1. INTRODUCTION

Along with the increasing prevalence of obesity comes the need for dietary strategies to reduce bodyweight and prevent weight gain following weight loss. Various dietary approaches have been pursued (1–4), and a dietary strategy that has gained considerable attention, and where substantial evidence now supports improved weight loss and weight loss maintenance after consumption, is high-protein diets (5–8). Higher protein meals increase diet-induced thermogenesis (DIT) and satiety compared with lower protein meals (9–14), which has been suggested to mediate the effect of high-protein diets on weight loss and weight loss maintenance (15,16). Proteins have unique characteristics depending on the content of amino acids and absorption rates (17). Thus, it has been speculated whether proteins from different sources affect appetite and DIT differently.

The Danish health authorities recommend the general population to consume seafood, particularly oily fish, and to increase the intake of dietary protein from vegetable-based sources, at the expense of animal protein (18). Proteins from fish have been shown to increase satiety and reduce ad libitum energy intake (EI) compared with protein from animal and vegetable sources (19–22). However, the results may have been affected by texture differences, varying protein content between the tested protein sources, and the use of liquid test meals (19,21,22). Protein from vegetable sources has been observed to increase satiety compared with meat (a combination of pork and veal), egg albumin, and whey protein (23,24). However, the fiber content in those studies reflected the natural content in the tested food and the effect can therefore not be ascribed the proteins per se. The effect of protein from vegetable and fish sources on DIT is not well investigated and studies are sparse (25–27).

In a large European study, an ad libitum diet with a combination of modestly higher protein and lower glycemic index (GI) resulted in more effective weight maintenance after a weight loss when compared with the official dietary guidelines (2). Low GI meals have been demonstrated to increase satiety and reduce EI compared with high GI meals (28–30). However, this has not been shown consistently, and the results in several of the studies may have been affected by a different fiber content between the test meals (28–30). A recent study in mice found increased oxygen consumption and carbon dioxide production in the fed state when mice were fed a diet with fish oil in combination with low GI carbohydrates compared to a diet with fish oil in combination with high GI carbohydrates (31). This indicates that the type of carbohydrate could influence the thermic response. The research on the effect of GI on DIT in humans is
sparse and the evidence for a more positive effect of meals with low compared with high GI carbohydrates on DIT is not convincing.

Studies that compare protein from vegetable, animal, and fish sources using whole meals, and at the same time control for macronutrient and fiber content, are limited. The overall aim of this PhD thesis was, therefore, to investigate the acute effects of iso-caloric, macronutrient-balanced, and fiber-matched meals with protein from vegetables, eggs, fish, or meat on components of energy balance. In two of the three studies, the combined effect of protein source and glycemic index of the accompanying carbohydrates was additionally investigated.

1.1 Thesis delimitations
The literature review in the background section has more emphasis on the effect of protein sources on appetite and DIT compared with the effect of GI on appetite and DIT. This prioritization was made as the effect of different protein sources was the common theme in all three papers. Although the literature was reviewed in depth, the literature review was not performed systematically according to the PRISMA guidelines (32).