Cytokines as molecular biomarkers for cancer cachexia

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Abstract
Cachexia is a multifactorial syndrome defined by irreversible loss of skeletal muscle mass and function and multifaceted metabolic dysfunction that cannot be reversed by conventional nutritional support. The pathogenesis of cancer cachexia is characterized by a marked decrease in muscle mass and function, and is associated with increased risk of death in patients with advanced cancer. The underlying mechanisms have been poorly understood. This review will focus on the role of cytokines and their effects on muscle metabolism in cancer cachexia.

Introduction
Cancer cachexia is defined as a complex metabolic disorder associated with underlying chronic and characterized by loss of skeletal muscle mass and function. This syndrome is associated with progressive muscle weakness, loss of appetite and weight loss. The underlying mechanisms include increased muscle protein degradation and reduced muscle protein synthesis. Cachexia is characterized by an increase in net muscle mass and function, and is associated with increased risk of death in patients with advanced cancer. The underlying mechanisms have been poorly understood. This review will focus on the role of cytokines and their effects on muscle metabolism in cancer cachexia.

Cancer diagnosis
Progression of cachexia

Tumour-induced inflammation

- Protein catabolism
- Protein anabolism
- Calcium intake
- Insulin resistance
- Lipidysis
- RPE

Physical function
Independence for activities of daily living
Hospitalizations
Response to therapy
Toxicity
Quality of life

Figure 1: Cascade of events that lead to cancer cachexia and impact in the patients. Tumor-associated chronic inflammation induces an abnormal increase of proinflammatory cytokines such as IL-6, IL-6, TNFα, and IFN-α. These cytokines have been directly or indirectly implicated in the process of protein catabolism in the muscle, inhibition of protein anabolism, increase of muscle protein breakdown and loss of physique in cancer patients. This cachexia is characterized by an increase in net muscle mass and function, and is associated with increased risk of death in patients with advanced cancer. The underlying mechanisms have been poorly understood. This review will focus on the role of cytokines and their effects on muscle metabolism in cancer cachexia.