Vitamin A Stability after Wheat Flour Fortification

Opportunity

Vitamin A deficiency is a pressing public health problem worldwide and the leading cause of preventable blindness in children. Fortification of staple foods with vitamin A is a cost-effective intervention for reducing vitamin A deficiency. For vitamin A fortification to save lives, it must remain stable and able to be absorbed by the body, when it is added to wheat flour and baked, cooked, and processed in other ways.

Photo: Rod Waddington

Vitamin A and public health[1]

Vitamin A is important for visual health, a strong immune system, and fetal growth and development. According to the World Health Organization, an estimated 250 million preschool children are vitamin A deficient, with most of the burden shouldered by Africa and Southeast Asia. The health consequences are serious; vitamin A deficiency:

- Contributes significantly to preventable severe visual impairment and blindness.
- May increase the risk of illness and death from childhood infections, including measles and infections that cause diarrhea.
- May increase anemia and the risk of mothers' death during childbirth.

Why fortify with vitamin A?[2]

Food fortification with vitamin A can improve the health and longevity of individuals and their families, especially for those living in areas where improving diets with foods naturally rich in vitamin A is difficult.

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What is known about the stability of vitamin A after wheat flour fortification?

Nineteen unique documents were reviewed to determine if vitamin A remains stable when it is added to wheat flour and processed. Detail are listed below:

- **Ten studies evaluated baking; vitamin A retention ranged from <50% to 121%.**[3-12]
- **Thirteen studies evaluated storage; vitamin A retention ranged from 3% to 108%.**[4, 5, 7- 10, 12-18]
- **Three studies evaluated drying; vitamin A retention ranged from 29% to 87%.**[6, 16, 19]
- **Four studies evaluated cooking; vitamin A retention ranged from 83% to 107.3%.** [4, 9, 19, 20,
- **Two studies evaluated the fortification process; vitamin A retention ranged from 64% to 108%.**[10, 21]
- **One study evaluated other processes such as pneumatic conveying; vitamin A retention was ~100%.**[15]

Observations

1. Most studies reported ~70% or greater retention after baking fortified wheat flour.
2. Most studies reported 50% or greater retention after storing fortified wheat flour or products made with fortified wheat flour.
3. Most studies reported ~70% or greater retention after drying fortified wheat flour.
4. Most studies reported ~80% or greater retention after cooking fortified wheat flour.
5. Most studies reported ~60% or greater retention after fortification of wheat flour.
6. Most studies reported ~100% retention after other mill processes of wheat flour.
7. Despite these trends, there are instances of great variability in vitamin A retention within categories (e.g. storage) and within studies.[6]

For further research

Though the results are variable, generally ~50% or greater of vitamin A is retained after processing wheat flour fortified with vitamin A. However, large gaps persist in the knowledge of these factors and most decisions to fortify wheat flour with vitamin A are guided by assumptions. Future research should explore knowledge gaps including the type of fortificant used, amount of vitamin A added to flour, and baking or cooking time. This will enable evidence-based decision-making to fortify wheat flour with vitamin A.

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