First model considered for adipocytes "growing".

L lipides in the blood
$u(t,r)$ adipocytes number at time t of radius r
The link between r and l is the following,

$$V_l l = \frac{4}{3}\pi r^3 - V_{min}$$

with $V_{min} = \frac{4}{3}\pi r_{min}^3$ and $\frac{dl}{dt} = \frac{4\pi}{V_l}\frac{dr}{dt}r^2$.

Model the lipogenesis and the lipolysis (fluxes of triglycerides l) :

$$\frac{dl}{dt} = V_l a r^2 \frac{L}{L+\kappa_L}\frac{\kappa_r^n}{r^n+\kappa_r^n} - V_l(B+br^2)\frac{l}{l+\kappa_t V_l}$$

we rewrite with the variable r :

$$\frac{dr}{dt} = \frac{aV_l}{4\pi}\frac{L}{L+\kappa_L}\frac{\kappa_r^n}{r^n+\kappa_r^n} - V_l\frac{(B+br^2)}{4\pi r^2}\frac{\frac{4}{3}\pi r^3 - V_{min}}{\frac{4}{3}\pi r^3 - V_{min} + V_l\kappa_t} = \tau(r,L)$$

From these fluxes, the dynamics of the number of adypocytes u is described by

$$\partial_t u(t,r) + \partial_r(\tau(r,L)u - D\partial_r u) = 0$$

with D a diffusion coefficient. The intracellular quantity of triglycerides is $U(t) = \int l\rho_u dl$ with ρ_u adipocytes density. The total amount of triglycerides is assumed constant over time : $\frac{d}{dt}(L(t)+U(t)) = 0$ and $\frac{dL}{dt} = -\frac{dU}{dt}$

boundary/initial conditions. $u(0,r) =$ Gaussian density (minimum $= r_{min}$), first test : unimodal (Q : can we recover the bimodal distribution that is observed).
$L(t) = L_0 + U(0) - U(t)$
$(\tau(r,L)u(t,r) - D\partial_r u(t,r))|_{r_{max}} = 0$

Recruitment of new adipocytes. We assumed that when the level of triglycerides increases too largely, pre-adipocytes differentiate into adipocytes. This recruitment is modeled with the r_{min} BC, as follows,

$$(\tau(r,L)u(t,r) - D\partial_r u(t,r))|_{r_{min}} = f(L)$$

with $f(L) = \alpha L$ or $f(L) = \alpha\frac{L}{(L+\kappa)}$