X-Ray Crystal Structure of Herquline, a New Biologically Active Piperazine from *Penicillium herquei* Fg-372

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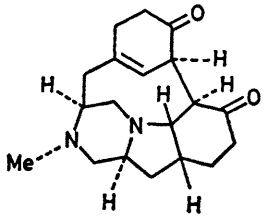
Summary Herquline, a biologically active substance from *P. herquei*, has been shown by *X*-ray analysis to have the structure (**1**).

DURING searches for new alkaloids from micro-organisms, we found that the fungal strain, *Penicillium herquei* Fg-372 produces a new nitrogen-containing basic compound, designated as herquline, which inhibited platelet aggregation induced by adenosine diphosphate but showed no antimicrobial activities.[1]



(**1**)

The present paper deals with the elucidation of the structure of herquline (**1**) by *X*-ray crystallography.

Crystal data: $C_{19}H_{26}N_2O_2 \cdot 0.5H_2O$, m.p. 171—174 °C (decomp.), orthorhombic, space group $P2_12_12$, $a = 11{\cdot}142(3)$, $b = 15{\cdot}110(5)$, $c = 9{\cdot}972(4)$ Å, $Z = 4$, $D_c = 1{\cdot}243$ g cm^{-3}. Intensity data ($2\theta < 50°$) were collected on an automatic, four-circle diffractometer using graphite-monochromated Mo-K_α radiation. 949 independent structure factor amplitudes with $F_0 > \sigma(F_0)$ were selected for the structure determination. The structure was solved by the Monte Carlo direct method[2] using the 20 strongest reflections as members of the starting set. The 110th random phase set led to the correct solution; an *E*-map based on 342 phases afforded all the 24 non-hydrogen atoms. After the least-squares refinement, using the carbon atomic scattering factors for all the non-hydrogen atoms, had been repeated, the nitrogen and oxygen atoms were located by taking account of isotropic temperature factors as well as interatomic distances. The structure thus obtained was refined by the block-diagonal least-squares method with anisotropic temperature factors. A difference-Fourier map yielded all the hydrogen atoms except those of the water molecule. Further least-squares refinement was repeated including these hydrogen atoms. The final *R*-value was 7·7%. The molecular structure obtained is shown in the Figure and the structure of herquline, except for its absolute configuration, has thus been established as that shown in structure (**1**).†

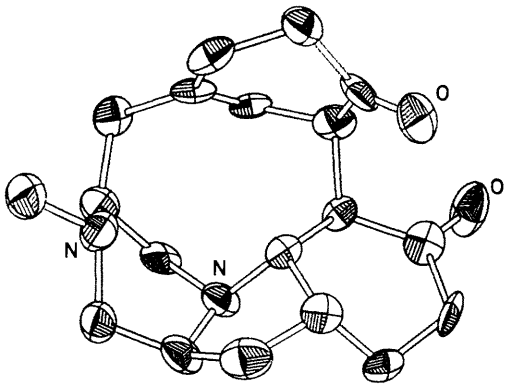


FIGURE. A perspective view of the herquline molecule.

Biosynthetically, we assume that herquline is assembled from two molecules of tyrosine.

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† The atomic co-ordinates for this work are available on request from the Director of the Cambridge Crystallographic Data Centre, University Chemical Laboratory, Lensfield Rd., Cambridge CB2 1EW. Any request should be accompanied by the full literature citation for this communication.

[1] S. Ōmura, A. Hirano, Y. Iwai, and R. Masuma, *J. Antibiot.*, 1979, **32**, 786.
[2] A. Furusaki, *Acta Crystallogr., Sect. A*, 1979, **35**, 220.