□ **Mean** of offspring of animal i with genotype $\underline{G_1 G_1}$ is computed as an expected value:

$$\mu_{11} = p \cdot a + q \cdot d \quad \text{(Mean of offspring of animal } i \text{ with genotype } G_1 G_1)$$

$$\mu = (p-q) a + 2pqd$$

Breeding Value (BV_{11}) for animal i with genotype $G_1 G_1$:

$$BV_{11} = 2(\mu_{11} - \mu)$$
$$= 2(p \cdot a + q \cdot d$$
$$\quad - [(p-q)a + 2pqd])$$

$$= 2(p \cdot a + q \cdot d - (p-q)a - 2pqd)$$
$$= 2(\underline{p \cdot a} + q \cdot d - \underline{p \cdot a} + q \cdot a - 2pqd)$$
$$= 2(q \cdot d + q \cdot a - 2pqd)$$
$$= 2(q a + q d(1 - 2pq))$$
$$= 2q(a + d(1 - 2p))$$
$$\underline{\underline{= 2q(a + (q-p)d)}}$$

US: Predicted Transmission Ability (PTA)

$$PTA = \tfrac{1}{2} BV$$
$$= \mu_{11} - \mu$$

$$p + q - 2p = q - p$$