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## THE CONCEPT OF WHOLE SUBSTANCE IN GALEN'S *SIMPLE MEDICINES*

**Abstract.** Galen's great treatise on drugs, *Simple Medicines*, begins with 5 theoretical books which explain the mechanisms of drug actions in the following catalogues. The key agent of change is the mixture of the qualities hot, cold, wet and dry. But drugs also have substance, the leaf, root or fruit of plants, the material of animals and minerals. How does substance act on the human body? This is one of the key questions for the theory of drugs, since mixtures had already been explored by Galen in *Mixtures*. Galen's exploration of substance brings him to the composition of a drug – in thick or fine particles – and to the notion of substances in the plural and the notion of whole substance in the cases of foods and poisons, all of which Galen places in the class of drugs. Whole substance is the core of the paper. Galen's understanding of substance as of qualities depends heavily, as often, on Aristotle. The paper presents an argument based on the key passages in *Simples* I–V, which I have recently translated for the Cambridge Galen series, as too on related passages in *Mixtures* and *On the Capacities of Foods*.

**Keywords:** ancient medicine, Greek medicine, Galen, concept of whole substance, *De simplicium medicamentorum temperamentis et facultatibus*, *On the Mixtures and Capacities of Simple Medicines*

The aim of this article is to discuss Galen's understanding of change in the body: his broad proposition is that food maintains the body as it is, while drugs change it. Beneficial drugs restore the balance of health, while poisonous drugs attack the body. My specific task is to challenge a recent article by Peter Singer in a collection of articles edited by Martelli et al. (2020). Galen has a concept of change of the 'whole substance' when a body is fed or poisoned: I present his use of the term in his principal text on drugs, while Singer places more emphasis on some exceptional cases. It should be noted that while the 'humours' (which I translate as 'bodily fluids') play a part in Galen's discussion, they are not of great importance in Galen's argument. Rather, the body's health or illness is determined by the balance of the 'qualities' of heat, cold, wetness and moisture in the 'mixture' of the body. Everybody's mixture is particular to them.

Galen's magisterial treatise on drugs, *de simplicium medicamentorum temperamentis et facultatibus*, *On the Mixtures and Capacities of Simple Medicines* (abbreviated to SMT)<sup>1</sup>, has a central position in his theoretical works, between on the one hand the elemental theory of *de Elementis secundum Hippocratem*, *On the Elements According to Hippocrates*; his work on the potentialities<sup>2</sup> of foods and drugs – *de naturalibus facultatibus*, *On Natural Faculties*<sup>3</sup>; and the work on the mixtures (κράσεις) of qualities (ποιότητες) – *de Temperamentis*, *On Mixtures*; and on the other, dependent volumes on nutrition and regimen, which refer back to SMT, such as *de alimentorum facultatibus*, *On the Capacities<sup>4</sup> of Foods*, *de Bonis et Malis succis*, *On Good and Bad Juices and de Sanitate*, *On Matters of Health*.

In SMT, Galen sets out in five books how drugs work, and then gives a catalogue of drugs in the following six books, on plants, minerals and animals, much of it in alphabetical order<sup>5</sup>. The catalogue entries do not normally contain experimental data, as the catalogue of foods does in *de alimentorum facultatibus*, *On the Capacities of Foods*. Rather, the catalogues set out the drug properties as Galen has inherited them and as modified by the tests he has done on the drugs, following the methodology described in the first five books. In these five theoretical books, Galen emphasises that drug action is normally activated by the biological qualities of heating, cooling, drying and moistening<sup>6</sup>: in a food these qualities normally replace lost energy<sup>7</sup>, but in a drug they introduce change to restore the balance of the body to a healthy state. As Galen puts it at the beginning of SMT,

<sup>1</sup> The text I use for SMT is the standard edition of Kühn 1826, modified by my collation of two manuscripts, detailed in note 15. Translations are my own, forthcoming in the Cambridge Galen series.

<sup>2</sup> Compare *Quod animi mores corporis temperament sequuntur* (QAM) 4.769–70 K *therefore we say that the substance has as many capacities as activities: for example the aloe has a capacity for cleansing, and toning the mouth of the stomach... Without there being some other thing that performs each of these actions apart from the aloe itself. For it is the aloe that does these things: and it is because it can do these things that it is said of it that it has these capacities, as many as the actions* (P. SINGER, *A Change in the Substance: Theory and its Limits in Galen's Simples*, *AIHS* 70, 2020 (= *Galen's Treatise On Simple Drugs. Interpretation and Transmission*, ed. M. MARTELLI, C. PETIT, L. RAGETTI), p. 377).

<sup>3</sup> 1.1–2, 2.4–6 K, alteration (ἀλλοίωσις) of the whole substance is discussed: *no one will consider that it is as it were a 'meeting of valleys' of bone, flesh, nerve and each of the other parts that befalls the bread, and then that each of them separates out and goes off in the body with what is of a similar kind to itself. No. Before this separation all the bread clearly becomes blood.*

<sup>4</sup> I translate the term δύναμις as 'capacity'. Alternative translations are 'powers', 'properties', 'faculties', 'potentialities', some of which appear in standard English translations of titles of Galen's works.

<sup>5</sup> The essays in *Galen's Treatise On Simple Drugs...* gives a valuable assessment of our current understanding of SMT, along with its characteristics and bibliography.

<sup>6</sup> On the overwhelming importance of qualities rather than humours as the agents of change in Galen, cf. P. VAN DER EIJK, *Galen on the Assessment of Bodily Mixtures*, [in:] *The Frontiers of Ancient Science. Essays in Honor of Heinrich von Staden*, ed. B. HOLMES, K.-D. FISCHER, Berlin–Boston 2015, p. 675–698. Cf. also V. BOUDON-MILLOT, *La notion de mélange dans la pensée médicale de Galien: mixis ou crisis?*, *REG* 124, 2011, p. 261–279.

<sup>7</sup> Galen defines a food as a replacement of lost energy: other parts of nutrition which a modern scientist would include, such as proteins, vitamins and minerals, are classed as drug actions by Galen.

We call a drug whatever produces change in our nature, just as in my opinion we call food whatever increases our substance (1.1, 11.380 K).

Galen, somewhat arrestingly, announces that he has nothing new to say about the mixtures of qualities (SMT 1.1, 11.381 K), and refers the reader to *Mixtures* itself. What he does have to add in SMT builds on that earlier treatise, and extends the enquiry to questions about substance, the internal composition of drugs<sup>8</sup>, and their speed of action<sup>9</sup>. Galen elaborates at SMT 1.3, 11.385 K<sup>10</sup>:

Distinguish food from drug and remember in relation to what purpose each is described: often they are composed around one substance, in line with what I also demonstrated. But no less because **some act towards each other and are acted upon** with their **whole substances**, while others **in respect of one or two qualities**. Additionally, some are finely composed, others thickly. Fine are those which are easily broken down into fine bits, thick the opposite.

This passage brings me to the kernel of the present chapter, Galen's concept of 'whole substance'. What does he mean by 'whole substance' and how is it distinguished from 'in respect of one or two qualities'? What does he mean by 'act towards each other and are acted upon'? What does he mean by fine and thick composition of a drug? These are questions that Galen examines in order to solve two problems: simple drugs are not simple; people make contradictory claims about many simples, thereby making prescriptions to patients uncertain.

To these questions Galen brings also an experimental method. The first step is to gather data by using the perception of the senses: touch, vision, and for drugs in particular taste and smell. Once this is gathered together, along with evidence from patients both healthy and sick, then logical deductions can be made. These must be done by the physician, who should not merely believe received claims from the tradition. Once all the experimental data is in and conclusions logically reached, explanations can be made about how and why drugs work.

<sup>8</sup> A drug may be of fine or thick in composition (λεπτομερής or παχυμερής), terms familiar in Greek science from the PreSocratics onwards: A. DEBRU, *Philosophie et pharmacologie: la dynamique des substances leptomères chez Galien*, [in:] *Galen on Pharmacology. Philosophy, History, and Medicine*, ed. IDEM, Leiden 1997 [= SAM, 16] notes that there are over 500 uses of the terms in SMT, in contrast with Dioscorides who barely uses the term or the concept. As we shall see below, Galen is also interested in the density or porosity of a drug, as too of the body tissue on which it is acting; in opposing qualities in the substance and mixture of a drug, among other factors.

<sup>9</sup> The intensity of a drug is discussed only briefly in the theoretical books 1–5, and specified in about 30% of the drugs in the catalogue: cf. G. HARIG, *Bestimmung der Intensität im medizinischen System Galens*, Berlin 1974.

<sup>10</sup> Διωρίσθω σοι καὶ τροφή φαρμάκου καὶ μνημονεύεσθω πρὸς τι μὲν ἄμφω λεγόμενα, πολλαχόθι δὲ περὶ μίαν οὐσίαν συνιστάμενα, καθ' ὅ τι καὶ τοῦτο ἐπεδείξαμεν. οὐδὲν δὲ ἦττον ὅτι τὰ μὲν ὅλαις ταῖς οὐσίαις εἰς ἄλληλα δρᾶ καὶ πάσχει, τὰ δὲ κατὰ μίαν ἢ δύο ποιότητας· καὶ πρὸς τούτοις τὰ μὲν εἶναι λεπτομερῆ, τὰ δὲ παχυμερῆ· λεπτομερῆ μὲν ὅσα ῥαδίως εἰς λεπτά καταθραύεται, παχυμερῆ δὲ τάναντία.

Singer (2020) gathered together some of the passages featuring Galen's concept of 'whole substance' in his pharmacological and associated works. Here I shall bring in more passages explicitly from SMT in order to establish how Galen uses the concept. Singer found that the concept normally applies either to the total transformation of food into bodily fluids or to the deadly action of poison on the body's systems, as we shall see shortly. First, though, Galen sets out what he means in *Mixtures* 3.1, 91, 2–14 H:

there are four capacities of the whole body... and these capacities belong to the **whole substance** of each body, which substance we state to arise from a mixture of hot, cold, dry and wet. But when the body effects a change on something that comes in contact with it through any one of the qualities in it, then one should not take it that it acts through its **whole substance**, nor that the object of change can ever be fully assimilated. Consequently, an object so changed will never be able to provide nourishment to any of those bodies effecting the change, either. If, however, the body produces a sufficiently big change, i.e. when it acts through its **whole substance**, then it will assimilate the object itself, and be nourished by the object so changed (trans. Singer).

The aim of the body, when it wishes to nourish itself, is to find food that is most appropriate (οικειός) and similar (ὅμοιος) to itself, which it will be able to process and absorb fully, assimilating to the extent that the bread, for example, will become blood, and the blood, in a second change will become tissue, bone or organ-parts, as needed (see SMT 3.4 below). This is change of the whole substance, as opposed to change of one or two qualities, to which we will come shortly. The whole substance change is a big one, in which the heat of the body acts on the foodstuff, assimilates it and increases its own energy: it acts upon and is acted upon in these respects. The change is not merely a big one, as Galen puts it: it is also an everyday, life-sustaining part of human and animal life, part of daily life we might say.

The second manifestation of change of the whole substance, Galen tells us, is the reverse, in the action of poisons. Here, the poison, activated by the body's heat (and, if a cold substance, helped along by a warming precursor such as wine) overcomes the body and kills the whole organism. In this instance, the body heat acts on the poison and then suffers its overwhelming power. Poisons and foods are thus at extreme ends of a spectrum of whole-substance-activity, that starts with life-giving food and ends with the destruction of the body. All other foodstuffs and drugs come somewhere in between, acting not with whole substance but with 'one or two qualities'. This could apply to a food such as pomegranates, which for Galen have no nutritive qualities, but nevertheless are astringent and aid various body functions, or to a drug such as wormwood (*Artemisia abrotanum*) which is bitter and heating. Drug and food in fact overlap, and pomegranate is discussed in both SMT and *On the Capacities of Foods*.

Singer's study embraces other passages where the concept of whole substance is used to explain unaccountable phenomena, one on the nature of the soul in the

In *Hippocratis Epidemiarum, Commentary on the Hippocratic Epidemics*<sup>11</sup>, one on a stone amulet<sup>12</sup> and the other on the amazing properties of burnt river crabs<sup>13</sup>. Singer takes these special cases to be part of Galen's concept of whole substance. My view is a different one, that such cases are rare and that the predominant use of the concept is applied to daily nourishment. This view is supported in the very late treatise of Galen, *de Propriis placitis, On My Own Opinions*, where Galen applies the term to digestion, liver action, nutrition and blood-making (84.86 and 86.13, p. 173 Nutton).

Galen refers to 'the whole substance or one or two qualities' on numerous occasions in SMT. We have already seen the first, at 1.3, 11.385 K, where whole substances and acting upon/acted upon are introduced. In the following survey, I follow the order of the books to note significant references to either the term 'whole substance' or to 'act and be acted upon' or related phrases. The overall context of the phrase concerns alteration (ἀλλοίωσις), change (μεταβολή), similarity (ὁμοιότης) or appropriateness (οἰκειότης) of one substance (normally the drug) to another (normally the body and its heat).

1.10–11, 11.398–400 K, Galen expands the description of fine and thick composition of drugs. Is the drug continuous with itself, dense in its entirety, or does it have gaps and a porous consistency? The examples given are pepper and fire. Pepper acts more rapidly if ground into a fine powder, indicating that Galen understands 'fine in composition' in a physical sense, as equivalent to being in the smallest achievable form. In this state pepper will best be able to act as a heating drug,

<sup>11</sup> VI V, 5, 17B.248 K = 271, 12–7 Wenkebach.

<sup>12</sup> SMT 9.2, 12.192 K. Crabs at 11.24, 12.336 K.

<sup>13</sup> An interesting and illuminating influence on Galen's thinking on whole substance may be Alexander of Aphrodisias *On Mixture*, who discusses the arguments of the Stoic philosopher Chrysippus on 'whole substances' in the context of mixture (48C Long & Sedley). Alexander of Aphrodisias' quotation includes the notion of whole substance in a heap of wheat (the individual unblended grains), dismissal of Atomism, refining of substance in incense and comparison with iron and fire. Chrysippus also considered 'appropriateness' in mixtures, and famously believed that a drop of wine diluted in the sea coexisted in the mixture with the vast amount of water and was not fully assimilated into it, as Galen's theory would insist upon. For Chrysippus, the mixture was held together with the tension of pneuma in a kind of mutual coexistence. Galen discusses this at *de Methodo medendi On the Therapeutic Method* 1.2, 1016–7 K, where he follows Aristotle against Chrysippus. In his excellent thesis, Robert VINKESTEIJN, *Philosophical Perspectives on Galen of Pergamum*, Utrecht 2020 (PhD dissertation), p. 98 remarks on Galen's concept of substance from a different perspective: primary substance is viewed either in its material aspect (underlying subject) or its formal aspect (most basic properties which determine secondary properties). He compares *On Elements* 128.11– de Lacy for discussion of the four qualities alone, which, by altering the underlying substance, cause the elements to change into each other, and also QAM 1.3, 773 K, where each of the organs has its own specific substance: *let us not yet enquire precisely what this is, but let us remember, regarding the common substance of all bodies, that this was shown by us to be composed of two principles, matter and form, matter being conceptually without quality, but having in itself a mixture of four qualities, hotness, coldness, dryness and wetness.*

and will be closer to the elemental heat of fire. Turning to fire itself, Galen observes that *it is the finest of all in composition and at the same time is the hottest of all and readily penetrates deep down and breaks down, refines, brings change, overpowers and transforms into its own nature, assimilating in every way and overcoming what is close to it*. When dry reeds are put on to a blaze, *what was previously reed has now become fire, so as to augment the whole substance of the fire which transformed it*. The elemental fire, Galen explains, shows on a large scale how food is transformed into blood by the action of the body's heat. The fire acts on the reeds and is acted upon in the sense of increasing its power through the addition of the fuel.

1.17, 11.407–8 K, Galen expands on how thick or thin composition may impede, promote or stop a capacity working. Wine is the example of fine composition, olive oil of thick. At 1.18, 11.411–2 K, fineness and thickness of composition determines how a drug will act or be acted upon. Asphalt is given as an example of a heating drug which is thick in composition, as are lead and tin.

3.4, 11.546–7 K, Galen adapts from *Mixtures* (87.4–17, 1.647–8 K) the process of how bread

changes into blood and phlegm by 'cooking' in the belly and the veins; and then from these substances into bone, flesh and all the other parts of the body. It is altered in its **whole substance** and loses its former nature by changing into another form. All the affective systems of the body are acted upon by nothing other than the hot, the cold, the dry and the wet, as I have shown, as they accept alteration and change into another kind of substance. And for this reason we said that there are four primary, elemental and form-changing qualities, namely moisture, dryness, heat and cold; and we asked of each drug which one of these qualities had acquired an excess in the mixture of the drug.

3.7, 11.552 K, Galen shows how assimilation works:

there are certain appropriate relationships and conflicts between qualities in all things; and what is appropriate<sup>14</sup> is readily assimilated, and what is opposed sometimes changes and brings destruction to plants and animals. Furthermore, how their appropriate relationships arise according to the particularity of the **whole substance** I have spoken about and shown on many occasions.

3.15, 11.577–8 K, Galen explains how quantity of substance interacts with capacity:

the tongue is often moved<sup>15</sup> in line with the abundance of the substance, but the activity is present in line with the strength of the capacity. So when the substance is small, but with

<sup>14</sup> οἰκεῖος.

<sup>15</sup> ἐκινήθη M: ἐνικήθη Pal., K, victa est Gaudanus. These manuscript reports and those following refer to Marcianus App. Cl. V, 6 (which I title M) and Palatinus gr. 31 (which I title Pal.). I have used these two witnesses to correct the standard edition of Kühn (which I title K in following notes). Gaudanus is the translator of the Latin version in Kühn.

a strong capacity, and is mixed with much other substance of weak capacity and comes into the body, it is undetected by taste but activates much more action than taste.

### 3.15, 11.579 K, a mixed composition may introduce confusing effects:

numerous<sup>16</sup> other foods are more astringent than aloe, copper flakes and burnt copper itself. In the case of such things, the mixed composition of the substance is instantly apparent; and in others even if it is not apparent it must be deduced and it should not be thought that the astringency works in one way in the aloe but in another in the apple.

### 4.10, 11.651–2 K, Galen declares, in his discussion of flavours in the fourth book,

all nourishment is in the class of sweet things<sup>17</sup>. Nourishment quite reasonably belongs to sweet things in addition through the very substance, such as it can be, of food. For nourishment is the filling of what has been emptied. What was emptied out was appropriate to it, so that the nourishment must also be appropriate. And if it is appropriate it must of<sup>18</sup> necessity be pleasant and friendly, and immediately with a balanced warmth in respect of what is being nourished. But in this process, the more and the less is no small matter because we come to foods when we are not in a strictly natural state. The body of those in need of food must be emptied, if they<sup>19</sup> are going to be really knowledgeable about their own appropriate quality. And if in addition to this they are hotter than they should be, or if they become colder either in the body as a whole or in places near the tongue or the stomach, they will need not only things which will nourish but also things that will cool or warm. And for this reason sometimes one food seems more pleasant to them, pleasantness being two-fold in kind, one being filling up what is emptied, which is the case with food, and the other curing what has been altered. And this indeed is a drug combining with foods when they are eaten by bodies that are not only emptied but also changed in their quality, to please<sup>20</sup> indeed in two ways, as nourishment and as drugs. Now as drugs some will, following our argument, assist and help as agents that cool, warm, dry and moisten, while as foods they will assist only as they are related and appropriate to the **totality of the substances** in the bodies being nourished. Clearly, they must instantly be moderately warm towards what is being nourished.

### 4.15, 11.666–71 K turns to sharp flavours:

sharpness in flavours is most likely to arise in change brought about by heat, when it does not prevail completely<sup>21</sup>. One can find evidence for this not least also in heartburn, which does not follow on from foods that are not wholly changed in the stomach, nor, likewise, those that are properly digested, but only those that are semi-digested, as one might say. By semi-digested I mean those that undergo alteration by heat in the stomach but are not overcome by it to completion.

<sup>16</sup> μύρια MPal, innumera Gaudanus. ὁμοίως K.

<sup>17</sup> The link between sweetness and nourishing goes back to Aristotle and Theophrastus CP 6.7.

<sup>18</sup> ἐξ Pal.M, om. K.

<sup>19</sup> μέλλομεν M.

<sup>20</sup> ἡδύνεσθαι om. Pal.

<sup>21</sup> τελέως om. Pal.M.

...

The tongue can distinguish the two [pungent and biting flavours], both those combined in common, like any other of the sensory bodies, and the individual ones, in its function as an organ of taste. And it seems to me that this is its excellent feature in relation to the appropriateness and foreignness of **whole substances**. I have said and shown on many occasions, and will say again no less what it is to act or be acted upon in **whole substances**. I think I will mention it now too, as far as suffices for present purposes, starting from this point: generation for all individual bodies derives from the four elements, and they are unequal and differ in their mixtures. Some have more fire than other elements, some more water; others might happen to have more earth, some more air. From such inequality, then, the particularities of individual bodies have been perfected. From the elements themselves come the particularities of plants, and from these too those of living beings, as I demonstrated in the treatise *On the Elements*. Some of them change immediately into each other, others through other intermediaries, such as earth into wheats, barleys and other such things. And then each of these into human flesh; for it is not possible for the earth itself to become flesh by leaping over the intermediary change. And indeed of those that change into each other, some alter readily and swiftly, while others alter with difficulty and over time. Those that are close in similarity have a swift alteration, those more distant a slower one. What was needed, I think, was an organ in living beings which naturally distinguishes the similarity and dissimilarity of things: this would distinguish natures and choose what is familiar and avoid what is strange. Now this is the tongue, which through an excess of sensation can distinguish not only types of cold, hot, dry or wet but also appropriate and inappropriate things.

...Furthermore, those that are bitter are hot, and those that are pungent hotter still. So all such things are nourishing *with* sweetness, but none of these things I mention is sufficient to nourish on its own. They are mixed in two ways: either they are not uniform in their substances and have various qualities in their parts; [11.671 K] or they are simple and uniform, and come to be so through changing greatly differing things into each other. For honey does not suddenly become bitter, but when either boiled considerably or aged, changes slowly to bitterness when subjected to such processes. Neither do those fruits that end up<sup>22</sup> sweet from earlier bitterness, such as some of the cucumbers<sup>23</sup> and melons, cast off<sup>24</sup> all at once their original quality. For only slowly do changes befall all things that are altered by<sup>25</sup> nature, and particularly in cases when the alteration and transformation result in very different or even opposing qualities.

#### 4.19, 11.684–5 K, Galen turns to bitterness:

when making distinctions about the capacity of bitter flavours and declaring them to be cutting, thinning and cleansing, and, clearly, hot to the extent that they do not yet burn, let us go back in the discussion to pungent flavours. First let us say, to be precise, that they are hot, and then that they corrode, burn, form scabs and melt down. All such items can be placed on the skin; and taken internally, those that are most opposed in their **whole substance** to

<sup>22</sup> ἐκ πικρῶν Pal.M: om. K.

<sup>23</sup> Or possibly 'gourds' if this is a feminine noun. Cucumbers and melons are considered together however at *On the Capacities of Foods*, 2.5–6.

<sup>24</sup> μεταβάλλουσι Pal.

<sup>25</sup> ὑπὸ Pal.M, om. K.



certain living beings cause sepsis<sup>26</sup> and destruction of those living beings. Those that are so only because of the imbalance of heat – if they are thick in composition and earthy – cause ulceration of the internal parts; those fine in composition are diuretic and induce sweat: to put it simply they cut and disperse. Some of them are helpful in expectoration from the thorax and the passing of monthly periods.

### 5.6, 11.722–4 K, Galen discusses pus-moving medicines, which

disperse excessive moisture by heating in a similar way to hot water, when it is contained in empty spaces, as was set out in the work *on Anomalous Bad Mixture*<sup>27</sup>. But they add<sup>28</sup> no moisture to uniform bodies that are in a natural state, just as they do not remove anything clear or perceptible. Care must be taken that they be equal<sup>29</sup> in their mixtures with their substance, so that they alter them in no respect. In pus-removal at least the moisture is altered, and likewise if the flesh is bruised; but all the other parts which are in a natural state preserve their substance. Of the three alterations that occur in the bodies of animals, one is precisely natural, when food is digested in the stomach: the juice<sup>30</sup> generated there [is] either in the organs and vessels, or<sup>31</sup>, again, each limb may be nourished from it. Alteration<sup>32</sup> that is precisely contrary to nature occurs in all cases of putrefaction. So these two are somehow opposite to each other. The third is a mixture of these two and in the middle, having something of the natural aspect of the first, and something of the unnatural aspect of its opponent. Now two features belong to the natural one: the alteration arises from material appropriate to the organism; and it is mastered precisely by innate heat. For the unnatural one, meanwhile, change is brought about by heat from outside and is good for nothing. The middle stage between these two, following on in pus-removal<sup>33</sup>, arises from innate heat, but that heat is not fully in control: it is not completed from precisely good materials just as it is not from completely alien material either.

### 5.14 11.752–3 K, Galen moves to a class of drugs which tend to close up the channels of the body:

the substance of those that are the opposite of aperients is thick in composition, and cold, of all astringents without pungency in the mix. I gave adequate examples of their matter in Book Four, where I discussed the substance of such drugs as being earthy and cold. So there is nothing amazing in this substance alone naturally drawing together and closing the apertures of vessels closed contrary to nature. In this substance alone is everything<sup>34</sup>

<sup>26</sup> Galen understands *sepsis* as negative heating of the body: beneficial heating turns food into blood, while sepsis turns waste products into excrement and can cause serious damage when it gets out of control.

<sup>27</sup> *de inaequali intemperie*, 7.733–52 K.

<sup>28</sup> προσδίδωσι Pal.

<sup>29</sup> ὅμοια M.

<sup>30</sup> χυμὸς M.

<sup>31</sup> ἢ Pal.M: ἴνα K. K could be right and seems to be supported by 'unde' in Gaudanus.

<sup>32</sup> εἰ M.

<sup>33</sup> ποιήσεις M.

<sup>34</sup> μόνης γὰρ αὐτῆς πᾶν M. ὅσων Pal.

needed to draw together on account of its thick composition when applied externally and its inability to travel through fine channels<sup>35</sup>, as too to its coldness when it contracts and draws together to itself what comes into contact with it. That it dries was shown in everything that is astringent being such, and it feeds on liquid and tones the part of the body. But if all these things come together, the aperture will be closed as if from fingers from outside the parts, as the astringent substance<sup>36</sup> draws it together. Those drugs which are cold, whether similarly<sup>37</sup> or more so, are watery in their substances. Such drugs draw together and squeeze with slight strength on account of their softness. What is needed is a strong and hard opposing substance to compress everything it is about to encounter, and draw in strongly whatever it might be: this the more watery drugs do not have in their substances and they draw together and condense the fine channels in each body but are unable to squeeze the whole organ from all sides. Consequently these quite reasonably are condensing but not compressing.

### 5.17, 11.760–1 K, Galen notes

a second kind of attracting drugs which draw in through similarity of quality, which is nothing other than a similarity of their **whole substance**, just as what is being nourished draws in appropriate nourishment. Among such drugs are all purging drugs and some protective drugs. All such are hot. Of those that are similar in substance, the hotter attracts more, and as it were takes up the heat like an ally in similarity. Such an attracting drug with two causes will have more resources than draws together with one alone. It makes no difference whether we speak of drawing, attracting or of an extracting capacity.

5.18, 11.761–3 K, Galen addresses the concept of whole substance in poisons, the other end of the spectrum, as we have said, from nutrition. He had alluded to the action of poisons earlier, at 3.18, 11.596–8 K, but the main discussion comes late in book five:

let us proceed to the so-called protective and antidote capacities. The nature of these too is two-fold, the first altering and the second emptying out from the suffering part either the corrupting poison or the poisonous drug. The first alter through either one or a pair of qualities, or through their **whole substance**; and the second empty out through the similarity of their **whole substance** and their heat that is fine in composition. So four differences in all will arise in their usefulness, two of them altering and two emptying. One of them is abundantly clear in how it helps from the opposition of its quality: if the poisonous drug were to be cold, or the poison from an animal, then the help will be with the heating drugs; if hot, then from the cooling drugs; if dry, from the moistening drugs; if wet, from the drying drugs. So if it is both cold and wet, then from the drying and heating, and so on for the remaining pairs. The alteration made through the capacity<sup>38</sup> in its **whole substance** is not unclear either to those who recall what was previously demonstrated in *On the Natural Faculties* and also in *On Mixtures*<sup>39</sup>. The capacities that alter poisonous drugs are intermediate in nature

<sup>35</sup> ἐξωθεν add. M.

<sup>36</sup> Note the substance is here astringent, rather than the capacity or quality term we might expect. Contrast *LSJ* II 7, where Stoics oppose *ousia* with *dunamis* and *energeia*.

<sup>37</sup> To the part treated.

<sup>38</sup> δυνάμεως M, facultatem Gaudanus: δυνάμεων Pal.K.

<sup>39</sup> 101–2 Helmreich.

between the bodies that are affected and the drugs that harm them, so that there is a correspondence: as the body is to the protecting capacity, so is that capacity to the poison; and as the poison corresponds to the protective drug, so does the protective drug to the body. For this reason almost all drugs opposed to poisons when taken in quantity do great harm to the body of an animal. Now all such capacities must be given in such an equilibrium of quantity that they neither damage the body in large amounts nor by being too little are overcome by the poisons. But this belongs already to the *Therapeutic Method*. Let us now take up what follows. Every destructive poison is emptied by the application of external drugs which create an attraction either with heat or with the similarity of the **whole substance**. It is at this point necessary for the protective drug to be as far as possible particularly midway<sup>40</sup> in its nature between the body it is curing and the poison which is doing harm.

The following chapter, 5.19, 11.766–7 K, turns to specific poisons:

some are hostile to us in their **whole substance** and so even if taken in minimal amounts are utterly harmful, such as black oak fern, *pituokampe*, deadly carrot, thorn apple<sup>41</sup>, and mercury, some of the fungi, and the saliva and bile of poisonous animals. All such drugs are poisonous in kind, not by quantity. Consequently none of them are added to protective antidotes like poppy juice, myrrh<sup>42</sup>, storax<sup>43</sup> and saffron. If these are taken in quantity some cause madness<sup>44</sup> and some death. When mixed with others in a certain equilibrium they are helpful. Those that damage the mind mostly bring headaches, filling the head with a mass of noxious vapours. Some too attach to the mouth of the stomach, causing it to suffer with the head.

The production of bodily substances comes next, 5.21, 11.770–3 K:

the capacities which make milk and semen are partly found among the drugs alone and partly among the nutriments. Among the drugs when we change phlegmatic bodily fluids into blood with heat; and among nutriments in the similarity of the **whole substance**. And when they are of good fluid and moderately moist and of a warm heat as<sup>45</sup> indeed is milk. For the blood partakes in heat in equilibrium with the animal, while yellow bile in heat that is more than mid-way, just as phlegm partakes in more cold. Milk, as far as heat is concerned, is in between phlegm and blood, but is not equally distant from each: it is further from phlegm and closer to blood... Those drugs that are heating... partake in no evident dryness and are rightly said to have capacities that generate milk. These are few in number and do not easily come to the aforementioned<sup>46</sup> equilibrium in mixture. Unlimited<sup>47</sup> however, one might say, and intractable<sup>48</sup> are those which harm the milk. There are those that heat

<sup>40</sup> μέσον om. M.

<sup>41</sup> *Datura stramonium* L, Dioscor. 4.73, Beck Andre.

<sup>42</sup> *Commiphora myrrha* Eng, Dioscor. 1.64, Beck Andre.

<sup>43</sup> *Styrax officinalis* L, Dioscor. 1.66, Beck Andre.

<sup>44</sup> ἐκμένει Pal.

<sup>45</sup> οἷας Pal.K, οἶον M.

<sup>46</sup> τοῖς προειρημένοις Pal.

<sup>47</sup> ἀπείραντα M.

<sup>48</sup> τὸ πλῆθος add. M.

more than is necessary, those which dry and which cool, some bringing damage with the quality of the blood, some reducing the **whole substance**: they prevent milk production<sup>49</sup>.

As for semen, 5.23, 11.775 K,

people are accustomed to name some drugs generative and those opposed suppressant, others promoting and their opposite retentive. Generative are those which generate what did not exist before, while suppressants destroy that. Promoting are those that bring to light what has been gathered together deep down, and opposed to these are the retentive drugs. Generative drugs are foods for sperm which are nourishing, windy and appropriate in their **whole substance**: drugs that are *pneuma*-like and hot.

\* \* \*

What to conclude from this review? Galen employs the concept of whole substance to cover the processing of foods and poisons in the body: the body's heat acts on the food and is acted upon in the sense of augmented by it. With food, the body replaces energy lost in heat and muscle action (3.4 and 4.10). As for poisons, the body acts upon the poison with body heat, thereby activating it, and is acted upon as a result, possibly fatally (5.18–19). Singer (2020) identified other special uses of whole substance, but those apart, the concept acts at two ends of a spectrum of substances taken into the body, with all other drugs acting with 'one or two qualities' at intermediary stages on the spectrum. We have seen too, as Vinkesteyjn (2020) observed, that substance (οὐσία) in Galen may be composed of matter (ὕλη) combined with form (εἶδος) in a standard Aristotelian formation (cf. 3.4), but additionally it is composed of the four qualities, hot, dry, wet and cold (nearly every passage). Exactly how these concepts come together is not completely clear. Elemental considerations (3.10, 4.15) come to bear – a substance may be earthy, airy, watery or fiery – as does fine or thick composition (in many passages). Galen uses some or all of these considerations as needed to explain what in modern science would be a question of chemistry and identifying active ingredients of what to Galen was a 'simple', albeit a complex one. How successful Galen's attempt in this field turned out to be is best judged in comparison with alternative theories of the time, for example those of the Stoics, the Monists or the Pneumatists, many of which he takes on and tries to refute in the first five books of *Simples*, employing those key scientific methods of experiment and deduction.

<sup>49</sup> γένεσθαι Pal.K, τὴν γένεσιν M.

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