

## SHORT COMMUNICATIONS

SC 43065

### Molecular structure of polyglycine II

Polyglycine II was first observed by BAMFORD *et al.*<sup>1</sup> who recorded its X-ray diffraction pattern which contained in particular two strong rings at 4.15 Å and 3.1 Å. CRICK AND RICH<sup>2</sup> interpreted the diffraction pattern as arising from a hexagonal lattice of unit cell dimensions  $a = 4.8$  Å,  $c = 9.3$  Å, with space group  $P3_1$  or  $P3_2$ .

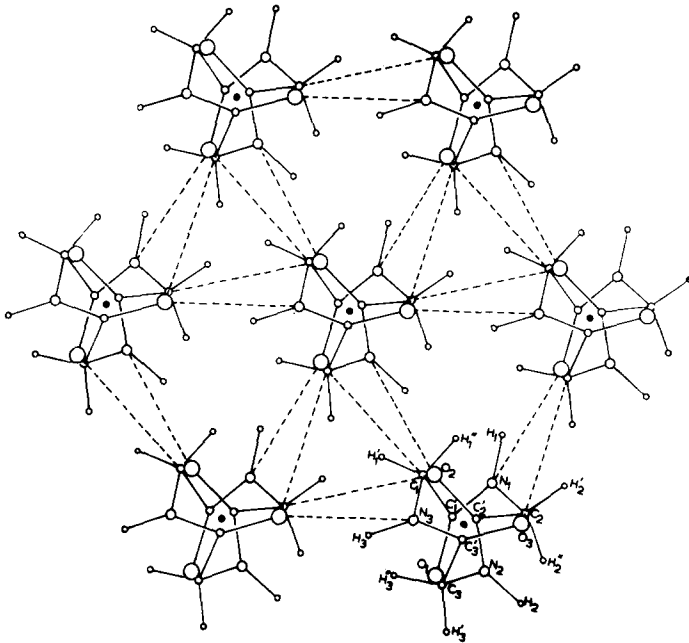


Fig. 1. The structure of polyglycine II projected down the helix axis.

TABLE I

CYLINDRICAL COORDINATES OF THE ATOMS IN ONE RESIDUE OF THE STRUCTURE OF POLYGLYCINE II

Atom	$r$ (Å)	$\Phi$ (°)	$\zeta$ (Å)
C <sub>1</sub>	1.27	71.0	0.00
C <sub>1'</sub>	0.26	88.2	1.14
O <sub>1</sub>	1.17	186.4	1.26
N <sub>1</sub>	1.00	356.2	1.94
H <sub>1</sub>	1.95	7.9	1.82
C <sub>2</sub>	1.27	311.0	3.10
H <sub>2'</sub>	2.17	322.8	3.38
H <sub>2''</sub>	1.72	277.1	2.86

They also proposed for it a structure similar to the triple-helical structure proposed for collagen<sup>3</sup> containing planar peptide groups and NH...O hydrogen bonds of length 2.76 Å.

Recently, while revising the structure of collagen<sup>6</sup>, we observed that a CH...O bond can be formed between the neighbouring chains of its triple helix. A similar inter-chain CH...O bond was therefore looked for in the polyglycine II structure and was found to be possible in it. The structure thus worked out for polyglycine II is shown in Fig. 1 and the atomic coordinates are listed in Table I. The structure contains planar peptide residues with the dimensions as given by COREY AND PAULING<sup>4</sup>. The NH...O bond length is 2.73 Å and the CH...O bond length is 3.20 Å, both of which are quite normal. The hydrogen bond angles (NH∧NO and CH∧CO) are also reasonable, namely 22° and 24°. In the notation of RAMACHANDRAN, RAMAKRISHNAN AND SASISEKHARAN<sup>5</sup>, the conformation at an  $\alpha$ -carbon atom is (100°, 150°), which is fully allowed.

It is interesting to note that the structure of a single fibre is asymmetric, for if one of the chains takes a right- or left-handed helical conformation, the others which aggregate with it also take the same conformation. In agreement with CRICK AND RICH, it is found that occasionally one of the chains can be reversed in direction in the present structure also, but the sense of its twist has to be the same as the others. Thus, optically active fibrils are built up from asymmetric glycol residues (just as in quartz, where an asymmetric crystal is built up from planar SiO<sub>2</sub> groups). However, the number of fibrils of either type will be expected to be equal in solution, and hence the solution will not exhibit optical activity.

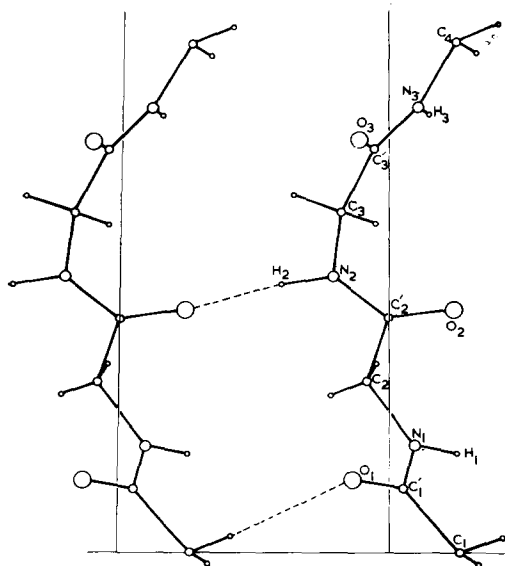


Fig. 2. The structure of polyglycine II projected on to the *ac* plane.

In the collagen helix, on the other hand, because of the occurrence of L-type residues containing a  $\beta$ -carbon atom, only the left-handed helix ( $3_2$ ) can be formed.

However, the facile formation of the conformation ( $100^\circ$ ,  $150^\circ$ ) in polyglycine, similar to the collagen fold, in preference to the  $\alpha$ -helical fold ( $130^\circ$ ,  $310^\circ$ ) indicates that the former is more natural for a polypeptide chain than the latter. This explains how 3 such chains can readily come together in a triple helix and link with one another through inter-chain hydrogen bonds, as in collagen.

The CH...O bond is not formed in the structure proposed by CRICK AND RICH for polyglycine II, since the C...O distance is 3.54 Å (although the angle CH $\wedge$ CO is  $6^\circ$ ). The possibility of its formation in polyglycine greatly strengthens the case for a similar bond in the collagen triple helix also<sup>6</sup>.

Fig. 2 gives the projection of the structure on the *ac* plane.

One of us (G.N.R.) is grateful to the U.S. National Science Foundation for financial assistance.

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Received September 30th, 1965

*Biochim. Biophys. Acta*, 112 (1966) 168-170

SC 43060

### **Morphological and functional changes in isolated chloroplasts under the influence of oleate**

Unsaturated fatty acids formed endogenously<sup>1</sup> or added from outside<sup>2</sup> cause mitochondria to swell and suppress oxidative phosphorylation. In chloroplasts, fatty acids suppress the Hill reaction<sup>3</sup>.

In this connection a study was made of the influence of sodium oleate on the morphological state and photochemical activity of isolated chloroplasts. The swelling and contraction was inferred from changes in the absorption of a suspension of chloroplasts ( $A_{520}$ ). The measurements were carried out using a SF-4 spectrophotometer.

Under the influence of oleate, a rapid swelling of chloroplasts takes place (Fig. 1). Addition of ATP and Mg<sup>2+</sup> to the medium results in contraction of the chloroplasts. The action of ATP is markedly intensified by simultaneous addition of serum albumin.

The contraction of swollen chloroplasts when ATP is added presupposes that ATPase participates in this process. Table I presents data which attest a considerable increase in the ATPase activity of the chloroplasts in the presence of oleate. The

*Biochim. Biophys. Acta*, 112 (1966) 170-172