

02.5-5 CRYSTAL STRUCTURE OF THE UV-PHOTOPRODUCT OF d(TpT) CYANOETHYL ESTER WITH A CIS-SYN CYCLOBUTANE RING. By J. Cadet, L. Voituriez, F.E. Hruska and A. Grand, Laboratoires de Chimie, DRF/CENG, F.38041 Grenoble Cedex, France.

We report crystallographic data for a dinucleoside monophosphate d(T[p]T) (as its cyanoethyl derivative) with the cis-syn cyclobutane geometry generated by UV irradiation. The molecule crystallizes in the orthorhombic space group $P2_12_12_1$ ($Z = 4$) with two water molecules. The refinement was based on 3176 reflections (R factors : 0.04 (weighted) ; 0.06 (unweighted)). The T[p] base (diketo) is syn about the N-glycosyl link ($\chi(O1'-C1'-N1-C2)$: $+60.7^\circ$ whereas the [p]T base (diketo) is anti (χ : -104.1°). The cyclobutane ring is puckered with torsion angles about the C5-C5 and C6-C6 bonds of -21° . The T[p] sugar has an S-type pucker (2T_3) (phase angle $P = 176.1^\circ$; degree of pucker, $\chi_m = 39.9^\circ$) ; the [p]T sugar has an N-type pucker (3T_4) ($P = 33.0^\circ$; $\chi_m = 42.1^\circ$). Starting at the T[p] end the sugar phosphate has the dihedral angles : $\Psi(C5'-C4')$ (-64.2°) ; $\Psi'(C4'-C3')$ (158.0°) ; $\Phi'(C3'-O3')$ (-153.4°) ; $\omega'(O3'-P)$ (-137.7°) ; $\Omega(P-O5')$ (58.7°) ; $\Phi'(O5'-C5')$ (-124.6°) ; $\Psi(C5'-C4')$ (-171.0°) ; $\Psi'(C4'-C3')$ ($+81.1^\circ$).

02.5-6 MOLECULAR-MODELLING AND BIOPHYSICAL STUDIES ON MODIFIED AND UNMODIFIED OLIGONUCLEOTIDES

J. Gunning, S.D. Cutbush, R. Kuroda and S. Neidle
CRC Biomolecular Structure Group, King's
College, London WC2B 5RL

Computer graphics modelling and energy calculations have been carried out on a series of modified and unmodified oligonucleotides to investigate the effects of base deletion, base substitution and base methylation, particularly O⁶-methylguanine and 5-methylcytosine, as well as the substitution of bases by analogues. These studies have been accompanied by investigations of the thermal stability of these modified molecules in terms of melting temperature. Preliminary crystallographic studies are now underway on several of these oligomers.

02.5-7 THE STRUCTURE OF d(GGGGCCCC) : A MODEL FOR POLY d(G).POLY d(C). Maxine McCall, Tom Brown, Bill Cruse and Olga Kennard. University Chemical Laboratory, Lensfield Road, Cambridge CB2 1EW, U.K.

Crystals of the deoxyoligonucleotide d(GGGGCCCC) can be grown at room temperature from aqueous solutions containing the chloride salt of either magnesium or barium. X-ray diffraction data have been obtained from both types of crystals : diffractometer data to 2.5Å resolution for the Mg-containing crystals, and synchrotron data to 2.3Å for the Ba-containing crystals. The space group is $P6_1$, with $a=45.32$, $c=42.25$ (Mg), $a=45.24$, $c=42.58$ (Ba).

There are two strands of d(GGGGCCCC) in the asymmetric unit. These strands associate to form a right-handed helix with a Watson-Crick pattern of hydrogen-bonding in each G.C base pair. Within the duplex at each GpC (=CpC) base step the base pairs slide over each other towards cross-strand overlap, as observed in the A-model of DNA. At the sole GpC step there is intra-strand base-stacking, a feature of the B-model of DNA. The packing of the duplexes in the unit cell is very similar to that adopted by d(GGTATACC) [Shakked et al., J. Mol. Biol. (1983), 166, 183-201].

The structure is heavily hydrated. The positions of many of the water molecules have been determined and their pattern of solvation is being analysed.

No denaturing agent (such as alcohol) was included in the crystallization mixture and so it is likely that the solid state structure closely resembles the conformation adopted in solution. The coordinates for this structure have been used to generate a model for poly d(G).poly d(C).

02.6-1 CRYSTAL STRUCTURE OF THE HISTONE TETRAMER FROM CALF THYMUS. By Karen A. Magnus and Eaton Edward Lattman, Dept. of Biophysics, Johns Hopkins University School of Medicine, Baltimore, MD 21205, and R. Burlingame and E.N. Moudrianakis, Dept. of Biology, Johns Hopkins University, Baltimore, MD 21218, U.S.A.

Histones are proteins that control the first level of compaction of DNA in eukaryotic chromosomes. The structures formed at this level of organization, nucleosomes, each contain 1 and 3/4 turns of DNA duplex wrapped around a histone core octamer, the histone H1 and variable lengths of spacer DNA. The octamer consists of two copies each of the histones H3, H4, H2a and H2b. The tetramer (H3H4)₂ is an integral part of nucleosomes since by itself it can organize DNA into nucleosomes-like particles. We have grown crystals of trypsinized histone tetramer from calf thymus (Lattman et al., Science (1982) 216, 1016) that have the symmetry of the space group $P6_1$ (or $P6_5$) and one tetramer of molecular weight about 43,000 per asymmetric unit. Native data and normal and anomalous data from two derivatives to 3 Å resolution have been collected at the Multiwire Area X-ray Diffractometer at the University of Virginia. We have calculated a preliminary 5.5 Å map of trypsinized tetramer using normal and anomalous information from the mercury derivative. We are presently in the process of improving the phases through solvent flattening, and the addition of a uranium derivative and, if necessary, by averaging about the tetramer's molecular two-fold axis.

This work supported by NSF grant PCM 81-09755 and NIH fellowship GM 07985 to K.A.M.