Streptococcus thermophilus CNRZ160 preserves muscle anabolism in old rats by targeting anti-inflamamtory mechanisms at the gut level: A probable gut-muscle crosstalk

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Introduction et But de l'étude

By preventing post prandial muscle anabolism, inflammation has been recognized to be one of the factors responsible for sarcopenia during aging. Age-associated microbiota dysbiosis by increasing intestinal permeability/inflammation could be the starting point of an intestinal followed by systemic inflammation. However, the mechanisms by which intestinal inflammation can lead to a blunted anabolic response is still under hypothesis. Our study was designed to first link a targeted intestinal inflammation to muscle anabolic response and how a bacterial strain presenting gut anti-inflammatory properties in vitro could prevent these adverse effects.

Matériels et Méthodes

Microbiota dysbiosis and intestinal inflammation in elderly rats (18m) were generated by adjusted ingestion of low concentration of Dextran Sodium Sulfate (DSS) for 1 month, with (CNRZ group) or without (DSS group) S. Thermophilus CNRZ160 (10^9 CFU/day) with anti-inflammatory potential in vitro (Junjua, 2016). They were compared to pair fed control rats (PF). Muscle and colon were harvested and tissues protein synthesis assessed in the post-prandial state (flooding dose method with ^{13}C Valine). Expression of tight junction / inflammatory markers and proteolytic systems were determined in colon and muscle respectively. Insulin and glucose levels were assayed in plasma. Groups were compared using ANOVA and Fisher posthoc test (significance: $p < 0.05$).

Résultats et Analyse statistique

As expected, colon weight was increased by 13% with DSS ($P<0.05$) and a muscle mass loss was indeed recorded compared to PF ($p < 0.05$). CRZ170 allowed to :1) maintain normal colon weight 2) limit the loss of fat free mass by a better maintenance of post prandial muscle protein synthesis ($p < 0.05$) and an inhibition of proteolysis (MURF1 and Cathepsin L, $P<0.05$). Mechanisms involved are independent to an improvement of insulin sensitivity as CNRZ160 did not prevent the increase in HOMA induced by the DSS (+66% vs PF, $P<0.01$) but rather by an anti-inflammatory mechanism at the colon level (IFNγ inhibited and IL10 activated respectively, $P<0.05$).

Conclusion

In the elderly, an inflammation of intestinal origin could participate in sarcopenia development by limitating anabolic response. Ingestion of S. Thermophilus could prevent these adverse effects by mechanisms excluding a probiotic effect on insulin sensitivity but involving specifically an anti-inflammatory status in the colon highlighting a probable gut-muscle axis which remains to be further characterized at the systemic level.