INPLASY

INPLASY202440031

doi: 10.37766/inplasy2024.4.0031

Received: 06 April 2024

Published: 06 April 2024

Preclinical Perspectives of Common Iron Fortificants on Iron Bioavailability: A Systematic Review and Pairwise Meta-analysis

Zhang, J; Lindshield, B.

Corresponding author:
Jiejia Zhang

xjtzbflt@126.com

Author Affiliation:
Kansas State University.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202440031

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 06 April 2024 and was last updated on 06 April 2024.

INTRODUCTION

Review question / Objective (1) In animal model, does iron fortification compared with control prevent or improve iron-deficient status or/and anemia? (2) In cell model, does iron fortification compared with control improve the cellular capacity of iron absorption?

Condition being studied Iron deficiency anemia was recognized by the World Health Organization as a major global concern of public health and a common comorbidity of many chronic diseases. Approximately 1.2 billion population worldwide is suffering from iron deficiency anemia, particularly among growing children, pregnant women and the elder. Food fortification is one of the most cost-effective ways to combat this disease. However, it is challenging to achieve high iron bioavailability and good organoleptic properties. Thus,
Since some persistent doubts and barriers remain as to how the iron fortifications have sufficient bioavailable forms without adverse sensory changes of food vehicle, many in vitro and in vivo studies have been conducted in recent decades to upgrade the products of iron fortification. Exploring the effect of iron bioavailability with cell models and animal models can promote the development of iron physiology and pathophysiology in human body.

METHODS

Participant or population Animals and cell models.

Intervention In this preclinical systematic review, the intervention is iron fortification. Iron fortification refers to food or drink fortified with iron, so that the iron is consumed with the food.

Comparator Positive control such as ferrous sulfate or blank control.

Study designs to be included Preclinical study including in vitro study (cell-culture model) and in vivo study (small animal model).

Eligibility criteria Inclusion Criteria: 1. Utilizes fortified food. 2. The included study should contain at least one type of iron fortification. 3. At least one identified outcome evaluated and reported. 4. Article must present peer-reviewed primary research. 5. Preclinical study. 6. English manuscripts. Exclusion criteria: 1. Iron fortification was provided without food. 2. No relevant iron outcomes were reported. 3. Study with unidentified type and/or quantity of iron. 4. Special food used, e.g.,: testing foods naturally high in iron. 5. Theses, dissertations, book sections, abstracts, proceedings, etc. 6. Observational studies, reports, reviews, protocols, not primary research, etc.

Information sources Pubmed, Web of Sciences Core Collection, Scopus, and EBSCO Agricola.

Main outcome(s) Hemoglobin and ferritin.

Quality assessment / Risk of bias analysis (1) Were there clear research purposes? (2) Was there relevant background information? (3) Were randomized allocation methods employed? (4) Were the investigators blinded? (5) Were dosage-response relationships investigated or the accepted fortification levels (e.g., licensed dosages) explained? (6) Did researchers explain the attritions (incomplete outcomes) and negative results? (7) Was the data clearly related to methodological design? (8) Did the conclusions and discussions match up with the findings?

Strategy of data synthesis After the preliminary screening based on title and abstract viewing and the secondary screening based on full-text viewing, eligible studies were included. The researchers will further extract data from the included studies and then organize it into multiple spreadsheets for bias risk (quality) assessments and meta-analysis. The characteristics of the studies including author, year of publication, iron type, iron concentration, enhancer, animal type (species, sex) or cell line (strain), intervention duration, sample size, model type (prophylactic–preventive method or depletion-repletion method), and outcome will be extracted. Data for pairwise meta-analysis was performed in STATA with the significance at P-value 50%), a random-effect model would be used for pooling data. Otherwise, the random-effect model would be replaced by a fixed-effect model. Publication bias was assessed with the Egger's test and displayed in the funnel plot. A symmetrical funnel plot suggested the less possibility of publication bias, and vice versa.

Subgroup analysis The animals can be divided to several subgroups according to the characteristic factors.

Sensitivity analysis The influence of excluded or included studies from meta-analysis based on methodological characteristic factors will be investigated by sensitivity analysis. If the results are consistent in the sensitivity analysis, they can be regarded as strong supports for the overall effect. If the results vary in sensitivity analyses, they should be interpreted cautiously.

Country(ies) involved United States.

Keywords Iron bioavailability, Iron fortification, Preclinical study, Meta-analysis.

Contributions of each author
Author 1 - Jiejia Zhang.
Author 2 - Brian Lindshield.