the united liquors were each paſſed through three filtres of the ſame weight, which, when dried, were weighed

weighed again, and found to be perfectly equal, each having gained ſix grains of additional weight.

Ob. The common practice of prolonging the infuſion to three days at leaſt, is always tedious, frequently inconvenient, and, if we may truſt this experiment, not neceſſary, becauſe not uſeful, ſince the menſtruum appears to have been as fully impregnated after one day's infuſion, as after three.

## Experiment XXV.

Three parcels of the ſame powdered bark were put, with ſix ounces of water to each, to infuſion at the ſame time. After twelve hours the firſt was filtered, the ſecond after twenty four, and the third after ſix and thirty hours infuſion. The filtered liquors were not diſcernibly different in colour and taſte, nor in a reſiduum obtained from each, as in Experiment 24, was there any perceptible inequality on the ſcale.

Ob. This experiment may direct our practice in preparing the cold watery infuſion with more preciſion than is commonly known. I apprehend too, that it may further ſerve to amend our pharmaceutical practice in many other ſimilar points, in which our veneration for the antients has induced us to acquieſce in their forms, which they did not found upon experiment, the only admiſſible teſt of their propriety.

Theſe are all the pharmaceutic experiments I have hitherto made on the Peruvian bark; they were intended as a part of a compleat hiſtory of this medicine, which, though almoſt finiſhed, an unexpected and indiſpenſable call into my own country, prevents me from making public. I will juſt beg leave to ſubjoin a remark, concerning the tincture of the bark

with

with rectified ſpirit of wine, prepared by heat. I found the filtered water, made uſe of to precipitate the reſin, ſo ſtrongly impregnated, as to be more intenſely bitter than the watery infuſions; from whence I conclude, that ſpirit diſſolves not only the reſinous, but the gummy part, more powerfully than water; and as it is a more expeditious way than common decoction or infuſion, it might be more eligible for preparing the officinal extract. I have remarked too, that, after one ſuch extraction, the remaining bark is almoſt wholly inſipid, which ſhows how great the extracting power of ſpirit is, when aided by heat. In making this tincture, it is neceſſary that the ſtopper be taken out of the phial, a little after it has been in the heat, to let the extricated air eſcape, ſo that it may afterwards continue ſtopped without any danger.