An X-Ray Analysis of Blasticidin S Monohydrobromide

By Shigeki ONUMA, Yoshiharu NAWATA and Yoshihiko SAITO

The Institute for Solid State Physics, The University of Tokyo, Azabu, Tokyo

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Blasticidin S is an antibiotic isolated[1] from *Streptomyces griseochromogenes*. In cooperation with the organic chemical investigation of Yonehara et al.,[2] blasticidin S monohydrobromide has now been subjected to X-ray analysis in order to elucidate its molecular structure.

Small plate-like crystals were kindly supplied by Professor H. Yonehara and Professor N. Otake. They are orthorhombic, of the space group $P2_12_12_1$, with four molecules of $C_{17}H_{26}O_5N_8 \cdot HBr$ in a unit cell with dimensions of $a=20.39$, $b=21.34$ and $c=4.81$Å.

The intensities were estimated visually from equi-inclination Weissenberg photographs of the *hk*0–*hk*3 layers; the multiple-film technique was employed. The relative values of the observed structure amplitudes of 1653 reflections were collected by means of Cu $K\alpha$ radiation. The exposures were such that the various layers were approximately on the same relative scale; the absolute scale of each layer was obtained at a later stage by correlation with the calculated structure amplitudes. No absorption correction was applied.

At first the analysis proceeded directly on the basis of the usual two-dimensional sign-determining heavy-atom method, because the *c*-axis is fairly short. The initial coordinates of the bromide ion were determined by calculating the Patterson projection. With the signs determined by only the bromide ion and with the observed 354 *hk*0 amplitudes, the first two-dimensional electron-density distribution was calculated; however, it was hard to interpret. The heavy atom did not seem to be powerful enough for the signs to be determined correctly. Many cycles of iterative Fourier syntheses had to be carried out until a structure was found plausible enough for further refinement. At later stages of the analysis, the structure was refined by the difference syntheses and by the isotropic least-squares method. The final R index for *hk*0 reflections was about 0.15.

The final two-dimensional electron-density distribution and the corresponding molecular framework are shown in Fig. 1. The topography of the final difference synthesis is flat, even in the neighborhood of the bromide ion, within the range of ± 1 e/Å^2. The individual isotropic temperature factors, B, refined by the least-squares method are reasonable values of 4.3 for the bromide ion and 2.5—3.9 for the carbon, nitrogen and oxygen atoms; the light atoms were assigned correctly. The resulted molecular structure is consistent with the modified structure reported by the chemical group.

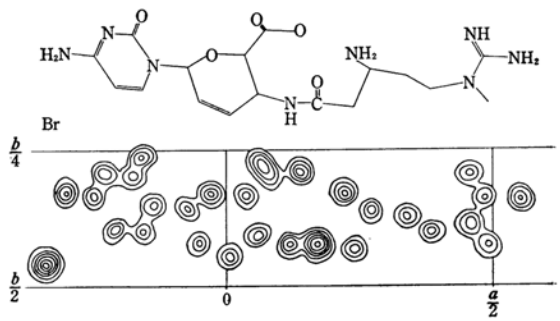

Fig. 1

A three-dimensional analysis is now in progress; the results will be published elsewhere.

1) S. Takeuchi, K. Hirayama, K. Ueda, H. Sakai and H. Yonehara, *J. Antibiotics*, **11a**, 1 (1958).

2) N. Otake, S. Takeuchi, T. Endo and H. Yonehara, *Tetrahedron Letters*, **1965**, 1405, 1411.