ture, in nature and action; they are perishable and changeable to a degree unknown in any other class of remedies; their preparation deals with the infinitely small; contamination and ruin may creep in all unobserved and unsuspected by the novice manufacturer; the quality and strength of the finished product can not be determined by one of limited skill and experience; and finally, special equipment and favorable surroundings are an absolute necessity for the proper prosecution of this work. Clean, pure, reliable antitoxins can not be produced in a livery stable or in a veterinary hospital, any more than linen can be cleansed and purified in a blacksmith's shop. The fad for making antitoxins began as soon as antitoxins became articles of recognized utility, and the craze extended until antitoxins and blood-serums are on tap at short notice in many a dingy barn where not a single sanitary prerequisite for their production is to be found. All this is to be deplored; for no matter how little the manufacturer may possess, either in skill or equipment, a certain amount of his product will find its way to the consumer, where its failure will be noted and charged up against the entire system.

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EXPERIMENTS WITH PARALDEHYDE.*

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This remedy was first introduced to the medical profession by Cervello. I think he was an Italian, as it was soon after reported by Morello and Bergesio at a meeting of the Italian Medical Association.

Paraldehyde is formed from an aldehyd or dehydrogenated alcohol by the action of an acid, either acetic, nitric, sulphuric or sulphurous. Some writers have called it an exaggerated aldehyd, as its molecular composition is a multiple of the latter by three, aldehyd being represented by the symbol C_2H_4O , and paraldehyde by $C_6H_{12}O_3$. When acted on by chlorin it is said to be converted into chloral. It is a colorless liquid, having an unpleasant taste and peculiar odor, which remains with the breath many hours after its administration. Its specific gravity is 0.998, boils at a temperature of 225 F., and is miscible in eight times its bulk of water. Some of the Italian medical profession recommend it as a sedative and hypnotic. For it are claimed all the good qualities of chloral, without its dangers; that it acts first on the cerebral hemispheres without the preceding excitement so common to hypnotics, and subsequently affects the medulla and cord; that in fatal doses it paralyzes the center of respiration, and the heart is last to act; that its hypnotic effect can be maintained by the repetition of sufficient doses; that no ill effects, no nausea, depression nor headache have been noticed after its free administration. This is in substance a quotation from the *Medical News*, on introducing the drug to the medical profession as founded on the experience of Italian reporters.

Another quality of the drug discovered by Cervello is its antagonism to strychnia, although strychnia does not antagonize paraldehyde, the antagonism not being reciprocal¹.

Of the American profession, Dr. C. L. Dana of New York, Dr. J. C. Wilson of Philadelphia, and Dr. J. R.

Uhler, have reported their experience with paraldehyde², and recently Dr. John V. Shoemaker of Philadelphia.

It has been used in sciatica and supra-orbital neuralgia, but gave only temporary relief. The dose was from .5 to 1 dram, with no bad effects. Dr. Dana thought it somewhat less sure and powerful than chloral, but that it might prove useful when that failed or was contra-indicated. Dr. Wilson's observations do not seem to have been so favorable. He thinks it requires a speedy increase of the dose, and that while it may be safe, it will never supersede chloral. Dr. Uhler thinks the sleep produced by this agent is not so profound as that of chloral, but if a patient has to use a sleep-producing agent for a long time, paraldehyde is probably the best, as it does not cause excitement in the early stages of its action, nor interfere with the heart, and is probably a safer remedy. Dr. Shoemaker gives the most flattering report. It may be well to add that the taste and odor are so unpleasant that a patient would very likely not become addicted to its use except in case of necessity.

EXPERIMENT No. 1.

Six patients in the hospital were selected for the experiment.

The first patient, Mr. W., was given .5 dram, pulse 68; dose repeated in 30 minutes, pulse 65; returned in twenty minutes, found patient asleep, pulse 64; patient still asleep at 5 a. m.; on the following morning, pulse 84; no ill effects.

The second patient, Mr. T., was given .5 dram, pulse 68; dose repeated in thirty minutes, pulse 80; returned in twenty minutes, pulse 64, patient not asleep, but slept most of after part of night; bad headache next morning, pulse 72.

The third patient, Mr. K., was given .5 dram, pulse 88; dose repeated in thirty minutes, pulse 80; returned in twenty minutes, pulse still 80; patient slept very little, if any, during the night; no ill effects.

The fourth patient, Mr. C., was given .5 dram, pulse 84; dose repeated in thirty minutes, pulse 65; returned in twenty minutes, pulse 64; patient up all night and tore up his bed; no ill effects.

The fifth patient, Mr. N., received a dose of .5 dram, pulse 68; repeated in twenty minutes, pulse 64; returned in twenty minutes, patient dozed, pulse 60; he slept well during the night; no ill effects.

The sixth patient, Miss C., was given .5 dram, pulse 96; repeated in thirty minutes, pulse 100; twenty minutes later, pulse 92; patient slept two hours during the night, no ill effects.

At another time five female patients were selected, who were kept on the medicine for a number of nights in succession.

The first patient, Miss C., same as before mentioned, was given .5 dram, which was repeated in thirty minutes; only slept a few minutes during the night; the second night she was given 1 dram, but slept none; next morning she had a headache, dry mouth, and was crying and begging the nurse to give her something to relieve her misery and put her to sleep. She ever after refused to take the medicine.

The second patient was given .5 dram, repeated in thirty minutes, and slept well; the second night she was given a dram and slept after one hour. The third night she was given 2 drams and slept in half an hour; the fourth she was given 2 drams, seemed stupid, but slept very little during the night.

The third patient was given .5 dram, repeated in thirty minutes, but slept very little all night; the sec-

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¹ Med. Record, November, 1883.

² Ibid, August 25; N.Y. Med. Jour., Dec. 15, 1883; JOURNAL, May 3, 1884.

second night she was given 1 dram, and still slept very little; the third night she was given 2 drams, but had very little sleep, and the fourth night she was given 2 drams, but remained up all night.

The fourth was given .5 dram, repeated in thirty minutes, with no sleep; the second night she was given 1 dram and rested moderately well; the third she was given 2 drams and slept very little, and the fourth night she was given 2 drams and slept well.

The fifth patient was given .5 dram, repeated in thirty minutes, with no sleep; the second night she was given 1 dram and slept very well; the third she was given 2 drams and had very little sleep during the night, but the fourth, given 2 drams, she rested much better than on the previous night.

On the fifth night, the night-watch reported all as resting well with one exception, but to her great surprise was informed that none of the medicine had been given.

This remedy has been resorted to in a number of other cases in which it acted like a charm, but in many it has failed me altogether. I tried the remedy on myself, but with such ill effects that I did not care to repeat it. As this was tried mostly in cases of insanity, it is, probably, not a fair test either for or against it.

Alcohol, we are sure, is a violent poison in large doses. In the dose of less than an ounce it has been known to kill a medium-sized dog, and many cases are on record of fatal effects being immediately produced in the human subject after comparatively small quantities have been swallowed. As paraldehyde is a preparation from alcohol, and much more concentrated, it is proof that it is more poisonous, unless it is denarcotized during the process of preparation. From reports of different experimenters, a number of patients who were given large doses complained of feeling very similar to those following debauch. Judging from the opinions of others, and that of my own experience, I do not consider it a good hypnotic. I found .5 and 1 dram doses to act better than larger doses. Headache was less liable to follow. Out of eleven cases selected, I can boast of but one happy result. In other cases I had some good and some bad results, occurring with the same patients. Also, we notice in most of the cases, the increase of dose seemed to add to the bad effect. In some cases I recorded pulsations, but took no notice of respiration. It is certainly a hypnotic, and while it may be safe, given in proper doses, I fail to notice any property which makes it equal to other remedies at our command.

EXPERIMENT NO. 2.

In testing it as a germicide I used the following:

Sugar (gran.)	
Yeast (dried) āā.....	gr. xx
Paraldehyde	3i
Distilled water.....	3i

Misce.

I let the mixture stand one week in a warm place, with no fermentation whatever. From this and further observation I believe paraldehyde to be a germicide, but do not know the minimum per cent. at which it will act as such.

Finally, the taste of the drug is very disagreeable. A large quantity of water is necessary to dilute it for use, and the fact that it does not supply the demand already met by other agents, will, in my opinion, prevent its extensive use both in private and in hospital practice.

EXPERIMENT NO. 3.

A large dog was given strychnin sulphate, gr. i, at 9:45 a. m., but on account of the very disagreeable odor and taste of the antidote—paraldehyde—its administra-

tion per orem was a failure, as only one dram was given in one and a half hours. Still the effects of the poison did not show until about 3 p. m., possibly being retarded by the antidote. At 6 p. m. I found him in tetanic spasms of a very severe type, a mere touch being sufficient to throw him into convulsions. At this time I gave hypodermatically, paraldehyde, m. xl, at 6:30; half an hour later I repeated, m. xlv, also hypodermatically, and left him for the night. On the following morning the dog was reported dead. At 4 p. m., on learning that he was alive, I proceeded to his kennel, at which time he partook of raw beef freely. He made a complete and rapid recovery.

Three weeks from the time of this experiment, at 9:30 a. m., I administered to the same dog, paraldehyde, m. xxv per orem, at the same time giving him strychnin sulphate, gr. i, immediately after followed by paraldehyde, m. xxiv, hypodermically. In one hour, m. l, two hours later, m. l, and at this time he ate raw beef freely. At 6 p. m. I repeated, m. xxv—all hypodermatically, except the first m. xxv—and left him for the night. During this experiment he did not reach the spasmodic stage, although locomotion was very much disturbed, which possibly was partially caused by the free use of the paraldehyde. Next morning he refused to eat, but I think it was possibly on account of a sore mouth, caused by the first dose of paraldehyde, fearing that the meat was again saturated with it. At noon, however, he ate with relish, but deglutition was somewhat disturbed. On the following morning he ate again, and took water freely, deglutition still slightly disturbed. He made a perfect recovery. With this limited experience I am forced to believe that it is at least partially a physiologic antidote to strychnin. However, to establish this conclusion further observation must be made.

The experiments of Prof. Bokai confirm what I have stated³. "In no case did the strychnin produce death, neither in moderate nor lethal doses, but in fatal doses of paraldehyde, strychnin had no effect in removing the poisonous symptoms, or to delay its fatal processes. Hence the antagonism is probably one-sided." The hope is not unreasonable then—and in fact, proven in my case—that if paraldehyde be given soon after symptoms of a poisonous dose of strychnin it might serve to antagonize it. Should it prove to be an antidote, its use for this purpose would be almost without risk, since it is freer from unfavorable action on the heart and respiratory center than that possessed by chloral and chloroform, which are known to have some antagonistic power to strychnin. But before these conclusions can be accepted as established, much more elaborate experimental research must be made.

The Italian observers give us the most favorable reports. I have observed, however, that in large doses we may have, in some, symptoms similar to those following a debauch. I have often used it in acute alcoholism, with very marked hypnotic effects when other hypnotics have failed to produce sleep. In properly selected cases I find it to act very well, but as a universal remedy I do not think it as good as some others at our command.

Since the cord in a dog is much larger in proportion than in a man, and the principal physiologic effect is on the cord, would not a grain dose of strychnia be greater in proportion to the relative sizes of the spinal cords of the dog and man? This so, it would require a much smaller dose to counteract the same amount of strychnia in a man.

It might be well to mention here the dangers of a con-

³ Pharm. Recd., April 24, 1886.

tinued use of paraldehyde, as a number of cases of drug habit have been published which seemed to be as serious in its nature as that of any other drug habit.

ACCIDENTAL WOUNDS OF THE FEMALE BLADDER.*

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Accidental opening of the bladder has, for many years, been considered one of the most serious accidents that could occur in the course of the complicated work which gynecic surgeons are often called on to do. It was not until 1886 that a successful case of intraperitoneal suture of the bladder was recorded by Sir William MacCormac and Mr. George Heaton, while White, in the course of an article in Dennis' "Surgery," states his belief that sutures placed in the wall of the bladder for the purpose of closing extraperitoneal wounds of the viscera are useless. This, coupled with the fact that there are on record comparatively few cases of injuries to the bladder successfully treated by suture, while accidents of this nature must be of common occurrence, makes it important that all individual experience bearing on this subject should be recorded.

Injuries to the inferior surfaces of the bladder generally occur in the course of the separation of the uterus from this wall, when the peritoneal cavity is entered by means of an incision made in the anterior vaginal wall. The accidental opening of the bladder in this situation is, however, less common than might be supposed, close as is the relation between the organs and the frequency of this procedure.

The following case is offered in illustration of this type of injury:

M. M., 37 years of age, was admitted to the gynecic division of the New York City Hospital, Nov. 1, 1897, suffering from ovarian disease, chronic endometritis and interstitial myomata, for which a vaginal hysterectomy was performed by means of an incision along the anterior vaginal wall, beginning about one inch below the meatus urinarius, and carrying it down to, and around the cervix. During the dissection of the right vaginal flap from the bladder, such persistent oozing of blood was encountered as to render the proceeding extremely difficult. On nearing its junction with the cervix, the bladder was opened, but the accident was immediately discovered. The wound was forthwith closed by means of three Lembert sutures of fine silk, which were introduced through the muscular coat only. The wound was disinfected, and the operation completed in the ordinary manner. The wound in the vaginal wall was brought together by means of catgut sutures; iodoform gauze was placed in the vagina, and suitable dressings were applied. The bladder was catheterized every three hours for several days, after which the patient was able to urinate naturally.

Accidents are also so likely to occur to the posterior wall of the bladder, while the operator is breaking up old adhesions to the intestine and omentum, to diseased pelvic organs or to tumors. In separating such adhesions, unless great care be taken, the bladder will often suffer injury. In cases of this kind the wound rarely extends through the mucous membrane, and a few interrupted Lembert sutures will ordinarily suffice.

The following case is an illustration of intra-abdominal bladder injuries:

M. H., a single woman, 41 years of age, was admitted to the gynecic service of the New York City Hospital, Sept. 30, 1898, suffering from a large myoma, which extended above the umbilicus. On Oct. 3, after the usual preparation, and under ether narcosis, the abdomen was opened by means of an incision six inches in length, and to the right of the median line, beginning about two inches above the pubes. The tumor, which weighed seventeen pounds, was drawn through this incision, freed from its attachments and removed, together with the body of the uterus, which was amputated at the internal os. This tumor proved to have sprung from the anterior uterine wall. During the operation hemorrhage occurred from some sinuses on the surface of the tumor, which having rigid walls could not be clamped, therefore it was necessary to remove the mass very rapidly. To accomplish this the anterior attachment of the tumor was clamped and cut, when it was discovered, from the escape of urine, that the bladder had been opened at the fundus. At the beginning of the operation, the general cavity had been shut off with gauze pads, and the parts had been thoroughly irrigated, and the bladder walls, including the wounded part, drawn well up. The irrigation of the pelvic cavity was followed by the use of hydrozone in half strength, and this, in turn, by saline solution. The gauze pads were next changed, and the opening in the bladder, which proved to be about four inches in length, was closed by means of two layers of chromicized catgut sutures. The first row was introduced from within the bladder, and included the mucous and muscular coats, the knots being in the interior of the bladder. These sutures were thus placed on account of the extensive wound, which made it impossible to get the parts properly joined together in any other way. The second row was introduced from the outer side, after the manner of the mattress sutures, and included only the muscular and peritoneal coat. The wound was disinfected, and there being a large peritoneal flap, it was attached to the bladder, and made to cover the line of sutures, thus making the bladder wound extraperitoneal. After further washing out of the abdominal cavity the abdominal wound was closed without drainage, and the usual dressings applied. As the operation was prolonged, and the patient feeble, it was not thought advisable to make a vesicovaginal fistula for the purpose of draining the bladder, but instead a self-retaining catheter was introduced. For about ten days the convalescence was uneventful, except that occasionally the catheter would become blocked by a knot of one or other of the catgut sutures, which began to come away by the end of the third day. At the end of this time tumefaction occurred over the lower angle of the abdominal wound, and, on opening it, urine began to escape. A vesicovaginal fistula was made, and the mucous lining of the bladder attached on either side to the mucous lining of the vagina, by means of silk sutures. This was done for the purpose of keeping the fistula open, and to afford adequate drainage. The sinus in the abdominal wall was curetted and, after being thoroughly disinfected with hydrozone, its walls were sutured. The abdominal sinus having closed, the sutures which kept open the vesicovaginal fistula were removed, and this fistula closed quickly without any further operative interference.

The most dangerous and least often injured portion of the bladder is in the region of the trigone. It is here, when an injury does occur, more than in any other place, in gynecic operations, that a cool head, and a good knowledge of anatomy and surgical technic are necessary, but with these requisites and a knowledge of

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