

Supplementary Material

Node	Health ¹	Obesity ²	Cite
Anthocyanin	■	■	[52]
Cyanidin-3-o-β			[58]
Astaxantin	■	■	[59]
Lycopene			[59]
Punicalagin			[50]
HSL			[41]
Capsaicin			[43]
Resveratrol			[46]
Bilobalide			[41]
Berberine			[45]
Isoorientin			[44]
Oleanolic acid			[51]
NRG4			[49]
Nobilentin			[60]
Celastron			[53]
Pyrroloquinoline quinone			[42]
Allicin			[49]

Unsaturated fatty acids			[61]
Lipopolysaccharides			[53]
VEGF α			[49]
ChREBP- β			[50]
Exercise			[62]
Insulin			[57]
Insulin receptor			[57]
Akt			[59]
Lipolysis			[58]
Adiponectin			[63]
Extracellular glucose			[58]
GLUT 4			[58]
Intracellular glucose			[53]
Acetil CoA			[64]
Fatty acids			[61]
Triglycerides			[59]
Pyruvate			[59]
Citric acid cycle			[64]
ATP			[43]

TLR 2/4 adipocytes			[53]
NFkB adipocytes			[53]
TNF α			[53]
STAT3			[55]
SOCS3			[67]
Leptin			[68]
IL-6			[68]
Th1			[69]
STAT1			[68]
M1 macrophages recruitment			[53]
TLR 2/4 macrophages			[57]
AP-1			[67]
NFkB macrophages			[57]
Monocytes recruitment			[57]
C/EBP β			[69]
C/EBP α			[65]
PPAR γ adipocytes			[44]
IL-4			[66]
PPAR γ macrophages			[51]
pSTAT6			[52]

M2 macrophages recruitment		[50]
IL-10		[66]
AMPK		[49]
SIRT1		[45]
pPGC1		[48]
Mitochondrial biogenesis		[47]

Table 2S. We summarize the information of the literature review; for every node, we associated it with a value between zero and one for a state of health and obesity. Green cells correspond to node's values greater than red ones (for example, anthocyanin has a higher expression level in health than in obesity).

¹ The column health relates the initial values of every node in the case of health

² The column obesity shows the common values in each node compared to the healthy state.

HSL: hormone-sensitive lipase; NRG4: neuroreguline 4; VEGF α : vascular endothelial growth factor alpha; ChREBP-B: carbohydrate-responsive element-binding protein beta; Akt: protein kinase B; GLUT4: glucose transporter 4; ATP: adenosin triphosphate; TLR2/4: Toll-like receptor 2/4; NF- κ B: nuclear Factor-kappaB; TNF α : tumor necrosis factor alpha STAT3: signal transducer and activator of transcription 3; SOCS3: suppressor of cytokine signaling 3; STAT1: signal transducer and activator of transcription 1; IL-6: interleukine 6; Th1: helper T cell 1; AP-1: AP-1: activator protein-1; C/EBP β : CCAAT/enhancer-binding protein beta; C/EBP α : CCAAT/enhancer-binding protein alpha; PPAR γ : peroxisome proliferator-activated receptor gamma; IL-4: interleukine 4; pSTAT6: phosphorylated signal transducer and activator of transcription 6; IL-10: interleukine 10; AMPK: AMP-activated protein kinase; SIRT1: silent information regulator sirtuin 1; pPGC1: phosphorylated peroxisome proliferator-activated receptor gamma coactivator.

Explanation Supplementary 1

We used Wolfram Mathematica software to solve the ordinary differential equations describing the expression pattern in each health- or disease-state and the transitions between them. Initially, we established the fuzzy logic propositions for all nodes, then we defined the decay rates ($b=5$) and the saturation parameter ($\alpha = 1$) for each node. Every attractor was considered in the next step as a set of initial conditions of each node and with the previous initial conditions we solved the equations, showing the results as graphs. For more detail about the mathematical description and parameters, see the Material and methods section in the main text.

$\ln[\cdot] :=$

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winsr[t_] := insulin[t]
wnfkbad[t_] := lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t]))
wstatuno[t_] := thuno[t]
wtlrad[t_] := lipopoly[t]
wtlrmac[t_] := lipopoly[t]
wapuno[t_] := lipopoly[t] + lipopoly[t] - lipopoly[t] × lipopoly[t]
wnfkmac[t_] :=
(celastr[t] + lipopoly[t] - celastr[t] × lipopoly[t]) (1 - (unsatfatac[t]))
wmonocy[t_] := (lipopoly[t] + lipopoly[t] - lipopoly[t] × lipopoly[t]) +
(celastr[t] + lipopoly[t] - celastr[t] × lipopoly[t]) (1 - (unsatfatac[t])) -
(lipopoly[t] + lipopoly[t] - lipopoly[t] × lipopoly[t])
((celastr[t] + lipopoly[t] - celastr[t] × lipopoly[t]) (1 - (unsatfatac[t])))
wildiez[t_] := ilcuatro[t]
wmdosmacrop[t_] := (ilcuatro[t] + oleanacid[t]) - (ilcuatro[t] × oleanacid[t])
wstatseis[t_] := ilcuatro[t]
wppargm[t_] := ilcuatro[t]
(1 - ((celastr[t] + lipopoly[t] - celastr[t] × lipopoly[t]) (1 - (unsatfatac[t])) +
oleanacid[t] - ((celastr[t] + lipopoly[t] - celastr[t] × lipopoly[t])
(1 - (unsatfatac[t])) oleanacid[t])))
wpparga[t_] := (cebpb[t] + isoorien[t] - cebp[t] × isoorien[t])
(1 - (punical[t] + (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t])) -
punical[t] (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t]))))) (1 - (oleanacid[t])))
wcebp[t_] := cebp[t] + (cebp[t] + isoorien[t] - cebp[t] × isoorien[t])
(1 - (punical[t] + (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t])) -
punical[t] (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t]))))) (1 - (oleanacid[t]))) -
cepb[t] ((cepb[t] + isoorien[t] - cebp[t] × isoorien[t])
(1 - (punical[t] + (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t])) -
punical[t] (lipopoly[t] (1 - (punical[t] + lycop[t] - punical[t] × lycop[t]))
(1 - (astax[t] + anthocy[t] - astax[t] × anthocy[t]))))) (1 - (oleanacid[t]))))
wglut[t_] := (pakt[t] + chre[t] - pakt[t] × chre[t] + extrag[t] + nrg[t] - extrag[t] × nrg[t] -
(pakt[t] + chre[t] - pakt[t] × chre[t]) (extrag[t] + nrg[t] - extrag[t] × nrg[t])) +
celastr[t] - (pakt[t] + chre[t] - pakt[t] × chre[t] + extrag[t] + nrg[t] -
extrag[t] × nrg[t] - (pakt[t] + chre[t] - pakt[t] × chre[t])
(extrag[t] + nrg[t] - extrag[t] × nrg[t])) celastr[t]
wlipol[t_] := ((cyanidin[t] + oleanacid[t] - cyanidin[t] × oleanacid[t]) +
hsl[t] - (cyanidin[t] + oleanacid[t] - cyanidin[t] × oleanacid[t]) hsl[t])
(1 - (pakt[t] + pparga[t] - pakt[t] × pparga[t]))
whsl[t_] := bilobalide[t] (1 - (punical[t]))
wadiponectin[t_] := (anthocy[t] + nrg[t] - anthocy[t] × nrg[t]) (1 - (lipopoly[t]))
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wintrag[t_] := glut[t]
wpiruvate[t_] := glut[t]
wcitric[t_] := glut[t]
watp[t_] := glut[t]
wacetil[t_] := glut[t]
wfattyac[t_] := glut[t]
wtrigly[t_] := glut[t]
wmuno[t_] := statres[t] + statuno[t] - statres[t] × statuno[t] +
  monocy[t] - (statres[t] + statuno[t] - statres[t] × statuno[t]) monocy[t]
wchre[t_] := anthocy[t]
wtmf[t_] := muno[t] (1 - punical[t]) (1 - anthocy[t])
wsocs[t_] := statres[t]
winsulin[t_] := insulin[t]
wlipopoly[t_] := lipopoly[t]
wpunical[t_] := punical[t]
wlycop[t_] := lycop[t]
wastax[t_] := astax[t]
wanthocy[t_] := anthocy[t]
wthuno[t_] := thuno[t]
wcelastr[t_] := celastr[t]
wunsatfatac[t_] := unsatfatac[t]
wilcuatro[t_] := ilcuatro[t]
woleanacid[t_] := oleanacid[t]
wcebpb[t_] := cebpb[t]
wisoorien[t_] := isoorien[t]
wnrg[t_] := nrg[t]
wpakt[t_] := pakt[t]
wextrag[t_] := extrag[t]
wcyanidin[t_] := cyanidin[t]
wbilobalide[t_] := bilobalide[t]
wstatres[t_] := statres[t]
wexercise[t_] := exercise[t]
wcapsaicin[t_] := capsaicin[t]
wresveratrol[t_] := resveratrol[t]
wberberine[t_] := berberine[t]
wallicin[t_] := allicin[t]
wpyrro[t_] := pyrro[t]
wnobi[t_] := nobi[t]
wveg[t_] := nrg[t]
wleptin[t_] := leptin[t]
wampk[t_] := ((adiponectin[t] + isoorien[t] - adiponectin[t] × isoorien[t]) +
  (capsaicin[t] + resveratrol[t] - capsaicin[t] × resveratrol[t]) -
  (adiponectin[t] + isoorien[t] - adiponectin[t] × isoorien[t])
  (capsaicin[t] + resveratrol[t] - capsaicin[t] × resveratrol[t]) +
  (bilobalide[t] + exercise[t] - bilobalide[t] × exercise[t]) +
  (berberine[t] + sirt[t] - berberine[t] × sirt[t]) -
  (bilobalide[t] + exercise[t] - bilobalide[t] × exercise[t])
  (berberine[t] + sirt[t] - berberine[t] × sirt[t])
  - (((adiponectin[t] + isoorien[t] - adiponectin[t] × isoorien[t]) +
    (capsaicin[t] + resveratrol[t] - capsaicin[t] × resveratrol[t]) -

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      (adiponectin[t] + isoorien[t] - adiponectin[t] × isoorien[t])
      (capsaicin[t] + resveratrol[t] - capsaicin[t] × resveratrol[t])) -
      (adiponectin[t] + isoorien[t] - adiponectin[t] × isoorien[t])
      (capsaicin[t] + resveratrol[t] - capsaicin[t] × resveratrol[t]))
    ×
    ((bilobalide[t] + exercise[t] - bilobalide[t] × exercise[t]) +
     (berberine[t] + sirt[t] - berberine[t] × sirt[t]) -
     (bilobalide[t] + exercise[t] - bilobalide[t] × exercise[t])
     (berberine[t] + sirt[t] - berberine[t] × sirt[t]))))
  (1 - atp[t])
wsirt[t_] := ampk[t] + resveratrol[t] - ampk[t] × resveratrol[t] +
  berberine[t] - (ampk[t] + resveratrol[t] - ampk[t] × resveratrol[t]) berberine[t]
wmitoc[t_] := pparga[t] + pyrro[t] - pparga[t] × pyrro[t] + celastr[t] -
  (pparga[t] + pyrro[t] - pparga[t] × pyrro[t]) celastr[t] + allicin[t] -
  (pparga[t] + pyrro[t] - pparga[t] × pyrro[t] + celastr[t] -
   (pparga[t] + pyrro[t] - pparga[t] × pyrro[t]) celastr[t]) allicin[t] +
  pgc[t] - (pparga[t] + pyrro[t] - pparga[t] × pyrro[t] + celastr[t] -
   (pparga[t] + pyrro[t] - pparga[t] × pyrro[t]) celastr[t] + allicin[t] -
   (pparga[t] + pyrro[t] - pparga[t] × pyrro[t] + celastr[t] -
    (pparga[t] + pyrro[t] - pparga[t] × pyrro[t]) celastr[t]) allicin[t]) pgc[t]
wpgc[t_] := sirt[t]
wilseis[t_] := muno[t] (1 - anthocy[t]) (1 - punical[t])

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Out[]:= 1 - atp[t]

In[]:=

In[]:=

In[]:= **b = 5.5;**
dinsr = 1;
dinsulin = 1;
dnfkbad = 1;
dstatuno = 1;
dtlrad = 1;
dtlrmac = 1;
dapuno = 1;
dlipopoly = 1;
dpunical = 1;
dlycop = 1;
dastax = 1;
danthocy = 1;
dthuno = 1;
dnfkmac = 1;
dcelastr = 1;
dunsatfatac = 1;
dmonocy = 1;
dildiez = 1;

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dilcuatro = 1;
dmdosmacrop = 1;
dstatseis = 1;
dppargm = 1;
dpparga = 1;
doleanacid = 1;
dcebpb = 1;
disoorien = 1;
dcebpa = 1;
dglut = 1;
dnrg = 1;
dpakt = 1;
dextrag = 1;
dlipol = 1;
dhs1 = 1;
dcyanidin = 1;
dbilobalide = 1;
dadiponectin = 1;
dintrag = 1;
dpiruvate = 1;
dcitric = 1;
datp = 1;
dacetil = 1;
dfattyac = 1;
dtrigly = 1;
dmuno = 1;
dstatres = 2;
dexercise = 1;
dcapsaicin = 1;
dresveratrol = 1;
dberberine = 1;
dallicin = 1;
dpyrro = 1;
dnobi = 1;
dveg = 1;
dchre = 1;
dtnf = 1;
dleptin = 1;
dsocs = 1;
dampk = 1;
dsirt = 1;
dmitoc = 1;
dpgc = 1;
dilseis = 1;

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ln[]:=

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insr0 = 0.5;
insulin0 = 0.5;
nfkbad0 = 1;
statuno0 = 1;

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tlrad0 = 2;
tlrmac0 = 1;
apuno0 = 1;
lipopoly0 = 2;
punical0 = 1;
lycop0 = 0;
astax0 = 0;
anthocy0 = 1;
thuno0 = 1;
nfkbmac0 = 1;
celastr0 = 0;
unsatfatac0 = 0;
monocy0 = 1;
ildiez0 = 1;
ilcuatro0 = 0;
mdosmacrop0 = 0;
statseis0 = 0;
ppargm0 = 0.5;
pparga0 = 0.5;
oleanacid0 = 0;
cebpb0 = 0.5;
isoorien0 = 0;
cebpa0 = 0.5;
glut0 = 0.5;
nrg0 = 0;
pakt0 = 1;
extrag0 = 1;
lipol0 = 0.5;
hsl0 = 0;
cyanidin0 = 0;
bilobalide0 = 0;
adiponectin0 = 0;
intrag0 = 1;
piruvate0 = 1;
citric0 = 1;
atp0 = 1;
acetil0 = 1;
fattyac0 = 1;
trigly0 = 1;
muno0 = 1;
statres0 = 1;
exercise0 = 0;
capsaicin0 = 0;
resveratrol0 = 0;
berberine0 = 0;
allicin0 = 0;
pyrro0 = 0;
nobi0 = 0;
veg0 = 0;
chre0 = 0;
tnf0 = 1;

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leptin0 = 0.5;
socs0 = 1;
ampk0 = 0.5;
sirt0 = 0;
mitoc0 = 0.5;
pgc0 = 0;
ilseis0 = 1;

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In[ ]:= betahepato = NDSolve[{
  |resolver diferencial numérico
  insr'[t] == (1 / (1 + Exp[-b (winsr[t] - .5)])) - dinsr insr[t]),
  |exponencial
  insulin'[t] == (1 / (1 + Exp[-b (winsulin[t] - .5)])) - dinsulin insulin[t]),
  |exponencial
  nfkbad'[t] == (1 / (1 + Exp[-b (wnfkbad[t] - .5)])) - dnfkbad nfkbad[t]),
  |exponencial
  statuno'[t] == (1 / (1 + Exp[-b (wstatuno[t] - .5)])) - dstatuno statuno[t]),
  |exponencial
  tlrad'[t] == (1 / (1 + Exp[-b (wtlrad[t] - .5)])) - dtlrad tlrad[t]),
  |exponencial
  tlrmac'[t] == (1 / (1 + Exp[-b (wtlrmac[t] - .5)])) - dtlrmac tlrmac[t]),
  |exponencial
  apuno'[t] == (1 / (1 + Exp[-b (wapuno[t] - .5)])) - dapuno apuno[t]),
  |exponencial
  lipopoly'[t] == (1 / (1 + Exp[-b (wlipopoly[t] - .5)])) - dlipopoly lipopoly[t]),
  |exponencial
  punical'[t] == (1 / (1 + Exp[-b (wpunical[t] - .5)])) - dpunical punical[t]),
  |exponencial
  lycop'[t] == (1 / (1 + Exp[-b (wlycop[t] - .5)])) - dlycop lycop[t]),
  |exponencial
  astax'[t] == (1 / (1 + Exp[-b (wastax[t] - .5)])) - dastax astax[t]),
  |exponencial
  anthocy'[t] == (1 / (1 + Exp[-b (wanthocy[t] - .5)])) - danthocy anthocy[t]),
  |exponencial
  thuno'[t] == (1 / (1 + Exp[-b (wthuno[t] - .5)])) - dthuno thuno[t]),
  |exponencial
  nfkbmac'[t] == (1 / (1 + Exp[-b (wnfkbmac[t] - .5)])) - dnfkbmac nfkbmac[t]),
  |exponencial
  celastr'[t] == (1 / (1 + Exp[-b (wcelastr[t] - .5)])) - dcelastr celastr[t]),
  |exponencial
  unsatfatac'[t] == (1 / (1 + Exp[-b (wunsatfatac[t] - .5)])) - dunsatfatac unsatfatac[t]),
  |exponencial
  monocy'[t] == (1 / (1 + Exp[-b (wmonocy[t] - .5)])) - dmonocy monocy[t]),
  |exponencial
  ildiez'[t] == (1 / (1 + Exp[-b (wildiez[t] - .5)])) - dildiez ildiez[t]),
  |exponencial
  ilcuatro'[t] == (1 / (1 + Exp[-b (wilcuatro[t] - .5)])) - dilcuatro ilcuatro[t]),
  |exponencial

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$$\text{mdosmacrop}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wmdosmacrop}[t] - .5)]} \right) - \text{dmdosmacrop mdosmacrop}[t],$$

$$\text{statseis}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wstatseis}[t] - .5)]} \right) - \text{dstatseis statseis}[t],$$

$$\text{ppargm}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wppargm}[t] - .5)]} \right) - \text{dppargm ppargm}[t],$$

$$\text{pparga}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wpparga}[t] - .5)]} \right) - \text{dpparga pparga}[t],$$

$$\text{oleanacid}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{woleanacid}[t] - .5)]} \right) - \text{doleanacid oleanacid}[t],$$

$$\text{cebpb}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wcebpb}[t] - .5)]} \right) - \text{dcebpb cepb}[t],$$

$$\text{isoorien}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wisoorien}[t] - .5)]} \right) - \text{disoorien isoorien}[t],$$

$$\text{cebpa}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wcebpa}[t] - .5)]} \right) - \text{dcebpa cebpa}[t],$$

$$\text{glut}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wglut}[t] - .5)]} \right) - \text{dglut glut}[t],$$

$$\text{nrg}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wnrg}[t] - .5)]} \right) - \text{dnrg nrg}[t],$$

$$\text{pakt}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wpakt}[t] - .5)]} \right) - \text{dpakt pakt}[t],$$

$$\text{extrag}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wextrag}[t] - .5)]} \right) - \text{dextrag extrag}[t],$$

$$\text{lipol}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wlipol}[t] - .5)]} \right) - \text{dlipol lipol}[t],$$

$$\text{hsl}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{whsl}[t] - .5)]} \right) - \text{dhsl hsl}[t],$$

$$\text{cyanidin}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wcyanidin}[t] - .5)]} \right) - \text{dcyanidin cyanidin}[t],$$

$$\text{bilobalide}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wbilobalide}[t] - .5)]} \right) - \text{dbilobalide bilobalide}[t],$$

$$\text{adiponectin}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wadiponectin}[t] - .5)]} \right) - \text{dadiponectin adiponectin}[t],$$

$$\text{intrag}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wintrag}[t] - .5)]} \right) - \text{dintrag intrag}[t],$$

$$\text{piruvate}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wpiruvate}[t] - .5)]} \right) - \text{dpiruvate piruvate}[t],$$

$$\text{citric}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wcitric}[t] - .5)]} \right) - \text{dcitric citric}[t],$$

$$\text{atp}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{watp}[t] - .5)]} \right) - \text{datp atp}[t],$$

$$\text{acetil}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wacetil}[t] - .5)]} \right) - \text{dacetil acetil}[t],$$

$$\text{fattyac}'[t] = \left(\frac{1}{1 + \text{Exp}[-b(\text{wfattyac}[t] - .5)]} \right) - \text{dfattyac fattyac}[t],$$

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    trigly' [t] == (1 / (1 + Exp[-b (wtrigly[t] - .5)])) - dtrigly trigly[t],
    muno' [t] == (1 / (1 + Exp[-b (wmuno[t] - .5)])) - dmuno muno[t],
    statres' [t] == (1 / (1 + Exp[-b (wstatres[t] - .5)])) - dstatres statres[t],
    exercise' [t] == (1 / (1 + Exp[-b (wexercise[t] - .5)])) - dexercise exercise[t],
    capsaicin' [t] == (1 / (1 + Exp[-b (wcapsaicin[t] - .5)])) - dcapsaicin capsaicin[t],
    resveratrol' [t] ==
      (1 / (1 + Exp[-b (wresveratrol[t] - .5)])) - dresveratrol resveratrol[t],
    berberine' [t] == (1 / (1 + Exp[-b (wberberine[t] - .5)])) - dberberine berberine[t],
    allicin' [t] == (1 / (1 + Exp[-b (wallicin[t] - .5)])) - dallicin allicin[t],
    pyrro' [t] == (1 / (1 + Exp[-b (wpyrro[t] - .5)])) - dpyrro pyrro[t],
    nobi' [t] == (1 / (1 + Exp[-b (wnobi[t] - .5)])) - dnobi nobi[t],
    veg' [t] == (1 / (1 + Exp[-b (wveg[t] - .5)])) - dveg veg[t],
    chre' [t] == (1 / (1 + Exp[-b (wchre[t] - .5)])) - dchre chre[t],
    tn timer' [t] == (1 / (1 + Exp[-b (wtimer[t] - .5)])) - dtimer timer[t],
    leptin' [t] == (1 / (1 + Exp[-b (wleptin[t] - .5)])) - dleptin leptin[t],
    socs' [t] == (1 / (1 + Exp[-b (wsocs[t] - .5)])) - dsocs socs[t],
    ampk' [t] == (1 / (1 + Exp[-b (wampk[t] - .5)])) - dampk ampk[t],
    sirt' [t] == (1 / (1 + Exp[-b (wsirt[t] - .5)])) - dsirt sirt[t],
    mitoc' [t] == (1 / (1 + Exp[-b (wmitoc[t] - .5)])) - dmitoc mitoc[t],
    pgc' [t] == (1 / (1 + Exp[-b (wpgc[t] - .5)])) - dpgc pgc[t],
    ilseis' [t] == (1 / (1 + Exp[-b (wilseis[t] - .5)])) - dilseis ilseis[t],

    nfkb[0] == nfkb0, statuno[0] == statuno0, tlr[0] == tlr0, tlr mac[0] == tlr mac0,
    ap[0] == ap0, lipopoly[0] == lipopoly0, punical[0] == punical0,
    lycop[0] == lycop0, astax[0] == astax0, anthocy[0] == anthocy0, thuno[0] == thuno0,
    nfkb mac[0] == nfkb mac0, celastr[0] == celastr0, unsatfatac[0] == unsatfatac0,
    monocy[0] == monocy0, ildiez[0] == ildiez0, ilcuatro[0] == ilcuatro0,
    mdosmacrop[0] == mdosmacrop0, statseis[0] == statseis0, ppargm[0] == ppargm0,
    pparga[0] == pparga0, oleanacid[0] == oleanacid0, cebpb[0] == cebpb0,

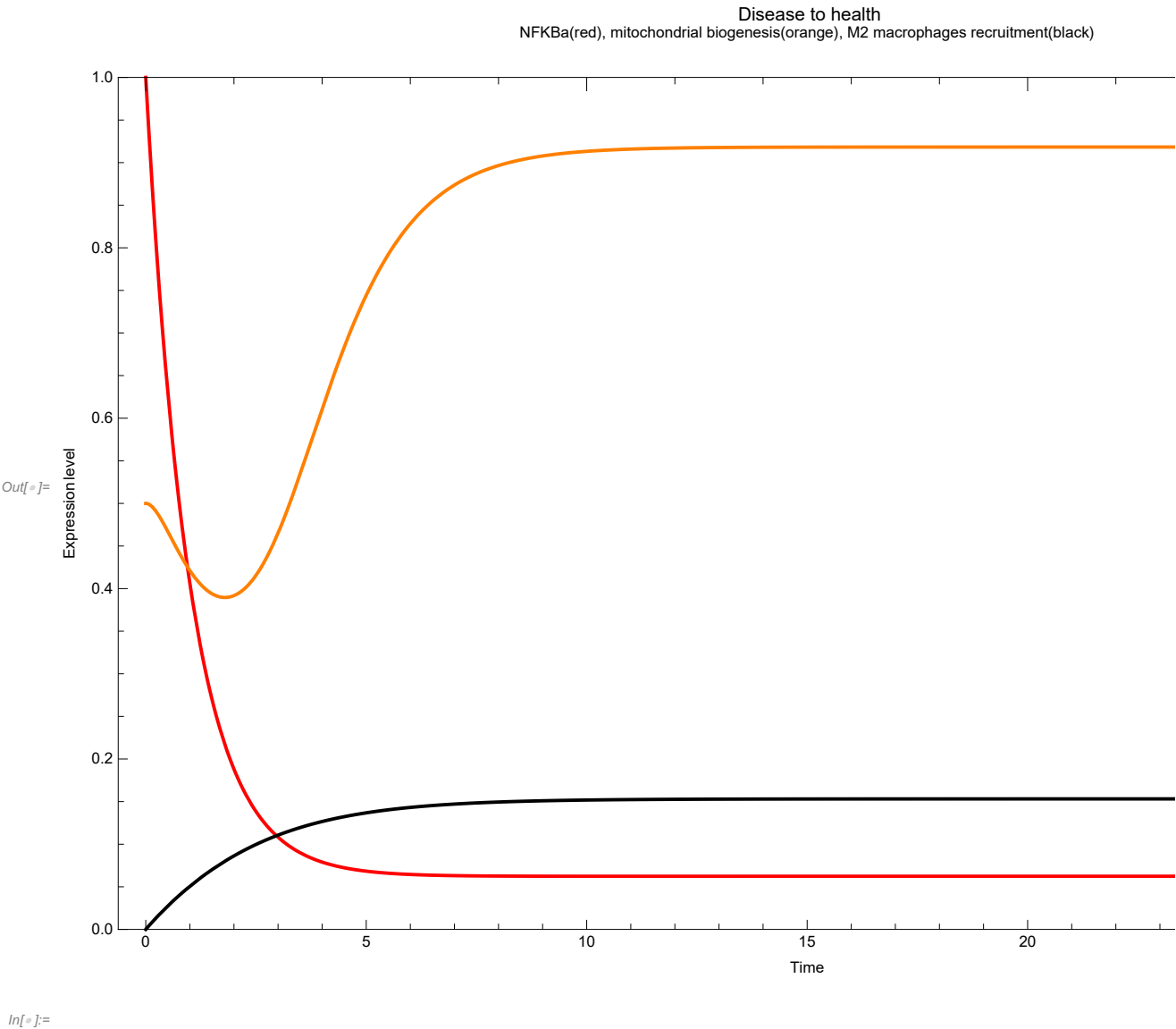
```

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isoorien[0] == isoorien0, cebpa[0] == cebpa0, insr[0] == insr0,
insulin[0] == insulin0, glut[0] == glut0, nrg[0] == nrg0, pakt[0] == pakt0,
extrag[0] == extrag0, lipol[0] == lipol0, hsl[0] == hsl0, cyanidin[0] == cyanidin0,
bilobalide[0] == bilobalide0, adiponectin[0] == adiponectin0, intrag[0] == intrag0,
piruvate[0] == piruvate0, citric[0] == citric0, atp[0] == atp0,
acetil[0] == acetil0, fattyac[0] == fattyac0, trigly[0] == trigly0, muno[0] == muno0,
statres[0] == statres0, exercise[0] == exercise0, capsaicin[0] == capsaicin0,
resveratrol[0] == resveratrol0, berberine[0] == berberine0, allicin[0] == allicin0,
pyrro[0] == pyrro0, nobi[0] == nobi0, veg[0] == veg0, chre[0] == chre0,
tnf[0] == tnf0, leptin[0] == leptin0, socs[0] == socs0, ampk[0] == ampk0,
sirt[0] == sirt0, mitoc[0] == mitoc0, pgc[0] == pgc0, ilseis[0] == ilseis0},
{nfkbad[t], statuno[t], tlrads[t], tlrads[t], apuno[t], lipopoly[t], punical[t],
lycop[t], astax[t], anthocy[t], thuno[t], nfkbmac[t], celastr[t], unsatfatac[t],
monocy[t], ildiez[t], ilcuatro[t], mdosmacrop[t], statseis[t], ppargm[t],
pparga[t], oleanacid[t], cebpb[t], isoorien[t], cebpa[t], insr[t], insulin[t],
glut[t], nrg[t], pakt[t], extrag[t], lipol[t], hsl[t], cyanidin[t], bilobalide[t],
adiponectin[t], intrag[t], piruvate[t], citric[t], atp[t], acetil[t], fattyac[t],
trigly[t], muno[t], statres[t], exercise[t], capsaicin[t], resveratrol[t],
berberine[t], allicin[t], pyrro[t], nobi[t], veg[t], chre[t], tnf[t],
leptin[t], socs[t], ampk[t], sirt[t], mitoc[t], pgc[t], ilseis[t]}, {t, 0, 30.});

In[ ]:= netw = Plot[Evaluate[{nfkbad[t], mitoc[t], mdosmacrop[t]} /. betahepato], {t, 0, 30},
  \[repr... evalúa
  PlotRange -> {0, 1}, FrameLabel -> {{Expression level,}, {Time,
    \[rango de representación \[etiqueta de marco \[expresión
    "NFKBa(red), mitochondrial biogenesis(orange), M2 macrophages recruitment(black)
  }}, PlotStyle -> {{Thick, Red}, {Thick, Orange}, {Thick, Darker[Black]}, {Thick, Pink},
    \[estilo de represe... \[grueso \[rojo \[grueso \[naranja \[grueso \[más o... \[negro \[grueso \[rosa
    {Thick, Purple}, {Thick, Blue}, {Thick, Red}, {Thick, Gray}, {Thick, Black}},
    \[grueso \[púrpura \[grueso \[azul \[grueso \[rojo \[grueso \[gris \[grueso \[negro
  Frame -> True, PlotLabel -> " Disease to health"
  \[marco \[verd... \[etiqueta de representación

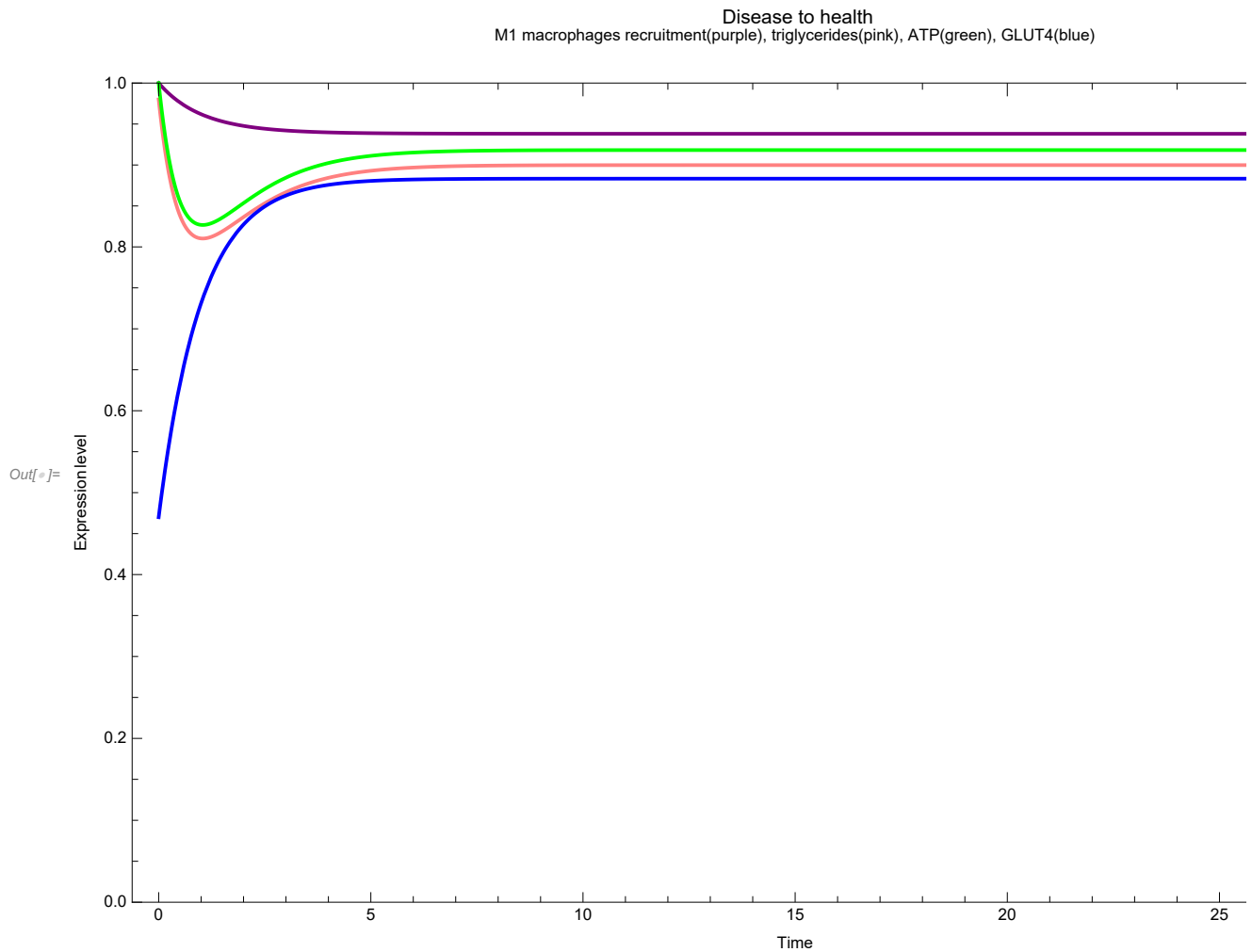
```



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In[ ]:= netw = Plot[
  representación gráfica
  Evaluate[{muno[t], 0.98 trigly[t], atp[t], 0.94 glut[t]} /. betahepato], {t, 0, 30},
  evalúa
  PlotRange -> {0, 1}, FrameLabel -> {{Expression level,}, {Time,
  rango de representación etiqueta de marco expresión
    "M1 macrophages recruitment(purple), triglycerides(pink), ATP(green), GLUT4(blue)
  "}}, PlotStyle -> {{Thick, Purple}, {Thick, Pink}, {Thick, Green}, {Thick, Blue},
  estilo de represe... grueso púrpura grueso rosa grueso verde grueso azul
    {Thick, Blue}, {Thick, Blue}, {Thick, Red}, {Thick, Gray}, {Thick, Black}},
  grueso azul grueso azul grueso rojo grueso gris grueso negro
  Frame -> True, PlotLabel -> " Disease to health"]
marco verd... etiqueta de representación

```



```

In[ ]:=

```