

Dr. Beke with the  
author's consent.

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## THE KOSSO OR BRAYERA ANTHELMINTICA.

BY JONATHAN PEREIRA, M.D., F.R.S.

**HISTORY.**—*Kosso* has been in use in Abyssinia, as an anthelmintic for more than two centuries; for Leutholf (Ludolfi, *Historia Æthiopica*, lib. i., cap. ix., sect. 31, 1681) says that “N. Godingus\* praises another tree as being very efficacious against *lumbrici*, which are produced by the use of raw meat. But the Abyssinians purge themselves every month with the fruit of this tree, and thus,” he says, “destroy these worms.” Now there can be little doubt, I conceive, but that this passage refers to the *kosso*.

Bruce in his *Travels to discover the Source of the Nile, from 1768 to 1773* (vol. v., p. 73), published at London in 1790, mentions this medicine, which he calls *cusso*, and proposes to name the tree *Banksia Abyssinica*, after Sir Joseph Banks, the then president of the Royal Society. But the younger Linnæus, in the *Supplementum Plantarum*, published at Brunswick in 1781, had already appropriated the name of *Banksia* to a New Holland genus of proteaceous plants, and he has been followed by all succeeding botanists; so that it is obvious that Bruce's proposed botanical name for the *kosso* cannot be adopted.

Bruce gave a very good popular account of *kosso*, accompanied by what he justly terms “a true and exact” figure of the plant. I have compared his figures with a specimen of the plant collected in Abyssinia by Schimper, and contained in the herbarium of my friend Mr. N. B. Ward, and with the commercial flowers, and find that they are fair representations of the plant.

Bruce states that the Abyssinians evacuate once a month “a large quantity of worms; these are not the tape-worm, or those that trouble children, but they are the sort of worm called ascarides.” This statement agrees with that of Godingus just quoted; but it does not accord with the observations of other travellers, who tell us that the worms with which the Abyssinians are troubled, and for which they employ the *kosso*, is the tape-worm. The accuracy of this latter statement has been proved by Dr. Hodgkin (*Medical Times*, October 26th, 1844, p. 74) who gave oil of turpentine to an Abyssinian in the service of Dr. Beke, and thereby expelled a *Tænia solium*—the same kind of tape-worm which prevails in England, and which is understood to prevail at the Cape of Good Hope.

In the *Encyclopédie Méthodique* (*Botanique*, Supplem. t. ii., p. 423, 1811) Lamarck has described the *Cusso d'Abyssinie*, which he named after Dr. C. G. Hagen, a professor at Königsberg, the *Hagenia Abyssinica*. He says the tree was discovered by Brown—but I presume that this is a typographical error, and that for “Brown” should

\* *De Abyssinorum rebus*, lib. i., cap. 2. Lyon, 1615. 8vo.

be read "Bruce;"—for the figures of the plant given by Lamarck (pl. 311) are obviously copied from those of Bruce, though he does not refer to this distinguished traveller as his authority.

It is remarkable that Lamarck's proposed generic name (*Hagenia*) has been applied by the late Professor Eschweiler (*Systema Lichenum*, 1824) to a proposed genus of lichens usually included in that of *Parmelia*; and by Mönch (*Methodus*, 1794) to a caryophyllaceous plant now regarded as a species of *Gypsophila*. Willdenow (*Species Plantarum*), and Sprengel (*Syst. Veget.* ii., 220, 1825) have each adopted Lamarck's name (*Hagenia Abyssinica*) for *kosso*.

Dr. Brayer, a French physician, who resided for a considerable time at Constantinople, and who had witnessed the valuable anthelmintic properties of *kosso*, and had himself successfully employed this remedy, sent, on his return to Paris, in 1823, some fragments of the male flowers to the late celebrated Prussian botanist, Kunth, who ascertained that the plant which yielded them formed a new genus, near to, but distinct from, that of *Agrimonia*\*. To this genus Kunth gave the name of *Brayera*, after the physician who sent him the flowers, and the species he called *B. anthelmintica*. This generic name has been adopted in the systematic works both of De Candolle (*Prodromus*, vol. ii. p. 588) and Endlicher (*Genera Plantarum*, 6395). Kunth does not appear to have been aware either of Bruce's notice of *kosso*, or that Lamarck had previously given to this genus the name of *Hagenia*, otherwise, doubtless, he would have referred to them, and have adopted this designation. Dr. Brayer published a little pamphlet (*Notice sur une nouvelle Plante de la Famille des Rosacées*, Paris, 1823, 8 pages) on this medicine, but which I have not been able to get a sight of; the reply to my enquiries for it at Paris being that it was out of print. According to the information furnished by Dr. Brayer, it appears that *kosso* is carried by the caravans to Egypt, and from thence finds its way to Constantinople†.

The identity of the genera *Hagenia* and *Brayera* was first recognised by Fresenius (*Museum Senkenbergianum*, vol. ii., p. 162, 1837).

In 1839, Buchner (*Repertorium*, 2te Reihe, Bd. xviii, S. 367) gave a notice of three Abyssinian remedies which he had received from Engelmann. One of these was the *kosso* (called *koso*), which was stated to be the flowers of the *Bracera* [*Brayera*] *anthelmintica*. In 1840, Wittstein (Buchner's *Repertorium*, 2te Reihe, Bd. xxi., p. 24) published an analysis of *kosso*, which he calls *Bracera anthelmintica*.

Riecke's *Die neuern Arzneimittel*, published in 1840, contains a notice of the *Brayera anthelmintica* by Dr. Plieninger, who obtained his information respecting it from some missionaries returned from Abyssinia; and the same notice includes some botanical and pharmacological account of this medicine by Dr. Kurr.

In 1841, Dr. Aubert, who had spent some time in Abyssinia, read a

\* In the first volume, p. 470, of the *Mémoires de l'Académie Royale de Médecine*, it is erroneously stated that *kosso* is the *Agrimonia orientalis* of Tournefort, who saw it in Abyssinia. Now, in the first place, Tournefort never was in Abyssinia; and secondly, the *A. orientalis* (*A. repens*, Linn.) is a creeping herb, whereas the *kosso* is a large tree!

† In the *Journ. de Pharmacie*, t. ix, p. 160, 1823, is an *Extrait du Bulletin de la Société Philomathique*, 1822, containing a notice of Dr. Brayer's observations respecting *kosso*, and of Kunth's determination of the plant.



*Mémoire sur les Substances Anthelminthiques usitées en Abyssinie*, before the Académie Royal de Médecine, at Paris, and which was published in the Memoirs of the Academy for that year. His account of the anthelmintic virtues of the *kosso* confirms the statements of preceding writers. A very interesting Report on his memoir was drawn up by Mérat, and published in the *Bulletin de l'Académie Royale de Médecine*, tom. vi., p. 492, 1840—41.

M. Rochet d'Hericourt, in his *Second Voyage sur les deux Rives de la Mer Rouge dans le Pays des Adels et le Royaume de Choa*, published at Paris in 1846, gives a very brief notice of the *kosso*, with a lithograph of the flowers and leaves. This traveller is the present holder of the entire European stock (about 1400 lbs.) of *kosso*.

Drs. R. Quartin-Dillon and A. Petit, the naturalists of the French expedition to Abyssinia in the years 1838—43, collected the *kosso*; of which a botanical description has been published by A. Richard, in the *Tentamen Floræ Abyssinicæ*, which forms the fourth volume of the *Voyage en Abyssinie*, edited by M. Th. Lefebvre. The forty-eighth plate of the "Botanique" of this "Voyage" contains an excellent figure of the plant, with dissections of the flower.

NATIVE NAMES.—My friend Dr. Beke, the well-known Abyssinian traveller, has given the following note respecting the native names for this remedy:—"The tree, of the flowers of which you have a sample, is called in the Amharic language *kosso*\*, and in that of Tigre, *hhàbbe*†. In the Gafat language it is styled *kossish*, and in the Gonga, *kosbo*‡; in the Agau of Waag, *sika*; in that of Agau-mider, *shinei*; and in Falasha, *sakikana*; whilst in Galla, its name is *bêti*. In the countries further to the south, it has other names§, which, however, I have not collected in my vocabularies of the languages of those countries. But it is best known in Abyssinia and Europe by its Amharic designation, *kosso*." Dr. Beke further observes, that "the tape-worm, for which the *kosso* flowers are a remedy, is known in the languages of Amhara and Tigre by the same names respectively as the medicine itself, viz., *kosso* and *hhàbbe*. So, too, in the Gafat and Ginga, in which respectively both are called *kóssish* and *kósbo*. In the Waag-Agau, likewise, the name *sika* is the same for both; but in the dialect of Agau-mider, the worm is called *turo*, and, in the Falasha, *saka*; whilst in the Galla, it is *minui*."

BOTANY.—The first accurate botanical description of the flowers of *kosso* was given by Kunth, whose account has been adopted in De Candolle's *Prodromus*. Kunth, however, was acquainted with the male flowers only. The most recent systematic notice of the genus *Brayera* is that of Endlicher, which I shall adopt.

#### BRAYERA Kunth.

BRAYERA Kunth in *Brayer Notice*, in 8vo, 1824, Paris; *Dict. Class. Hist. Nat.*, vol. ii., p. 501, cum icone. DC. *Prodr.* ii. 588. Meisner *Gen.* 103 (73). Fresenius in *Mus. Senkerb.* ii. 162; Endlicher, *Gen. Plant.*,

\* This word is variously spelt by different writers, *cusso*, *cosso*, *cousso*, *coso*, *koso*, and *kosso*. Dr. Aubert says it should be pronounced (in French) *cousso*.—J. P.

† According to Dr. Plieninger, who obtained his information from the Abyssinian missionaries, the Tigre name is *hepah*. Wittstein writes it *habi*.—J. P.

‡ Written *cobso* by some persons.—J. P.

§ Dr. Brayer gives *cotz* or *cabotz*, as vernacular names: according to Dr. Aubert (*Bullet. de l'Acad. Royale*) these names are erroneous.



p. 1248, 6395 ; HAGENIA Lamarck *Encycl. Méth. Bot.*, Suppl. t. ii., p. 423 ; Willdenow *Sp. Pl.* ii. 331. CUSSO, BANKESIA, Bruce's *Travels*, vol. v., p. 73.



*Brayera anthelmintica* Kunth.

A. Flowering branch. B. Bunch of female flowers. C. Flower seen laterally.  
D. Female flower. *a, b, c, d, e* the five outer segments of the calyx.

*Calyx*, with the tube bitracteolate at the base, turbinate ; throat constricted internally by a membranous ring ; limb, 10-partite ; the segments in two series, the five outer ones much larger, oblong-lanceolate, obtuse, reticulate-veined, stellately patent, the five inner ones alternate, smaller, spathulate. *Petals* 5, inserted in the throat of the calyx, small, linear. *Stamens* from fifteen to twenty, inserted along with the petals. *Filaments* free, unequal in length. *Anthers* bilocular, dehiscing longitudinally. *Carpella* two, placed at the bottom of the calyx, free, unilocular, containing one or two pendulous ovules. *Styles* terminal, exerted from the throat of the calyx, thickened upwards. *Stigmas* subpeltate-dilated, crenato-oblong.



*Nat. Ord.*—ROSACEÆ Jussieu. De Candolle places it in Tribe v. *Dryadeæ*. Endlicher, in his suborder, *Spiræaceæ*.

BRAYERA ANTHELMINTICA, Kunth, l. c. DC. l. c. ; A. Richard, Tentamen Floræ Abyssinicæ; *Hugenia Abyssinica*, Lamarck, l. c. ; *Cusso*, *Banksia Abyssinica*, Bruce, l. c.

The only species.

An Abyssinian tree, twenty feet high. Branches round, rusty, tomentose-villose, marked by the annular cicatrices of the fallen leaves. Leaves crowded, alternate, interruptedly imparipinnate and sheathing at the base. Leaflets oblong, or elliptical lanceolate, acute, serrate, villose at the margin and on the nerves of the under surface. Stipules adnate to the petiole, which is dilated at the base and amplexicaul. Flowers diœcious, small, greenish, and becoming purple; repeatedly dichotomous; the pedicels with an ovate bract at the base.

The so-called male flowers may be regarded as hermaphrodite flowers, inasmuch as the carpels are well developed. The female flowers are somewhat different in their structure. The outer segments of the calyx are much more developed than in the female flowers, and are four or five times larger than those of the inner row, and are placed somewhat below them; the petals are entirely wanting; the stamina are rudimentary and sterile.

The ripe fruits are unknown.

The tree grows in Tigre, Agame, and Shoa; it is cultivated everywhere.

Dr. Beke writes that the tree is "found throughout the entire table land of North-eastern Abyssinia, but appears to require an elevation of upwards of six thousand (perhaps of seven thousand) feet for its growth. Where I found it most luxuriant was in the vicinity of the source of the river Abai (Bruce's Nile), at an elevation of close upon nine thousand feet. Tigre, the northern portion of Abyssinia, being, on the whole, of lower elevation than the rest of that country, the tree is only found there in a few places."

Bruce describes the flowers as being of a greenish colour, tinged with purple; and, when fully blown, of a deep red or purple. The petals, he says, are white.

PREPARATION.—Mr. Johnston states that the kosso is gathered for medicinal purposes before the seeds are quite ripe, whilst still a number of florets remain unchanged. The bunches are suspended in the sun to dry, and if not required for immediate use, are deposited in a jar.

PHARMACOGRAPHY.—I have seen only one package of *kosso* (*flores brayeræ anthelminticæ*); this was kindly opened in my presence by M. Simond, of the firm of Caylits, Simond, and Co., the agents of M. Rochet d'Hericourt. It was a deal-box, containing about 30lbs. of the dried flowers, wrapped up in a large skin of red leather. On removing the lid of the box and untying the leather package, the fragrant or balsamic odour of the dried flowers was very powerful. It appeared to me to be somewhat similar to the combined odours of tea, hops, and senna-leaves. The flowers had apparently undergone no preparation beyond that of desiccation. The bunches of flowers were perfect and unbroken, though of course compressed. The general colour of the dried mass was greenish-yellow; but when the flowers were more closely examined, the edges of the petals were seen to have a reddish or purplish colour.

The taste of the dried flowers is at first not very marked, but after a few minutes a feeble, senna-like, acrid, unpleasant taste becomes perceptible. By soaking the dried flowers in water they may be unfolded sufficiently to determine their botanical characters, which have been already described. When submitted to microscopic examination the hairs are perceived to be simple lymphatic hairs, tapering at the distal extremity.

In Abyssinia, two sorts of kosso are distinguished; viz., 1st, the *red* kosso produced by the female flowers; 2dly, the male flowers known as *kosso-esels*. In commerce, the two sorts are always mixed together.

**ADULTERATION.**—Considering the enormous price (about £1 15s. per ounce) at which kosso has hitherto been sold in Paris, and the very limited quantity originally supplied by M. Rochet d'Hericourt, it cannot be surprising that the article should be extensively adulterated. Indeed, I have been assured, on credible authority, that the powder now selling as "kousso" is, in fact, the powder of pomegranate bark; and that legal proceedings have been commenced in Paris to put a stop to the fraud, which is well calculated to injure the reputation of the genuine Abyssinian remedy.

I have no doubt but that the microscope would readily detect the substitution; but the surest way of obtaining the genuine article, is to purchase the dried flowers in the entire state, not in the form of powder.

**CHEMISTRY.**—The flowers of the *Brayera* (*i. e.* *kosso*) have been analysed by Wittstein (*ante cit.*) and by Martin (*Journ. de Chimie Med.*, t. vi., 2nde sér., p. 579, 1840). The following are the results obtained:—

<i>Wittstein's Analysis.</i>		<i>Martin's Analysis.</i>	
Fatty oil ... }		Starch	
Chlorophylle } .....	1.44	Saccharine matter	
Wax .....	2.02	Vegetable extractive	
Bitter acrid resin .....	6.25	matter	
Tasteless resin .....	0.77	Green very odorous resin	
Sugar .....	1.08	Crystalline substance,	
Gum .....	7.22	called <i>kwoseine</i>	
Tannin striking a green colour with iron .....	8.94		
Tannin striking a blue colour with iron.....	15.46		
Vegetable fibre.....	40.97		
Ashes .....	15.71		
	99.86		
[Loss .....	00.14]		
	100.00		

The *ashes* consist of potash, magnesia, lime, oxide of iron, sulphuric and phosphoric acids, chlorine, and silica.

With regard to the two kinds of *tannin*, Wittstein observes that, as far as he knows, this is the first instance recorded of a plant containing simultaneously two kinds of tannin, striking, the one a blue, the other a green, colour with the salts of iron.

Although it is not improbable that the anthelmintic property of *kosso* may in part depend on tannin (since the pomegranate bark, which con-



tains this principle in abundance, is, like *kosse*, also an anthelmintic), yet what may be termed the peculiar property of the kosso probably resides chiefly in the bitter acrid resin. This is soluble in alcohol and in ether, and appears to be a neutral body, manifesting neither distinct alkaline nor acid properties.

The crystalline principle to which Martin has given the barbarous name of *kwoséine* (from *kwoso*, the supposed name for *kosso*), is described as consisting of white silky crystals, having a styptic taste, and as being soluble in alcohol and sulphuric ether. They are said to redden litmus paper, and to dissolve, without undergoing decomposition, in sulphuric, nitric, and muriatic acids.

By boiling the dried plant in water a fragrant odour is evolved. No doubt this as well as the odour of the dried plant itself depends on the presence of a *volatile oil*, of which, however, no mention is made in Wittstein's analysis, the oil being present in too small a quantity to admit of its collection when small quantities of the flowers are operated on.

It is not improbable that the anthelmintic properties may in part depend on this oil, for Schimper states, that in Abyssinia the plant is considered to have lost its anthelmintic powers in the third year after its collection. In Europe, however, it retains its powers for a longer period (on account of the cooler climate?); for the flowers which have been used for all the recent experiments, have been collected more than four years, and we are told in the shop-bill of a Parisian pharmacien, that they may be kept for an indefinite period!

An infusion or a decoction of kosso strikes a dark green olive tint with a solution of the sesquichloride of iron.

**MEDICINAL PROPERTIES.**—Neither botanical characters, sensible qualities, nor chemical composition, would have induced us to suspect that *kosso* possesses the valuable anthelmintic properties which experience has shown that it does.

The general and prevailing quality of the Rosaceæ is astringency, dependent on the presence of tannic and gallic acids. This is observed in the flowers (*e. g.* rose petals), as well as in other parts of the plants. In this quality *kosso* agrees with its congeners. But it can scarcely be on this that its vermifuge property solely depends; otherwise rose petals, or any other equally powerful astringent, would be as effective in expelling worms as these Abyssinian flowers. But in Rosaceæ, as in many other families of the vegetable kingdom, anomalies exist—and to this head we must for the present be content to refer *kosso*.

Our confidence in the anthelmintic properties of kosso rests, then, on experience only; and the evidence on this point is very strong. All modern travellers in Abyssinia are agreed on the great success of the remedy on the natives of that country; and the experience of physicians in France, England, Germany, and Switzerland, confirms the favourable reports made by those who have seen the kosso used in its native country.

In Paris it has been employed with great success by Chomel and Sandras (*Ann. de Therap., pour 1847*), as well as by numerous other distinguished physicians. In London our experience of it is much more limited; but the successful results of its use in King's College Hospital, in the hands of Drs. Budd and Todd (*Lancet*, March 16th, April 20th, and May 25th, 1850), and of Dr. Gull (*Lancet*, May 25th),

in Guy's Hospital, confirm the favourable reports of its efficacy, which had reached this country from abroad.

The physiological effects of *kosso* are not in general very great. Sometimes it excites a slight sensation of heat, nausea, or even vomiting, creates thirst, and frequently, perhaps usually, a gentle action on the bowels. But the latter is commonly so slight, that in a considerable number of cases, it is necessary to follow its administration by a mild purgative. It is obvious, therefore, that the efficacy of *kosso* as an anthelmintic does not depend on its purgative or evacuant influence, but on its poisonous or toxic action on the worm; in fact, it is a true *vermicide*. In one case, that of a woman in France, it brought away ten worms, of which one only manifested evidences of vitality, and that for a few minutes only.

*Kosso* appears to be an effective anthelmintic in both kinds of tape-worm, viz., the *Tænia solium*, and *Bothriocephalus latus*. In most of the reported successful cases, the *Tænia solium* was the parasite expelled; but in one of Chomel's cases, the worm which was evacuated was the *Bothriocephalus latus*, and I am informed, that *kosso* has proved most effectual in Switzerland, where, as is well known, the *Bothriocephalus* is the prevailing tape-worm.

The dealers in *kosso* assert that one dose will, in every case, effect the radical cure of tape-worm. But this must be obviously an error. Even supposing that it invariably destroys all the worms in the alimentary canal at the time of its exhibition, it can in no way prevent their recurrence, provided the patient retains his predisposition (which there is no reason to suppose is affected by the *kosso*), and is subjected to the same influence. It certainly does not radically cure the Abyssinians, since, as several writers tell us, they resort to this remedy monthly. Schimper, the governor of Adoa, says it does not completely expel the *tænia*, or at least rarely does so. But, he adds, that possibly in Europeans, in whom the verminous disposition is not so pronounced as in the Abyssinians, it may perhaps act in a more complete manner. In the Abyssinians this verminous disposition is innate, and is dependent, he adds, on the regimen which they adopt.

Hitherto the great drawback to the use of *kosso* has been the difficulty of procuring the remedy, and its enormous cost. At the time when it could be purchased in Paris its price was £1 15s. per oz., or 17s. 6d. per dose. M. Rochet d'Hericourt, the sole holder of the medicine at the present time, refuses to sell any quantity less than his entire stock, at the rate of one guinea per ounce! His nephew tells me that his uncle possesses 1400lbs. of it, which, at one guinea per ounce, will cost 22,400 guineas!!! The impossibility of effecting a sale on such terms will, I doubt not, ultimately compel the holder to reduce his demands to something approaching to reason. It does not appear that the remedy is very costly in Abyssinia. Schimper, writing from Adoa, in Abyssinia, says that it is found in commerce at a very low price. At Yangaro (commonly called Zingaro) the sovereign has the exclusive use of it, his subjects being prohibited from employing it; but in other parts, free trade in *kosso* is permitted. Considering the frequency and rapidity of our communications with Egypt (to which place, according to Dr. Brayer, *kosso* is conveyed by caravans) no difficulty I apprehend will be experienced in obtaining an abundant supply of it. Its present price is a virtual prohibition of its use.



The flavour though not very strong is by no means agreeable ; and is sufficiently powerful in some patients to create disgust and excite vomiting. In one case, under M. Chomel (*Ann. de Therap. pour* 1847), the whole of the remedy was rejected by vomiting.

No ill effects have resulted from its use in this country ; nor have I met with any statement of its injurious action, except in Mr. Johnston's *Travels in Southern Abyssinia* (vol. ii., p. 272, 1844), where it is stated that its—

“ operation is speedy and effectual; and to judge by the prostration of strength it occasioned in my servants when they employed this medicine, it must be dreadfully severe. I can answer for this, that it occasions frequent miscarriages, often fatal to the mother, and even men have been known, after a large dose, to have died the same day from its consequences. I am, therefore, surprised at the noise this remedy has occasioned the last few years in Europe, as if it promised to be a valuable addition to our *Materia Medica*. This, I conceive, can never be, for no civilized stomach could bear the bulk of the drug necessary to produce its effects. Even in Abyssinia it is but barely tolerated, and let another remedy equally efficacious for dislodging tape-worm be introduced into that country, and the use of kosso will be soon abandoned. In fact, several other vegetable productions are now employed to escape the punishment of a dose of this violent cathartic.”

ADMINISTRATION.— Both Bruce (*op. ante cit.*) and Schimper (Bourchardat, *Annuaire de Therapeut. pour* 1849, p. 257) tell us that the Abyssinians take a handful of the dried flowers as a dose. In Paris the dose has varied from four to six drachms. In general, however, half an ounce (troy weight) is considered a dose for an adult.

For different ages the doses are thus adjusted :

Adults .....	1 dose = 240 grs. (half-an-ounce)
Children of from 7 to 12 years.....	$\frac{2}{3}$ of a dose = 160 grs.
“ “ 3 to 7 “ .....	$\frac{1}{2}$ of a dose = 120 grs.
“ not exceeding 3 “ .....	$\frac{1}{3}$ of a dose = 80 grs.

The kosso should be taken in the morning fasting. The only preparation necessary is, that the last meal of the previous evening should be slight. The evacuation of the bowels by a mild purgative or a lavement is also desirable.

The mode of administering the remedy is as follows :—The powdered flowers are to be mixed with luke-warm water (for an adult about ten ounces), and allowed to infuse for a quarter of an hour. A little lemon juice is then to be swallowed, and, the infusion being stirred up, the whole is taken, liquid and powder, at two or three draughts, at short intervals, being washed down by cold water and lemon juice. To promote the operation, tea (without sugar or milk) may be taken. In three or four hours, if the remedy has not operated, a dose of castor oil or a saline purgative should be administered.

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