

## THE PRESCRIPTION RECORDS

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John Snow's prescriptions were composed in a style that developed during the eighteenth century when advances in natural science and medicine encouraged a rationalization of the materia medica. In the second decade of the century a new edition of the Edinburgh *Pharmacopoeia* was cleansed of many of those "simples" or crude drugs which had been introduced by the credulity and superstition of former times.<sup>1</sup> This was followed by a thorough revision of the London *Pharmacopoeia* leading to the "reformed" edition of 1746. Here the list of crude drugs was drastically reduced and the majority of the items which had hitherto appeared under the headings 'Animalia', 'Metalica', and 'Mineralia' were no longer recommended.<sup>2</sup>

The critical and experimental revision of the London formulary also resulted in a far-reaching simplification of the pharmacopoeial preparations. The Committee of the College of Physicians responsible for the new edition acknowledged the necessity of rejecting "irregular mixtures which the ignorance of the first ages introduced". Two exceptions to this rule were *Mithridatium* and *theriac*, described as *alexipharmics* or medicines framed to counter all poisons. These complex preparations had been severely criticized by William Heberden (1710–1801) in his essay *Antitheriaca* published in 1745.<sup>3</sup> The Committee, however, retained them, pleading the "prevalence of custom" although the preface to the *Pharmacopoeia* leaves little doubt that they were held in little regard.<sup>4</sup> In 1756 these two ancient panaceas were dismissed from the Edinburgh *Pharmacopoeia* giving official recognition to the follies of polypharmacy.<sup>5</sup>

The reform of the materia medica was accompanied by a revision in the manner in which medicines were prescribed. The most influential advocate for change was David Gaub (1705–80) of Leiden, who had studied under Boerhaave. In his book on the compounding of medicines, published in 1739, Gaub introduced a system of prescribing in a series of rules, the first being "Medicus, vir prudens, praescribat nihil, nisi cujus sufficientum queat redere rationem, cum requiritur": the physician should prescribe nothing unless he can render a sufficient reason for its use.<sup>6</sup>

The advantages of simplicity in prescribing were acknowledged by the Committee revising the London *Pharmacopoeia*. Strong medicines in combination with numerous other ingredients were seen to have their doses diminished and so rendered ineffective. As

<sup>1</sup> *Pharmacopoeia collegii regii medicorum edinburgensis*, Edinburgi, J. Mosman for J. Paton, G. Steward & J. Gillan, 1722.

<sup>2</sup> *Pharmacopoeia collegii regalis medicorum londinensis*, Londini, 1746; H. Pemberton, *The dispensatory of the Royal College of Physicians*, London, London, T. Longman and T. Shewell, 1746, pp. 130–44.

<sup>3</sup> William Heberden, *Antitheriaca: an essay on Mithridatium and theriac*, [Cambridge?] 1745. Theriac originated in antiquity as an antidote first against the bite of serpents, then against all poisons. Mithridatium also originated as an antidote and is attributed to Mithridates, King of Pontus 132–63 BC. See Gilbert Watson, *Theriac and Mithridatium: a study in therapeutics*, London, Wellcome Historical Medical Library, 1966.

<sup>4</sup> Pemberton, op. cit., note 2 above, pp. viii, ix.

<sup>5</sup> D. L. Cowen, 'Expunctum est mitridatium', *Pharmaceutical Historian*, 1985, 15: 2–3.

<sup>6</sup> Hieronymus David Gaubius, *Libellus de methodo concinnandi formulas medicamentorum*, Lugduni Batavorum, C. Wishoff, 1739, p. 1.

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an example the Committee observed: “Had Peruvian bark [Cinchona or quinine bearing bark] when first recommended to Europe as a febrifuge, been constantly administered in company with a numerous tribe of ingredients . . . its real efficiency could never have discovered itself”.<sup>7</sup>

Principles for prescribing medicines were laid down by John Snow’s older contemporary John Ayrton Paris (1785–1856). He was educated at Cambridge and Edinburgh, admitted a Fellow of the College of Physicians of London in 1814 and settled in the capital in 1817 after relinquishing his practice in Cornwall. He gave a series of lectures on the materia medica in Windmill Street and soon earned for himself a reputation as one of the most popular teachers of the subject. In 1819 he lectured on the ‘Philosophy of materia medica’ at the College of Physicians and the substance of this discourse was included in the new editions of his *Pharmacologia*, a treatise on materia medica first published in 1812.<sup>8</sup> The book had reached its sixth edition by the time John Snow entered into his apprenticeship. A ninth and final edition appeared in 1843, one year before Paris was elected President of the College.

The fourth “much enlarged” edition of the *Pharmacologia* published in 1820 will be used here to describe the recommendations for prescribing. It has a quotation from Gaub on the title-page and is sub-titled *History of medicinal substances with a view to establish the art of prescribing and of composing extemporaneous formulae upon fixed and scientific principles*.

Paris assigned considerable importance to the “Art which . . . enables the physician to adapt and graduate a powerful remedy to each particular case by a prompt and accurate prescription”. Emphasis was placed upon simplicity. The medical prescription must be precise in its direction, concise in its construction and decisive in its operation. Formulae should be composed so as to enable the medicine to act *Cito, tuto et jecunde*: quickly, safely and pleasantly. The formula is to be composed of the principal medicine and three possible constituents: the *adjuvans* which assists and promotes the operation of the principal, the *Corrigens* which corrects the operation and the *Constituens* which imparts an agreeable form.<sup>9</sup>

The achievement of the several editions of the *Pharmacologia* was to attempt a scientific approach to the combination of medicines and to recommend the exhibition of the active drugs untrammelled by pharmaceutical excesses. It was a considerable advance in the art of prescribing, but Paris recognized its limitations. He observed that the investigation of remedies was not yet subject to the principles of research being applied to the physical sciences, and commented:

every problem which involves the phenomenon of life is unfavourably embarrassed by circumstances so complicated in their nature, and fluctuating in their operation, as to set at defiance every attempt to appreciate their influence; thus an observation or experiment upon the effects of a medicine, is liable to a thousand fallacies, unless it be carefully repeated under the various circumstances of health and disease, in different climates and on different constitutions.<sup>10</sup>

<sup>7</sup> Pemberton, op. cit., note 2 above, p. 4.

<sup>8</sup> W. Munk, *Roll of the Royal College of Physicians of London*, London, College of Physicians, 1878, vol. 3, p. 123.

<sup>9</sup> John Ayrton Paris, *Pharmacologia*, 4th ed., London, W. Phillips, 1820, pp. 142–6.

<sup>10</sup> *Ibid.*, pp. 4, 5.

The problems perceived by Paris were addressed again in mid-century by Rudolph Buchheim (1820–79) who held the Chair of Materia Medica in the University of Dorpat. In 1849 he observed that contemporary therapy resulted largely from observations made at the bedside which are subject to “numerous errors, often lack scientific value and on a number of occasions can be used even in support of preposterous hypotheses”.<sup>11</sup>

The nature of pharmacotherapy which gave rise to such criticisms may be exemplified by a brief profile of calomel and digitalis, two drugs widely prescribed and both occurring in Snow’s Case Books.

John Ayrton Paris declared that calomel (mercurous chloride) was more extensively used and more usefully applied than almost any other article in the range of the materia medica.<sup>12</sup> It was popular as a purgative because of its relatively mild action (due to its low solubility). It was also widely prescribed in combination with other drugs. In such combinations it was regarded as an “alterative”, a medicine that assists in the restoration of the healthy function of the “animal economy”. Tenderness of the gums or mild ptyalism were signs that the alterative action of the regular doses of calomel was taking effect. Anthony Todd Thomson (1778–1849), when discussing the use of calomel in combination with opium in cases of sub-acute inflammation, pointed out that if given until there was tenderness of the gums, but without exciting salivation, it would excite the glandular and capillary systems checking and absorbing effused lymph.<sup>13</sup> Jonathan Pereira (1804–53) in his encyclopaedic *Elements of materia medica and therapeutics* reported on the use of calomel in peripneumonia, pleuritis, croup, laryngitis and other inflammatory diseases.<sup>14</sup>

In 1785 William Withering (1741–99) in his *An account of the foxglove* showed that preparations of digitalis leaf were beneficial in the treatment of dropsy.<sup>15</sup> Its use was widely extended in the nineteenth century. It was recommended as a diuretic, anti-inflammatory, febrifuge and sedative. The observation that it decreased the frequency of the pulse led to the conclusion that it was a drug of value in diseases associated with vascular excitement. Pereira recorded its use in fevers, inflammatory diseases, dropsy, haemorrhages, heart and vascular disease, phthisis, scrofula and asthma. He observed that it was occasionally serviceable in insanity and epilepsy, “by repressing excessive vascular excitement which sometimes accompanies them”.<sup>16</sup>

The manner in which calomel, digitalis and other active drugs were exhibited in the mid-nineteenth century clearly indicates that, for any particular case, the therapeutic intentions of the prescriber cannot be accurately determined without additional evidence of symptoms or diagnosis. This presents a problem with regard to John Snow’s prescription records. When the records began symptoms were briefly noted or a diagnosis given. Within a short time, however, this practice ceased and the entries were confined to

<sup>11</sup> Rudolf Buchheim, *Beiträge zur Arzneimittellehre*, Leipzig, 1849. English translation quoted from B. Holmstedt and G. Liljestränd, *Readings in pharmacology*, Oxford, Pergamon Press, 1963, p. 79.

<sup>12</sup> Paris, op. cit., note 9 above, pp. 405, 406.

<sup>13</sup> Anthony Todd Thomson, *Elements of materia medica and therapeutics*, 2nd ed., London, Longman, 1835, p. 272.

<sup>14</sup> Jonathan Pereira, *The elements of materia medica and therapeutics*, 3rd ed., London, Longman, 1849–50, vol. 1, pp. 854, 855.

<sup>15</sup> William Withering, *An account of the foxglove, and some of its medical uses*, Birmingham, M. Swinney for G. G. J. and J. Robinson, 1785.

<sup>16</sup> Pereira, op. cit., note 14 above, vol. 2, pp. 1392–5.

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the prescribed treatment. It was not until February 1850, when Snow was called to Mr. Cooper (170–180), that the records again include the pharmacotherapeutic regime together with the related symptoms.

During the period when symptoms and diagnosis were omitted only the contemporary classification of medicine can serve to indicate why Snow prescribed a particular item. Drugs were classified according to their actions, e.g. as sedatives, expectorants, diuretics, purgatives. The writers on the *materia medica* were generally agreed on the classification of a particular drug although they differed on the finer points of taxonomy. Anthony Todd Thomson grouped together excitants, sedatives, refrigerants, narcotics, and antispasmodics as agents acting on the nervous system. Tonics he classified as items affecting the muscular and sanguiferous systems. Jonathan Pereira, on the other hand, classed tonics as substances affecting the tonicity of the muscles in the class 'Neurotics', sub-class 'Cerebro-spinals'.

These detailed classifications provided a structure for the presentation and discussion of the information available on the reported action of drugs. The practising physician, however, relied on more practical classifications: he recognized a group of cathartic drugs which ranged from laxative, purgative, to drastically purgative; drugs such as ipecacuanha and antimony potassium tartrate were regarded as both emetic and expectorant, their action depending upon the dose administered. Table 1, compiled from contemporary sources,<sup>17</sup> shows the recorded activity of thirty of the drugs prescribed by John Snow.

In writing his prescriptions Snow adopted the conventions of his time except that the hurriedly written entries were laid out on a single line instead of the normal format where the drugs were listed one below the other.<sup>18</sup> From the time of his apprenticeship Snow would have become familiar with the prescribing habits of his masters as well as with the preparation of pharmaceuticals and the dispensing of medicines (one examining body for medicine found it necessary to warn prospective doctors against "exclusive attention to practical pharmacy"<sup>19</sup>). This experience was the source of his knowledge of pharmaceutical presentation and, one may assume, for some of the preparations he prescribed by name only, i.e. *Haust anod* (anodyne draught), *Mist aper* (aperient mixture), *Pil cath* (cathartic pill), *Pulv alter* (alterative powder).

In the first ten weeks of the period covered by the Case Books (from mid-July to the end of September 1848) there were a total of 106 pharmaceutical entries. Thereafter the numbers dropped and in the corresponding period one year later the entries were reduced to 30. In the last months of 1849 the number fell sharply to 5 and the average rate of recorded prescribing remained low.

The prescriptions are written in Latin using an abbreviated form for drug names and preparations. Snow, however, is occasionally careless, writing "P" when he should have written either "Pil" for *pilula* or "Pulv" for *pulvis*. He frequently omits the conventional ℞ or recipe sign at the beginning of the formula. The directions for use are given in

<sup>17</sup> Paris, *op. cit.*, note 9 above; R. Norton, *Elements of diagnosis, general pathology and therapeutics*, London, 1831–32; Thomson, *op. cit.*, note 13 above; Pereira, *op. cit.*, note 14 above.

<sup>18</sup> The standard format for Latin prescriptions is given in J. Ince, *The Latin grammar of pharmacy*, 1st ed. 1882, 8th ed., London, Ballière, 1903.

<sup>19</sup> *Regulations to be observed by students intending to qualify themselves to practise as apothecaries in England and Wales*, London, Society of Apothecaries, 1833.

standardized abbreviated Latin, for example, “4ta q. q. hora” for *Quarta quaque hora* or every fourth hour, and “h. s.” for *hora somni* or at bedtime. The quantities are given in the apothecary system of weights and measures (see Table 2 for the symbols and metric equivalents.)

In the case of unit dose forms such as pills and powders the formulae are composed to give an exact number of doses. Mixtures are adjusted in volume to give an approximate and convenient number of doses equivalent to common domestic measures, i.e. one fluid ounce equivalent to two tablespoonfuls, one fluid drachm equivalent to one teaspoonful, which was a common measure for children’s mixtures. The pharmaceutical forms used internally are mixtures (*misturae*), pills (*pilulae*), a powder (*pulvis*), and a draught (*haustus*). External forms are liniments (*linimenta*), ointments (*unguenta*), and plasters (*emplastra*). Mixtures and pills are the most common forms recorded in the Case Books representing 60 per cent and 24 per cent of all prescriptions respectively.

The drugs and pharmaceutical preparations recorded number just over 150 items of which approximately 60 per cent appear for the first time in the first ten pages of the manuscript. The most common are the cathartics, antacids, carminatives and astringents.<sup>20</sup>

A large proportion of drugs and preparations prescribed occurred in the ninth edition of the London *Pharmacopoeia* published in 1836. This edition was a considerable advance on earlier versions and included for the first time the alkaloids aconitine, morphine, quinine, and strychnine, preparations of iodine and bromine, ergot (which Snow prescribed under the synonym Tincture of Secales), phosphoric acid and dilute hydrocyanic acid.

The tenth and final edition of the London *Pharmacopoeia* was published in 1851.<sup>21</sup> As with all previous editions there were changes in nomenclature, an example being Snow’s sodium sesquicarbonate which was renamed sodium bicarbonate. Changes in pharmaceutical nomenclature often took some time before they were fully observed. We note for example that Snow continued to use Potassae Subcarbonas for Potassae Carbonas and Tincture Lyttae for Tinctura Cantharides after these names had been changed in the *Pharmacopoeia*.

A number of named preparations prescribed by Snow occur also in the London hospital formularies. Among them are Emplastrum Antimonii Potassio Tartratis (London Hospital), Haustus Rhei (St. George’s and Westminster), Lotio Alumnis (St. Mary’s and St. Bartholomew’s) and Mistura Salina (University College and St. Thomas’s).<sup>22</sup>

Two cases may be used to illustrate John Snow’s prescribing in greater detail. They are: Mrs. Wainright’s baby (25 July 1848) {5} and Mr. David Cooper (4 February 1850). The Wainright baby was six months old, emaciated, suffering from a cough and shortness of breath. There were mucous and sibilant râles (rattling sounds heard in the bronchi). The following mixture was prescribed:

<sup>20</sup> Catechu was one of the astringents employed by Snow. On 22 August 1849 {136} he prescribed a mixture of chalk, opium and catechu which was a mixture employed in the treatment of cholera. There were outbreaks of cholera in London in August 1849, but there is nothing to suggest that Snow’s patient was a cholera victim.

<sup>21</sup> The final editions of the London, Edinburgh, and Dublin pharmacopoeias were published in 1851, 1841, and 1850 respectively. They were replaced by the *British pharmacopoeia* after the Medical Act of 1858.

<sup>22</sup> P. Squire, *The pharmacopoeias of thirteen of the London hospitals*, London, Churchill, 1863.

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V Ant 3iiii T<sup>r</sup> Hyos 3ss Syr 3iii Aq 3vss [th] 3i 3<sup>iii</sup> horis.

This reads as follows: Antimonial Wine 3 fluid drachms, Tincture of Hyoscyamus 1/2 fluid drachm, Syrup 3 fluid drachms, Water 5 1/2 fluid drachms.

One fluid drachm (one teaspoonful) to be given every three hours.

The formula for Antimonial Wine in the London *Pharmacopoeia* contained 40 grains of antimony potassium tartrate (tartar emetic) in one pint of sherry wine. Assuming the London preparation was used, each of the doses prescribed by Snow contained 1/16th of a grain (approximately 4 milligrams) of the antimony salt. Antimonial Wine was used as a diaphoretic and expectorant. It was also regarded as an antiphlogistic reducing inflammation in cases of pneumonia.<sup>23</sup>

Tincture of Hyoscyamus was used for its narcotic properties and was considered to have an advantage over opium in the treatment of children.<sup>24</sup> Snow also prescribed this tincture with the expectorant ipecacuanha in the case of Mrs. Buckingham's children (24 November 1848) {34}. The reason for using hyoscyamus was to avoid the constipating effects of opium.<sup>25</sup> Another alternative for opium was hemlock (conium) which Snow prescribed in the form of the extract for a child with whooping cough (1 August 1848) {8} although its value in this condition was held to be in doubt.<sup>26</sup>

On 4 February 1850 Snow began to record the symptoms and treatment of Mr. David Cooper aged twenty-four years. Cooper was suffering from a cough, was feverish and experienced pain in his right side. He had been ill for some days and had been treated with aperients, saline preparations, and digitalis. After his examination, Snow prescribed pills, a mixture, and a large blister.

The pills contained one grain of calomel and one grain of digitalis. One pill was to be taken every six hours. One grain of digitalis every six hours was the dose of the drug recommended at that time and its use here corresponds to Pereira's opinion that "as a remedy for inflammation, [digitalis] is principally of value where the disease has a tendency to terminate in serous effusion".<sup>27</sup> Calomel as an alterative was used throughout the treatment of Mr. Cooper. The mixture was as follows:

Sod Pot Tart 3iiii Vini Ant Tart 3iii Sp<sup>ls</sup> Junip 3iii T<sup>r</sup> Hyos 3i Aqua 3v th 3i 6<sup>ta</sup> q. q. hora.

Sodium potassium tartrate 3 drachms, Antimonial Wine 3 drachms, Spirit of Juniper 3 drachms, Tincture of Hyoscyamus 1 drachm, water 5 fluid ounces. One fluid ounce to be taken every six hours.

Spirits of Juniper was generally used as an adjunct to diuretic mixtures. Both potassium sodium tartrate (Rochelle Salt) and antimony potassium tartrate were accredited with diuretic properties.<sup>28</sup>

Mr. Cooper was visited again on the 6th, 7th and 8th of February, but it was not until 9 February that there was any change in medication. On that day an opium and calomel pill was prescribed: six grains of "hyd chlor" [calomel] mixed with two grains of opium to be

<sup>23</sup> Pereira, op. cit., note 14 above, vol. 1, p. 704.

<sup>24</sup> Ibid., vol. 2, p. 1400.

<sup>25</sup> Thomson, op. cit., note 13 above, p. 434.

<sup>26</sup> Pereira, op. cit., note 14 above, vol. 2, p. 1730; Thomson, op. cit., note 13 above, p. 428.

<sup>27</sup> Pereira, *ibid.*, vol. 2, p. 1393.

<sup>28</sup> Ibid., vol. 1, pp. 517, 698; vol. 2, p. 1209.



divided into six pills of which one was to be taken every six hours. At the same time a mixture was prescribed containing ammonium acetate, Antimonial Wine and Tincture of Digitalis. Ammonium acetate was frequently prescribed with antimony potassium tartrate for the treatment of febrile conditions. Two days later cupping was recommended. On 13 February, the day the patient's chest was tapped to remove fluid, Snow recorded that his "gums are slightly tender from ca[lomel] taken regularly to this time". The response was to reduce the dose of calomel from every six hours to night and morning. The following day another diuretic mixture was prescribed containing chimaphila (wintergreen), potassium acetate and Spirits of Juniper. No further prescriptions were recorded for Mr. Cooper up to the time he was admitted to St. George's Hospital on 21 February. Four days later he was said to be taking squill, salines, and bluepill [mercury pill], which may have been intended as a purgative, but more likely replaced calomel as an alterative.

The evidence from these cases shows that although John Snow's prescribing was heroic by modern standards, particularly in the use of antimonial and mercurial preparations, for his time it was neither unique nor idiosyncratic. His use of drugs corresponds closely with the descriptions and recommendations of contemporary texts on therapeutics and materia medica.

It was during the period that Snow was keeping these records that the foundations were being laid for further advances in pharmacology and an improvement in drug use. Rudolph Buchheim, who translated Pereira's influential textbook into German, began to teach pharmacology as an experimental science at the University of Dorpat, investigating drugs using the methods pioneered earlier in the century by François Magendie (1783–1855) in his studies of the alkaloids. As a result, the emphasis shifted from recorded clinical observations on the use of drugs to experimental observations on the nature of drug action. Oswald Schmiedeberg (1838–1921), Buchheim's most distinguished pupil, insisted that the new pharmacology was a biological science distinct from therapeutics but that the knowledge it provided would assist the formulation of general rules for the rational employment of remedies.<sup>29</sup>

<sup>29</sup> Oswald Schmiedeberg, *Elements of pharmacology*, transl. T. Dixson, Edinburgh, Young J. Pentland, 1887, pp. v, 1–12.

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*Table 1*

*The Operation of Medicines*

|                              |                                    |
|------------------------------|------------------------------------|
| Antimony potassium tartrate  | diaphoretic: emetic: expectorant   |
| Ammonium carbonate           | stimulant: diaphoretic             |
| Aloes                        | purgative: emmenagogue             |
| Bismuth trinitrate           | astringent: gastric antispasmodic  |
| Calomel (mercurous chloride) | purgative: alterative: sialagogue  |
| Creta (chalk)                | antacid: adsorbent                 |
| Catechu                      | astringent                         |
| Cochicum                     | drastic purgative: diuretic        |
| Digitalis                    | diuretic: antiphlogistic: sedative |
| Dilute hydrocyanic acid      | gastric antispasmodic: sedative    |
| Gentian                      | tonic                              |
| Hemlock                      | narcotic: sedative: alterative     |
| Hyoscyamus                   | narcotic: sedative: antispasmodic  |
| Ipecacuanha                  | emetic: expectorant                |
| Iron carbonate               | haematinic: tonic                  |
| Jalap                        | drastic purgative                  |
| Juniper                      | diuretic: emmenagogue              |
| Magnesium carbonate          | antacid: adsorbent                 |
| Magnesium sulphate           | purgative                          |
| Opium                        | narcotic: sedative: anodyne        |
| Potassium acetate            | diuretic: mild purgative           |
| Potassium iodide             | diuretic: resolvent                |
| Quinine                      | febrifuge: tonic                   |
| Quassia                      | stomatic: tonic                    |
| Rhubarb                      | purgative                          |
| Sodium potassium tartrate    | mild purgative                     |
| Sodium bicarbonate           | antacid                            |
| Squill                       | diuretic: emetic: expectorant      |
| Valerian                     | antispasmodic: emmenagogue         |
| Zinc sulphate                | astringent: emetic                 |

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|                |  |
|----------------|--|
| Antiphlogistic | reduces inflammation                       |
| Astringent     | contracts tissues: arrests discharge       |
| Diaphoretic    | produces perspiration                      |
| Diuretic       | increases the flow of urine                |
| Emetic         | causes vomiting                            |
| Emmenagogue    | stimulates menstrual flow                  |
| Febrifuge      | reduces fever                              |
| Haematinic     | improves the quality of the blood          |
| Resolvent      | reduces glandular swelling by liquefaction |
| Sialogue       | increases the flow of saliva               |
| Stomatic       | gastric stimulant or tonic                 |



Table 2

*Apothecary Weights and Measures*

The apothecary system of weights was based on the Troy pound of 5760 grains used by gold and silver merchants. In this system there were 12 ounces to the pound. The fluid measures used for dispensing were based on the official gallon. For the history of this system and a comparison with other systems in use see D. Vangroenweghe and T. Geldof, *Pondera medicinalia*, Brugge, Centre for the Study of Apothecaries' Weights, 1989.

|         |    | <i>Weights</i> |                   |
|---------|----|----------------|-------------------|
| Grain   | gr |                | 64.799 milligrams |
| Scruple | ʒ  | 20 grains      | 1.296 grams       |
| Drachm  | ʒ  | 60 grains      | 3.888 grams       |
| Ounce   | ʒ  | 480 grains     | 31.104 grams      |

|        |   | <i>Liquid Measures</i> |                    |
|--------|---|------------------------|--------------------|
| Minim  | ℥ |                        | 0.0592 millilitres |
| Drachm | ʒ | 60 minims              | 3.552 millilitres  |
| Ounce  | ʒ | 480 minims             | 28.413 millilitres |