

Immune responses that are induced in
the human and mouse gastrointestinal
tract by *Lactobacillus plantarum*

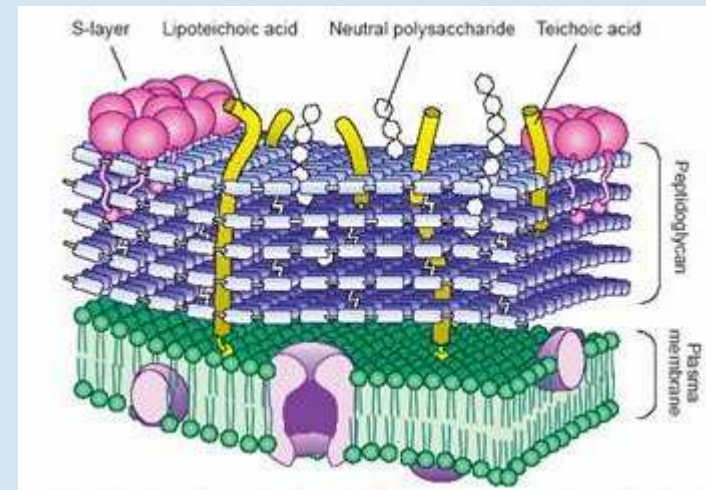
Wageningen, 14 november 2007

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Muriel Derrien,
Erik Peters,
Fred Troost,
Roland Siezen,
Cindy van der Meer,
Michiel Kleerebezem,
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et al.

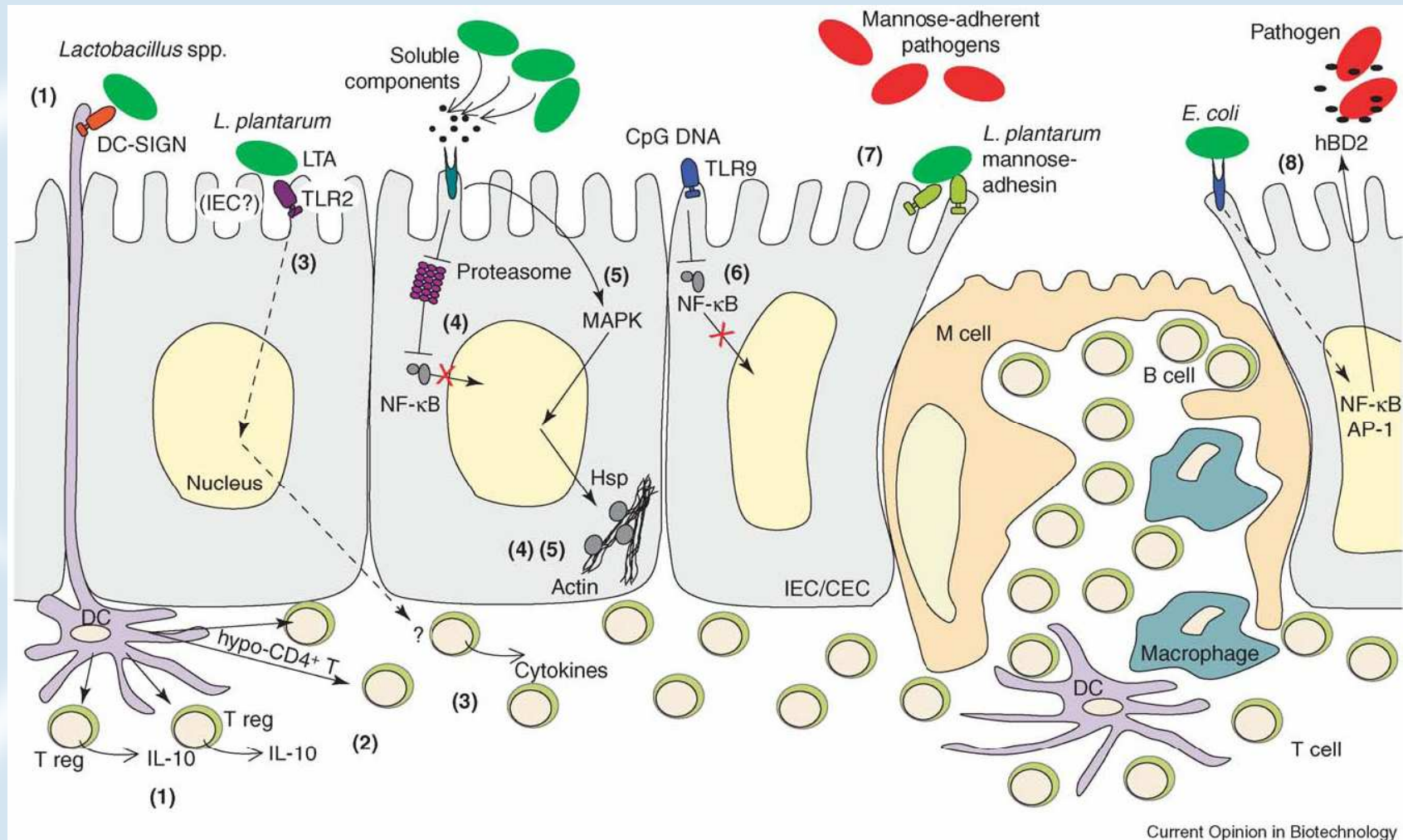
Immunogenicity of *Lactobacillus plantarum* - wall composition

© *Lactobacillus plantarum* immunogenic wall fragments:

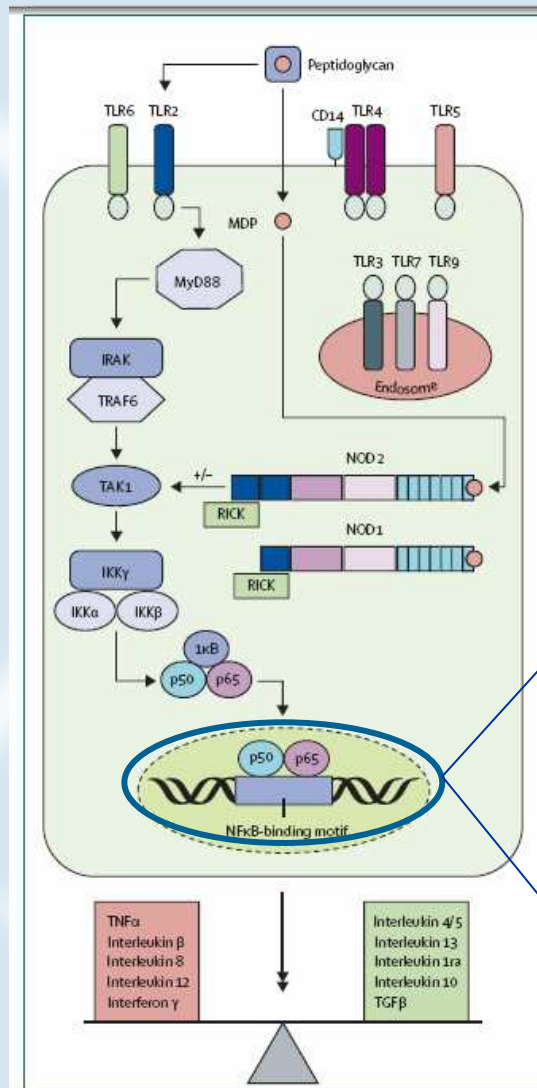
- mDAP-acid and/or mDAP-alanine PGN
- (ribitol) teichoic acids
- lipoteichoic acids
- polysaccharides and surface proteins



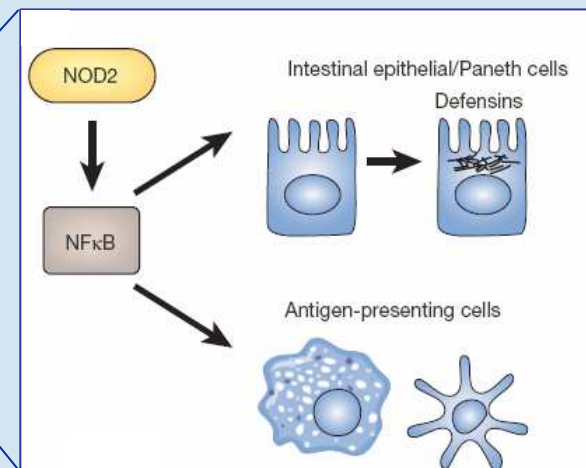
Interactions between *Lactobacillus* and intestinal mucosa



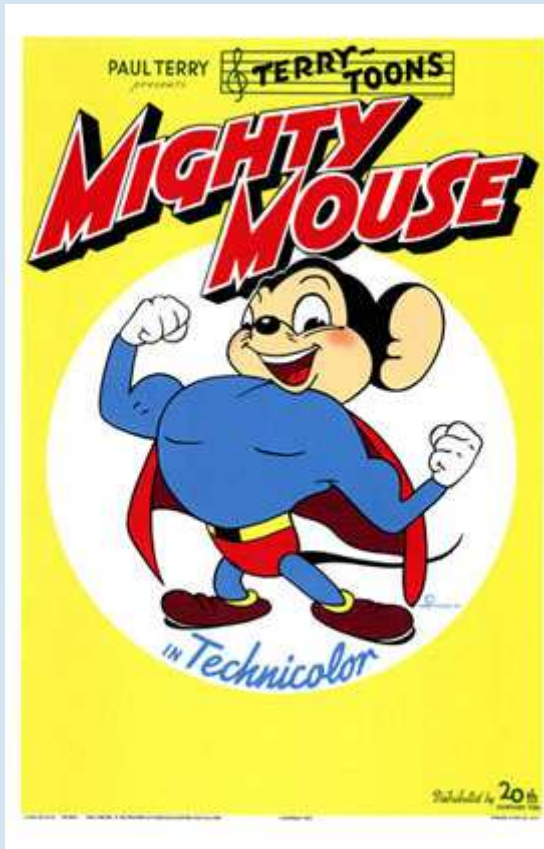
Gut bacteria are perceived by TLRs and NODs



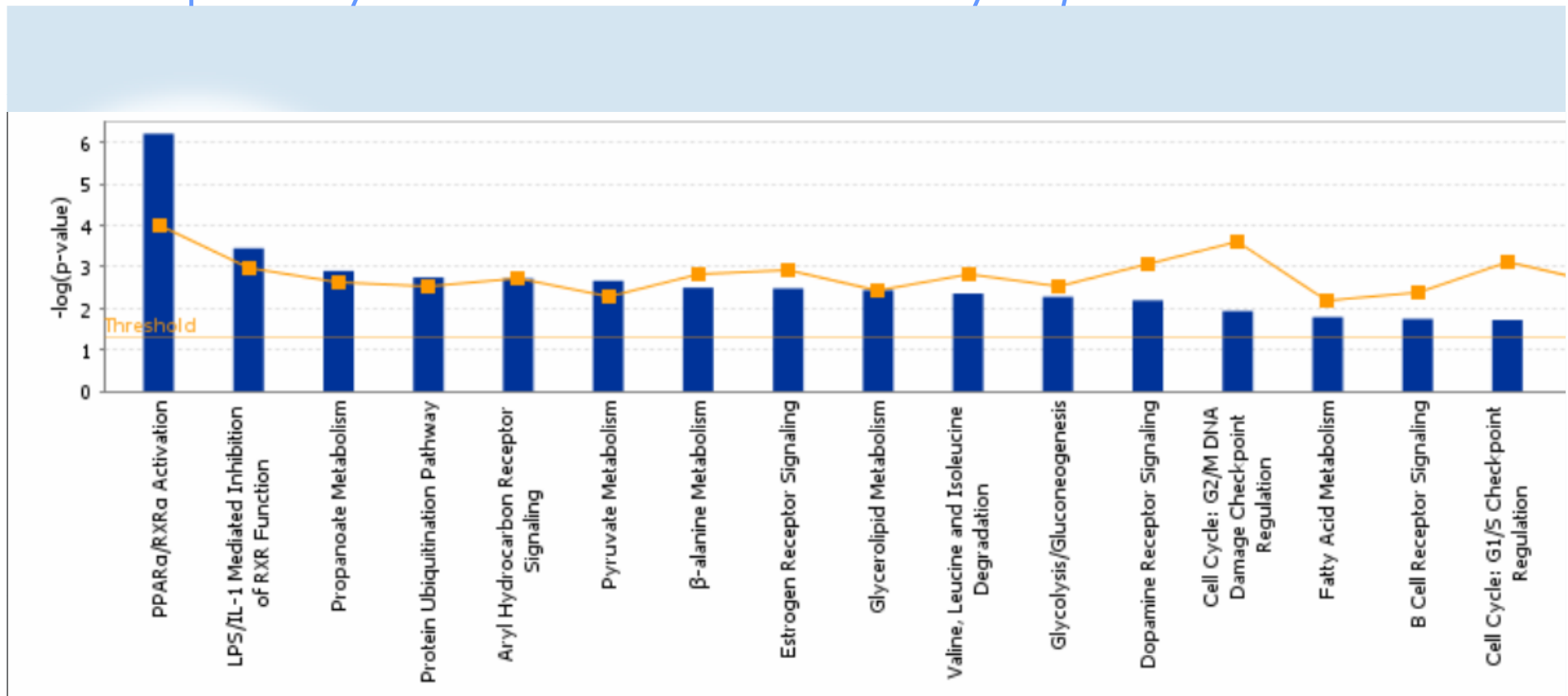
• *Lactobacillus plantarum* MDP perception through bacterial pattern recognition receptors: Toll-Like Receptors (TLRs) and Nuclear Oligomerisation Domain receptors (NOD2*)



• * Hasagawa *et al.* (2006) J Biol Chem

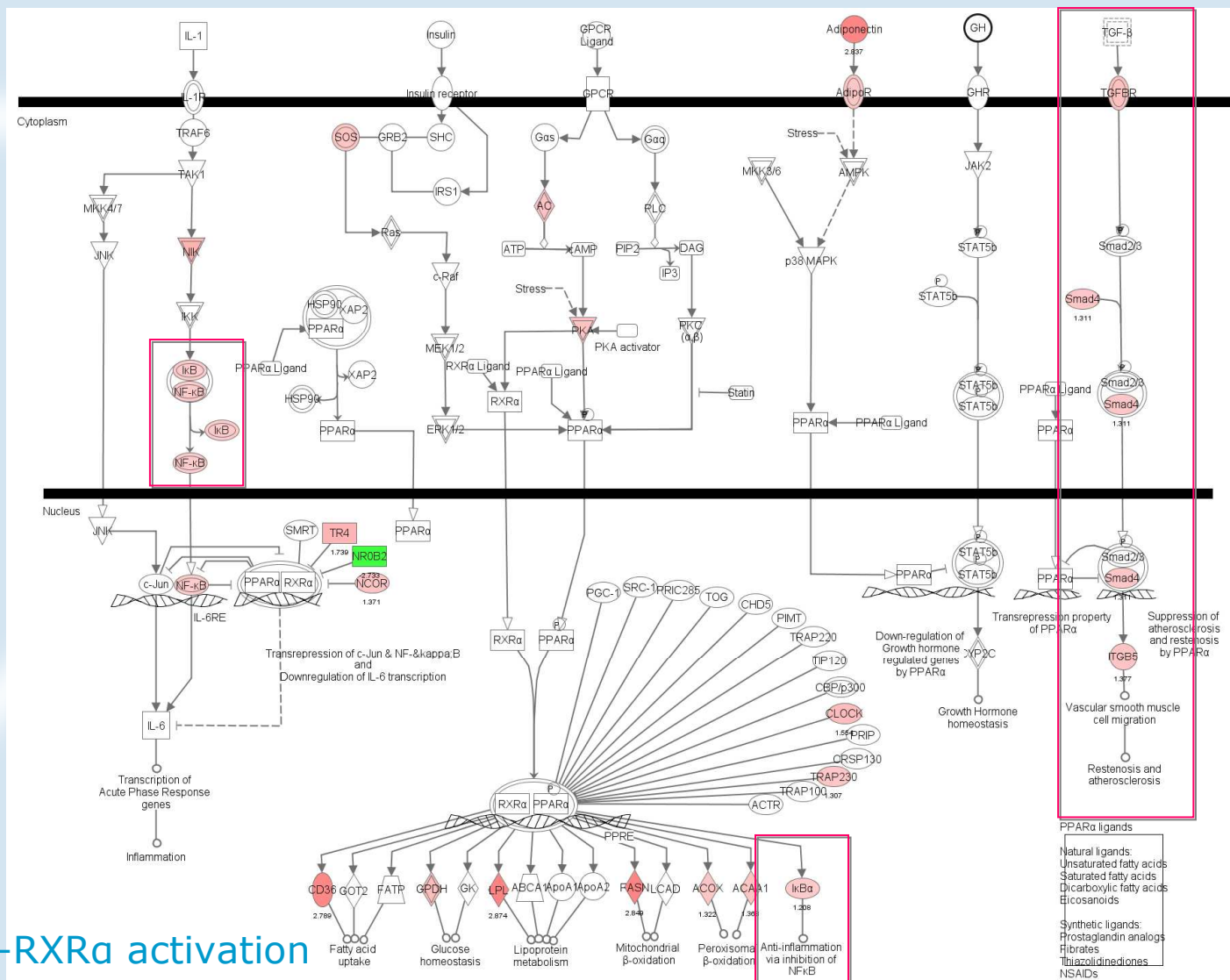


Cellular pathways induced in mouse ileum by *L. plantarum*



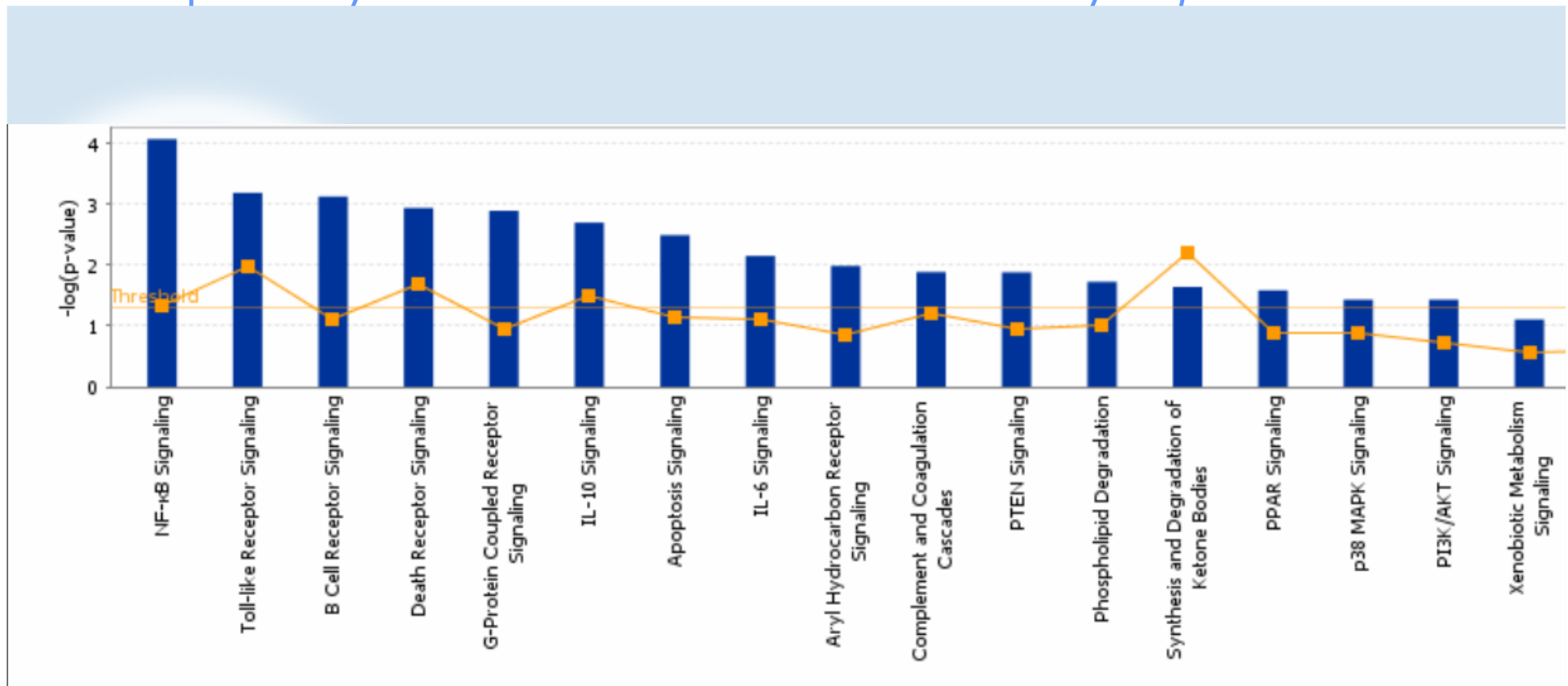
© *L. plantarum* induces fatty acid, lipid and other metabolic processes together with immune responses after colonisation of the germ-free mouse ileum

Comparison of responses of human and mouse at pathway level (I)



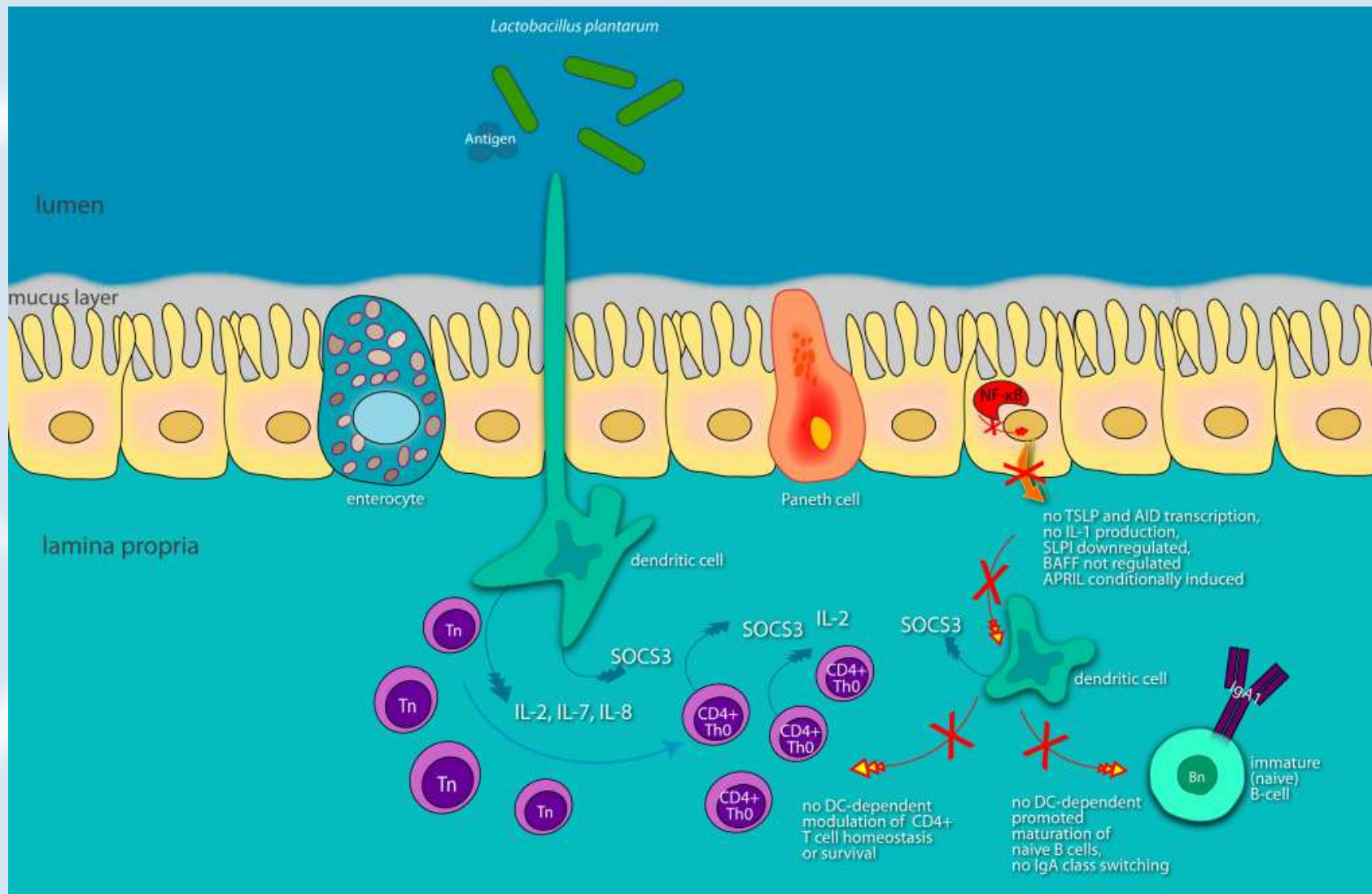


Cellular pathways induced in human duodenum by *L. plantarum*



© In pre-colonised human duodenum, *L. plantarum* induces regulated immune responses, less modulation of fatty acid and lipid metabolism (compared to mouse)

Immune responses induced by *L. plantarum* in healthy humans



Comparison of some basal responses in human and mouse

pathway	induced in mouse	induced in human
Aryl Hydrocarbon Receptor Signaling	yes	yes
Fatty Acid Metabolism	strong	low upregulation
Apoptosis Signaling	down	modulated
integrin signalling	yes	yes
Cell Cycle: G1/S Checkpoint Regulation	yes	yes
NF-κB Signalling	hardly	yes
IκB	yes	yes
B Cell Receptor Signaling	yes	yes
LPS/IL-1 Mediated Inhibition of RXR Function	yes	yes
PPARα/RXRα Activation	yes	yes
PPAR Signalling	yes	yes
IL-10 Signalling	⊘	yes
Propanoate Metabolism	yes	⊘
etc... etc... etc...		

Global overview responses human and mouse to *L. plantarum*

- mouse and human show some basal similarity in responses to *Lactobacillus plantarum*
- *L. plantarum* induces clear immune responses in human, immune response-associated genes induced in mouse are more often also involved in lipid and fatty acid metabolism (based on pathway analysis)
- stimulation of cell metabolism in germ-free mice may hint at growth-promoting effect of intestinal colonisation
- further comparisons using pre-colonised mice may help to delineate the balance between altered immune responses and metabolism

