Quaternary Structure

By Arun Arjunakani and Joseph Jagusah

What is Quaternary Structure?

- The arrangement of folded protein subunits in protein complexes.
- Quaternary structure is flexible, and can be measured by solvent-accessible surface area (Marsh & Teichmann, 2014).

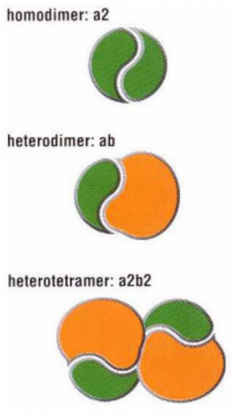

Figure 2: These are examples of types of polymers and how they are named.

Dimerization

- The process of combining two protein subunits
- Homodimers involve two identical monomers and Heterodimers involve two different monomers
- Homodimers can be classified as Isologous and Heterologous Structures

Isologous Structure

Heterologous Structure

Advantages

- By closely positioning subunits against each other, intermolecular forces including hydrogen bonding can hold the complex together.
- The more compact structure allows more stable molecules and this also leads to a lower surface area to volume ratio.

Symmetry

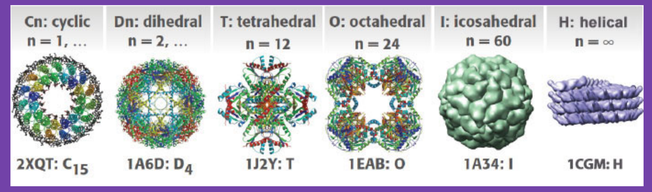

Figure 3: Types of symmetry possible with

- There are several different types of symmetry in terms of geometric shapes
- SymD and CE-Symm programs identify symmetry in protein complexes based on residues and protein geometry (Balaji, 2015).

Bibliography

Balaji, S. (2015). Internal symmetry in protein structures: Prevalence, functional relevance and evolution. *Current Opinion in Structural Biology*, 156-166. doi: 10.1016/j.sbi.2015.05.004

Janin, J., Bahadur, R., & Chakrabarti, P. (2008). Protein–protein interaction and quaternary structure. *Quarterly Reviews of Biophysics Quart. Rev. Biophys.*, 41(2), 133-80. doi:10.1017/S0033583508004708

Marsh JA, Teichmann SA (2014) Protein Flexibility Facilitates Quaternary Structure Assembly and Evolution. PLoS Biol 12(5): e1001870.doi: 10.1371/journal.pbio.1001870

Protein Symmetry View http://www.rcsb.org/pdb/help/viewers/jmol_symmmetry_view.html

QUATERNARY STRUCTURE. Retrieved November 1, 2015 from http://www.bmb.uga.edu/wampler/tutorial/prot4.html.

Quaternary Structure. Retrieved November 1, 2015 from http://www.acsu.buffalo.edu/~sjpark6/pednotes/Quaternary%20Structure.pdf