

hot concentrated solutions. The medicinal use of light and heavy magnesia is identical, both being laxative and antacid; the advantage of the heavy magnesia depending entirely upon its greater density, the average heavy magnesia occupying only about one-quarter the bulk of the light magnesia. In some cases the same substance can be precipitated in a light, flocculent form or in a heavy, granular form, giving rise to the distinction between "light" and "heavy" precipitates.

It is evident then, that "Heavy, calcined, hydrated magnesia" is some kind of "heavy magnesium hydroxide" containing appreciable amounts of magnesium carbonate of the "heavy" kind. It is worth while noticing that heavy magnesias, except this particular kind, are more expensive and scarce in this market so that their use is rather limited.

Regarding calcium carbonate it is astonishing to find products for medicinal use with impurities such as observed in this rather elementary study. The presence of sulphides is inexcusable and dangerous. Other impurities were found in larger amounts than in crude industrial chalk. It is hoped that the present campaign initiated and carried out by our Health Department will put an end to the introduction of drugs and drug-products unfit for medicinal use.

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A PHARMACOLOGICAL NOTE ON BAPTISIA TINCTORIA.

BY DAVID I. MACHT AND JAMES A. BLACK.

INTRODUCTORY.

Baptisia Tinctoria is a plant which has been described in the United States Dispensatories of all the older editions and is still to be found mentioned in the latest 21st edition of the Dispensatory of the United States published in 1926. While the value of this drug is open to question all kinds of extravagant claims have been made in regard to its medicinal virtues in all of the works. Thus we read of its being used as an emetic, cathartic, "hepatic and intestinal stimulant" and of its having been recommended in the treatment of Typhus, Scarlet Fever, Dysentery, and also of its virtues as a nervous stimulant, antipyretic, etc. Locally, preparations of this drug have been used for the treatment of laryngitis and applications to foul ulcers. The U. S. Dispensatory mentions the following N. F. preparations: **Dentifricium** N. F. and **Fluidextractum Baptisiæ** N. F. Perhaps the commonest use of this drug which is still prevalent is as an ingredient of certain mouth washes and dentifrices on account of its peculiar stinging and tingling taste to the buccal mucous membranes. Inasmuch as very little is known concerning the pharmacology of this drug a brief pharmacological examination was made of it by the authors and is here reported.

HISTORICAL.

The drug *Baptisia Tinctoria* or wild indigo comes on the market as the **Radix Baptisiæ Tinctoriæ** and is the dried Rhizome and roots of *Baptisia Tinctoria* a perennial herb growing in the eastern United States and Canada (1). The taste of the root is extremely bitter and acrid, producing a tingling sensation of the mucous membranes of the lips, mouth and tongue. While the pharmacology of the sub-

stance has not been investigated, the chemistry of wild root has been quite thoroughly studied by such distinguished chemists as Husemann and Marmé (2), Partheil (3), Kobert (4) and others owing to its similarity to another alkaloid. It was found that the active principle of Baptisia, called by some Baptitoxin, is really identical with a powerful and interesting alkaloid known as Cytisin, the chemistry of which has been carefully studied by the above investigators. Cytisin is the active poisonous principle found in Laburnum (*Cytisus Laburnum*) and has been isolated also from several other species of Leguminosae besides Baptisia, namely, from *Ulex Europæus*, *Sophora Tomentosa*, etc. It was first obtained from Laburnum root by Gray (5). The empirical formula for this alkaloid has been first established by Partheil and is $C_{11}H_{14}N_2O$. This alkaloid Cytisin is remarkable physically in being very soluble in water and alcohol and almost insoluble in ether and chloroform. The pharmacology of Cytisin has been studied to some extent by Dale and Laidlaw who found that its properties classed it in the Nicotin group (6). Radziwillowicz found that Cytisin produces paralysis of the respiratory and vasomotor centers and affected also the spinal cord (7). Marmé found that Cytisin was especially poisonous for cats and dogs. Thirty to forty mg. given subcutaneously were found to be fatal for cats (8).

Toxicologically Laburnum poisoning is not at all rare. Cases of mass-poisoning by Laburnum have been reported by several writers and have been collected by Blythe (9), a total of one hundred and fifty-five cases of Laburnum poisoning in human beings, one hundred and twenty of which were among children. Vallance reported mass poisoning in fifty-eight boys who ate the root of an old Laburnum tree (10). The chief symptoms were vomiting, narcosis, pain in the stomach, diarrhea, catarrh of the gastro-intestinal tract, dilated pupils and muscular weakness. Poisoning in cattle has also been described following eating of Laburnum roots.

Inasmuch as *Baptisia Tinctoria* contains an active principle Baptitoxin together with several others, namely, Baptisin, Baptin, etc., the first of which at least is very closely related if not identical with Cytisin, it was found desirable to investigate the toxicity of Baptisia preparations and study some of their pharmacological properties. The preparations used in the present experiments were an infusion of Baptisia and a decoction of the same. These were deemed to be very suitable for pharmacological experiments inasmuch as the alkaloid Cytisin (Baptitoxin) has already been found by chemists to be freely soluble in water.

The infusion used in the present investigation was made from a finely powdered root by taking ten Gm. of the powder and pouring boiling water over it. The mixture was allowed to stand for one hour and filtered, with the aid of a suction flask. The powder was then washed with water sufficient to make 200 cc. of infusion.

A decoction of the drug was made by taking ten Gm. of the same powder, putting it in a flask with 200 cc. of water and heating the mixture to boiling. After bringing the water to a boil the boiling was continued for fifteen minutes, after which the cooled mixture was filtered as in the case of the infusion and made up to 200 cc.

EXPERIMENTAL.

Toxicity.—Injections of the infusion and decoction were made into white rats, rabbits and cats. Although Laburnum has been stated by some writers not

to affect the rabbit, the present authors found that *Baptisia* solutions were certainly very poisonous for this animal. On administering 10 cc. of the infusion to a rabbit weighing 1.5 kilo through a stomach tube the animal was markedly depressed, showing some narcotic effect. There was slight paralysis of hind legs. The animal lost its appetite and became greatly emaciated in a few days. An injection of 3 cc. of the infusion or decoction into a rabbit's ear vein was followed by more poisonous symptoms. Here again weakness of limbs was noted, and marked diarrhea.

In white rats injections of infusion and decoction were made intraperitoneally and such injections produced death, the fatal dose of the decoction being about 1 cc. per 100 Gm. of weight.

The most violent poisoning was produced by *Baptisia* infusions and decoctions in the cat. A subcutaneous injection of 5 cc. of such solutions given to a cat weighing 2.5 kilo or more was followed in five minutes by marked salivation and vomiting. Fifteen minutes later the pupils were dilated. There was twitching and spasmodic contraction of the muscles and collapse. The heart was at first slowed and then made more rapid; respiration was depressed and the animal was in moribund condition.

Pharmacology.—In view of the fact that the chief use of *Baptisia* at present is as an ingredient of certain mouth washes and dentifrices and in view of the fact that the taste of *Baptisia* preparations is an extremely bitter one producing tingling of the mucous membranes somewhat resembling that of aconite, the chief pharmacological interest in connections with the drug was thought to be in regard to its possible effect on the sensory nerve terminals. Experiments were, therefore made to determine whether the preparations of *Baptisia* had any local anæsthetic action.

The local anæsthetic effects of *Baptisia* infusion and decoction were carefully investigated in three well-known pharmacological ways, namely, 1. On the cornea of the rabbit. 2. On the skin of the frog. 3. On the conduction of sensory and motor nerve fibers of higher animals.

Experiments on the rabbit's eye were made by instilling solutions of the drug in the regular pharmacological way into the conjunctival sack and testing the corneal reflex. It was found that neither short nor long treatment of the cornea with *Baptisia* solutions produced any local anæsthetic effect whatever as far as the rabbit's eye is concerned.

Experiments on the sensory nerve endings of the frog's skin were carried out according to the classical pharmacodynamic methods. Frogs were pithed and the reflexes of the lower extremities were tested by immersing in weak acid solution. The skin was then washed off with water. After preliminary examination of the reflexes, one of the legs was dipped into a solution of *Baptisia* the other into control solution of water or saline, and after various intervals of time the effect of the solutions on the sensory nerve endings of the legs was tested. No evidence whatever was obtained indicating a local anæsthetic action.

Finally the effect of *Baptisia* solutions on the nerve conduction of the various fibers of the sciatic nerve of the cat was studied by applying bits of cotton soaked in the solution to the nerve so as to block conduction in case of an anæsthetic action on the part of the drug. Electrical stimulation was then applied above and below, according to the ordinary pharmacodynamic methods. No evidence, whatever,

of any anæsthetic effect of either ascending or descending sensory or motor fibers were noted even after prolonged application of Baptisia.

Only small percentages of Baptisia are generally incorporated into mouth washes or dentifrices. The antiseptic properties of Baptisia in such low dilutions (1%) could be *a priori* discounted. Nevertheless, definite proof of the non-antiseptic and non-germicidal properties of Baptisia infusion and Baptisia decoction were not lacking. It was noted in a few days that the infusion and decoction of Baptisia standing at room temperature became cloudy, due to the presence of microorganisms. This indicated that even a pure or strong infusion and decoction were not antiseptic. An examination of these solutions kindly made by Dr. G. F. Reddish, Bacteriologist to this Institution, proved that the solutions were full of various bacteria.

SUMMARY.

It is thus evident that while Baptisia solutions are quite poisonous for various animals they do not exhibit any important pharmacological or therapeutic properties as far as the authors could ascertain. Such solutions were neither antiseptic nor locally anæsthetic. The rational use of such solutions is, therefore, very questionable.

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A PHASE OF THE RELATIONSHIP OF CHEMICAL STRUCTURE TO PHARMACOLOGICAL ACTION.*

BY CHARLES W. BAUER.¹

A discussion of the influence of an acid radicle that renders a drug water-soluble on its degree of toxicity.

Pharmacologists have given enough experimental evidence on the actions of drugs of known chemical composition that the manufacturing organic chemists have found the story of drug action written in the structural formula.

The pharmaceutical-synthetic chemist analyzes the need of the physician, goes to the laboratory and manufactures accordingly. He is interested in manu-

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