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COCAINE POISONING.

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FOR THE CURE OF INEBRIETY,  
N. Y. ACADEMY OF MEDICINE, MEDICO-LEGAL  
SOCIETY, N. Y. NEUROLOGICAL SOCI-  
ETY, MEDICAL SOCIETY OF  
THE COUNTY OF KINGS.

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Reprinted from THE MEDICAL AND SURGICAL  
REPORTER, October 24, 1891.





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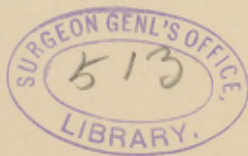
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At a meeting of the New York Neurological Society, November 5, 1886, Dr. Wm. A. Hammond, speaking of cocaine said, "He did not believe any dose that could be taken was dangerous."

In a paper by the writer, read before the Kings County Medical Society, February 13, 1887, on "Cocaine Dosage and Cocaine Addiction"—published in the *Lancet*, London, May 23, 1887—four deaths from single

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\*Read before the N. Y. Medico-Legal Society, March 11, 1891.



or repeated doses, and 46 less toxic cases were cited; and in a second paper, on "Cocaine Toxæmia", read before the American Association for the Cure of Inebriety, November 8, 1887—published in *La Tribune Medicale*, Paris, January 1, 1888—3 more deaths and 73 less lethal cases were noted—more than 125 in all—making the most extensive resumé, to that date, and impelling an editorial assertion from the *British Medical Journal*, that "if it were needful to produce more proof of the unsoundness of Dr. Hammond's statement, Dr. Mattison has effectually done this."

In discussing a paper on "Cocainism", read by myself before the D. C. Medical Society in Washington, December 24, 1890, Dr. Hammond confessed that he was *wrong* in his original statement, and said *he* had noted nearly fatal results from cocaine.

This paper will add proof upon proof as to its poisonous power, by citing more fatal, several nearly so, and many less toxic cases; it will place a proper estimate on the lethal strength of this—in some respects—peerless drug; and it will make pertinent the preamble and resolutions presented this Society.

In an extensive brochure, brought out last year, by Dumont of Berne, reference is made to the more than six score cases cited in my papers, and others are noted.

We shall first detail the fatal cases instanced from June 1888, to March 1891, and then those less toxic.

*Simes*—Male, age 29, one drachm of a 20 per cent. solution injected in urethra, prior to urethrotomy. Instrument was scarcely removed, when patient made a foolish remark, facial muscles twitched, eyes staring, frothed at mouth, and face was congested, breathing embarrassed and a violent epileptiform convulsion, lasting several seconds, ensued. This, increasingly severe, continued several times a minute; the whole muscular system was involved, requiring force to keep him on table. Lung action first failed, then the heart irregular and slow, breathing more and more disturbed, face and entire body deeply congested, and twenty minutes from the first convulsion, patient was dead.

*Abadie*—Three-quarters of a syringe full of a 5 per cent. solution, was injected prior to operation on eye-lid. In ten minutes patient became unconscious, face cyanosed,

and respiration ceased. After great effort with hypodermic ether injections, and artificial breathing, there was partial resuscitation, but patient died.

*Zambianchi*—Female, 4 grains, 225 milligram. injected near mammary cancer, as local anæsthetic; immediately epileptiform convulsions ensued, lasting fifteen minutes; transient rally under artificial respiration, then renewed convulsions, and in 5 minutes, death.

*Montalti*—Female, phthisical, one lung; 22 grains taken per mouth, by mistake. In 15 minutes, mental wandering, general coldness, increasing delirium, lips cyanotic, pallid and pulseless; became unconscious and “in short time” died.

*University College Hospital, London*—Male, 20 grains, in solution, intended for bladder injection, swallowed through mistake. Patient's condition not noted for nearly an hour; then found with opisthotonos and limb spasms. Soon after, died.

*J. fur Z.*—Female, 29 years, healthy, but very nervous, three injections, one-third gr. each, in gum, prior to teeth extraction. Operator withdrew from patient's chair to

get water for rinsing mouth, and on return, found her motionless. Artificial respiration employed, but woman died.

*Stewart*—Male, 32 years, one and one-half drachms of four per cent. solution, injected prior to dilating urethra. Almost at once patient said, "I feel sick", pupils widely dilated, pulse weak and quick, became rigid and unconscious. After one minute partial recovery, but two minutes later fell back on table, rigid, unconscious and began to have violent general convulsions, almost throwing him to floor. Spasms were clonic, commencing in face and extending over whole body; deep cyanosis, quick, weak heart, and partial suspension of breathing; convulsions lasted three minutes, then gradual return to consciousness and able to leave in an hour.

*Chetwood*—Male, 25 years, one drachm, four per cent. solution injected, before cutting stricture. In three minutes patient nervous and excited, wildly violent, needing several men to restrain him; fought and shouted like a madman; had tetanic spasms, arm, leg and thorax muscles rigid and drawn; stiff-legged walk, would have tumbled with-

out aid; under whiskey and hypodermic morphia, became quiet.

*Finlay*—Female, six teeth extracted, prior to each, one grain injected in gum. It caused extreme general pallor, coldness and insensibility; pulse 38, weak and intermittent; “heart almost exhausted”; respiration fell to 5 per minute, shallow, irregular and extremely dyspnœac; arm spasms; great pains in back of head and heart. Despite free stimulation, breathing almost ceased, then artificial respiration and external stimulating for forty-five minutes; heart and lung action improved, but spasms continued. Relapse; pulseless and seemingly dead; renewed forced breathing, and hypodermic injection, ether 30 min. in arm; treatment continued three hours; gradual recovery. Patient was five months pregnant; no untoward effect on child.

*Golookoff*—Female, 15 min. 2 per cent. solution injected. In five minutes, patient restless, pallid, shivering, quick pulse, “respiration soon ran up to 200 per minute” (?), and was labored; heart sounds heard two paces from patient; limb spasms, and great pain in heart and back.



*Monat.*—Male, 29. 7 min. of a 20 per cent. solution for local anæsthesia. In 3 minutes patient faint, gasping, cold, rigid extremities, face blue and pinched, pulse 120 and weak, speechless, and had repeated clonic spasms.

*Booth.*—Male. Ten grains injected in urethra, patient became excited and demented for 45 minutes.

*Gooding.*—Female. One-half grain injected in gum before tooth taking. Immediately wild staring look, very restless, quick gasping breath; in two minutes condition alarming, wildly delirious, tossing arms and legs, extremities cold to elbows and knees, breathing fast and irregular, pulse 120 and weak. Despite ether, ammonia, and brandy by mouth and ether hypodermically, the collapse became profound, R. 60, P. 150, irregular and almost lost; rallies under continued stimulating, but after 3 hours was still delirious; mental disorder continued 7 hours and ended in sleep.

*Neilson.*—Male 29. 45 min. of 4 per cent. solution in prepuce as anæsthetic; patient became restless and excited, incoherent talk, pale, profuse sweat, feet cramps, pinched,

ashen face, pulse 44 and small, breathing shallow.

*Neilson.*—Male, 33. 50 min. of 5 per cent. solution injected in scrotum. In one minute eyes fixed, pallid, sweat bath, running pulse and violent vomiting.

*Randall.*—Male, 6. Pledget, 5 min. of 4 per cent. solution,  $\frac{1}{2}$  grain in nose, caused inability to walk, wild delirium, with hallucinations, tremors, unconsciousness. Sub-sultus and convulsive movements lasting several hours.

*Roux.*—Female.  $2\frac{1}{2}$  centigrammes injected caused opisthotonos.

*Roux.*—Female.  $3\frac{1}{2}$  centigrammes, toxic symptoms, pallor, and cardiac distress.

*Roux.*—Female.  $5\frac{1}{2}$  centigrammes injected in temporal region for headache caused violent tetanoid spasms.

*Earle.*—Male, 65. Three-quarters of a grain injected as local anæsthetic caused great depression and other toxic symptoms, so that, despite nitro-glycerine injections with amyl inhalations and whiskey, *ad. lib.*, it was nearly an hour before patient was safe.

*Wissinger.*—Ten min. 15 per cent solution injected, caused pallor, profuse sweating,

small, wiry, 140 pulse, respiration 40, great dyspnoea, and spasms of arms and legs.

*River.*—Male. Six drops 4 per cent. solution in each eye caused nausea, faintness, clammy sweat, and pulse of 40.

*Schadle.*—Male, 35. Repeated application of 4 per cent. solution on cotton to nostrils caused peculiar feeling about genitalia; cold and sensation as of penis absent; this effect repeated several times; remarkable action on genitalia; “cold and relaxed;” “gone feeling,” noted towards end of treatment; this increased to semen loss and impotence, which lasted till cocaine ended, when virile power gradually returned.

*Settier.*—Male. 25 grammes of 4 per cent. solution in bladder: patient had daily injected for 7 months; this time caused vertigo, nausea, vomiting, “rocky” gait, cold sweat, thready, 103 pulse, indistinct speech, voice thick and shaky. Two relapses, 1½ minutes each, but quite recovered in eight hours.

*B. M. J.*—One and one-quarter grains injected for sciatica; soon restless and excited; pulse and breathing rapid; choreic

movements; symptoms lasted 4 days; even then, patient restless and giddy.

*B. M. J.*—Boy, 13.  $1\frac{1}{2}$  grains injected as local anæsthetic. In 5 minutes patient pale, restless, and dyspnœac; pulse almost uncountable; nausea and epigastric pain. Patient recovered in 4 hours.

*Garcin.*—One-half drachm of 3 per cent. solution by bowel, caused hurried breathing, quick, weak pulse, and cold extremities. Recovered under stimulants.

*Myrtle.*—Female, 45. 3 drops of 3 per cent. solution in each eye. Immediate numbness of tongue and throat, faintness, intense palpitation and irregular heart action, extreme nausea and great flatulent distension of stomach and bowels, lasting one hour. Not  $\frac{1}{11}$  grain in each eye.

*Myrtle.*—Eight minims, same solution as nasal injection, caused like, but less severe symptoms.

*Stedman.*—Twenty min. 5 per cent. solution—1 grain—as local anæsthetic in labial cancer. Soon became excited, pulse 160 and scarcely felt; respiration quick, short, irregular, panting; cold feet and clammy sweat; marked cyanosis. Recovered under hypo-

dermic ether, 20 minims, every 7 minutes, 4 times. Symptoms ended in one and a half hours, except that pulse continued at 112.

*Ficano.*—Woman, 45. “Few drops” of a 5 per cent. solution in cavity of middle ear. Caused vertigo, nausea, vomiting and cramps, lasting several hours.

*Brinton* noted a case in which cocaine was injected after applying a tourniquet, but “as soon as it was loosened, the patient gave a gasp, face became livid, he struggled for breath, pulse was feeble and his condition quite alarming for some time.”

*Mitchell* reported 5 cases. Both sexes, age from 20 to 50, in which a 4 to 10 per cent. solution used under skin, by spray and nasal pledget, caused vertigo, heart pain, dyspnoea, quick, weak pulse, syncope, general numbness and tremor, rigid limbs, and in one case complete paralysis, except tongue.

*Hænel.*—Female, 19. One and one-half grs. injected in gum, two injections, prior to tooth extraction. Immediately after second injection patient became pallid and fell in convulsions. Nitrite of amyl, useless. Was cyanosed. Unconscious and in severe convulsions 5 hours. After convulsions uncon-

sciousness continued 2 hours, pulse at first uncountable, then 176, resp. 44, axillary temperature 101; mouth, throat and nose numb; suppression of urine 24 hours; sleepless 40 hours. Symptoms persisted 2 days.

*Lobker* observed five cases in which severe collapse followed the injection of small doses of a fresh 5 per cent. solution in gums prior to tooth drawing.

*Judkin* observed two cases with dangerous symptoms.

*Buscarlet* reported a case with toxic symptoms, after injecting in a hydrocele.

*Witzel* noted hallucinations of sight, hearing and taste after injection of one-half grain.

*Meyer* reported a child with headache and difficult speech from injection of two decigrammes.

*Schilling*.—Male. Age 20. Prior to lithotomy, one grain in bladder caused general rigidity and pulse of 180.

*Ricci*.—Male. Injected in thigh for sciatica, 22 grains by mistake. Caused restless excitement, facial spasms, choreic movements, quick action of heart and lungs, symptoms persistent 3 days. On 4th day symptoms recurred with increased intensity; patient

unable to lie down on account of dyspnoea several nights; vertigo persisted for days.

*Manley.*—Male. 1½ oz. 4 per cent. solution, 4 grs. nearly, as anæsthetic before amputation; “He reeled over in a faint, became nearly pulseless, cold and deathly pale. After perhaps 20 minutes, reaction set in. \* \* \* I felt earnestly thankful that a life was not lost through our experiment, for I was thoroughly frightened.”

*Wyeth* has seen convulsive movements followed by opisthotonos. In another case decided convulsions after gradual injection of 30 min. of a 4 per cent solution in urethra.

*Hallopeau* noted a case in which an injection of 8 centi-grammes in the gum caused grave toxic symptoms.

*Brush* reported two cases of poisonous results.

*Bissell.*—Male. Age 29. 40 min. of a 6 per cent. solution injected before circumcision: “Serious constitutional symptoms;” nausea, vertigo, blindness and unable to walk for several hours.

*Spivak.*—Girl. Age 2 years. 1 gr. by suppository. One hour later child became

restless, very excited, quick pulse and choreic movements.

*Douthwaite*.—Female. Accustomed to using injections to relieve sciatica. Took repeated doses, aggregating 16 grains; was found unconscious and in convulsions.

*Slayter* noted a case in which 15 min. of a 10 per cent. solution injected in toe, caused cyanosis and epileptiform convulsion.

*Réclus and Wahl* observed, in 4 cases, serious symptoms; pallor, nausea, cold sweats, quick pulse, dyspnœa, vertigo and syncope.

*Johnston*.—Female. Aged 20. After half gr. injection in toe for anæsthesia in ingrowing nail, patient was cyanotic, pulseless and collapsed.

*Moizard*.—Child. Aged 4. Given by mistake, four grains, caused extreme nervousness, severe chest cramps, muscular twitching, lasting 31 hours. Hallucinations and convulsions.

*Wood* cites a case in which 5 grains by mouth caused nausea, great sweating, incoherent speech, blindness, rapid intermittent pulse, cyanosis and suffocation.

*Von Ploss*.—Male. Would-be-suicide took



22 grains in beer, causing great belly pain, intense dyspnœa and vertigo, and urine suppression for 24 hours.

*Cauldwell* noted a case where 15 minutes after injection of 5 grains, there was unconsciousness and general convulsions.

In another case, headache, great vertigo, partial blindness, and temperature fell to 96.7.

*Ingalls* reported alarming symptoms from  $\frac{1}{2}$  grain applied to nasal membrane.

*De Beck* reported two cases, female. 4 per cent. solution to eye, caused clammy sweat, quick weak pulse, with gasping respiration, 6 per minute. Third case. 8 drops of a 5 per cent. solution caused such alarming symptoms, cataract operation had to be abandoned.

*Chalmers Da Costa* reported to me case of woman, age 22, in whose forehead he injected 10 min. of a 6 per cent. solution, causing shallow, rapid breathing, quick, weak pulse, great tremor, temperature 102, with delirium for several hours, and complete analgesia.

Here are more than 200 recorded cases. What of the unrecorded? Here is evidence

too weighty to be rejected. Here is an oft-told lethal tale. What is the moral?

Before reaching conclusions, let us note the views of various observers touching the toxic power of cocaine, with such counsel as they have given to lessen the risk of untoward results that have robbed this peerless drug of much favor in the minds of many surgeons, and so deprived them of a most valued ally.

Réclus and Dumont lay large stress on three points—the quality of the drug, the quantity of the drug, and the site of injection. The former's brochure—brought out last year—is the most extensive yet presented on the action of cocaine as a local surgical anæsthetic—his experience covering 700 operations. He thinks many ill results, near and remote, due to stale or spurious solutions. Dosage, too, is important;  $\frac{1}{2}$  to 2 grains he thinks the maximum, and that not less than 20 centigrammes would poison. In this last opinion he is wrong.

Réclus has a special method of dosing. He quadrangles the operative field, and plunges a long, fine needle in its entire

length along each lateral outline. Then—and on this he much depends—as the piston is pushed down the needle is withdrawn, timing the combined movement so that when the needle tip emerges, the syringe is empty. This is done four times, quickly, and, by so doing, he thinks a large area is anæsthetized and the chance of a blood vessel injection brought to a minimum. He also thinks it of “priceless value” in weak heart and renal disorders.

Réclus is clearly an enthusiast on cocaine, and we think, although his experience has been such a happy one, it would be courting a large risk to place full reliance on his assertions. Judging by scores of well attested, he is wrong as to non-toxic effects from less than 12 to 20 centigrammes. His care as to slowness of injecting and gradual withdrawal is commendable.

Dujardin Beaumetz takes issue with him on one point—claiming it extra-hazardous in cardiac weakness; and, just here it may be well to recall a case noted by Knabe of Berlin—cited in my first paper—girl, aged eleven, who was given 4 to 12 drops of a 4 per cent. solution, by injection over the

deltoid to remedy frequent fainting fits, she having cardiac debility sequeling scarlatina. In less than 40 seconds she took a deep breath, became deadly pale and dropped unconscious. One minute later she was dead.

As to its effect in renal disease, more than one writer has laid stress on the fact that as it is largely excreted by that organ, a crippled kidney would enhance the toxic risk.

As an opposite extreme to Réclus regarding dosage, Lauderer says, a maximum injection should be 12 to 15 millegrammes!

Dumont thinks a surgical subcutaneous injection should not exceed  $\frac{1}{2}$  to  $\frac{5}{8}$  of a grain. Litten, Wölfer, Decker, Hænel, Orloff and Szumann share in this opinion.

Wölfer says injections about the head are more dangerous than on body or limbs, and that more than  $\frac{1}{2}$  gr. should not be injected. Dumont thinks there is less danger from cocaine in eye, nose and throat diseases.

Koller advises weaker solutions on body than on limbs, and says that nothing stronger than a 5 per cent. solution should be used in the nose; the effects being the

same as from a 20 per cent. solution, only more time is needed to secure it.

Wyeth advises against cocaine under 10 or 12 years ; and it is worth noting that the smallest fatal dose recorded was in a girl of twelve.

Regarding a danger from impure cocaine I believe this feature as a toxic factor is small. It has a killing power, *per se*, and the purer the product, the more decided this may be. Let no one think the pure drug harmless.

Dumont, Wyeth and J. M. Barton specially advise the use of Esmarch's bandage whenever cocaine is injected in the limbs for local anæsthesia. Barton says that when the operation is ended he loosens the bandage and immediately tightens it. This is repeated several times, every few minutes. In this way a small quantity enters the circulation at a time, and a large amount can be disposed of without harm. He states that prior to using this plan he often found toxic symptoms when bandage was loosened after fifteen minutes, whereas before no ill effects at all were noted. Leonard Corning adopts a similar device.

Of the fatal cases, 4 were by hypodermic injection, 2 by urethra, one each by gums, larynx, stomach, bowels and bladder, 2 unknown.

In 9 cases death followed collapse; 3 convulsions; 1 unknown.

The largest fatal dose, not injected, was 23 grains, by bowel. The next highest, 22 grains, by mouth. The largest non-fatal dose, not injected, was 22 grains, by mouth. The largest non-fatal dose injected was 19 grains, in leg. The smallest fatal dose, hypodermically, was 8 drops of a 4 per cent. solution, in arm.

COCAINE HAS KILLED IN SMALLER DOSE  
THAN MORPHINE.

Autopsies were held in cases of Simes, Montalti, and University College Hospital. In each there was marked congestion of brain, lungs, liver, and kidneys. Montalti thinks the drug kills by causing vaso-motor paralysis and consequent congestion.

CONCLUSIONS.

1. Cocaine may be toxic.
2. This effect is not rare.

3. There is a lethal dose of cocaine.
4. The lethal dose is uncertain.
5. Dangerous or deadly results may follow doses usually deemed safe.
6. Toxic effects may be sequence of doses large or small, in patients young or old, the feeble or the strong.
7. The danger, near and remote, is greatest when given under the skin.
8. Cardiac or renal weakness increase this risk.
9. Purity of drug will not exempt from ill-result.
10. Caution is needful under all conditions.
11. Réclus' method, Corning's device, or Esmarch's bandage should be used when injecting.
12. Nitrate of amyl, hypodermic morphia, hypodermic ether, alcohol, ammonia, and caffeine should be at command.

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