The mechanisms underlying the accelerated muscle loss in critical illness are poorly understood. An innovative isotope tracer approach will be applied over a period of ~7 days in critically ill patients. Blood and muscle tissue will be collected to assess muscle protein synthesis rates and determine concurrent changes in muscle fiber characteristics. We will assess muscle protein synthesis rates in critically ill patients over a period of (multiple) days, which provides the basis to assess nutritional and exercise strategies to prevent and counteract muscle loss in critically ill patients during their admission to the ICU.