of them the tailrings were counted after death. Their number varied between 172 and 228 with an average of 207.38±1.53. (Standard deviation ±10.83.)

From the 63 descendants of the first group 10 animals were again selected. After death 8 of them appeared to have 211 to 227 tailrings, with an average of 217. Within 3 months this second group of 10 selected animals had 53 descendants. In 47 of them the tailrings were counted after death. The number varied between 187 and 220 with an average of 204.06±1.23. (Standard deviation ±8.48.)

This second selection had no greater success than the first selection in the H T M series. This proves that a fairly pure race with a higher number of tailrings had been isolated from the original stock by the first selection. The original colony also contains a race with a low number of tailrings, but this has not yet been successfully isolated. How many other races with intermediate numbers of tailrings may be selected from the original colony remains uncertain.

The study of these races of *Mus musculus* with widely differing numbers of tailrings will be continued, but the results of the experiments already appear to justify the opinion that in the phaenotype of the mouse a new detail has been found which may serve as basis for genetical analysis.

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Some New Alkaloids from Chinese Corydalis Ambigua, Cham. et. Sch. (Yen-Hu-So).

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Corydaline, the principal alkaloid of Corydalis roots, was discovered by Wackenroder[1] in the tubers of *Corydalis tuberosa*. It was subsequently examined by several investigators, but not in a pure state until Dobbie and Lauder[2] analyzed the pure alkaloid and its salts and assigned to it the formula $C_{22}H_{28}O_4N$. Freund and Josephy[3] found that the alkaloid was better represented by the formula $C_{22}H_{27}O_4N$, which is now generally adopted. A dozen other

[1] Wackenroder, cited by *Kastner's Archiv.*, 1826, viii, 423.

[2] Dobbie, J. J., and Lauder, A., *J. Chem. Soc.*, 1892, lxi, 244.

[3] Freund, M., and Josephy, W., *Annalen*, 1893, cclxxvii, 1.

alkaloids were successively isolated from *Corydalis cava* and other species of Corydalis roots by Dobbie and Lauder,[4] Freund and Josephy,[5] Merck,[6] Gadamer,[7] Spath,[8] Heyl,[9] Makoshi,[10] Asahina,[11] and others, to most of which molecular and constitutional formulae have now been assigned. The Chinese Corydalis tubers, Yen-hu-so, are, according to Matsumura[12] and Stuart,[13] *Corydalis ambigua, Cham. et Sch.* They are small, firm, brownish-yellow pellets, with a depression on one of the surfaces. To the drug itself, in China, are ascribed tonic diuretic, emmenagogue, deobstruant, astringent, alterative and sedative properties. Its chemical investigation was first carried out by Makoshi,[10] who isolated from it corydaline, dehydro corydaline, Corbulbine, protopine, and 2 other alkaloids, $C_{20}H_{17}O_4N$, a quaernary base and a substance m. p. 197-199°, resembling, but not identical with bulbocapnine. With the object of obtaining some bulbocapnine for certain medical requirements, the writer investigated chemically the Chinese drug Yen-hu-so again and found that it contains more alkaloids than had hitherto been isolated. The basic products, obtained from 16 kg. of crude drug, were divided into 4 fractions A, B, C, D. The fraction B, which is non-phenolic and consists of the largest part, weighing about 20 gm., was first studied, from which 5 alkaloids have been isolated, purified, analyzed and some of their salts prepared. One of these is identical with Corydaline in all respects and the other 4 are new. They are named provisionally *Corydalis* A, *Corydalis* B, etc., until further confirmation.

1. *Corydalis* A. (Corydaline) $C_{22}H_{27}O_4N$ m.p. 135° $[\alpha]$ 25/D $= +295°$. Crystallized from alcohol in six-sided prisms. Ethyl sulphate, m.p. 162°; hydrochloride, m.p. 214°; nitrate, m. p. 197°; platinit chloride, m.p. 227°; methiodide, m.p. 228°. It is identical with Corydaline in all respects.

2. *Corydalis* B. (new alkaloid) $C_{20}H_{23}O_4N$ m.p. 148-149° $[\alpha]$ $D = 0°$. Recrystallized from alcohol in plates, hydrochloride, needles, m.p. about 218°; and oxalate, prisms, m.p. 208°. This

[4] Dobbie, J. J., and Lauder, A., *J. Chem. Soc.*, 1895, lxvii, 25.

[5] Freund, M., and Josephy, W., *Ber.*, 1892, xxv, 2411.

[6] Merck, E., *Arch. Pharm.*, 1893, ccxxxi, 131.

[7] Gadamer, J., Ziegenbien, H., and Wagner, H., *Arch. Pharm.*, 1902, ccxl, 19; *ibid.*, 1911, ccxlix, 30.

[8] Spath, E., Mosettig, E., and Trothandt, O., *Ber.* 1923, lvi, 875.

[9] Heyl, G., *Apoth. Zeit.*, 1910, No. 17 reprint.

[10] Makoshi, K., *Arch. Pharm.*, 1908, ccxlvi, 381.

[11] Asahina and Motigase, *J. Pharm. Soc. Japan*, 1920, 463, 766.

[12] Matsumura, J., "Chinese Names of Plants," 1915.

[13] Stuart, G. A., "Chinese Materia Medica," 1911.

alkaloid has the same m.p. as that obtained by Heyl[9] from the roots of *Corydalis aurea,* but differs from it in its color reactions toward HNO_3 and Erdmann's reagent. Heyl did not give its specific rotation and molecular formula.

3. *Corydalis* C. (new alkaloid or Protopine?) $C_{20}H_{19}O_5N$. m.p. 201°; $[\alpha]/_D = 0°$. Recrystallized from a mixture of chloroform and alcohol in nodular mass or prisms, hydrochloride, prisms, m.p. 248°; acid oxalate, prisms, m.p. 237°; aurochloride m.p. 195°; hydrobromide, prisms, m.p. 250°. This alkaloid is similar to Protopine in its molecular formula and some color reactions towards H_2SO_4. Froedes and Erdmann's reagents, but its m.p. remains constant at 201° after repeated crystallization from a mixture of alcohol and chloroform instead of 207° m.p. of Protopine.[14]

4. *Corydalis* D. (new alkaloid) $C_{19}H_{16}O_4N$ or $C_{19}H_{17}O_4N$. m.p. 204°. $[\alpha]^{25}/_D = -295°$. Recrystallized from a mixture of alcohol and chloroform in prisms. Hydrochloride, fine needles m.p. about 250°; hydrobromide, crystalline powder, m.p. about 260°. This is the first alkaloid of Corydalis series having a very high leavorotatory power.

5. *Corydalis* E. (new alkaloid). Recrystallized from chloroform and alcohol in long needles m.p. 219°, hydrochloride, m.p. 246°. The small amount of this alkaloid in hand does not permit the writer to determine its specific rotation and molecular formula.

Further study of these alkaloids as well as the isolation of other alkaloids from the other 3 fractions A, C, D, is in active progress. The physiological properties of *Corydalis* B and *Corydalis* C have been studied respectively by Drs. H. P. Chu and C. Pak.[15] The results are interesting and promising medically.

The following is a summary of their results:
Corydalis B (by H. P. Chu).

1. It produces general narcosis when given subcutaneously into a rat weighing 81 gm. With 10 mg., sleep sets in promptly and lasts for about 2 hours. It is not preceded by any symptoms of excitement.

2. It promotes local anesthesia when applied to the scarified areas on the extensor surface of the fore arm. The sensibility to pain becomes completely abolished within 5 minutes and the effect persists for about an hour.

3. In cats, with 5-10 mg., it produces a slight rise of blood pressure, which is accompanied by a decrease in the rate and an in-

[14] Danckwortt, P. W., *Arch. Pharm.*, 1912, ccl, 590.
[15] Private communications.

crease in the height of contractions of the heart. The cardiac effects are also observed directly on the isolated strips of the heart. In an excised right sinus auricle of the cat 0.002% to 0.01% produces a slowing of the rate and increases excursions.

Corydalis C (by C. Pak).

Non-toxic doses of *Corydalis* C produce a depression of the central nervous system or slight convulsion in frogs, and violent chronic convulsions in rats and rabbits, which are chiefly confined to the head, neck and dorsal muscles. The poisoned animals recover rapidly. The convulsions are independent of reflux stimulation. In decerebrated rat, *Corydalis* C causes no convulsions and its action is probably, therefore, located in the cerebrum. The blood pressure shows in rabbit a primary fall and a secondary rise. The respiration is accelerated.