

soil. This opens up a very interesting field for study and observation. For instance, we cannot grow any of the ericaceae, rhododendrons, azalias, etc., in Cincinnati, on account of the alkalinity of the soil. I hope to be able to do this by the aid of aluminum sulphate.

BEZOAR.*

BY WILLIAM KIRKBY.

The *Via Appia* of historical medicine presents to the eye of the traveller many tombs of dead theories and of defunct remedies, some of which may repay a half hour's contemplation by the student of anthropology. Even in these later times of high scientific attainment it is a quite common experience to find people, under the compulsion of bodily pain or mental distress, indulging themselves in the hope, and often in the belief, that a panacea will be forthcoming for each and every ill that flesh is heir to. Such a hope may be vain, but if it keeps alive the spirit of research, as we believe it does, it is by no means unfruitful. In the quest of agents to alleviate human suffering it is natural that the keener vision, which enlarged knowledge supplies, should often be directed backwards over the travelled path to see if each by-way has indeed been thoroughly explored. Thus it comes to pass that old remedies are resuscitated and tried again in new circumstances and in new combinations. Indeed it is in but a few cases that we can feel assured that an expired remedy is really beyond the call to a resurrection. Of these few there is one which is sufficiently interesting, I think, to occupy your thoughts for a few minutes because its vogue was at its height for a fairly well-defined period, because it is a good illustration of the deep-seated desire to possess a panacea, because it exhibits a prevalent human weakness to cherish the notion that the mysterious may, and probably does, achieve results of a miraculous nature, and because when the character and composition of the remedy were tested in the true scientific spirit it was manifest that its supposed medicinal properties were nonexistent and would not sustain the belief in its reputed virtues of the most credulous civilized person.

Bezoar stones are now merely medical curiosities, but during the seventeenth century and part of the eighteenth they were highly valued as a medicine of great efficacy. In 1621 we find Robert Burton writing in "The Anatomy of Melancholy," in the subsection in which he discourses on "Alteratives and Cordials," that

"Christophorus Ayreus prefers Bezoar stone and the confection of alkermes before other cordials, and amber in some cases. Alkermes comforts the inner parts, and bezoar stone hath an especial virtue against all melancholy affections; it refresheth the heart and corroborates the whole body. . . . After a purge three or four grains of bezoar stone, and three grains of amber-grease, drunk or taken in borage or bugloss water, in which gold hot hath been quenched will do much good."

He goes on to say that

"To bezoar stone most subscribe, Manardus and many others; 'it takes away sadness and makes him merry that useth it; I have seen some that have been much diseased with faintness, swooning and melancholy that taking the weight of three grains of this stone, in the water of oxtongue, have been cured.' Garcias ab Horto brags how many desperate cures he hath done upon melancholy men by this alone, when all physicians had forsaken them."

* Section on Historical Pharmacy, A. Ph. A., Cleveland meeting, 1922.

On the other hand that most sceptical physician, "whose whole life was 'wrapt in a pure flame and ecstasy of high curiosity'"—Sir Thomas Browne—was not imposed upon by the great praises lavished upon bezoar.¹

It is said that Avenzoar was the first to introduce this remedy. Avenzoar was an Arab physician who was born in Seville in the eleventh century and is said to have lived to the age of 135 years. He practiced in his native city, and, according to the best authorities, he died in Morocco about 1217. Bezoar was recommended by him as an antidote for jaundice which he imagined to be the effect of poison. His account of the origin of the drug is curious. He says:

"The best (Bezoar) is found in the East, where it is produced from the eyes of the Deer. In those countries the larger kinds of deer eat serpents for the purpose of improving their strength and, before they have sustained any injury from them, they run down to the rivers, and plunge themselves in water up to the head, a practice taught them by instinct; here they remain immersed, without drinking (which would be instantly fatal) till their eyes begin to water; this humour continues to exude under their eyelids, and coagulates there till it acquires the size of a chestnut. As soon as the deer find the venom of the serpent exhausted, they quit the water, and return to their usual haunts, when the concretion, hardening progressively to the consistence of stone, drops off at length by frequent friction."²

There are other early references to Bezoar in the works of the Arabian physicians, but they are of a vague character and in not a few instances the references are not so much in regard to the drug as to the word Bezoar which was used apparently as signifying alexipharmal. By the beginning of the seventeenth century a considerable amount of information, of a more or less authentic nature, concerning Bezoar and bezoardic drugs was available and was collected by Caspar Bauhin in his *De Lapidis Bezaaris* (1625). This treatise is divided into fifty-two chapters and the author has drawn on the writings of no less than one hundred and eighty-five authorities. As a further indication of the thorough researches of Bauhin as well as of the widespread interest in bezoardic remedies it is worth pointing out that in the first chapter—*De Nomine Bezaar*—his references reach the high figure of sixty-nine. I do not propose to take you through this most interesting volume which, as you will gather, contains pretty well all that was known of these substances at that time.

The derivation of the name indicates the use of the drug. Bezoar, according to almost all the authorities, ancient and modern, is derived from the Arabic—*bāzahr* or *bādizahr*, Persian—*pādzahr*, meaning an antidote or counterpoison.³ In the older literature the word assumed a great variety of forms. Bauhin mentions Bedazahar, Albezahar, Bezahar, Bezarad, Bedezarahath, Bezahart, Bezachar, Bedzahar, Bezaar, Bezadaret, Berzad and others. An old English dictionary⁴ gives an origin for the word which differs from any other I have met with: "Bezoar, from the Persick *Pazar* or *Pazan*, a Goat, because it is found in the Belly of a certain Goat." Bauhin in giving the Hebrew name, Belzaar, says that it is a compound of *Bel* and *Zaar* signifying "the Master or Overcomer of Poison."

As to the virtues of the substance there is much evidence to show that it was regarded as a general antidote when administered internally, and it was thought

¹ *Pseudodoxia Epidemica*, 1646.

² Wm. Hamilton, "History of Medicine," Vol. I, p. 267, 1831.

³ Murray & Bradley's "Oxford English Dictionary."

⁴ *Gazophylacium Anglicanum*, 1689.

that it possessed magical properties and, in consequence, it was worn as a charm or amulet. Matthiolus¹ says that its special virtue is that it is a most excellent remedy against poisons in general; it is, he continues, not only taken internally, but is also worn on the person in such a way as to touch the naked flesh on the left side, and when so worn it overcomes all poisons. In his "*De Simplicium Medicamentorum*" he writes of *Lapis Bezoar* as an antidote to all poisons whether communicated by bite or a blow; twelve grains may be given in a draught and the drug should be smeared on the wound. He also recommends it specifically for the bite of the viper and as an antidote against aconite poisoning when seven grains should be given in pure white wine (*Septem grana ex albo meraco*).

Having seen how the name and reputed virtues of Bezoar have reacted upon each other we may now enquire what was the origin of the drug as recorded by those writers who sought a reasonable account of it, in place of such traditional stories as that we have already referred to.

In the seventeenth and eighteenth centuries we have descriptions given of several kinds of Bezoar, of which the chief varieties were *Lapis Bezoar Orientale* and *Lapis Bezoar Occidentale*. Bauhin's monograph was the work from which subsequent writers took the statements which, by degrees, with the increase of knowledge, gradually became qualified and modified so as to more nearly represent the actual truth. Schroeder² says that Bezoar stone of the East is found in

"a Persian or East-Indian Beast, partly like a Deer, partly like a Goat, called the Indian Goat, or Deer-like Goat—chiefly in the stomach and other cavities within, of an oval form, or round and hollow within (having chaff or hair, or the like within it), shining and smooth without, with folds like an onion, of a divers colour, commonly of a blackish green, or clearer green, or pale, or Ash-coloured, or Honey-coloured, with no scent: of a different bigness and weight, they being less than Walnuts, sometimes bigger."

The *Lapis Bezoar Occidentale* he says is obtained

"from a Beast of Peru, like the other of the East, but without Horns, that eats wholesome Herbs." The stone is "without any strange thing in the cavity, with coats, bigger commonly than the Eastern, rough without, Ash-coloured, white or black, or blackish green which is best."

Lovell's³ description is similar to the foregoing, and his account of the origin of the stones is taken from Bauhin's work to which he refers his readers. Pomet⁴ in 1694 gave a long account of *Bezoar orientale* and *occidentale* as well as of other varieties of Bezoar from other countries and other animals. His volume, as you are aware, is well illustrated and among his pictures is a curious one of the "Bezoar Goat" with horns which are quite unlike the horn figured by Bauhin. Pomet's article contains a large amount of matter derived from Tavernier, De Renou⁵ and Lemery.⁶ Another writer of the seventeenth century, William Salmon,⁷

¹ *Commentaires de M. Pierre Andre Matthiole sur les six livres de Ped. Dioscoride*, Lyons, 1572.

² "The Compleat Chymical Dispensatory," by John Schroeder, Englished by William Rowland, 1669.

³ *Panzöologicomineralogia*, by Robert Lovell, 1661.

⁴ *Histoire generale des Drogues par P. Pomet*, 1694. English translation, 2nd Edition, 1725.

⁵ "Medicinal Dispensatory," Englished, 1657.

⁶ *Dictionnaire des drogues simples*.

⁷ "The Compleat English Physician," 1693. "The New London Dispensatory," 1678.

gives a compendious summary of all that had been previously written concerning the origin, characters and virtues of Bezoar and mentions most of the better known authorities on the drug.

Bezoar stones were held in very high esteem, as were indeed almost all kinds of remedies obtained from animals. The more difficult conditions attaching to the obtaining of a drug inspired the more abundant faith in it as a panacea for some sickness or other. I should think it is most unlikely for one to meet with a Pharmacopœia or Dispensatory published in the seventeenth century which does not include *Lapis Bezoar* and one or more preparations of it. It was made official in the first *Pharmacopœia Londinensis* (1618) and continued until the 1746 edition after which it was deleted. The insolubility of Bezoar led to its being exhibited generally in only two classes of preparations, namely, confections or electuaries, and powders. Bauhin gives a formula for "*Antidotus Bezaartica adversus omnia venena*"¹ which contains over forty ingredients including the true Oriental Bezoar, gold leaves, prepared emeralds, Mithridate, and the *Theriaca Andromachi*; the two latter preparations represent more than another hundred ingredients. Perhaps one may be excused for quoting a formula not quite so elaborate but which will serve to illustrate the kind of preparation in which Bezoar frequently found a place. It is taken from the *Pharmacopœia Dogmaticorum Restitua* of Quercetanus (1614):²

Antidotus minor contra pestem.

R. Succī Scordii

Rutæ

Cardui benedicti

Ulmariæ

Menthæ crispæ

Salviæ ana unc. 4 vel plus minus.

Rad. Angelicæ

Zedoariæ ana unc. 1.

Dictamni

Sem. Cardui benedicti

Cort. Citrii ana unc. sem.

Cinnamomi drach. 6.

Myrrhæ unc. 2.

Croci drach. 3.

Camphoræ drach. 1.

Theriacæ optimæ unc. 1. sem.

Confect. Hyacinthi.

et Alkermes ana unc. 1.

Perlarum præparatorum

Corallor. præparatorum

Cornu Cervi præparati

Spec. Diambrae

De gemmis ana drach. 2.

Unicornu drach. sem.

Lapidis bezoardici drach. 1.

This work of Quercetanus requires that it should be mentioned here that in it he refers to a *Bezoar metallicum fixum* and to bezoardic preparations which contain no Bezoar stone. For one of these latter he gives a formula the ingredients of which are principally what we should class as carminatives; it is named *Praeparatio extracti bezoardici*. This volume was not overlooked by Bauhin. Without attempting to give you any adequate notion of the extent of the use of this drug by naming the many authorities with which I have become acquainted I may content myself with referring to De Spina's *Lexicon Pharmaceutico-Chymicum*³ in which there are three formulae for *Pulvis Alexipharmacus* each containing *Lapis Bezoar*, and twenty-five formulas for *Pulvis Bezoardicus* attributed to as many different authorities. The esteem in which it was held was truly extraordinary.

¹ *Loc. cit.*

² The first edition appeared in 1603.

³ 2nd Edition, 1715.

Lovell¹ in his monograph has between five and six pages dealing with the uses of the drug and the authors whose works had been consulted. There is other evidence of a more striking kind testifying to its tangible value. Matthiolus² says, on the authority of Abdalanarakus, that a magnificent palace at Cordova was bartered in exchange for one of these Bezoar stones. Bauhin³ gives instances of monetary value and tells of one stone which was sold for one hundred and thirty gold ducats. Pomet⁴ states that an ounce was worth from fifteen to twenty *livres* (francs), but a single stone of that weight would sell for a hundred *livres*. He, himself, sold one weighing four and a quarter ounces for two thousand *livres*. Salmon⁵ giving his experience writes:

"now they are much more plentiful; the best Oriental green ones have borne price from 30 shillings to 50 shillings an ounce, but of late (by reason of the plenty of Occidental ones) they have been sold much cheaper, scarcely reaching 20 shillings an ounce. The Occidental are worth from 5 shillings to 12 shillings an ounce."

This exaggerated idea of the value of Bezoar was not entertained by everyone. Boyle,⁶ for instance, states:

"That the Bezoar stone, sold at an immense price, is in every way inferior in virtue to the *Calculus Humanus*, we have the testimony of the experienced Bontius."

Pitt in 1702 published his "*The Craft and Frauds of Physic Expos'd*" and in it makes use of the Bezoar stone as an illustration of the credulity of the physicians of his day. Some quotations will serve to show that scepticism of its value was by no means confined to a few. He affirms that "Bezoar has held its Name and Reputation almost Sacred with us, tho' exploded long since in almost all the Parts of Europe. Dr. Guybert in a Discourse entitled '*Les Tromperies du Bezoar decouvertes, The Cheat of Bezoar laid open*,' convinced the French that they had been imposed on by the Trading Physicians returning from the Indies." He tells of the "Two Criminals who by the King's Command had poyson given them with the promise of Life if Bezoar could procure their Pardon. They lost their lives and the stone and the Physicians their Reputation."

He gives an imposing list of names from Guibert's treatise of those who do not believe in the drug. Among them are Diemberbroeck, Paré, Sennert, Sanctorius, Mindererus, Rulandus, Bauhin, Hoffmann, and Bontius who tells us

"That if we must give stones we ought to put a greater value upon the Stones cut out of the Bladders of Man, a more noble creature, fed with meat of the highest nourishment and his Spirits warmed with wine, than that of a Goat, starving upon the Mountains."

Up to this period the history of this substance has been an account of specific superstition, credulity and gullibility, on the one hand, and of scepticism, assertion and, sometimes, prejudice on the other hand. We have heard practically nothing of any attempt to estimate the medicinal value of it when exhibited alone—as distinct from the theatrical episode of using as an antidote to a virulent poison.

¹ *Loc. cit.*

² *Loc. cit.*

³ *Loc. cit.*

⁴ *Loc. cit.*

⁵ *Loc. cit.*

⁶ "The Usefulness of Philosophy," published 1671, in Peter Shaw's 2nd Edition of "The Philosophical Works of the Honourable Robert Boyle," 1728, Vol. I.

The history of many other drugs is of a similar character, but in this case the exaggerated reputation of the substance inspired not only the jealous prejudices of some physicians but it brought into play the spirit of research of a man whose name is not very familiar in the annals of medicine. As has already been intimated Bezoar stones were administered for the most part in the powdered form in electuaries and compound powders. They were used as amulets attached to gold and silver frames and chains for hanging about the person of the patient, and, although practically insoluble in wine and water, they communicated a bitter taste to the liquid in which they were placed, and the infusion was thought to be efficacious in many ailments. Being so valuable the stones used in this way were attached to gold chains and preserved in gold boxes. Some of these specimens are said to be found in museums but it has not been my good fortune to meet with any. Dr. Frederick Slare was a man, as he himself indicates, well versed in the knowledge of the *Materia Medica* and interested in the nature and properties of the medicines in common use which he was led to examine and was well acquainted with the facts just mentioned. Bezoar being as Slare says "of the first Rank" it became very early the subject of his "Test and Scrutiny", and he soon found that "it did not deserve the great Encomiums which were given it." The results of Slare's examination were read before the Royal Society, of which he was a Fellow,¹ and were published in 1715.² This is a record of twenty years' work which "required both Expense, Patience and Industry, accompanied with some Sincerity and Honesty." I don't propose to follow Slare through the record of his enquiries in the course of which he tested Bezoar stones as to their solubility in different fluids and as to the clinical value of the drug when exhibited alone. Bezoar was one of the chief constituents of the so-called "Gascoign's powder." Slare also submitted this preparation to his scrutiny. His final conclusion was that chalk is a more useful remedy than either Gascoign's powder or Bezoar—"But" he continues "it must be confessed that this useful Salt lies under the vile Reproach of being cheap, compared with those enriching Powders we have examined." In his correspondence with his friends in the East he elicited the fact that only about one goat in seven was found to yield a stone. Twelve stones on the average weighed an ounce. It was not difficult to compute what number of goats would require to be killed to supply one druggist. A druggist, a particular friend of his, told him he used five hundred ounces a year. So that over 40,000 goats would have to be killed to supply one establishment. It is small wonder that genuine stones were very rare and difficult to obtain, and that the great majority were counterfeit.

Notwithstanding Slare's work Bezoar continued to be regarded as a remedy of importance for many years. Every dispensatory and compendium of medicines gave it and its preparations the fullest notice; but the London Pharmacopœia of 1746 was the last one in which it was official. Having reached this period it seems that we may look at the collected information which was brought together by James in the first volume of his "*Medicinal Dictionary*," published in 1743.

¹ Slare was a man of marked ability. He has been well described as "a forerunner of the almost exclusively clinical school of Sydenham." But he was also a chemist; he demonstrated the presence of sodium chloride in the blood, and in Evelyn's diary we have an account of him showing experiments with phosphorus at the house of Samuel Pepys.

² *Experiments and Observations upon Oriental and Other Bezoar-Stones Which Prove Them to Be of No Use in Physick*, by Frederick Slare, 1715.

He devotes about four folio pages to it. He says it is nothing but a stone formed in the gall bladder of several species of animals found in the East and West Indies such as goats, hogs, apes, etc. It is also sometimes found in other parts of these animals. From James' account of his examinations of Bezoar stones it appears fairly certain that the stomach and intestines are the organs in which the stones are found, because there are many in which is found a nucleus of some ingested foreign substance. They are laminated and in form may be round, oblong or reniform. The consistence is firm and the surface generally smooth. Water and spirit of wine are rendered turbid when a Bezoar stone is placed in them, but no appreciable quantity is dissolved. The evidence adduced by this author is not at all conclusive as to the organic origin of the stones. Neumann¹ is no more illuminating. He quotes Kaempfer: "that the genuine Bezoar is in Persia itself so rare and so dear, that he cannot believe that a single stone comes into Europe." Neumann continues: "Many others agree in this account; and indeed the Bezoar stone carries in itself strong marks of art, but hardly any traces of its being formed by nature." It is not surprising, therefore, that Neumann's experiments do not result in any certain indication as to how and where the stones are formed. Perhaps it would have been as well if I had followed Wm. Lewis in his method of treating the subject, but you will apprehend that my discursive treatment is for another purpose than merely conveying predigested information. In his "Experimental History of the Materia Medica"² he states that the "Oriental Bezoar stone is supposed to be produced in the pylorus, or in a cavity at the bottom of the fourth stomach, of an animal of the goat kind." "Occidental Bezoar: said to be found in the stomach of an animal of the stag kind." "*Lapis Simiae*—Bezoar of the monkey: said to be found in the stomach of certain monkeys." "*Calculus humani, bezoar microcosmicum quibusdam dictus*—The Calculus of the human bladder." "*Lapis Porcinus—Bezoar Hystricis*: Bezoar of the porcupine: said to be found in the gall-bladder of an Indian porcupine." This writer commits himself to a definite statement only in the case of the *calculus humani*; the other statements are founded only on "hear-say."

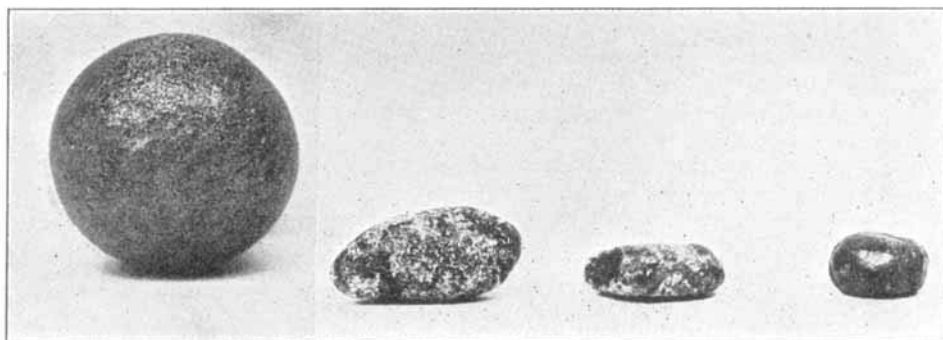
The brief history of Bezoar serves to illustrate again the small amount of reliance to be placed upon the reports of merchants and travellers. Slare tells of two most trustworthy friends in the East who had to confess they had been misled in the accounts which had been given them concerning the obtaining of the stones. It is only when we reach a period in which actual scientific investigation has been brought to bear on the matter that we obtain any certainty at all. Fourcroy, Vauquelin and Berthollet examined a number of animal concretions and they placed them in eight classes. These researches threw much light on the problem. Berthollet found that the three Bezoar stones sent by the Shah of Persia as a royal gift to Napoleon Bonaparte consisted only of agglomerated woody fiber and were probably produced in the stomach of some animal in the same manner as the so-called hair-balls. Authentic intestinal calculi from herbivorous animals consist of concentric layers of ammonium-magnesium phosphate with a nucleus of plant residues. More recently, what were considered to be two different varieties of Bezoar stones have been chemically examined: (a) of an olive-green color, faintly shining and formed of concentric layers which yielded as its chief constituent

¹ "Chemical Works," abridged by Wm. Lewis, 1759.

² 2nd Edition, 1768.

lithofellic acid ($C_{20}H_{36}O_4$) together with some lithobilic acid, while (b) had as its principal constituent ellagic acid ($C_{14}H_6O_8$).¹ We may conclude, therefore, that Bezoar stones have an intestinal origin. The Persian, or so-called *Bezoar orientale*, being obtained from the *Capra aegagrus* (*Capra hircus aegagrus*) and the South American, or so-called *Bezoar occidentale*, from the South American Deer, *Mazama bezoartica* (?).

In the Museum of the Pharmaceutical Society of Great Britain there are two specimens of *Bezoar orientale* of which one is cylindrical and oval at the ends, it is two and a half inches long and an inch in diameter; the other specimen is kidney-shaped and is $1\frac{3}{4}$ inches long and $1\frac{1}{4}$ inches in diameter. Both are laminated, have a dark greenish color and have a polished surface. There are several of these stones in the Wellcome Historical Medical Museum and through the kindness of the Curator Mr. C. J. S. Thompson, M.B.E., I am able to show you photographs of four of them. No. 1 weighs four drachms, and in color is speckled gray and white; No. 2 weighs one drachm, No. 3 thirty-five grains and No. 4 seventeen grains. The three latter are all brownish gray in color.



Courtesy of the Wellcome Historical Museum, London

1

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I should have liked to say something about the *Bezoar animale*, *Bezoar minerale* and the so-called Bezoars of metallic origin but these must find a place, perhaps, in another communication. I think I may appropriately close this paper with a reflection made by that eminent teacher of *Materia Medica*, Anthony Todd Thomson, when writing on Bezoar stones to the effect that they "afford an addition to the many thousand proofs of the influence of mind over the body, and show how truly efficacious Imagination may prove in removing disease."²

I must take this opportunity of expressing my sincere thanks to Mr. Thompson of the Wellcome Historical Medical Museum for his courtesy and kindness in providing me with photographs for this paper.

¹ O. Hammarsten, "Text Book of Physiological Chemistry," 3d Edition, 1901. Schmidt and Langlebert (*Repertoire de Pharmacie*, July 1886; through *Pharm. Journal*, July 31, 1886) report that they examined a South American specimen said to be obtained from the intestines of the *Antilope rupicapra*, which consisted chiefly of calcium oxalate. This appears to be a quite unusual constituent.

² Eusebe Salverte, "The Philosophy of Magic," translated by Anthony Todd Thomson, M.D., 1846.