We have grown crystals that contain an amino-terminal fragment of lambda repressor (residues 1-92) and an eleven-base-pair operator fragment. The operator fragment (GAGCGGTGCGA) contains slightly more than half of an operator site, and we believe that it provides a binding site for one amino-terminal fragment. (A repressor dimer binds to each full operator site.)

Chemical protection experiments have shown that the amino-terminal fragment of repressor binds specifically to this operator fragment (Alexander Johnson, unpublished).

We have grown two crystal forms that contain the repressor and operator fragments. Hexagonal plates grow in space group P6,22 with cell dimensions a=67 Å, c=296 Å. Hexagonal pyramids have also been grown. These have cell dimensions of a=71 Å, c=293 Å. Both crystal forms diffract to 3-6 Å resolution. (There is anisotropic disorder.) Diffuse scattering at 1/3 Å shows that the DNA helices are parallel to the c axis in the hexagonal plates and tilted at about 20° to this axis in the bipyramids. Precession photographs have allowed us to determine the main features of the packing in these co-crystals.

The structure shows that the most extensive subunit-subunit contacts are observed, but that the interfaces containing the calcium binding sites in the native form are disrupted to leave large holes in the particle surface. This may be of significance to the viral assembly mechanism.

The Satellite Tobacco Necrosis Virus (STNV), M.W.1.7·10^6, is a small spherical plant virus with icosahedral symmetry in the protein shell. It requires in vivo co-infection with Tobacco Mosaic Virus for growth. STNV is composed of a coat with 60 identical protein molecules (195 amino acids) and a single-stranded RNA, (about 1,200 nucleotides) known to code for the coat protein. STNV crystallizes in space group C2 with four particles in the monoclinic cell with a=317.3, b=304.0, c=184.6 and β=94.26°. The crystallographic asymmetric unit contains a complete virus particle. Thus the virus particle is located in a general position in the unit cell, and the crystallographic symmetry does not exclude a determination of even the nucleic acid structure.

2.5 Å native data, 4.0 Å iodide and 2.8 Å platinum chloride derivative data have been collected using oscillation camera technique. The native data set consists of 500,000 measured independent reflections. The utilization of the 60-fold non-crystallographic symmetry requires an accurate determination of particle orientation parameters. This has been achieved using 1) the rotation function and 2) an icosahedrally constrained heavy atom parameter refinement. Density averaging techniques employing the 60-fold structural redundancy have been used for phase refinement.

REFERENCE: