Supplementary Information to manuscript Guzmán et al.

SUPPLEMENTARY TABLES

Table S1: Obtained values for the rates of association, dissociation and collapse.

Rate	H-rasG12V-R169A/K170A	H-rasG12V	H-rasG12V-R128A/R135A
r_1	200 s^{-1}	200 s^{-1}	110 s^{-1}
a_1	5 $s^{-1}mol^{-1}$	100 $s^{-1}mol^{-1}$	30 $s^{-1}mol^{-1}$
r_2	0.2 s^{-1}	15 s^{-1}	21 s^{-1}
a_2	0.01 $s^{-1}mol^{-1}$	0.05 $s^{-1}mol^{-1}$	0.07 $s^{-1}mol^{-1}$
c_1	50 s^{-1}	100 s^{-1}	80 s^{-1}
Ras_{On}	8	8	10
Gal_{On}	3.45	2.15	2.5
$Coll_{Gal}$	1.45	1.3	1

Table S2: Ordinary differential equations (ODE) used in the computational model of nanocluster formation:

Below we give the differential equations that describe the reactions leading to nanocluster formation as displayed in **Fig. 8**.

Here:

- $H \rightarrow$ H-ras-GTP
- $G \rightarrow$ galectin-1
- $H_{\#} \rightarrow$ complex of # number of H-ras-GTP molecules
- $HG \rightarrow$ complex of H-ras-GTP and galectin-1
- $H_{\#}G_{*} \rightarrow$ complex of # number of H-ras-GTP molecules and * number of galectin-1 molecules
- $r_{\#} \rightarrow$ dissociation rates according to scheme
- $a_{\#} \rightarrow$ association rates according to scheme
- $c_{\#} \rightarrow$ collapse rates of the different multimers ($1 \rightarrow H_3$; $2 \rightarrow H_2G$; $3 \rightarrow HG_2$; $4 \rightarrow H_4$; $5 \rightarrow H_3G$; $6 \rightarrow H_2G_2$; $7 \rightarrow H_4G$; $8 \rightarrow H_3G_2$; $9 \rightarrow H_4G_2$; $10 \rightarrow H_3G_3$; $11 \rightarrow H_4G_3$; $12 \rightarrow H_3G_4$ and $13 \rightarrow H_4G_4$)

$$\begin{aligned}\frac{dH}{dt} = {} & (2 * r_1 * H_2) - (2 * a_1 * H * H) + (r_2 * HG) - (a_2 * H * G) + (r_3 * H_3) - (a_3 * H_2 * H) \\ & + (r_5 * H_2G) - (a_5 * HG * H) + (r_7 * H_4) - (a_7 * H_3 * H) + (r_9 * H_3G) \\ & - (a_9 * H_2G * H) + (r_{11} * H_2G_2) - (a_{11} * HG_2 * H) + (r_{13} * H_4G) - (a_{13} * H_3G * H) \\ & + (r_{15} * H_3G_2) - (a_{15} * H_2G_2 * H) + (r_{17} * H_4G_2) - (a_{17} * H_3G_2 * H) + (r_{20} * H_4G_3) \\ & - (a_{20} * H_3G_3 * H) + (r_{23} * H_4G_4) - (a_{23} * H_3G_4 * H) + (3 * c_1 * H_3) \\ & + (2 * c_2 * H_2G) + (c_3 * HG_2) + (4 * c_4 * H_4) + (3 * c_5 * H_3G) + (2 * c_6 * H_2G_2) \\ & + (4 * c_7 * H_4G) + (3 * c_8 * H_3G_2) + (4 * c_9 * H_4G_2) + (3 * c_{10} * H_3G_3) \\ & + (4 * c_{11} * H_4G_3) + (3 * c_{12} * H_3G_4) + (4 * c_{13} * H_4G_4)\end{aligned}$$

$$\frac{dG}{dt} = (r_2 * HG) - (a_2 * H * G) + (r_4 * H_2G) - (a_4 * H_2 * G) + (r_6 * HG_2) - (a_6 * HG * G) + (r_8 * H_3G) - (a_8 * H_3 * G) + (r_{10} * H_2G_2) - (a_{10} * H_2G * G) + (r_{12} * H_4G) - (a_{12} * H_4 * G) + (r_{14} * H_3G_2) - (a_{14} * H_3G * G) + (r_{16} * H_4G_2) - (a_{16} * H_4G * G) + (r_{18} * H_3G_3) - (a_{18} * H_3G_2 * G) + (r_{19} * H_4G_3) - (a_{19} * H_4G_2 * G) + (r_{21} * H_3G_4) - (a_{21} * H_3G_3 * G) + (r_{22} * H_4G_4) - (a_{22} * H_4G_3 * G) + (c_2 * H_2G) + (2 * c_3 * HG_2) + (c_5 * H_3G) + (2 * c_6 * H_2G_2) + (c_7 * H_4G) + (2 * c_8 * H_3G_2) + (2 * c_9 * H_4G_2) + (3 * c_{10} * H_3G_3) + (3 * c_{11} * H_4G_3) + (4 * c_{12} * H_3G_4) + (4 * c_{13} * H_4G_4)$$

$$\frac{dH_2}{dt} = -(r_1 * H_2) + (a_1 * H * H) + (r_3 * H_3) - (a_3 * H_2 * H) + (r_4 * H_2G) - (a_4 * H_2 * G)$$

$$\frac{dHG}{dt} = -(r_2 * HG) + (a_2 * H * G) + (r_5 * H_2G) - (a_5 * HG * H) + (r_6 * HG_2) - (a_6 * HG * G)$$

$$\frac{dH_3}{dt} = -(r_3 * H_3) + (a_3 * H_2 * H) + (r_7 * H_4) - (a_7 * H_3 * H) + (r_8 * H_3G) - (a_8 * H_3 * G) - (c_1 * H_3)$$

$$\frac{dH_2G}{dt} = -(r_4 * H_2G) + (a_4 * H_2 * G) - (r_5 * H_2G) + (a_5 * HG * H) + (r_9 * H_3G) - (a_9 * H_2G * H) + (r_{10} * H_2G_2) - (a_{10} * H_2G * G) - (c_2 * H_2G)$$

$$\frac{dHG_2}{dt} = -(r_6 * HG_2) + (a_6 * HG * G) + (r_{11} * H_2G_2) - (a_{11} * HG_2 * H) - (c_3 * HG_2)$$

$$\frac{dH_4}{dt} = -(r_7 * H_4) + (a_7 * H_3 * H) + (r_{12} * H_4G) - (a_{12} * H_4 * G) - (c_4 * H_4)$$

$$\frac{dH_3G}{dt} = -(r_8 * H_3G) + (a_8 * H_3 * G) - (r_9 * H_3G) + (a_9 * H_2G * H) + (r_{13} * H_4G) - (a_{13} * H_3G * H) + (r_{14} * H_3G_2) - (a_{14} * H_3G * G) - (c_5 * H_3G)$$

$$\frac{dH_2G_2}{dt} = -(r_{10} * H_2G_2) + (a_{10} * H_2G * G) - (r_{11} * H_2G_2) + (a_{11} * HG_2 * H) + (r_{15} * H_3G_2) - (a_{15} * H_2G_2 * H) - (c_6 * H_2G_2)$$

$$\frac{dH_4G}{dt} = -(r_{12} * H_4G) + (a_{12} * H_4 * G) - (r_{13} * H_4G) + (a_{13} * H_3G * H) + (r_{16} * H_4G_2) - (a_{16} * H_4G * G) - (c_7 * H_4G)$$

$$\frac{dH_3G_2}{dt} = -(r_{14} * H_3G_2) + (a_{14} * H_3G * G) - (r_{15} * H_3G_2) + (a_{15} * H_2G_2 * H) + (r_{17} * H_4G_2) - (a_{17} * H_3G_2 * H) + (r_{18} * H_3G_3) - (a_{18} * H_3G_2 * G) - (c_8 * H_3G_2)$$

$$\frac{dH_4G_2}{dt} = -(r_{16} * H_4G_2) + (a_{16} * H_4G * G) - (r_{17} * H_4G_2) + (a_{17} * H_3G_2 * H) + (r_{19} * H_4G_3) - (a_{19} * H_4G_2 * G) - (c_9 * H_4G_2)$$

$$\frac{dH_3G_3}{dt} = -(r_{18} * H_3G_3) + (a_{18} * H_3G_2 * G) + (r_{20} * H_4G_3) - (a_{20} * H_3G_3 * H) + (r_{21} * H_3G_4) - (a_{21} * H_3G_3 * G) - (c_{10} * H_3G_3)$$

$$\frac{dH_4G_3}{dt} = -(r_{19} * H_4G_3) + (a_{19} * H_4G_2 * G) - (r_{20} * H_4G_3) + (a_{20} * H_3G_3 * H) + (r_{22} * H_4G_4) - (a_{22} * H_4G_3 * G) - (c_{11} * H_4G_3)$$

$$\frac{dH_3G_4}{dt} = -(r_{21} * H_3G_4) + (a_{21} * H_3G_3 * G) + (r_{23} * H_4G_4) - (a_{23} * H_3G_4 * H) - (c_{12} * H_3G_4)$$

$$\frac{dH_4G_4}{dt} = -(r_{22} * H_4G_4) + (a_{22} * H_4G_3 * G) - (r_{23} * H_4G_4) + (a_{23} * H_3G_4 * H) - (c_{13} * H_4G_4)$$

Rates of association, dissociation and collapse:

Estimated variables:

- r_1 → Dissociation rate between two single H-ras-GTP molecules.
- a_1 → Association rate between two single H-ras-GTP molecules.
- r_2 → Dissociation rate between a single H-ras-GTP molecule and a single Gal-1 molecule.
- a_2 → Association rate between a single H-ras-GTP molecule and a single Gal-1 molecule.
- c_1 → Collapse rate of the H_3 state.
- Ras_{On} → Decrease on the association rate between a single H-ras-GTP and 2- or 3-mers of H-ras-GTP when compared to the association rate of two single H-ras-GTP molecules.
- Gal_{On} → Increase on the association rate for the binding of both; H-ras-GTP and Gal-1 to any multimeric structure due to the presence of a Gal-1 molecule on the multimeric structure.
- $Coll_{Gal}$ → Decrease on the collapse rate of any multimeric structure due to the presence of a Gal-1 molecule on it.

Other variables:

$a_3 = {}^{a_1}/_{Ras_{On}}$, $r_3 = r_1$

$a_4 = a_2$, $r_4 = r_2$, $c_2 = {}^{c_1}/_{Coll_{Gal}}$

$a_5 = a_1 * Gal_{On}$, $r_5 = r_1$

$a_6 = a_2 * Gal_{On}$, $r_6 = r_2$, $c_3 = {}^{c_1}/_{(Coll_{Gal})^2}$

$a_7 = {}^{a_1}/_{(Ras_{On})^2}$, $r_7 = r_1$, $c_4 = c_1$

$a_8 = a_2$, $r_8 = r_2$, $c_5 = {}^{c_1}/_{Coll_{Gal}}$

$a_9 = \frac{a_1 * Gal_{On}}{Ras_{On}}$, $r_9 = r_1$

$a_{10} = a_2 * Gal_{On}$, $r_{10} = r_2$, $c_6 = {}^{c_1}/_{(Coll_{Gal})^2}$

$a_{11} = a_1 * (Gal_{On})^2$, $r_{11} = r_1$

$a_{12} = a_2$, $r_{12} = r_2$, $c_7 = {}^{c_1}/_{Coll_{Gal}}$

$a_{13} = \frac{a_1 * Gal_{On}}{(Ras_{On})^2}$, $r_{13} = r_1$

$a_{14} = a_2 * Gal_{On}$, $r_{14} = r_2$, $c_8 = {}^{c_1}/_{(Coll_{Gal})^2}$

$a_{15} = \frac{a_1 * (Gal_{On})^2}{Ras_{On}}$, $r_{15} = r_1$

$a_{16} = a_2 * Gal_{On}$, $r_{16} = r_2$, $c_9 = {c_1}/{(Coll_{Gal})^2}$

$a_{17} = \frac{a_1 * (Gal_{On})^2}{(Ras_{On})^2}$, $r_{17} = r_1$

$a_{18} = a_2 * (Gal_{On})^2$, $r_{18} = r_2$, $c_{10} = {c_1}/{(Coll_{Gal})^3}$

$a_{19} = a_2 * (Gal_{On})^2$, $r_{19} = r_2$, $c_{11} = {c_1}/{(Coll_{Gal})^3}$

$a_{20} = \frac{a_1 * (Gal_{On})^3}{(Ras_{On})^2}$, $r_{20} = r_1$

$a_{21} = a_2 * (Gal_{On})^3$, $r_{21} = r_2$, $c_{12} = {c_1}/{(Coll_{Gal})^4}$

$a_{22} = a_2 * (Gal_{On})^3$, $r_{22} = r_2$, $c_{13} = {c_1}/{(Coll_{Gal})^4}$

$a_{23} = \frac{a_1 * (Gal_{On})^4}{(Ras_{On})^2}$, $r_{23} = r_1$

Lifetime of nanoclusters and RBD recruitment:

$$Lt_{H_4} = \frac{1}{[r_7 + (a_{12} * G_{free}) + c_4]}$$

$$Lt_{H_4G} = \frac{1}{[r_{12} + r_{13} + (a_{16} * G_{free}) + c_7]}$$

$$Lt_{H_4G_2} = \frac{1}{[r_{16} + r_{17} + (a_{19} * G_{free}) + c_9]}$$

$$Lt_{H_4G_3} = \frac{1}{[r_{19} + r_{20} + (a_{22} * G_{free}) + c_{11}]}$$

$$Lt_{H_4G_4} = \frac{1}{[r_{22} + r_{23} + c_{13}]}$$

$$RBD = [(Lt_{H_4} * H_4) + (Lt_{H_4G} * H_4G) + (Lt_{H_4G_2} * H_4G_2) + (Lt_{H_4G_3} * H_4G_3) + (Lt_{H_4G_4} * H_4G_4)] * 4 * 2.5$$