Inorganic nitrate (NO_3^-) supplementation, most commonly administered as NO_3^--rich beetroot juice, has emerged as a potential ergogenic aid in recent year. Initial studies indicated that NO_3^- supplementation could improve exercise economy (lower the O_2 cost of exercise) and performance during continuous submaximal endurance exercise in recreationally active and moderately trained participants. These beneficial effects were attributed to the stepwise reduction of NO_3^- to nitrite (NO_2^-) and then NO_2^- to nitric oxide (NO) since the latter is recognised as a multifaceted physiological signalling molecule. Initial mechanistic studies in humans suggested that improved exercise economy and endurance performance after NO_3^- supplementation could be linked to improved efficiency of mitochondrial oxidative phosphorylation (increased ADP/O ratio) or improved efficiency of skeletal muscle contraction (lower ATP cost of force production). Subsequent studies in rodents indicated that NO_3^- supplementation can improve skeletal muscle Ca^{2+} handling during evoked contractions and blood flow during exercise, and that such responses were more pronounced in fast-twitch skeletal muscle. Since the reduction of NO_2^- to NO is potentiated in acidosis and hypoxia, and since acidosis and hypoxia develop to a greater extent in fast-twitch compared to slow-twitch skeletal muscle fibres, this may account for preferential enhancement of physiological responses in fast-twitch skeletal muscle after NO_3^- supplementation. These observations prompted interest in assessing the ergogenic potential of NO_3^- supplementation in exercise settings that mandate increase recruitment of fast-twitch skeletal muscle fibres, such as single and repeated sprint exercise, and resistance exercise, with NO_3^- supplementation appearing to afford some ergogenic effects during such exercises. Relatedly, NO_3^- supplementation appears to have lesser ergogenic potential in highly trained endurance athletes, a population well documented to present with a higher slow-twitch skeletal muscle fibre proportion. Therefore, whilst it appears that NO_3^- supplementation has the potential to improve performance across a range of exercise performance tests, recent meta-analyses suggest that the overall ergogenic

effect size is small and that ergogenic effects can be mediated by NO_3^- supplementation regime, participant fitness status and the exercise settings. Interestingly, the ergogenic potential of NO_3^- supplementation appears to be lower in females than males, with some recent data suggesting possible ergolytic effects in females in some exercise settings.

Until relatively recently, it was believed that tissues, such as skeletal muscle, had a limited capacity to metabolise NO_3^- to NO_2^-, and that this reaction was almost exclusively catalysed by the oral microbiome. There is now evidence to suggest that skeletal muscle NO_3^- content can be increased following NO_3^- supplementation and that NO_3^- can be metabolised during exercise providing a potential alternative means to generate NO. However, the biochemical and physiological mechanisms by which NO_3^- supplementation can improve exercise performance remains unclear in humans, particularly in light of observations that NO_3^- supplementation appears to improve exercise performance independent of enhancements in skeletal muscle blood flow and mitochondrial respiratory function. This presentation will provide an overview of studies assessing the effects of NO_3^- supplementation on performance in different exercise settings and the candidate biochemical and physiological mechanisms that may underlie potential ergogenic effects.