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# Is the ancient wheat einkorn suitable for people with wheat sensitivity ?

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**Short running title:** Can the ancient wheat einkorn be used in wheat hypersensitivity ?

**Key words:** Wheat sensitivity, ancient wheat, einkorn, double blind provocation, elimination diet

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Contributors

Eva Lydeking-Olsen wrote the protocol and report with contributions from co- authors. E Lydeking-Olsen and Vita Damsøe investigated subjects.

Conflict of interest statement:

None declared.

**Abstract:**

**Background:** Wheat-sensitivity is a condition often reported by alternative or complementary practitioners to be involved in a variety of health problems, thus avoidance of wheat in the diet is often advocated. The condition is poorly defined as well as research in the area is virtually non-existent. Both clients and consumers often report of better tolerance when eating ancient wheat types, such as einkorn, emmer, spelt or giant durum instead of modern wheat. As the ancient wheat types have a different chromosome number ( 7, 14 or 28 instead of modern wheat 42) and generally a weaker gluten structure it is possible that they behave differently during digestion and metabolism than modern wheat, thus possibly creating fewer symptoms in sensitive individuals.

**Aim:** To clarify if einkorn (*Triticum Monococcum, var Gamlein Plus*) is tolerated better than modern wheat (*Triticum Aestivum, var Pentium*), in a group of self reported wheat sensitive subjects.

**Design and methods:** The study was proceeded by two pilot studies to clarify symptoms experienced by wheat sensitive persons ( questionnaire survey with n= 32) and to screen 4 ancient wheat types for tolerability (n= 5, double blinded provocations). Thus einkorn was chosen as the most promising candidate among the ancient wheat and the main study conducted as a double blind, placebo controlled, elimination – and provocation study (DBPCP), where subjects after an initial 4 wk of baseline symptom registration was entered onto a gluten free diet for 16 weeks (with provided food items to exchange their usual gluten containing foods). The first 4 weeks was a elimination period, then provocations took place every four weeks for four consecutive days followed by 3,5 wk washout, in a randomised crossover model, using 4 breads of equal appearance, nutritional value and texture: Einkorn, modern wheat, rye and a control bread free of grains ( potato starch, chick pea flour, psyllium fibre and coloring). Breads were raised by the honey- salt method or baking soda (control bread). Symptom registration took place on preformed diaries both in a simplified form in the elimination and washout periods and a more detailed form on the four provocation days, with scores of 0= none, 1= present, but not severe, 2= medium grade, 3= severe, 4 = incapacitating. Symptom registrations were combined to an index, multiplying raw score with duration of each symptom, then summed for each symptom group/day and the mean of 4 days used as the total score for each bread. This procedure provides a sensitive measure, weighing symptom severity and impact (duration) into one global score.

Subjects were provoked in- office the first morning where blood was sampled repeatedly for glucose metabolism and satiety hormone analysis ( reported elsewhere) and provoked at home for the following 3 days. At the end-day of each provocation round an extra blood sample was drawn in- office, urine samples delivered, questionnaires collected and subjects briefly interviewed about compliance. 41 invited persons were screened to exclude IgE allergy ( 7 grains ) and gluten intolerance/ celiac disease ( endomysium antibody test ).

**Results:** 32 subjects participated in the study, 9 self reported healthy controls (HC) and 23 self reported wheat sensitive (WS). One was an early drop out, one had an incomplete data set and one was excluded from analysis due to poor dietary compliance in the washout periods, thus the report are based on 29 : 3 males and 26 females, mean age 44 y (range 18 – 70 kg), height 168,8 cm (range 155 – 197 cm), weight 68,4 kg (range 47 - 105), BMI 23,9 (18,4 - 37). A general improvement in symptom score were seen in the gluten free elimination period, both for controls and WS ( figure 1).

Only 5 persons fulfilled the criteria for a food sensitivity towards wheat (WS) after the DBPCP: a significant improvement in symptoms during the elimination period, reaction to wheat during provocation and no reaction to placebo ( figure 2 and 3). Of these five, the three reacted to einkorn and four to rye, but reaction to einkorn was generally weaker/ not so severe/ of shorter duration (figure 3).

8 persons were healthy controls (HC), reacting neither to placebo or any other bread.

8 persons reacted both to wheat and placebo, but more severe to wheat and are classified as wheat sensitive with an additional part of their symptomatology rising “just from digesting food” – possibly a gut fermentation syndrome (WS+F) . Of these 6 reacted to einkorn and all 8 to rye, with no apparent difference in severity between the grain types. If values from the reaction to placebo are controlled for, this group follows the same pattern as the WS group with a less severe reaction to einkorn.

8 had a reaction to placebo similar to that of wheat, indicating gut fermentation syndrome as the main problem. Of these 7 reacted to einkorn and 7 to rye and the reactions to einkorn was more severe than that to wheat, rye or placebo (figure 3).

**Conclusion:** Research of non – IgE food sensitivities are, as expected, a complicated and heterogenous field to explore as placebo reactors are mixed into the group of persons with a more clear sensitivity pattern. This study does not support the hypothesis that wheat sensitive persons generally tolerate the ancient wheat einkorn better than modern wheat, but there seems to be a subgroup with better tolerance for einkorn than wheat. Future studies should attempt to stratify for possible gut fermentation syndrome as inclusion of this group blurs the findings.

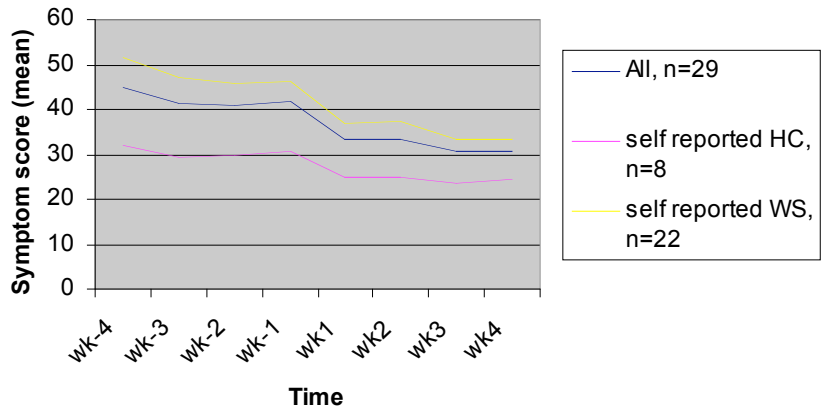
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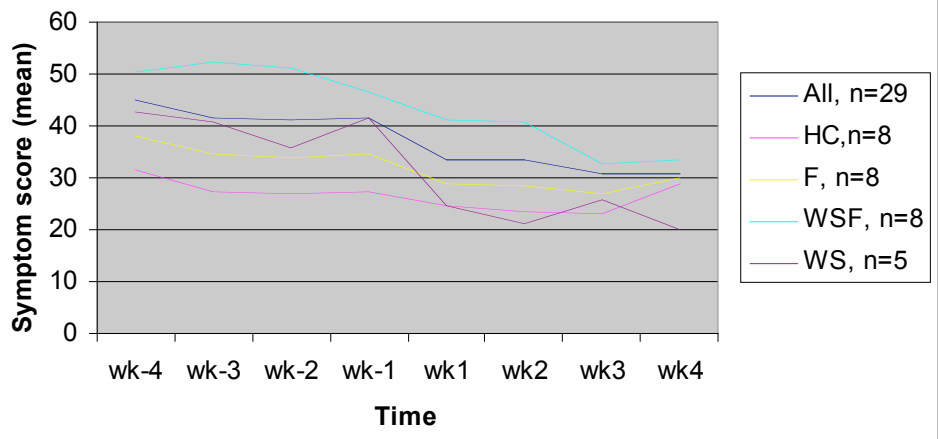
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**Figure 1. Symptom registration before provocation, 4 weeks on usual diet followed by 4 weeks on glutenfree diet, by self reported status for wheat sensitivity**



**Figure 2. Symptom registration before provocation, 4 weeks on usual diet followed by 4 weeks on glutenfree diet, group categories based on provocation, cut off 15**



**Figure 3. Symptom scores for the different bread types and groups (median values)**

