

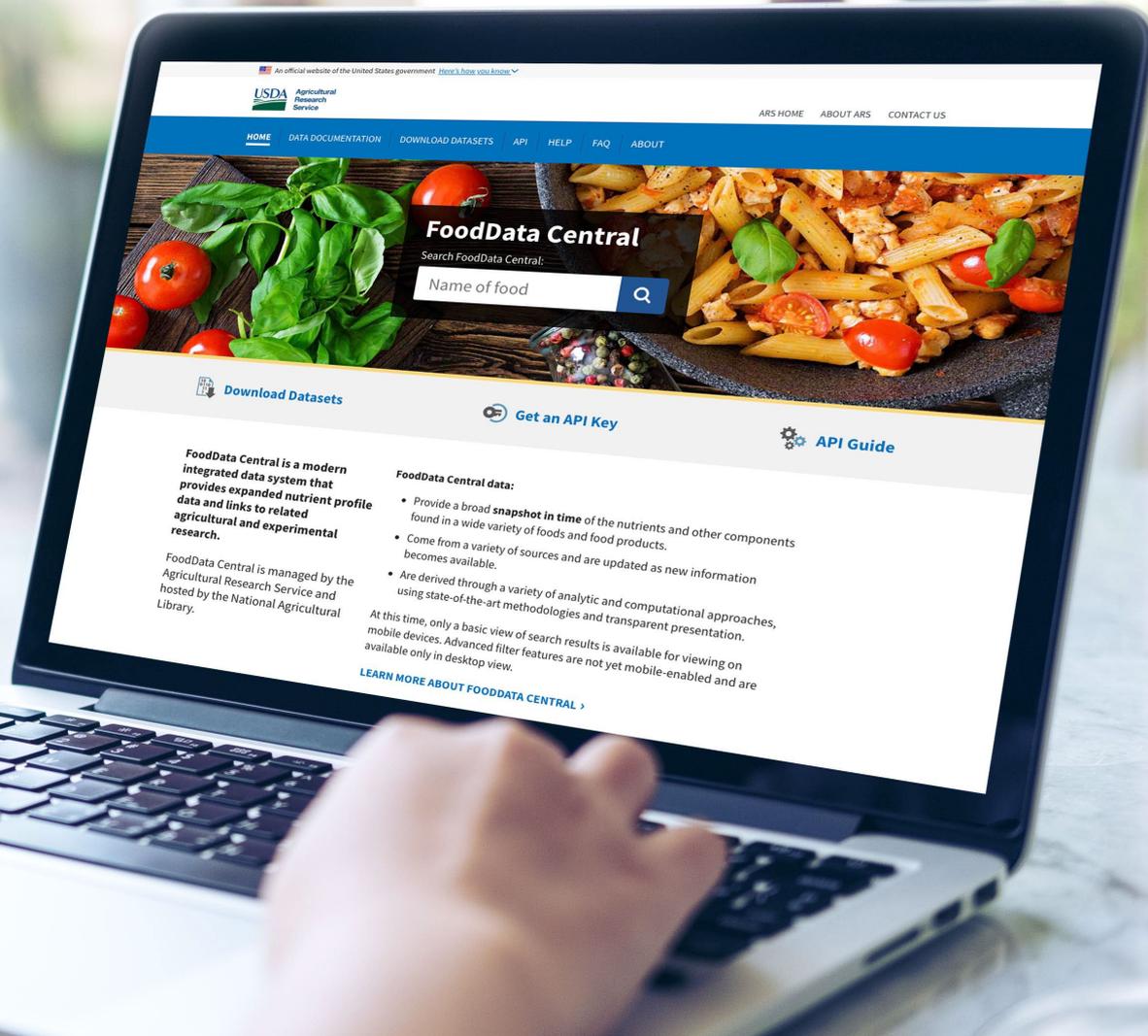
FoodData Central



United States
Department of
Agriculture

USDA's Updated Approach to Food Composition Data Systems

Kyle McKillop
FoodData Central Lead
BHNRC/MAFCL





United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Overview

- Introduction to FoodData Central (FDC)
- Explanation of FDC datatypes
- Overview of FDC application
- Branded Foods Presentation
- Future of FDC

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. The text "FoodData Central" is overlaid in white.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

WHY IS CHANGE NEEDED?

- Food supply has exploded
- Need for understanding of interrelationships between dietary intake and health is greater than ever
- Rapid evolution of technology & communication
- Demand for transparency and easy accessibility to data has skyrocketed
- Food systems are global and impact food security, the environment, and public health

A banner image at the bottom of the slide showing fresh ingredients like basil, tomatoes, and a pasta dish. The text "FoodData Central" is overlaid in white.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

FoodData Central: USDA's Response to Pressing Need

- Centralizing Food Composition Data
- Research focus-linking production of food to products to health outcomes
- Addresses variability in food components (inherent, environmental, processing, preparation)

A banner image at the bottom of the slide showing fresh green basil leaves, a red tomato, and a wooden cutting board with a knife, alongside a bowl of pasta with chicken and vegetables.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

FoodData Central (Launched in April 2019)

- **FoodData Central is an integrated, research-focused data system that provides expanded data on nutrients and other foods components as well as links to sources of related agricultural, food, dietary supplement, and other information.**
- **FoodData Central can be used by, and has benefits for, a variety of users**, including researchers, policy makers, academicians and educators, nutrition and health professionals, product developers, and others.

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. To the right, there is a bowl of cooked pasta with a tomato-based sauce and chicken pieces.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Pre-FDC Datasets

Standard Reference

- Historic comprehensive list of values for food components, including nutrients derived from analyses, imputations, and the published literature.

Food and Nutrient Database for Dietary Studies

- Data on the nutrient and food component values and weights for foods and beverages reported in the What We Eat in America dietary survey component of the National Health and Nutrition Examination Survey.

Branded Food Products Database (Branded Foods)

- Data from a public-private partnership that provides values for nutrients in branded and private label foods that appear on the product label.
- Information in Branded Foods is received from food industry data providers.

The text "FoodData Central" is displayed in a white, bold, sans-serif font. It is overlaid on a photograph of fresh food items, including green basil leaves, a red tomato, and a wooden cutting board with a knife. The background of the image shows a wooden surface and a plate of food with pasta, tomatoes, and basil.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

5 Datatypes

- **Foundation Foods**
- **Experimental Foods**
- **Standard Reference (SR) Legacy**
>30 years at USDA
- **Food & Nutrient Database for Dietary Studies (FNDDS)**
NHANES survey “What We Eat in America”
- **Global Branded Foods Database (BFPD)**
label data provided by food industry as PPP

A banner image at the bottom of the slide showing fresh green basil leaves, a red tomato, and a wooden cutting board with a knife. In the background, there is a dish of pasta with chicken and vegetables.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Individualized Sampling

- Individual samples
- Capture more extensive metadata on individual samples
- Capture dates of sample acquisition and analysis
- Because of branded data, focus on single commodity foods and single commodity-derived foods

Foundation Foods

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. To the right, there is a dish of pasta with chicken and vegetables.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Foundation Foods

- **Values derived from analyses for food components, including nutrients**
- **Extensive underlying metadata**, such as: the number of samples, sampling location, date of collection, analytical approaches used, and agricultural information such as genotype and production practices.
- Foundation Foods data can provide **valuable insights** into the many factors that influence variability in nutrient and food component profiles.

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden spoon with a pasta salad containing penne pasta, tomatoes, and chicken.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Research Focused

- Move beyond reference foods
- Add focus on food composition research
- Understand the Food System
 - Agricultural impact on food composition
 - Food composition impact on health

Experimental Foods

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. To the right, there is a bowl of pasta with a tomato-based sauce and chicken pieces.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Experimental Foods

- **Foods produced, acquired, or studied under unique conditions**, such as alternative management systems, experimental genotypes, or research/analytical protocols.
- The data in Experimental Foods may include (or link to) variables such as genetics, environmental inputs and outputs, supply chains, economic considerations, and nutrition research.
- These data will allow users to examine a range of factors used that may affect the profiles of food components, including nutrients and resulting dietary intakes as well as the sustainability of agricultural and dietary food systems.

A banner image at the bottom of the slide showing fresh green basil leaves, a red tomato, and a wooden cutting board with a knife. To the right, there is a bowl of pasta with a tomato-based sauce and chicken pieces.

FoodData Central

Launched April 2019
<https://fdc.nal.usda.gov>



FoodData Central

Search FoodData Central:

[Download Data](#)

[Get an API Key](#)

[API Guide](#)

FoodData Central is an integrated data system that provides expanded nutrient profile data and links to related agricultural and experimental research.

FoodData Central is managed by the Agricultural Research Service and hosted by the National Agricultural

FoodData Central:

- Includes five distinct types of data containing information on food and nutrient profiles, each with a unique purpose.
- Provides a broad **snapshot in time** of the nutrients and other components found in a wide variety of foods and food products.
- Presents data that come from a variety of sources and are updated as new information becomes available.
- Includes values that are derived through a variety of analytic and



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

FDC API/Download



Download Data



Get an API Key



API Guide

FoodData Central





Foundation Foods (2)

SR Legacy Foods (42)

Survey Foods (FNDDS) (98)

Branded Foods (16,775)

Experimental Foods (2)

almond

[Search Operators](#)

Require All Words

Reset

Search

Helpful Links

[Search Tips](#)

[FAQ](#)

[Inventory and Update Log](#)

Foundation Foods

- Data for food components including nutrients derived from analyses, and metadata for a range of single foods and ingredients providing insights into variability. Foundation Foods highlight information on samples and acquisition details.
- Documentation and further details about Foundation Foods https://fdc.nal.usda.gov/docs/Foundation_Foods_Documentation_Apr2021.pdf

2 results

NDB Number	Description	Most Recent Acquisition Date	SR Food Category
14091	Almond milk, unsweetened, plain, shelf stable	2020-08-19	Beverages
12563	Nuts, almonds, dry roasted, with salt added	2015-10-06	Nut and Seed Products





United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Foundation Food: Bananas, ripe and slightly ripe, raw

Name	Average Amount	Unit	Deriv. By	n	Samples	Min	Max	Median	Footnote	Initial Year Acquired
Sucrose	4.18	g	Analytical	12	Samples	1.15	9.4	4.17		2019

Samples for Sucrose							
Amount/100g	Unit	Technique	Method	City	State	Acquisition Date	FDC Sample ID
5.67	g	LC	AOAC 982.14	CHRISTIANSBURG	VA	12/2/2019	1105075
2.51	g	LC	AOAC 982.14	BLACKSBURG	VA	12/2/2019	1105097
2.84	g	LC	AOAC 982.14	CHRISTIANSBURG	VA	12/2/2019	1105117
1.15	g	LC	AOAC 982.14	CHRISTIANSBURG	VA	12/2/2019	1105136
4.12	g	LC	AOAC 982.14	CHRISTIANSBURG	VA	12/2/2019	1105159





FDC Foundation Food Sources

Beans, Dry, Pinto, 805

Subtype: Agricultural Acquisition

Food Group: Legumes and Legume Products

FD

Published: 1/14/2019

Acquisition Date: 11/11/2016

Nutrients

Attributes

Attribute

DOI	10.2135/cropsci2017.04.0244
-----	-----------------------------

Genotype	Olathe
----------	--------

Barcode	11G5060436
---------	------------



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

FoodData Central Statistics

Data

- 140 Foundation Foods
 - 1,982 Foundation Food Samples
 - 11 Experimental Foods
 - 368,686 Branded Foods
 - 7,083 Survey Foods
 - 7,793 SR Foods
-

> 6 Million Nutrient Values

Usage

- #1 API usage for USDA dataset on data.gov
- Average of 3 million calls to our API every month
- Over 3 million unique users to the FDC Website
- 43% of our users are outside the United States

From FDC Launch, April 2019

A banner image at the bottom of the slide showing fresh ingredients like basil, tomatoes, and pasta. The text "FoodData Central" is overlaid in white.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Global Branded Foods Partnership

A photograph of a dish of food, likely a pasta salad or chicken salad, featuring penne pasta, chicken, tomatoes, and fresh basil leaves, served on a wooden surface.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

An Updated Technology Approach

Graph Database
Knowledge Systems
Ontology Development

A banner image at the bottom of the slide showing fresh ingredients like basil, tomatoes, and pasta. The text "FoodData Central" is overlaid in white.

FoodData Central



Graph Database

- What is Graph?
- It is NOT tabular:

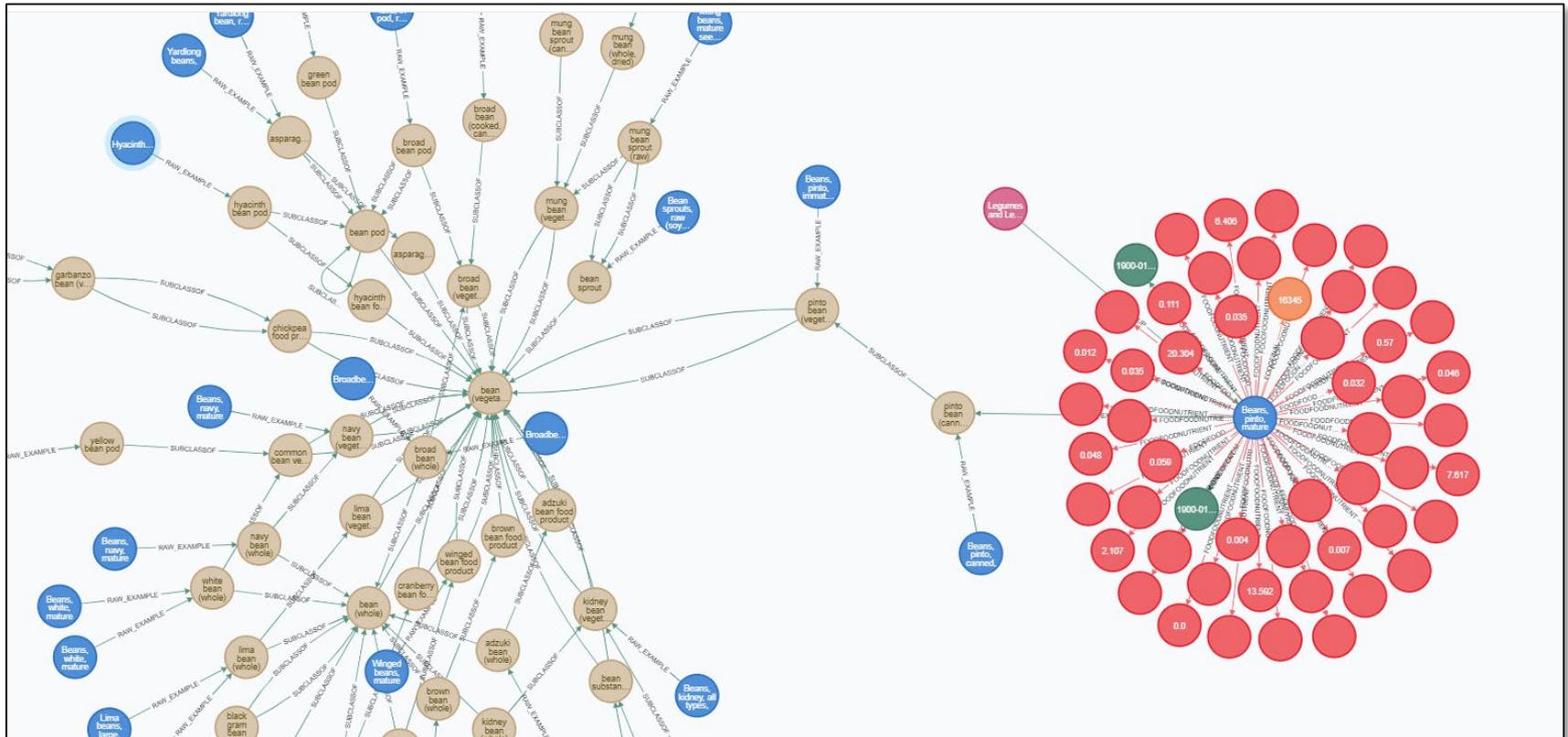
Measurements Table: Crop Composition																		
Please enter methods for all your measurements on the Methods page.										For Drought verses Control a separate det with 0.5% for dry weight			Multiplicative Factor 1.0		Multiplicative Factor 1.0		Multiplicative Factor 1.0	
Experimental Unit and Treatment Information																		
<i>mm/dd/yyyy</i>										Need GIS								
Exp Unit ID	Date	Treatment ID	Gene pool	Market-class	Genotype	Barcode	Analysis	Moisture %	Protein (% DW)	Protein (g/100g DW)	Fat (% DW)	Fat (g/100g DW)	Fiber (% DW)	Fiber (g/100g DW)	Starch			
441	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RR_2	11G5060109		0.00	25.46	25.46	1.37	1.37	4.15	4.15	37			
648	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RR_2	11G5060417		0.00	24.86	24.86	1.38	1.38	4.28	4.28	37			
446	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060110		0.00	31.62	31.62	1.19	1.19	4.50	4.50	33			
726	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060418		0.00	28.73	28.73	1.24	1.24	4.56	4.56	35			
465	11/11/2016	Control	pinto	Meso	BelDakMi_RR_5	11G5060111		0.00	29.35	29.35	1.27	1.27	4.49	4.49	32			
761	11/11/2016	Control	pinto	Meso	BelDakMi_RR_5	11G5060419		0.00	27.65	27.65	1.13	1.13	4.53	4.53	33			
235	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060112		0.00	28.65	28.65	1.32	1.32	4.19	4.19	36			
579	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060420		0.00	30.54	30.54	1.21	1.21	4.56	4.56	33			
306	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060113		0.00	26.11	26.11	1.43	1.43	4.26	4.26	37			
594	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060421		0.00	28.07	28.07	1.22	1.22	4.34	4.34	35			
423	11/11/2016	Control	greatnorthern	Meso	BelNeb_RR_1	11G5060114		0.00	23.25	23.25	1.12	1.12	4.17	4.17	39			
651	11/11/2016	Control	greatnorthern	Meso	BelNeb_RR_1	11G5060422		0.00	22.28	22.28	1.10	1.10	4.21	4.21	40			
315	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060115		0.00	28.27	28.27	1.36	1.36	4.44	4.44	34			
581	11/11/2016	Control	greatnorthern	Meso	BelMiNeb_RMR	11G5060423		0.00	29.35	29.35	1.27	1.27	4.48	4.48	34			
348	11/11/2016	Control	black	Meso	AC_Redbond	11G5060116		0.00	25.99	25.99	1.05	1.05	4.03	4.03	37			
737	11/11/2016	Control	black	Meso	AC_Redbond	11G5060424		0.00	26.27	26.27	1.08	1.08	4.07	4.07	36			
298	11/11/2016	Control	black	Meso	AC_Black_Diamo	11G5060117		0.00	24.49	24.49	1.45	1.45	4.18	4.18	36			
533	11/11/2016	Control	black	Meso	AC_Black_Diamo	11G5060425		0.00	23.41	23.41	1.45	1.45	4.16	4.16	37			
435	11/11/2016	Control	pinto	Meso	AC_Island	11G5060118		0.00	23.17	23.17	1.04	1.04	3.94	3.94	39			
743	11/11/2016	Control	pinto	Meso	AC_Island	11G5060426		0.00	21.85	21.85	1.18	1.18	3.97	3.97	39			
483	11/11/2016	Control	pink	Meso	AC_Early_Rose	11G5060119		0.00	25.02	25.02	1.06	1.06	4.02	4.02	37			
641	11/11/2016	Control	pink	Meso	AC_Early_Rose	11G5060427		0.00	22.00	22.00	1.13	1.13	4.06	4.06	39			





Graph Database

- Nodes and Edges:





United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Graph Database

- Flexibility of data entry
- Splitting data by multiple domains (location, growing conditions, processing, genotype, etc.)
- AI to help us understand our data
- Visualization
- Linking of ontology systems

A banner image at the bottom of the slide showing fresh ingredients like basil, tomatoes, and a pasta dish. The text "FoodData Central" is overlaid in white.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

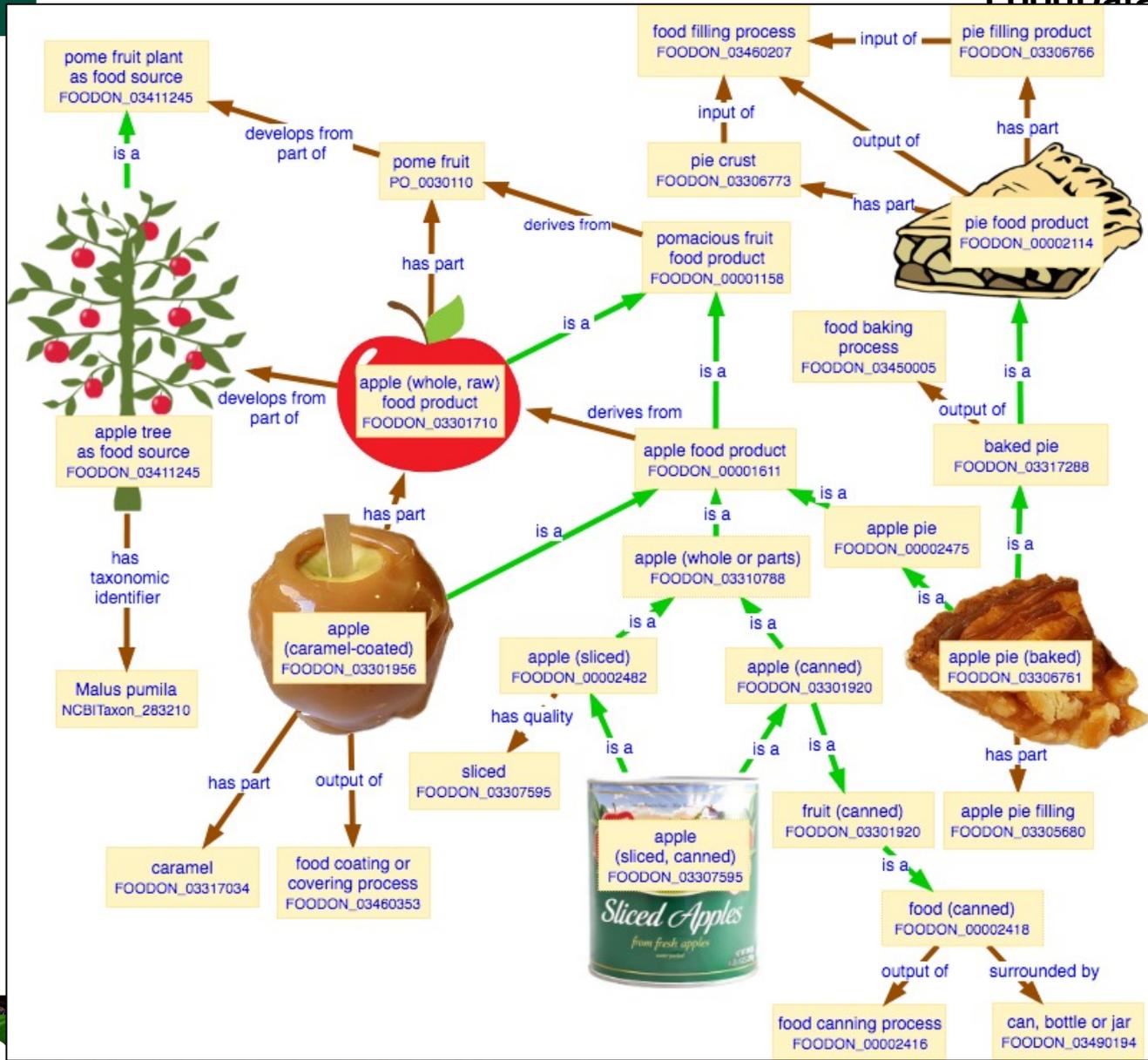
Knowledge Systems

- **Lexicon**
- **Dictionary**
- **Taxonomy**
- **Thesaurus**
- **Ontology**

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. The text "FoodData Central" is overlaid in white.

FoodData Central

FoodOn.org Ontology





United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Ontology

- Adding knowledge layer to information
- Classification and categorization of food and components
- Descriptive relationships between defined terms

- Help in understanding our data
- Be integrated into a search for more intelligent search results
- Promote linkages with other datasets and ontologies

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden cutting board with a knife. The text "FoodData Central" is overlaid in white.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Linkages

- Data Organization Linkages
 - Between Foundation and Experimental
 - Between FDC foods and external databases
- Data Knowledge Linkages
 - Between FDC and the ontology
 - Inside ontology and outside ontologies

A banner image at the bottom of the slide showing fresh green basil leaves, a red tomato, and a wooden cutting board with a knife, next to a bowl of pasta with chicken and vegetables.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

FoodData Central, Future Releases

- Major software and data updates, twice a year in April and October
- Expansion of Experimental Foods
- Integration of ontology and mappings to various controlled vocabulary systems
- New website and API functionality
- New food data types (Animal Feed)
- Higher resolution of component data (Carbohydrate fractions, stronger fiber analysis, full amino acid and lipid profiles, phytochemical components)
- Branded Food Global (New Zealand, Canada, Costa Rica)

A banner image at the bottom of the slide showing fresh ingredients: green basil leaves, a red tomato, and a wooden spoon with a pasta salad containing penne pasta, tomatoes, and chicken.

FoodData Central



United States Department of Agriculture

FoodData Central
fdc.nal.usda.gov

Questions?

FoodData Central

<https://fdc.nal.usda.gov>

Kyle McKillop

FoodData Central Lead

Kyle.McKillop@usda.gov

A banner image at the bottom of the slide showing fresh green basil leaves, a red tomato, and a wooden cutting board with a knife. To the right, there is a bowl of pasta with chicken and vegetables.

FoodData Central