

CONVERSION OF THE PROTOPINE N-OXIDES  
TO THE BENZO[C]PHENANTHRIDINES AND THE SECOBERBINES

Kinuko Iwasa and Narao Takao

Kobe Women's College of Pharmacy, Motoyamakita-machi, Higashinada-ku,  
Kobe 658, Japan

A number of the protopine and benzo[c]phenanthridine type of alkaloids have been isolated from the intact plant and cell cultures of Papaveraceae plants. It has been proved that the benzo[c]phenanthridines are formed from the protopines in nature. The characterization of a naturally occurring protopine N-oxide has previously been described. The present work was undertaken in order to obtain positive proof supporting a assumption that the protopine N-oxide is an intermediate between the benzo[c]phenanthridines and the protopines in the biosynthetic pathway.

Protopine N-oxide (1) was pyrolyzed by heating in a dry oven. The resultant mixture of three products was separated by preparative TLC. The main product was proved to be the ring-enlarged compound (2) which would be produced by the Meisenheimer rearrangement of N-benzylamine oxides to O-benzylhydroxylamines. Reduction of 2 with zinc in acetic acid afforded the natural secoberbines ( $\pm$ )-corydalisol (3) and hycorine (4). The second product of pyrolysis of 1 was isomeric with 2 and was the hydroxylamine (5), formed by a Cope elimination reaction. Acetylation of 5 with  $\text{Ac}_2\text{O}$  in pyridine afforded the corresponding acetate (6). The third product was the phenolic compound (7).

Photolysis of protopine N-oxide led to 2 and sanguinarine (8) which were one of the pyrolysis products and the natural benzo[c]phenanthridine, respectively.

In conclusion, photolysis of protopine N-oxide was shown to supply the benzo[c]phenanthridines. Pyrolysis and photolysis product 2 of the N-oxide was converted into the secoberbines. The N-oxides of the protopines may be converted in nature into the benzo[c]phenanthridines, the secoberbines, and the other type of isoquinoline alkaloids.

