

A TREATISE

ON

BELLADONNA.

The Therapeutic Uses are written for this Treatise by J. S. NIEDERKORN, M. D., Versailles, Ohio.

Illustrations Nos. 1, 2 and 4 are drawn for this Treatise by Mr. W. F. HAMMER. Illustration No. 3 is reproduced from the Microscopic Examination of Foods and Drugs, GREENISH.

The Description, History, Chemistry and Pharmaceutical Record are by JOHN URI LLOYD.

Treatise No. I	embraces Thuja Occidentalis.
Treatise No. II	embraces Cactus Grandiflorus.
Treatise No. III	embraces Pilocarpus (Jaborandi).
Treatise No. IV	embraces Veratrum Viride.
Treatise No. V	embraces Chionanthus Virginica.
Treatise No. VI	embraces Asepsin and Asepsin Soap.
Treatise No. VII	embraces Collinsonia Canadensis.
Treatise No. VIII	embraces Nux Vomica.
Treatise No. IX	embraces Gelsemium.
Treatise No. X	embraces Belladonna.
Treatise No. XI	will embrace Oenanthe Crocata, Vegetable Caustic, and Crataegus.

Drug Treatise, Number X.

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Belladonna.

[BEAUTIFUL LADY.]

Part Used.-The root, and the mature leaves of *Atropa Belladonna*, Linn. It is a native of Germany.

Common Names.-Deadly Nightshade, Dwale, Black Cherry, Strygium, Strychnon. According to Matthioli of old, the Venetians called it "Herba Belladonna," because their ladies used a distilled water of the plant as a cosmetic; hence the name, "Bella-donna" (Beautiful Lady).

Medical History.-About 1504 a book appeared in Paris, titled, the "Grand Herbarium," which carried the first authentic notice of this plant, although the term "Solatrum minus," used by Saladinus about 1450, is presumed to refer to it. From a very early day, Belladonna has been used in German domestic medicine.

Its effects, internally, were subjects of treatises by Amoreaux, Paris, 1760; Daries, Leipsic, 1776; Munch, Gottingen, 1783 and 1785; and subsequently by all who comprehensively wrote on medicine.

In Toxicology, the German botanist, Leonard Fuchs, figured it as *Solanum somniferum*, 1542, fully identifying its poisonous properties, and J. M. Faber, Augsburg, 1677, wrote on its poisonous action. But the people in the plant's habitat have always been aware that all parts, even to the berries, were poisonous.*

In the eye, so far as we can locate, the first study concerning its local effect is that of Himly of Paris, 1802, although country people in the habitat of Belladonna, from all time, knew that it possessed the power of dilating the pupil.

Although native to the Continent of Europe, Belladonna has been long used in England, having a place in the early Edinburgh and Dublin Dispensatories, as well as in the works of Withering; but Culpepper neglects it.

The earliest American works of the Regular School commend it, e. g. The Pharmacopeia of the Massachusetts Medical Society, 1808, Thacher's Dispensatory, 1821, while the Eclectic Dispensatory, Philadelphia, 1827, (†) commended the extract of the leaves. Homoeopathic literature from the first has valued Belladonna, which

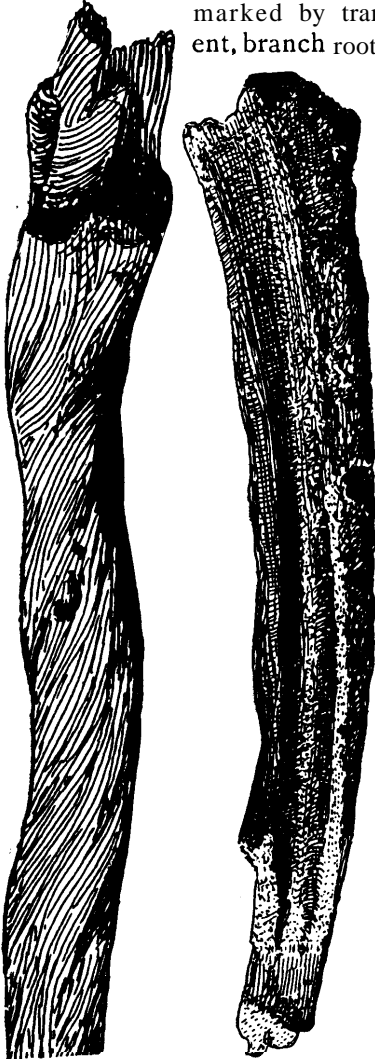
(*) The most complete treatise we know on Belladonna in a physiological direction is that of Dr. John Harley, co-editor of *St. Thomas' Hospital Reports*, 1874-76, London, 1869, in his work, titled, "The Old Vegetable Neurotics," of which the Lloyd Library is so fortunate as to possess a copy inscribed by the author. In it is also inscribed the autograph of "Monsieur Professor Ernest Charles Laseque," a well-known French physician and medical writer, born 1816, died 1885; co-editor of "Archives Generales de Medicine," 1855-83.

(†) This book was not a part of the literature now known as Eclectic in America. It was published anonymously, by "A Practising Physician," who belon ed, evidently, to the Regular School. In this connection it may be stated that a journal was published in Philadelphia, 1836 to 1840, under the editorship of Dr. John Bell, titled, "The Eclectic Journal of Medicine." It was strictly Regular and had no interest in the American Eclectic School. It was continued as the "Bulletin of Medical Science."

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is a favorite Homoeopathic remedy. In Eclecticism, Beach gave it prominence in all his works, while Dr. King, in the first edition of his American Eclectic Dispensatory, gives it much space. All Eclectic authors have highly commended it. The Thomsonians have never used it, and will not employ it. (*)

Description.—Green Belladonna root is from one to two inches thick, and a foot or more in length. The root is brown, rough, marked by transverse ridges, and by stout, divergent, branch roots. It has a radiate structure if sliced



NO. 1--PRIME BELLADONNA ROOT, DRIED.

NO. 2--INFERIOR, SLICED OLD BELLADONNA ROOT.

transversely; is possessed of an earthy smell, has little taste, but leaves a powerful, acrid after-taste. The bark is thick, juicy, and internally of a dull cream color. The dried root is rough, dirty-grey externally, whitish internally, appearing in commerce in irregular pieces. (See cut No. 1, showing good root; No. 2, inferior, sliced old root.) So far as medicinal value is concerned, the bark is the richest part of the root, hence (see cut No. 1 and also Drug Study No IX, page 5, Gelsemium), small roots are desirable, because in them the proportion of bark is greater.

Until now, all the Belladonna root of commerce has been the wild drug of Germany. Cultivation on a large scale by Johnson & Johnson have been exceedingly promising, especially as concerns its quality. If it becomes an American crop, culture will permit of its collection when in best condition.

The microscopic structure of Belladonna is peculiar, in that many of the cells of the middle layer, as well as central parts of the root, are loaded with small octahedral crystals of calcium oxalate. (Fig. 3, p. 4.)

(*) Thomson discarded all poisons, and his followers have adhered to his precept. Notwithstanding the favorite Thomsonian remedy, Lobelia, is classed by some with poisons, and Thomson was the subject of great persecution because of his using it.

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The following data from "Red Cross Notes," Series V, No. 2, Johnson & Johnson, records the yield of total alkaloid, at different dates, in cultivated Belladonna:

Seeds planted in hot houses in February and March, 1904, transplanted to the open field in May.

June 24th.	Plants, 6 inches high.	August 13th ,	Fruit Setting.
	Leaves, 0.453.		Leaves, 0.375.
	Roots, 9.568.		Roots, 0.27.
July 28th.	Plants in full bloom.	September 26th.,	End of Season.
	Leaves, 0.5 143.		Leaves, 0.800.
	Roots, 0.337.		Roots, 0.3275.
			Stems, 0.1734.

Constituents.-In our opinion, the term *derivatives* will better apply to the Belladonna ultimates, than *constituents*. Even the best

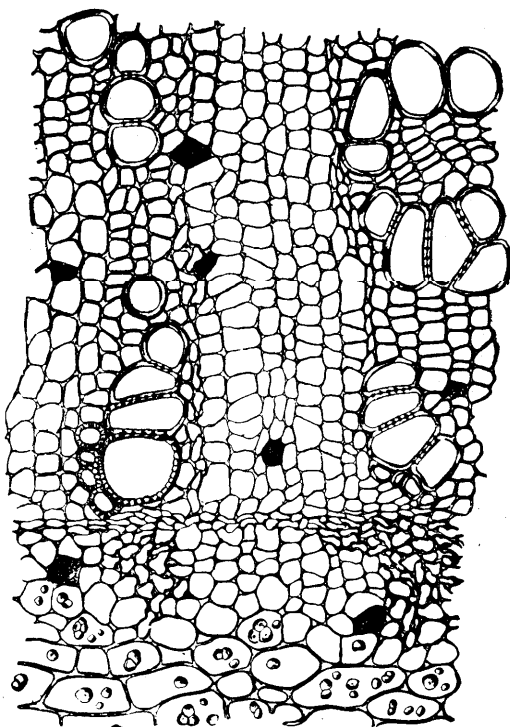


FIG. 3.—MICROSCOPIC SECTION OF BELLADONNA.

The black deposits are crystals of calcium oxalate.

known alkaloid derived from it (*atropine*) does not exist materially in prime Belladonna. But yet the drug tissue of all parts of Belladonna is strongly alkaloidal, and inasmuch as one of the final products of correlative chemistry is the characteristic alkaloid *atropine*, this strongly personal substance is usually taken as a standard for estimating the drug. Atropine was discovered in Belladonna root in 1819 by Brandes and was made in pure form, 1833 (Fluckiger), by a German apothecary named Mein, and was almost simultaneously discovered in the herb by Geiger and Hesse. The root is exclusively employed by alkaloid manufacturers (see *Scopolia*, p. 5), but it varies greatly in alkaloidal yielding qualities. Considered from this point of view, Belladonna is one of the drugs needing most watchful care. Lefort (1872) showed that the maximum of atropine yielded by young roots was 0.6 per cent, whilst old, large roots gave not

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more than 0.25 to 0.31 per cent. In our experience it is not easy to find commercial Belladonna to assay as high as 0.5 per cent pure, total alkaloid.

Belladonna root and leaves yield other alkaloids and other constituents than atropine. These are subjects of much controversy, because experimenters, by reason of different methods of procedure, have either failed to find what others have discovered, or by their chemistry have created substances others did not produce. Some of these products may be named as follows:

Hyoscyamine ($C_{17}H_{23}NO_3$) is the principal alkaloid of Belladonna; by its transformation, chemists make atropine, which has the same formula. *Hyoscine* ($C_{17}H_{23}NO_3$) was discovered by Ladenburg; *Chrysoatropic acid* by Kunz; *Atrosin* and *Belladonnine* by Hiibschmann. Succinic acid, malates, oxalates, combined with sodium, potassium and magnesium, are conceded by all analysts. These, together with gum, wax, asparagin, and chlorophyl (in the leaves only), starch, and albuminous bodies that are peculiar not only to Belladonna, but to most plants, constitutes the Belladonna products and educts, to which may be added certain artificial alkaloids produced from atropine, but more distant even than atropine, from natural Belladonna tissue.



FIG. 4 - SCOPOLIA
the Sophistican
of Belladonna

Adulterations.-The usual admixtures 'or contaminations of roots resembling Belladonna are found in the commercial drug, sometimes intentionally, and again, through carelessness of collectors. If chicory is present, it is always by intent. The one great sophisticant is the root of *Scopolia*(*) (Japanese Belladonna), a Japanese plant which stands as the connecting link between *Hyoscyamus* and *Atropa*, differing mainly in that the fruit is not a berry, and the root is in the form of a rhizome. For these reasons there is no excuse for either collector or user employing this drug, as the distinguishing berry is absent, and the scar-marked *Scopolia* (see fig. 4) rhizome does not in the least resemble the parsnip-like root of Belladonna (see fig. 1 and 2). Notwithstanding these facts, immense quantities of *Scopolia* are sold and used for Belladonna.(†)

The sensible and chemical qualities of *Scopolia* are markedly similar to those of Belladonna. It yields atropine by the same pro-

(*) Johann Anton Scopoli was a learned botanist, physician and apothecary, born at Fleimsthal, Tyrol, 1723, where he acquired Latin at the gymnasium, beginning next the study of medicine at Innsbruck. Natural history, chemistry, botany and materia medica were not there taught, and physiology, vathology and therapeutics only in a meager way, which induced him to resort privately to the medical books published by Boerhave, Hoffman, Sydenham and

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cess that produces atropine from Belladonna, and yields it in larger amount. Its alkaloidal constituents are naturally the subject of much controversy, both in themselves and when contrasted with those of Belladonna, and in our opinion are likely to remain so, as long as different chemists, with different chemicals, are attacking a structure that, under various influences, yields varying products. For example, *Scopolamine*, which was first asserted to be the characteristic alkaloid of the drug, was considered by E. Schmidt to be identical with *Hyoscine*. O. Hesse next found it to consist of two alkaloids, *Hyoscine* and *Atroscine*, and next, Schmidt proved, to his own satisfaction, that *Hyoscine* was a mixture of *Scopolamine* and some other body, finally asserting that *Hyoscine* does not exist. The facts are, the broken-out fragments of these natural drug structures are interesting, and chiefly so, because of the opportunity they give investigators to puzzle themselves and others over artificially made products, whose qualities, changing under the influence of 'chemical reagents or atmospheric action, remind one of the chameleon. If a

others. Early in life he showed his love for botany by gathering herbs for an apothecary and studying their names and uses. He also accompanied herb collectors to Innsbruck-Alps, gathering and drying herbs. Then he visited the Botanical Garden of Venice, where he studied the herbarium. Next he went to Vienna and passed an examination by the medical faculty, in order to pursue his profession in Austria. During this journey he was shipwrecked, and most of his books and other valuables lost. In Idria he was compelled to administer medicine free to 2000 people. Here his wife and son died, and his shop was twice destroyed by fire. Finally the Government increased his salary 400 fl. annually, conditioned that he also lecture on mineralogy. He remained in Idria sixteen years. In 1766 his much appreciated *Flora Carniolica* appeared in Venice. *Hyoxyamus Scopoli* was placed under *Atropa* by Scopoli himself, but later was named after him. This plant was distinct enough to typify a genus, and as such includes the Japanese plant *Scopolia Japonica*, that furnishes the drug *Scopolia*. In 1761 appeared his work on Physics and Chemistry, Idrian quicksilver and vitriol, and the sickness of the mountain people of the quicksilver regions near Venice. This was afterward reissued, 1771, by Schlegel, and again, in translated form, by Herr Von Meidinger, 1786. From 1769 to 1772 appeared his five volume *Anni Historica Naturalis*, subsequently issued in German at Leipzig, wherein he describes his botanic journey to the Tyrolean Alps, making additions and corrections. After Jacquin went to Vienna, Scopoli was appointed in his stead by the Queen, removing to Hungary, where he lectured on metallurgy and mineralogy. Here he issued *Crystallograpia Hungarica*, *Fundamenta Metallurgica*, and in 1772 a new edition of his *Flora Carniolica*, completely transformed to the Linnean system, and enlarged. In 1776 he received an appointment at Pavia, as Professor of Chemistry and Botany. Here he established both botanical gardens and chemical laboratories. His new discoveries were issued under the title "*Deliciae Florae et Faunae*." He also translated into Italian the valuable chemical dictionary of Macquer. He became blind in his right eye one year before his death, which occurred in his 66th year, 1788. This is the record of the scientist whose name is affixed to this Japanese sophisticant, *Scopolie Japonica*, the "Belladonna of Japan," a plant he had never seen

(f) One of the most acrimonious discussions this writer has ever indulged, ocured with a dealer in crude drugs some years ago, because a consignment of Belladonna turned out to be *Scopolia*. The argument, that others accepted it for Belladonna did not serve to prevent our returning it as a sophisticant. Let us reproduce in this direction, the remarks of Prof. Frank Woodbury, M. D., concerning such sophistication:

"It is alleged, however, that some pharmacists are in the habit of dispensing, for genuine Belladonna plaster, a preparation which contains no extract of Belladonna, either leaves or root, but which is made with extract of *Stramonium*, or of *Duboisia*, or of *Hyoxyamus*, or of *Scopolia*, or some other member of the mydriatic alkaloid-bearing group of solanaceous plants. I think such a course is ethically and scientifically indefensible." -Red Cross Notes, No. 12, 1898.

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person desires the full qualities of *Scopolia*, he must use a preparation carrying the drug's structural constituents, unaffected by acid, alkali, or other destructive chemical reagent.

Belladonna is not *Scopolia*, and no man has the right to sell the one drug for the other. Especially has no man the right to label a pharmaceutical preparation of *Scopolia* with a *Belladonna* label. And now we will consider, briefly, the principal artificial product of both *Belladonna* and *Scopolia*.

Atropine.-This, the most stable product, is a very valuable remedy in its proper sphere, and, possibly, it matters little whether it is derived from *Belladonna* or *Scopolia*. It is a very strong organic base, intensely poisonous, white, odorless, crystalline, or amorphous. It dissolves in 150 parts of water, and in three parts of alcohol. It is seldom used in therapy, other than, occasionally, for making ointments and oleates. Atropine Sulphate, the salt most used, is a white, odorless, crystalline salt. It dissolves in less than half its weight of water, and in about six parts of alcohol. It is the atropine compound employed by oculists, and is limited almost exclusively to oculists, largely because of its intense violence when administered internally. This is the decision of thousands of qualified practicing physicians, as well as of exceptional expert authority, which is well voiced by Professor Frank Woodbury, M. D., as follows:

"Atropine has been before the medical profession in the role of the active principle of *Belladonna* for more than fifty years. Notwithstanding its obvious points of superiority for medical purposes, in facility for administration, both by the mouth and hypodermically, the smallness of the dose, its solubility, and uniformity of action, atropine has certainly not succeeded in winning the favor of physicians to the exclusion of the official preparations of *Belladonna*. Practicing physicians and clinical teachers continue to prescribe *Belladonna* preparations for a multitude of morbid conditions, in which experience has shown them it is of value, and have restricted the application of atropine almost entirely to its hypodermic use, and for a very limited number of conditions. Among these its epidermal application is never included. In our clinical amphitheaters, as in private practice, the prescription of *Belladonna* plasters is of daily occurrence, but the prescription specifically calling for the application of atropine to the unbroken skin, in the form of a plaster, has yet to be written."-Red Cross Notes, No. 12, 1898

Attempts to replace natural *Belladonna* preparations by atropine have caused distressing results when the alkaloids were in amount sufficient to exert their violent influence. A small amount of an ointment containing only three grains of atropine produced death in two hours.

In this connection, we present the very latest, and let us add, exceptionally authentic information, from Mr. F. B. Kilmer, of Johnson & Johnson, than whom no man is better qualified to speak

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concerning the external use of Belladonna and the qualities of Belladonna plasters: (Personal letter with privilege of using facts given,)

“Observations made in our laboratory coupled with clinical observations made at our request, and reports from competent observers, have led us to emphatically believe that atropine does not represent the therapeutical value of Belladonna, especially when used in an external application, such as a plaster. All epidermal applications of atropine have given negative results and been abandoned, whereas, the external applications of Belladonna in the form of plasters and otherwise have a specific and an increasing use.”-Feb. 21, 1905.

ATROPINE SULPHATE IN EYE DISEASES.

BY PROFESSOR KENT O. FOLTZ, M. D., Cincinnati, Ohio,

Indications. - In nearly all forms of iritis; in irritation of the iris, as shown by a slight pinkish pericorneal zone; traumatism of the iris, whether accidental or operative. In ulceration of the cornea, especially with a tendency to perforation, and the ulcer is central. In interstitial keratitis, and in ophthalmia neonatorum when the cornea is implicated.

Contraindications. - In sympathetic iritis and in iridocyclitis the drug is usually contraindicated. In glaucoma this is especially true. After the age of 40, care must be observed, as it may possibly induce glaucoma. In perforating ulcers of the cornea located near the periphery, the drug is usually contraindicated.

The employment of the alkaloid for internal administration is usually unsatisfactory, better results following the use of a reliable preparation of the crude drug Belladonna.

TOXICOLOGY AND TREATMENT OF BELLADONNA.

BY PROFESSOR HARVEY WICKES FELTER, M.D., Cincinnati, Ohio.

Except in degree and rapidity the toxic effects of Belladonna and its chief alkaloids are practically identical. Small doses occasion dryness and constriction of the throat, with possibly disordered vision and such unpleasant head symptoms as vertigo and confusion of ideas. Moderate doses provoke a greater degree of dryness of mouth and throat, on account of which there ensues marked difficulty in swallowing. The pulse is slowed, the pupils dilated, accommodation defective, and vision confused. The skin is dry and a considerable rise of temperature may take place. When, however, a dose large enough to produce vaso-motor paresis is taken, the temperature

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falls. Large and toxic doses greatly augment the dryness and dysphagia and giddiness, the patient reels or staggers when he walks, there is great thirst, and sometimes drowsiness and nausea and vomiting occur. The saliva now becomes suppressed, breathing is rapid, and dilation of the pupil extreme. Vision is either lost, or indistinct and double. The rate of the pulse may be doubled and the volume is full and hard. A marked scarlet efflorescence, resembling that of scarlatina, but lacking the punctations and subsequent desquamation of the latter, now overspreads the countenance and progresses upon the neck and body. The eyes are brilliant and staring, and the conjunctive may be congested. A peculiar active delirium accompanies and is of an illusional and loquacious character. The victim, though oblivious of his surrounding, sees visions, entertains spectres, has fancies and hallucinations, and other phantasmagoria, and gives way to laughter and gayety; again the cerebral "disturbance may be of a wild maniacal type, with furious delirium and fighting propensities. Loss of speech often occurs early, though repeated movements of the tongue and lips indicate the efforts to articulate. Purging, vomiting and unsuccessful attempts to micturate are frequent, though not constant, symptoms of Belladonna poisoning. Finally, with (rarely) or without convulsions, occurs a complete abolition of function, stupor sets in, the pulse becomes rapid and weak, the limbs cold, and paralysis closes the scene in death, which results chiefly from respiratory paralysis.

Should recovery take place, the patient seldom recollects any of the circumstances of his illness.

Extreme dryness of throat and mouth, scarlet efflorescence without puncta, widely dilated pupils, staring eyes, suppression of urine, and talkative or wild delirium should lead one to suspect Belladonna poisoning. In medication, the first three symptoms should be a warning to cease the administration of Belladonna or its alkaloids.

Dose and Fatal Period. - When atropine is the poisonous agent the effects are much quicker than with Belladonna, and abolition of muscular power may occur without either delirium or convulsions having occurred. A few Belladonna berries have caused death, as has an enema containing 1-6 grain of atropine. By mouth 1-12 grain of atropine and hypodermically 1-30 grain have likewise proved fatal., Again, recovery has followed the injection of much larger doses. Death has occurred in five minutes after the injection of atropine. It seldom takes place in less than two hours, and usually does not occur under fifteen to eighteen hours. Symptoms of poisoning are often delayed from one hour to five hours after taking the drug.

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Treatment of Belladonna poisoning should be prompt. Emetics, stomach pump, lavage tube, and tickling the throat to produce emesis should be resorted to at once. As Belladonna tends to wholly suppress the urine, catheterization should be resorted to early and frequent, to eliminate the poison and to prevent its reabsorption. As emetics, zinc sulphate, 20 grains, powdered ipecac, 10 grains, or mustard and salt (equal parts), 2 teaspoonfuls may be given in warm water, followed by copious draughts of luke warm water, to facilitate emesis. Unless contraindicated by marked depression, $\frac{3}{8}$ grain of apomorphine may be given. Purgatives, such as castor oil, are useful to free the intestinal tract of the poison. Sweet spirit of nitre facilitates its removal by way of the urinary organs.

As partial chemical antidotes, animal charcoal, tannic acid, and solution of iodine may serve a useful purpose.

While by no means a settled fact that morphine and Belladonna are in all respects antagonistic, it is still recognized that morphine judiciously employed is the best antidote to Belladonna and atropine poisoning. The best rule to follow is to be guided by the pupillary response. Therefore small and repeated doses administered until the pupils contract and are maintained in contraction is the best method to pursue. From the fact that jaborandi and its alkaloid pilocarpine, and calabar bean and its alkaloid physostigmine are in some measure antagonistic to Belladonna, they have been recommended and employed as physiological antidotes in poisoning by atropine and Belladonna.

PHARMACEUTICAL PREPARATIONS.

Fluid and Solid Extracts, U. S. P.-The solid extract is made from Belladonna leaves, the fluid extract from Belladonna root. These are the official, pharmacopoeial preparations. When properly prepared they are very energetic, but are open to the general objection to extracts, in that the large amount of inert extractive materials present, is often a disturber of both quality and elegance. Still, inasmuch as no one constituent obtained from the drug parallels the natural combination in a safely therapeutic sense, physicians of the Regular School in medicine very wisely maintain these extracts as their remedial Belladonna standards. The solid extract, properly made, be it stated, stands unexcelled as a constituent for plasters, and as a component for Belladonna ointments.

Tincture of Belladonna, U. S. P., is made of Belladonna leaves. It has no advantage over the fluid extract, and seems to us to be one of the preparations the U. S. P. Revision Committee might well drop.

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Belladonna Plaster.-This is made (U. S. P.) by incorporating extract of Belladonna with an excipient made of a mixture of soap plaster and resin plaster. It is a great favorite with physicians and is a deservedly popular preparation. It should by assay produce 0.5 per cent mixed alkaloids of Belladonna root. In this connection the United States Dispensatory observes that “ machine-spread Belladonna plaster can be found on the market, which was admitted by a representative of the manufacturer, to contain no Belladonna whatever.” Whether such trade plasters are made of *Scopolia*, or the alkaloids, matters little, they are not true to name. The “rubber” machine plasters are very elegant and very satisfactory, and our experience with Mr. Kilmer during many years has convinced us that in his direction at least the most exacting pains are taken with the extract, which is unquestionably true to name.

Specific Medicine Belladonna.-This preparation is the recognized standard with Eclectic physicians. The process of preparation abstracts the characteristic structural drug constituents, without any application of chemistry or the use of chemicals, the aim being to correlate the qualities of the drug as a whole, and preserve them in an imperishable form. To this effect, continuous systematic investigations have been applied for several decades. The standard of strength is that of one grain of the best drug to one minim of the finished product. The concentration is accomplished by means of apparatus that attains the desired object, without disintegrating the natural drug constituents. (*)

Specific Medicine Belladonna has established itself as a standard of excellence, and has maintained this position for thirty years. It is not, however, commended nor employed because it contains atropine, for as Belladonna root does not appreciably contain atropine, the Specific Medicine Belladonna, carrying the unaltered constituents of the root, is practically free from the alkaloid. If, however, it be assayed by the usual methods adopted with Belladonna liquids it will, by reason of the chemistry applied, yield the Belladonna alkaloids liberally. Solutions of atropine and its salts are easily made (see atropine), they are physiologically very active poisons, and if the alkaloid only is wanted, preparations labeled Belladonna can be readily (**and very cheaply**) made to stand atropine tests, **without** the use of **any Belladonna drug whatever**.

Qualities.-Our experience teaches that to carry the full structural value of the Belladonna constituents into the Specific Medicine Belladonna necessitates the inclusion of the dark-colored semi-resin,

(*) This apparatus will be the subject of a treatise of this series, in which it will be illustrated and described in detail.

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between which and the structurally active compound exists a very intricate relationship. It is a part of the active tissue of Belladonna, and we accept that the markedly characteristic and yet lasting action of the Specific Medicine is largely due to the qualities that reside in the complex structure, in which this relative of resins takes an undetermined, but yet very important part. Consequently, Specific Medicine Belladonna is an exceptionally dark-colored member of the class of preparations (Specific Medicines) which are, as a rule, very light in color. It possesses a slightly sweet odor, and an insipid, but not unpleasant taste, which, however, leaves a long, lingering, acrid after-taste, and a persistent, dry sensation in the throat. Added drop by drop to alcohol, a red-brown color is imparted, the liquid remaining clear. Water, under the same conditions, becomes dark and semi-opaque. The gradual addition of ammonia water scarcely affects the color of the alcoholic solution, but it instantly clarifies the aqueous mixture, producing a brilliant, red-brown liquid.

THE THERAPEUTICS OF BELLADONNA.

BY J. S. NIEDERKORN, M. D., Versailles, Ohio.

Belladonna is a remedy deserving the 'most intimate consideration of the up-to-date therapist. It is not necessary that I contrive a scheme in mind, in order to substantiate the assertion that many medical men of to-day know comparatively little concerning the positive medicinal qualities of Belladonna, and less concerning when and how it should be exhibited in order to obtain its real value as a medicine. None of us know it all, but there are too many who do not understand the remedy as they should.

There can be no doubting the fact that the promiscuous prescribing of remedies is incorrect; and by that I mean the practice of prescribing medicines irrespective of real pathological conditions, and that of exhibiting them because some one recommended that they be employed in this or that disease, is no good practice and far from correct.

The laity in general understand that Belladonna is an energetic, narcotic poison, if taken in excessive and inordinate doses;-it is to be noted, and a fact attractive of particular attention; that the doses recommended by many medical men are, if therapeutic effects are desired, exceedingly excessive; for it certainly is one thing to get the physiological effect of a drug, and another to obtain its therapeutic result. And it is also a fact that drugs known to be active poisons may prove to be among our best medicines.

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Belladonna kills by exhausting the powers upon which circulation and respiration depend-it paralyzes cerebro-spinal centers probably more by its primary effect upon the sympathetic, than by its direct effect. Before its paralyzing influence is exerted, its effect as a circulatory and a cerebral excitant is particularly noticeable, cerebral disturbances being exceedingly prominent. Large doses paralyze, small doses stimulate, and it is through its action upon the nervous system that its circulatory effect is obtained. It is said of Belladonna that if given in continued large enough doses to dilate the pupils, its usefulness as a remedy is lost, in so far as concerns its specific action. To be able at all times to exhibit the remedy in such manner and doses as will best exhibit its specific action, is of far more importance to the therapist, than it is to administer it merely to the extent of receiving its physiological effect, and then discontinue its use. Whilst it is true that the physiological effect of a drug is sometimes desirable, it is equally true that the therapeutic, or rather specific action of a remedy is usually what we are interested in. The specific action can best be obtained by the careful observation of pathological conditions which have been known to be relieved by the remedy, the size of the dose, and the employment of a reliable preparation of the drug.

On account of the uniformity of strength, it has been our custom to use the Specific Medicine Belladonna, and at this time we entertain not the least desire to discontinue its use. Thousands of physicians highly esteem that preparation of the drug, and employ it exclusively.

It may be well to advise those unfamiliar with the Specific Medicine Belladonna, that if large doses of the drug must be administered, and specific action is desirable, this preparation of the remedy had best be let alone, for, owing to its energy, results will not be satisfactory, and the preparation will be wrongfully condemned. When dosage is mentioned throughout the following paper, it applies only to the Specific Medicine.

The direct specific indication for Belladonna is impairment of the capillary circulation, with congestion. With this condition always before us, not much difficulty will be experienced to find its exact place in therapeutics. In acute disorders, where there is inclination to dullness or stupor, or where these conditions really exist, pupils dilated, face pallid and expressionless, cerebral congestion, sluggish capillary circulation, extremities cool-all these call for Belladonna, *but in small doses*. It stimulates capillary circulation by its decided influence upon the vaso-motor centers and nerve peripheries; is a direct and powerful stimulant to the sympathetic and

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the heart, exercising a powerful influence in enfeebled heart's action and depression of the sympathetic influence.

Whether child or adult, if during the course of disease our patient shows a decided disposition to sleep, there is dullness of intellect, dilated pupils, oppressed pulse, eyes partially open, all indicative of cerebral congestion, Belladonna is indicated. There is a condition of chilliness, skin pallid, pulse full but oppressed, dull, sleepy headache, indicating capillary stasis, which Belladonna overcomes. Those dull, heavy headaches, where pain is constant and where there is a feeling that if it were not for the pain, the patient could sleep, the remedy promptly relieves.

In cerebral or spinal congestion, acute or chronic, where there is a dull, heavy aching and fullness in the head, drowsiness, eyes dull, pupils dilated, or a condition of apparently threatening apoplexy, Belladonna is a positive remedy. Sore throat, where the mucous membranes have a dark-red, dusky color, capillary engorgement plainly evidenced; at the onset of or threatened inflammatory conditions, pneumonitis for instance, to relieve the capillary engorgement and prevent local effects, the remedy is indicated. Persistent inclination to sleep, accompanied by vomiting, is relieved by it. So is whooping cough, where there is also the characteristic dullness, hebetude, and impairment of capillary circulation.

In the exanthemata, especially the congestive forms, scarlatina in particular, eruptions are tardy, the skin appears congested and patient is drowsy, the remedy proves of true value. In meningeal inflammations, especially in the subacute forms, temperature several degrees above normal, skin cold and moist, eyes dull, pupils dilated, head drawn back, and is being rolled from side to side, eyes partly open during sleep, the remedy is directly indicated. Post-scarlatinal nephritis is a frequent condition relieved by Belladonna; so are other cases of renal capillary engorgements.

In all of the foregoing conditions the remedy proves its best results when given in small doses; from five to eight drops are added to four ounces of water, and this solution is given in teaspoonful doses every hour, or every two hours. The condition commonly called diabetes insipidus, where extremities are cold and there is feebleness of the sympathetic, and incontinence of urine, when there is relaxed tissues and an engorged circulation, Belladonna will cure, but the dose usually is **larger**- say one-third to one-half drop doses, in children not so much. Its value in night sweats is unquestionable, and to arrest secretion of the mammary gland its action is prompt. I have seen exanthematous eruptions follow the administration of small doses of the drug; these were similar to the eruptions of scar-

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latina, and disappeared promptly with the withdrawal of the drug. And I have seen cases where the usual conditions calling for Belladonna were present, but the pupils were contracted; still, the agent seemed to exercise its usual beneficial effect. Neuralgic conditions, neuralgic dysmenorrhoea, where cool extremities and chilly sensations are marked, will be promptly relieved by the remedy, the dose being somewhat larger. I believe it to be a prophylactic against scarlet fever, if given in small doses; and if administered early in that disease, the eruptions will more readily appear and renal congestion will be avoided.

I believe Belladonna to be particularly a child's remedy, and know that the dose must be small, if beneficial results are to be obtained. Active delirium during fevers, where there is cerebral congestion and surface circulation is markedly sluggish, dusky appearance of skin, will be subdued if the remedy is given in grain doses of the 3x. Deep aching of loins or back, with a sense of heavy fullness, will be relieved by one-third drop doses; so will the aching and chilliness often present during a "cold" or preceding fever or gripe. In constipation, when the sphincter ani is abnormally contracted and there is local capillary congestion and lack of secretion, Belladonna is indicated.

In "run-down" individuals, where there is indisposition to exertion, extremities are cold, nervous debility, when it is desirable to stimulate, this agent alone, or combined with any other indicated remedy, will produce salutary effects.

Belladonna has proven valuable in other conditions farther than those mentioned. Salivary overactivity can be controlled by it; epilepsy or epileptiform convulsions, when congestion exists, are benefited by its use; it is known to cure certain cases of rhus poisoning and erysipelas; mastitis and orchitis are relieved; as an antidote to opium it is well known, and its influence in particular eye affections is pronounced. In eye affections, however, we do not usually depend upon the internal administration of Belladonna for results. Owing to its special adaptability in ophthalmic work, it is customary to exhibit sulphate of atropine, a poisonous alkaloid obtained from Belladonna, and even in the eye, particular care must be exercised in using the alkaloid, in order to avoid doing mischief or irreparable harm. The cases in which atropine is applicable should be selected according to conditions, and these distinguishing points are made clear to us in works devoted to this particular kind of affections.

I have said that the direct indication for Belladonna is impairment of the capillary circulation, with congestion. Feeble innerva-

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tion, feeble and sluggish circulation with tendency to drowsiness or coma, dilated pupils, cool extremities, describe it pretty well. Now, it matters not whether it is the skin, spinal cord, cerebral, cerebro-spinal centers, or where or by what name the disease present has been called; if such conditions as I have mentioned are present, Belladonna is the remedy. It will relieve the array of conditions above mentioned, which we recognize by nature's evident display of distress. But the dose of the remedy must be in the proportion as taught us by experience; small doses must be used if its specific effect is desired,

SPECIFIC INDICATIONS AND USES.

This the remedy for congestion, especially of the cerebro-spinal centers. The indications are: dull eyes, dilated pupils and somnolence or coma. The symptoms calling for the use of Belladonna are usually very plain: the patient is dull and stupid, and the child drowsy, and sleeps with its eyes partly open; the countenance expressionless ; the eyes are dull and the pupils dilated or immobile; whilst as it continues respiration becomes affected, and the blood imperfectly aerated.

Belladonna is the remedy for urinary affections, particularly for children, especially when associated with capillary inactivity and a tendency to congestion, throbbing pain in the region of the kidney, and urinal incontinence are conditions in which it proclaims its power. It overcomes spasms of the body orifices. Some forms of whooping cough are relieved by Belladonna, and it is an all important remedy in the exanthemata and in the sore throat of a dry, deep red and swollen character, with great difficulty in swallowing. Mental hebetude and the dull expressionless countenance are very clear indications for Belladonna.

Use.-In congestion of the brain and spinal cord ; in congestive disease of any part; in scarlet fever, and in some cases of whooping cough and sore throat.

Dosage.--Rx Belladonna, gtt. v to gtt. x; Water, ℥iv. M. Sig.-A teaspoonful of the dilution every hour,

Poisonous in overdoses.

PRICES OF BELLADONNA PREPARATIONS.

Specific Medicine Belladonna.

1/4-lb. Packages	60 c. each.	By mail, 82c. each.
1/2-lb.	\$1.15 ..	Not mailable.
1-lb.	2.25 ..	Not mailable.