## SI Text

If we assume that capsid has a shape of an oblate upon deformation (see Fig. 6 *a* and *b*), it is rather simple to show that following relations are valid for the volume and area of an oblate under the deformation with the force *F* along the short axis of the capsid from $2r_0$ to $2r_0\, r_{\text{short}} = 2r_0 - D$:

$$\frac{V}{V_0} = x_{\text{short}} \cdot x_{\text{long}}^2 \qquad [7]$$

$$\frac{A}{A_0} = 0.5 \cdot x_{\text{long}}^2 + 0.5 \cdot \frac{x_{\text{long}} \cdot x_{\text{short}}^2}{\sqrt{x_{\text{long}}^2 - x_{\text{short}}^2}} \cdot \ln\left(\frac{x_{\text{long}}}{x_{\text{short}}} + \sqrt{\left(\frac{x_{\text{long}}}{x_{\text{short}}}\right)^2 - 1}\right) \qquad [8]$$

where $V_0$ and $A_0$ are volume and area of the spherical capsid before the deformation:

$$V_0 = \frac{4\pi}{3} \cdot r_0^3 \text{ and } A_0 = 4\pi \cdot r_0^2 \qquad [9]$$

If we make an approximation that the area of the oblate is constant under deformation, then Eq. ***8*** can be used to describe how $x_{\text{long}}$ varies as a function of $x_{\text{short}}$ under capsid deformation. Fig. *7* shows this variation.

As a good approximation for relation between $x_{\text{long}}$ and $x_{\text{short}}$ for an oblate with constant mantle surface, for $x_{\text{short}} > 0.4$ the following relation can be used:

$$x_{long} \approx 1.5 - 0.5 \cdot x_{short} \qquad [10]$$

By combining this relation with Eq. *7*, one can construct the following relation between *V* and $x_{\text{short}}$ for an oblate with a constant mantle surface:

$$V = \frac{4\pi}{3} \cdot r_0^3 \cdot x_{\text{short}} \cdot x_{\text{long}}^2 \approx \frac{\pi}{3} \cdot r_0^3 \cdot x_{\text{short}} \cdot \left(3 - x_{\text{short}}\right)^2 = \frac{\pi}{3} \cdot r_0^3 \cdot \left(1 - \frac{D}{2r_0}\right) \cdot \left(2 + \frac{D}{2r_0}\right)^2 \qquad [11]$$

Now, taking the derivative of Eq. ***9*** with regard to the length of deformation *D*, we will obtain the following equation for the derivative *dV / dD*:

$$\frac{dV}{dD} \approx -\frac{\pi \cdot r_0 \cdot D}{2} - \frac{\pi \cdot D^2}{8} \qquad [12]$$

which implies that the contribution to the resisting force *F(D)* from the osmotic pressure of DNA in the viral capsid can be described by:

$$F_{\text{osmotic}}(D) \approx \Pi_{\text{osmotic}}( c_0 \cdot V_0 / V ) \cdot \frac{\pi \cdot r_0}{2} \cdot D \qquad [13]$$

where $c_0$ is DNA concentration in the undeformed capsid.

Similar relation is obtained also if we assume that the spherical capsid is deformed to a truncated sphere with a constant area, see Fig. 6*c*. One can show that for a truncated sphere, the following relations are describing capsid's volume and area:

$$\frac{V}{V_0} = x_{\text{short}} \cdot \left( 1.5 \cdot x_{\text{long}}^2 - 0.5 \cdot x_{\text{short}}^2 \right) \qquad [14]$$

$$\frac{A}{A_0} = \frac{A_{\text{mantle}} + 2A_{\text{plane}}}{A_0} = x_{\text{long}} \cdot x_{\text{short}} + 0.5 \cdot \left( x_{\text{long}}^2 - x_{\text{short}}^2 \right) \qquad [15]$$

By combing Eqs. ***14*** and ***15*** the following relation between *V, A* and $x_{\text{short}}$ can be constructed:

$$\frac{V}{V_0} = 3x_{\text{short}} \cdot \frac{A}{A_0} + 4 \cdot x_{\text{short}}^3 - 3 \cdot x_{\text{short}}^2 \cdot \sqrt{2x_{\text{short}}^2 + 2A / A_0} \qquad [16]$$

By taking the derivative of Eq. ***16*** with regard to the length of deformation *D*, we will obtain the following relation for the derivative *dV / dD* if area is constant:

$$\frac{dV}{dD} = -\frac{2\pi \cdot r_0^2}{3} \cdot \left( 3 + 12 \cdot x_{\text{short}}^2 - 6 \cdot x_{\text{short}} \cdot \sqrt{2x_{\text{short}}^2 + 2} - \frac{6 \cdot x_{\text{short}}^3}{\sqrt{2x_{\text{short}}^2 + 2}} \right) \approx$$

$$\approx -\frac{\pi \cdot r_0}{2} \cdot D + \frac{\pi}{16} \cdot D^2 + \ldots \qquad [17]$$

The same result as in Eq. ***13*** is obtained for the DNA osmotic pressure contribution to the force of capsid deformation *F(D)*.

**Figure Captions:**

Fig. 6 (a) *An undeformed spherical capsid with radius* $r_0$; b) *deformed oblate capsid and* c) *truncated spherical capsid with the length of short axis* = $2r_0\ x_{short}$ *and the length of long axis* = $2r_0\ x_{long}$ *(where x is the scaling prefactor).*

Fig. 7. The relative length of the oblates long axis, $x_{long}$, *as a function of the relative length of the short axis,* $x_{short}$, *for oblates with the same area of the mantle surface (solid line). Dashed line illustrates an almost linear relation.*