Supplementary Material

**Supplementary Table S1**. Differential and algebraic equations, and standard parameter values, for the model.

**Supplementary Figure S1.** Comparison of simulated time courses of C/EBP protein induced by stimuli of different strengths, in the absence of repressors. (*A*) Time courses of C/EBP protein after 1 min of stimulation with different strengths. Nine days after a stimulus analogue to IA training, C/EBP protein either returned to the basal level after a transient increase (e.g., red curve) or reached the upper steady state (e.g., orange curve). No intermediate steady states existed. (*B*). C/EBP protein level 9 days after stimulation vs. stimulus strength. One min of stimulation with an amplitude greater than 0.02 mM/s would switch C/EBP protein level from its basal level to the upper steady state.

**Supplementary Figure S2.** To test the robustness of the model, a parameter sensitivity analysis was conducted. (*A*) Compared to the control simulation with standard values of parameters (black curves), decreasing *Ka\_bdnf* by 6% (blue curve), 12% (dark green curve) or 18% (orange curve) substantially changed the time courses of pCREB and C/EBP post-stimulus. Increasing *Ka\_bdnf* by 6% (purple curve), 12% (red curve) or 18% (light green curve) did not substantially change the time courses of pCREB, and C/EBP. (*B*) Increasing *kminb* by 6% (blue curve), 12% (dark green curve) or 18% (orange curve), or decreasing *kminb* by 6% (purple curve), 12% (red curve) or 18% (light green curve) had moderate effects on the time courses of pCREB, and C/EBP post-stimulus. (*C*) Increasing *kbasalp\_creb* by 6% (blue curve), 12% (dark green curve) or 18% (orange curve), or decreasing *kbasalp\_creb* by 6% (purple curve), 12% (red curve) or 18% (light green curve) did not significantly change the time courses of pCREB, and C/EBP. Note although a total of 60 different values were simulated for each parameter (see main text), only six simulations are illustrated in each panel.