

# Food-Drug Interaction Evidence Ontology (FIDEO)

Georgeta Bordea  
[name.surname@u-bordeaux.fr](mailto:georgeta.bordea@u-bordeaux.fr)

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# Motivation

- Certain foods contain chemical substances that may interact with drugs
- Unexpected consequences
  - Increasing or reducing the effect of a drug
  - Treatment failure
  - Toxicity
  - Higher risk of side-effects
- Similar to drug interactions but there is limited research on extracting and representing these interactions

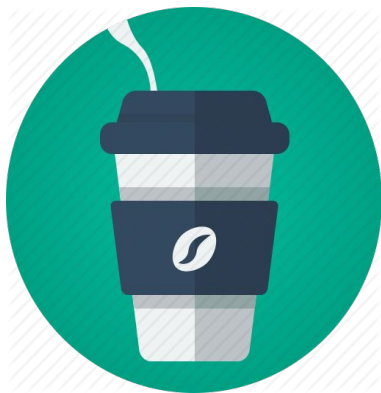
# Food-Drug Interaction Examples

- Altered absorption of drugs by **fatty, high protein and fiber diets**
- **Grapefruit juice** drug interactions - inhibition of CYP3A enzymes
- **Milk products** with antibiotics
- Food containing **tyramine** (matured cheese, red wine, ripped bananas, yogurt, shrimp paste and salami) with Monoamine Oxidase Inhibitors
- Vegetables high in **vitamin K** (broccoli, Brussels sprouts, kale, parsley, spinach) with warfarin

# FIDEO Ontology: Core concepts

- Object Drug
- Precipitant Food
- Food-Drug Interaction
- Interaction mechanism
- Related Evidence

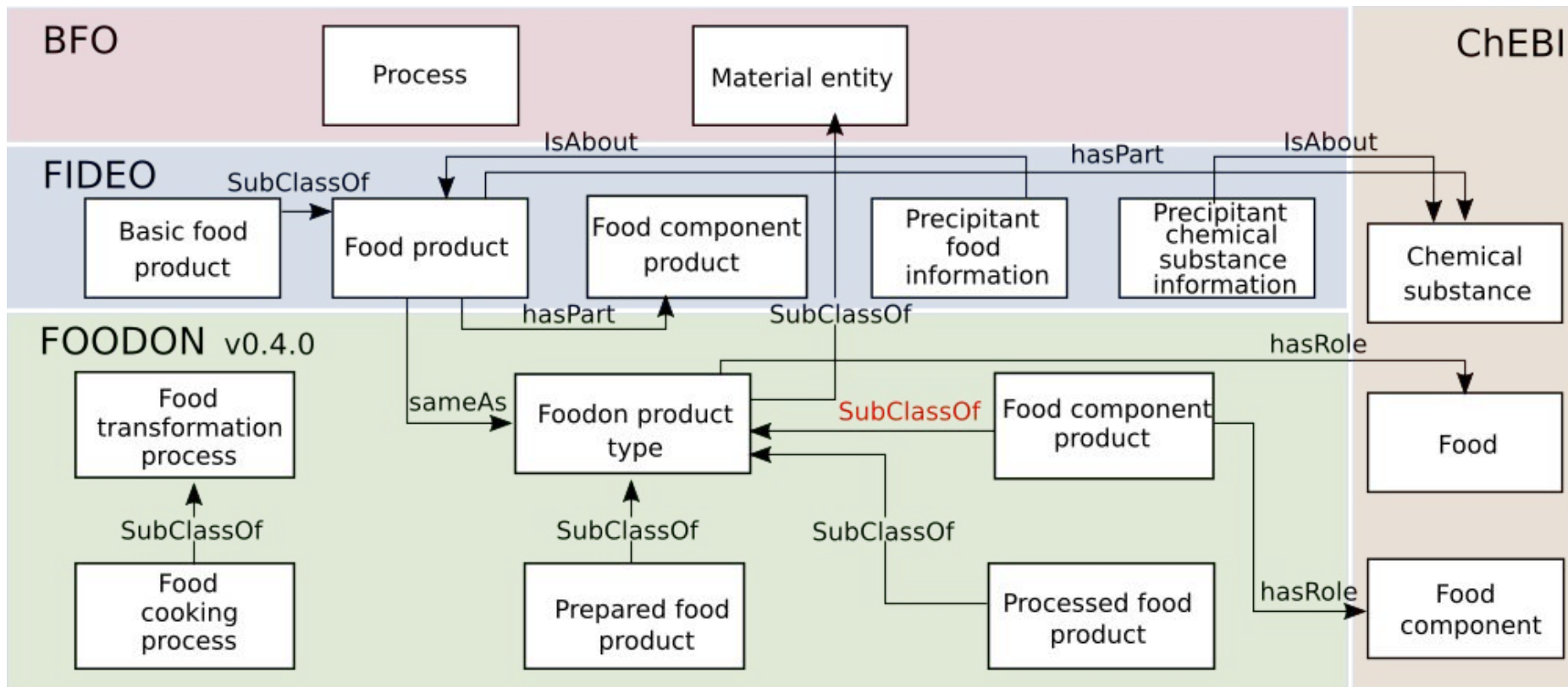
# Modeling the Food Domain



# LOD Food Resources

- **ChEBI** (additives and nutrients)
- **Open Food Facts Food Ontology** (Food nutrients, Food product data)
- **FOODON** (food cooking methods, preservation methods, food classifications, food treatments, physical state)

# Grounding food concepts on BFO



# Annotated corpora about Food-Drug Interactions

- POMELO 2017
  - Limited coverage of food-drug interactions
  - Large number of articles with incomplete information
  - Annotations done by one expert
  - No annotation guide
- 20 articles selected by hand
  - Annotation guide
  - Corpus annotated by two groups of experts (CNIM, CRPV)



# Entity linking approach

- Exact string match on labels (rdfs:label)
- UMLS synonyms
- Exact string match of synonyms
  - obo:IAO\_0000118 alternative term
  - obolnOwl:hasSynonym
  - obolnOwl:hasExactSynonym
  - obolnOwl:hasRelatedSynonym
- Generate concept name variants
  - Composed phrases (*food product, ratio, of material*)
  - Plurals
  - Upper/lower casing
  - Removing special characters

# Linking foods and food components with Foodon and ChEBI

- Found 62% of foods and 76% of food components
- Error analysis
  - Exotic foods not represented in the ontology - *natto*
  - Generic foods not represented - *milk, juice, coffee*
  - More specific labels - *skipjack* vs. *skipjack tuna fish*
  - Scientific names - *Amblygaster, Sardinella*
  - Composed phrases - *frozen grapefruit juice, brewed tea*

# Conclusions

- **Ontology design**

FIDEO extends drug interaction ontologies for food-drug interactions by modeling foods using FOODON

- **Entity Linking**

Incomplete coverage of foods involved in food-drug interactions

- **Future work**

Interaction mechanisms represented using the Interaction Network Ontology (INO)

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