2. GENE REGULATION

-35 ELEMENT

TRANScription STart

-35 -10 +1

CORE PROMOTER

PRIBNIOU BOX

(MINIMAL REGULATORY STRUCTURE)

3. TRANSCRIPTION FACTORS

RNAP → TRANSCR.

[R]

PROMOTER GENE

"ON"

"OFF"

R: REPRESSOR, BLOCKS TRANSCRIPTION

RNAP [LOW AFFINITY FOR RNAP]

"OFF"

A: ACTIVATOR, PROMOTES TRANSCRIPTION

A, R: TRANSCRIPTION FACTORS

(BIND (NEAR) PROMOTER, REGULATE TRANSCRIPTION)
COOPERATIVE BINDING

TRAF'S OFTEN FORM DIMERS OR HIGHER ORDER COMPLEXES
3.2 GENE EXPRESSION MODELS

NOREGULATION
LAST TIME: \( \dot{m} = \alpha_m - \gamma_m \cdot m \)

\[
\dot{m} = \alpha_m \left( \frac{q_{on}}{q_{tot}} \right) + \alpha_0 - \gamma_m \cdot m
\]

\( q_{on}/q_{tot} \) : FRACTION GENE "ON"
\( \alpha_0 \) : LENGY TRANSCRIPTION

REPRESSION:
\( q_{on} + k_{R} \xrightleftharpoons[k_{-}]{k_{+}} q_{off} \)

\[ q_{on} = -k_{+} q_{on} R^n + k_{+} q_{off} = 0 \] (in EQUILIBRIUM)

\( \Rightarrow \)
\[ q_{off} = \frac{k_{+}}{k_{-}} R^n q_{on} = \frac{k_{+}}{k_{-}} R^n \]

\( k = k_{+}/k_{-} \)

\( q_{tot} = q_{on} + q_{off} = q_{on} (1 + R^n/k) \)

\[ \dot{m} = \frac{\alpha_m}{1 + R^n/k} + \alpha_0 - \gamma_m \cdot m \]

HILL FUNCTION

ACTIVATION:
\( q_{off} + n \vec{A} \xrightleftharpoons[k_{-}]{k_{+}} q_{on} \)

\[ \frac{q_{on}}{q_{on} + q_{off}} = \frac{V_{max} A^n}{A^n + K} \]

\[ \dot{m} = \frac{\alpha_m A^n/K}{1 + A^n/K} + \alpha_0 - \gamma_m \cdot m \]

\[ \Rightarrow n > 1 \]