ImmunoTools *special* Award 2014

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Exercise training effects on immune function and metabolism

Obesity is characterized by low-grade systemic inflammation, which has been associated with the development of insulin resistance, atherosclerosis, neurodegeneration and tumour growth (*Gleeson et al., Nat Rev Immunol 2011*). Regular physical activity has extensive health benefits, acts anti-inflammatory and is effective in the prevention and treatment of obesity-associated diseases like type 2 diabetes, cardiovascular disease and mental disorders (*Pedersen, J Physiol 2009*). Beyond skeletal muscle, little is known about the molecular pathways underlying the systemic health effects of exercise. The overall aim of this project is to gain further understanding on the signalling pathways involved in the beneficial roles of exercise training.

Aim 1: Explore effects of exercise training on the immune system

Although exercise training has been associated with reduced inflammation, little is known about the effects of training on specific immune cells and systemic immune cell profiles. We will characterize exercise training effects on the immune system as a starting point for further mechanistic research. Initially, we will analyse immune cell profiles in spleen, blood and peripheral tissues after exercise training regimens in mice (wheelrunning and swimming) using Immunotools antibodies for flow cytometry. Further characterization will be done using qPCR and histology. This will provide a basis for further cell-focused experiments. In addition, we will investigate effects of exercise training on disease development by training mice for 3 weeks followed by induction of inflammatory diseases such as glomerulonephritis and colitis. Disease severity and development will be assessed by body weights, clinical assessment, flow cytometry-analysis, histology and qPCR.

Aim 2: Characterize novel exercise-associated myokines

Exercise training is associated with reductions in white adipose tissue mass, increased lipolysis, increased storage of lipids in muscle and reduced liver fat (*Bosma*

et al., Drug Discovery Today 2014). Factors secreted to the circulation upon exercise may be involved in the peripheral metabolic effects of exercise training.

Cytokines and chemokines that are described to be elevated upon exercise (training) and/or suggested to be secreted by muscle include interleukins 4, 6, 7 and 13, BMP-2, BDNF, VEGFb and CXCL1. In addition to their involvement in immunoregulation, these potential myokines may be involved in exercise (training) effects on metabolism. An Immunotools award would allow us to use Immunotools mouse recombinant cytokines to screen for (anti-)inflammatory effects *in vitro* (macrophages and T-cells) as well as lipid metabolic effects (adipocytes, hepatocytes and myocytes), which will provide the basis for further mechanistic *in vitro* and *in vivo* follow up experiments.

This project will result in further understanding of the anti-inflammatory effects of exercise training and will result in characterization of metabolic effects of exercise-induced cytokines.

ImmunoTools *special* AWARD for **Madeleen Bosma** includes 24 reagents

recombinant human cytokines: rh BMP-2, rh BDNF,

FITC - conjugated anti-mouse CD8a, CD44, CD45R, a/b TCR, g/d TCR,

PE - conjugated anti-mouse Gr-1, NK-cells,

APC - conjugated anti-mouse CD3e, CD4, CD11b, CD19, CD45, NK-cells,

recombinant mouse cytokines: rm FGF-b / FGF-2, rm IL-6, IL-7, rm IL-13, rm LIF, rm MIP3α / CCL20, rm VEGF, rm GRO-a / CXCL1, rm IL-15

DETAILS more AWARDS