method, using 1 cc. M/20 sodium lactate, 1 cc. M/2 phosphate buffer at pH 7.6, 2 cc. 1/5000 methylene blue, 100 mg. enzyme powder and 6 cc. of water, making a total volume of 10 cc. The tubes were evacuated for 2 minutes by a Hyvac pump. The reduction time for such tests varied from 30 to 60 seconds, or from 0.8 to 0.4 mg. methylene blue per minute. This dehydrogenase preparation is free from sulphydryl groups as shown by a negative nitroprusside reaction. It has no reducing action on methylene blue when sodium succinate or formate are substituted for sodium lactate. Differences in various other methods of preparation used by other workers result in different final concentrations of enzyme and make a comparison of potency difficult. However, the extract described is probably twice as active as the best previously reported upon by Ogston and Green.[5]

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Comparative Toxicity of Some Powerful Drugs for the Cat.

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While making a pharmacological and therapeutic study of snake venoms,[1] the writer deemed it desirable to compare their toxicity with that of some other powerful drugs and poisons. To render such a comparative study effective a uniform method of experimentation was required for all the chemicals to be examined. Solutions of the respective substances were accordingly tested for their toxicity by a uniform technique similar to that employed in ouabain and digitalis assay.[2] Healthy cats, weighing from 2 to 3 kg. and kept under light ether anesthesia, were used in these experiments. A cannula was introduced into the femoral vein and a dilute solution of the drug to be tested was injected at the rate of one cc. per 30 seconds until the heart stopped. The drugs examined were atropine sulphate, strychnine sulphate, cocaine hydrochloride, coniine hydrochloride, nicotine alkaloid, aconitine hydrochloride, potassium cyanide, sodium arsenate, cobra venom, rattlesnake venom, ouabain, ricin and abrin. The average lethal dosage of each substance per kg.

5 Ogston, F. J., and Green, D. E., *Biochem. J.*, 1935, **29**, 1983.

1 Macht, *Proc. Nat. Acad. Sc.*, 1936, **61**, 22.

2 Rowntree and Macht, *J. A. M. A.*, 1916, **66**, 870.

weight of cat is shown in Table I. The results obtained with ricin and abrin, however, are not exhibited because the action of these drugs (among the most potent known to man, as little as 0.005 gm. per kg. weight being fatal to a rabbit[3]) is very *slow* and their lethal dosage could not possibly be ascertained by the method described above. The lethal dose of atropine ranged from 30.0 to 42.0 mg.; of strychnine, from 2.2 to 2.8 mg.; of cocaine, from 9.5 to 12.0 mg.; of coniine, from 2.8 to 3.3 mg.; of nicotine, from 1.2 to 1.4 mg.; of aconitine, from 0.25 to 0.31 mg.; of potassium cyanide, from 2.0 to 2.4 mg.; of sodium arsenate, from 180.0 to 195.0 mg.; of cobra venom, from 0.9 to 1.2 mg.; of *Crotalus ruber* venom, from 16.5 to 22.0 mg.; and of ouabain, from 0.09 to 0.12 mg. The figures for ouabain, nicotine, aconitine and cobra venom were carried out to the second decimal place; those for the other drugs tested, to the first place. It will be noted that, with one exception, by far the most potent alkaloid examined was aconitine hydrochloride, 0.28 mg. per kg. weight being the average lethal dosage. Next in potency among the alkaloids was nicotine. When examined by this method, atropine and cocaine salts, on the other hand, gave surprisingly high figures. Snake venoms varied greatly in potency because of their deterioration with age and susceptibility to light, heat, etc. The average lethal dosage of solutions of cobra venom freshly made from a new consignment of the scales was 1.04 mg. per kg. weight while

TABLE I.
Average Lethal Dosage per Kilogram Weight of Cat.

Drug Examined	Concentration	No. of Experiments Performed	Average Lethal Dosage mg.
Atropine sulphate	1: 2,000	5	36.0
Strychnine "	1:10,000	3	2.50
Cocaine hydrochloride	1: 2,500	5	10.0
Coniine "	1:10,000	3	3.0
Nicotine alkaloid	1:10,000	10	1.3
Aconitine hydrochloride	1:10,000	5	0.28
Potassium cyanide	1: 5,000	3	2.2
Sodium arsenate	1: 1,000	2	187.50
Cobra venom	1:10,000	10	1.04
Crotalus ruber venom	1: 5,000	6	20.0
Ouabain	1:10,000	20	0.10

specimens of the same toxin, which had been kept in the laboratory for several years gave a figure as high as 2.6 mg. The oldest specimen of cobra venom, however, was much more potent than even fresh rattlesnake venom. The most interesting finding perhaps was

[3] Sollmann, A Manual of Pharmacology, fifth edition, W. B. Saunders Co., Philadelphia, 1936, p. 224.

that made in connection with a study of ouabain. This glucoside, regarded by physician and pharmacist alike as a medicinal agent and not as a poison, proved to be the most potent substance in a series of compounds studied, 0.1 mg. per kg. weight of cat being its average lethal dose.

It is a truism that every medicinal drug is also a poison; *vice versa*, most poisons under certain conditions exert a remedial action and may be regarded as medicinal agents. The very ambiguous terms by which such poisons are commonly described, however, convey but little scientific information. The word "violent", for instance, may be applied to a very *rapidly* acting poison such as hydrocyanic acid or it may refer to the *minuteness* of the quantity required to produce death (*e. g.*, aconitine, nicotine, ricin). Again, the term "violent" may refer neither to the rapidity of action nor the minute lethal dosage of the drug but may indicate instead the *destructive* local effects or the profound anatomic changes produced thereby. Finally, it is well to note that even the medical man's distinction between "medicine" and poison is often colored by his psychological associations. The words "cobra venom" instantly conjure up the image of a death-dealing serpent while "ouabain" does no more than recall a life-saving heart tonic although it is actually more toxic than the most potent venom listed in the table.

Summary. The comparative toxicity of a series of physiologically potent drugs for cats was determined by repeated injection, under ether anesthesia, of dilute solutions of the respective substances. The results obtained emphasize the ambiguity of the terms commonly used to describe the potency of powerful pharmacological agents. Aconitine, one of the most powerful alkaloidal poisons, is classed as a heart drug; nicotine, another highly poisonous alkaloid, is employed with impunity in the form of tobacco; and ouabain, generally regarded as but a valuable heart tonic, is in point of dosage the most lethal substance the writer has examined and about 10 times as toxic as any specimen of cobra venom tested. In order to convey adequate information with regard to the potencies of pharmacological agents, it is absolutely essential to state accurately the method of assay employed; that is, to specify (1) the species of animal employed, (2) concentration of the drug, and (3) its channel, and (4) speed of administration.