synthesized simple chemical, and has a new basal skeleton of chemical structure which is quite different from that of the known immunostimulants hitherto reported. Investigations for the medicinal application of this chemical are now undergoing in some experimental models for human diseases.

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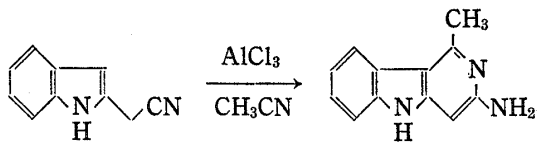
Synthesis of a Mutagenic Principle isolated from Tryptophan Pyrolysate

A potent mutagen, 3-amino-1-methyl-5H-pyrido[4,3-*b*]indole isolated from tryptophan pyrolysate was synthesized.

Keywords——tryptophan pyrolysate; mutagen; amino-5H-pyrido[4,3-*b*]indole; γ-carboline; tar constituent

In the course of our study[1] on biologically active tar constituents, we isolated two potent mutagens, named Trp-P-1 and Trp-P-2, from tryptophan pyrolysate.[2] The structure of Trp-P-1 was determined by X-ray crystallography as 3-amino-1,4-dimethyl-5H-pyrido-[4,3-*b*]indole, and that of Trp-P-2 was deduced as 3-amino-1-methyl-5H-pyrido[4,3-*b*]indole mainly by a spectral comparison with Trp-P-1. In the present communication, we wish to report a synthesis of Trp-P-2 in a quite simple way.



To a solution of 2-cyanomethylindole[3] (500 mg) in acetonitrile (10 ml) was added aluminum trichloride (5.0 g), and the mixture was refluxed for 12 hr. After addition of water, neutral and acidic products were removed by ether, and the basic fraction was extracted, after basification by solid K_2CO_3, with methylene chloride and then ethyl acetate. The crude basic product (173 mg) was dissolved in a small amount of methanol and few mililiters of ethyl acetate, and a drop of acetic acid was added. The crystalline precipitates (67 mg) were collected and recrystallized from ethyl acetate containing methanol to give the acetate, plates, mp 250—260° (the crystal form changed at about 220°.) The chromatography (silica gel, ethyl acetate–ethanol) of the mother liquor yielded an additional crystalline (54 mg). The identification with the authentic sample (Trp-P-2 acetate) was performed by the com-

1) T. Kosuge and H. Zenda, *J. Syn. Chem. Japan*, **34**, 612 (1976).
2) T. Sugimura, T. Kawachi, M. Nagao, T. Yahagi, Y. Seino, T. Okamoto, K. Shudo, T. Kosuge, K. Tsuji, K. Wakabayashi, Y. Iitaka and A. Itai, *Proc. Japan Acad. Sci.*, **53**, 58 (1977).
3) M. Ikeda, S. Matsugashita and Y. Tamura, *J. Chem. Soc., Perkin I*, **1976**, 2578.

parison of infrared (IR), ultraviolet (UV), nuclear magnetic resonance (NMR), and mass (MS) spectra, thin-layer chromatography, and a mixed melting point determination.[4]

Now, the structure of Trp-P-2 was confirmed, and a quantity of the material is available for further cancer studies.

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4) The spectral properties of Trp-P-2 acetate: NMR(*d*-DMSO, ppm from tetramethylsilane: 1.88 (3H), 2.68 (3H), 6.23 (1H, singlet), 7.0—7.35 (3H, multiplet), 7.80 (1H, doublet). IR(KBr, cm^{-1}): 3250, 3020, 2800—2400, 1670, 1655, 1615, 1540, 1462, 1403, 1340, 1268, 1205, 842, 734. MS: 197, 180, 170, 169, 157, 155, 149. UV (in acidic methanol, λ_{max}, nm, log ε): 224(4.03), 245(sh.), 266(4.64), 269 (4.68), 300—330 (broad, 3.4—3.6). (in alkaline methanol): 243(4.40), 263(4.51), 300—330(broad, 3.6 —3.7).