

# Analysis of Human Food Products Sold in Connecticut During 2022

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*The Connecticut Agricultural Experiment Station  
New Haven, CT*



# CAES

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### INTRODUCTION

The Department of Analytical Chemistry (DAC) at the Connecticut Agricultural Experiment Station (CAES) provides regulatory enforcement analysis of pesticide residues, total arsenic, and heavy metals found in domestic and imported food sold within the state for the Connecticut Department of Consumer Protection (DCP). The pesticide residue surveillance program ensures: 1) that pesticides on food products are used in accordance with their label and 2) that the public is protected from the deliberate or accidental misuse of pesticides. The DAC began testing for arsenic in select food samples for the DCP in 2016.

Aflatoxins are toxic compounds produced by *Aspergillus* molds which could grow on peanuts, corn, grains, and tree nuts such as almonds. In 2022 CAES in conjunction with DCP began testing almond milk beverages for the presence of aflatoxins. The US FDA has set an action level for total Aflatoxins (Aflatoxins B1, B2, G1, and G2) in human food at 20 ug/kg.

Violations of federal law occur when pesticides are not used in accordance with label registration and are: 1) applied in excessive amounts (over tolerance violation) or 2) when they are, accidentally or deliberately, applied to crops on which they are not permitted for use (no tolerance violation). A more complete overview of the agencies involved, their roles, and a discussion of tolerances is found in Krol *et al.* 2006<sup>1</sup>. Tolerance levels for pesticide residues

in food established are established by the FDA and apply to both human and animal food. Likewise, the FDA has issued nonbinding action level recommendations for arsenic in bottled water<sup>2</sup>, rice cereals for infants<sup>4</sup>, and draft action levels for apple juice<sup>3</sup>. Laboratory results are forwarded to the DCP for all submitted samples.

The Food Safety Modernization Act (FSMA)<sup>5</sup> mandated accreditation for regulatory testing laboratories. It is widely recognized that accreditation is a rigorous assessment, conducted by an independent science-based organization, which assures the capability and competency of a laboratory and its management systems. The DAC at the CAES gained initial accreditation for chemical testing to the International Organization for Standardization (ISO) / International Electrochemical Commission (IEC) ISO/IEC 17025:2005(E) standard on December 28, 2016 for pesticide and arsenic analysis in food. Subsequently, the laboratory gained accreditation to the updated ISO/IEC 17025:2017 standard on February 28, 2019. The laboratory is assessed on a biennial basis to ensure adherence to the ISO/IEC 17025:2017 standard. The DAC is currently accredited by the American Association for Laboratory Accreditation (A2LA) for: 1) Pesticide Residues in Food, 2) Aflatoxin Analysis in Animal Food, 3) Percent Crude Fat Analysis in Animal Feed, 4) Percent Crude Protein in Animal Feed, and 5) Total Delta-9 tetrahydrocannabinol (THC) and Cannabidiol (CBD) Analysis in Hemp (*Cannabis Sativa*) and 6) THC,

tetrahydrocannabinolic acid (THCA), CBD, and cannabidiolic acid (CBDA) in food, plant material, and consumer products<sup>6</sup>.

The current work reports upon the 412 human food samples tested during the 2022 calendar year for pesticide residues, aflatoxins arsenic, and/or heavy metals. All samples were collected and submitted by the CT DCP as part of the manufactured food regulatory program standard (MFRPS) and the laboratory flexible funding model (LFFM) cooperative agreement testing programs and were tested in accordance with the ISO/IEC 17025:2017 standard.

## METHODS

### Samples for Pesticide Residues:

The sample extraction and cleanup procedure is based on quick, easy, cheap, effective, rugged, and safe (QuEChERS) chemistry. Following homogenization and extraction, samples are analyzed using a liquid chromatograph with a high-resolution mass spectrometer (LC-HRMS) and a gas chromatograph coupled to a tandem mass spectrometer (GC-MS/MS). Findings are reported to the DCP in mg/kg (ppm). Based on past FDA enforcement and the enforcement levels in use in the European Union (EU), the CAES defines its Limit of Reporting (LOR) at 0.010 mg/kg (ppm). Limits of Detection (LOD) levels and measurement uncertainty have been established for all pesticides reported.

### Samples for Aflatoxins:

Samples analyzed for Aflatoxins were extracted with 80% acetonitrile in water, followed by clean up with solid phase extraction cartridges specific to Aflatoxins B1, B2, G1, and G2. Following clean up, analytes were eluted using methanol. Aflatoxins were quantitated using liquid chromatography paired with high resolution mass spectroscopy (LC-HRMS). Reporting limit for aflatoxins was set to 1 ug/kg<sup>9</sup>.

### Samples for Toxic Elements including Inorganic Arsenic:

Samples are digested with acid and analyzed by ICP/MS. Findings are reported to the DCP as  $\mu\text{g}/\text{kg}$  (ppb). In 2005, The FDA issued an action level for arsenic in bottled water at 10  $\mu\text{g}/\text{L}$  (ppb)<sup>2</sup>. A draft guidance action level for inorganic arsenic in apple juice at 10  $\mu\text{g}/\text{kg}$  (ppb) was proposed by the FDA in 2013<sup>3</sup>. An action level for inorganic arsenic in rice cereals for infants of 100  $\mu\text{g}/\text{kg}$  (ppb) was established by the FDA in 2020<sup>4</sup>. The CAES does not report arsenic levels lower than 10  $\mu\text{g}/\text{kg}$  (ppb). If no arsenic or trace levels are found, the CAES reports < 10  $\mu\text{g}/\text{kg}$  (ppb).

### Quality Assurance and Reproducibility

Calibration standards are prepared from reference materials that are traceable to the point of manufacture. Analyte spike-recoveries are evaluated with each batch of samples tested. All systems used for analysis are verified prior to use. Balances are calibrated annually and verified when used to ensure accuracy. Verification weights are National Institute of Standards and Technology (NIST) traceable through the Standard International (SI) system of units. Trends in the data produced are reviewed and analyzed. Overall method uncertainty (MU) has been established and is documented. Batch acceptability is determined using various quality control samples (QCS).

## RESULTS AND DISCUSSION

### Pesticide Residue Program

The 2022 findings for human food provided by the DCP are summarized in Table 1. Samples were collected between January 24, 2022 and October 12, 2022 from 14 cities and towns throughout the state. Beginning in the summer of 2022 (MM-310 forward) samples were collected exclusively from Connecticut growers. A total of 146 samples were tested for pesticide residues and 65 (45%) were found to contain at least one pesticide residue greater than the 0.010 mg/kg (ppm) reporting

limit. From the 65 samples that tested positive for pesticide residues, there were 45 different pesticides and 8 instances of no tolerance violations. No tolerance violations were reported for Chlorpropham in ginger (MM-153) and parsley (MM-160); Clomazone in yellow yam (MM-157); Thiabendazole in dragon fruit (MM-161); Phosmet in ginger (MM-195) and blackberries (MM-323); Cyhalothrin in radish tops (MM-387T); and Chlorothalonil in radish tops (MM-387T). Although the tested radish tops (MM-387T) contained illegal residues, no residues were detected in the radish flesh. Of the 65 positive samples, 37 were found to contain multiple residues. The most commonly occurring residue was Chlorothalonil, which was detected in 16 samples. The remaining 81 samples did not contain reportable residues.

The pesticide residue monitoring program has a historical violation rate of approximately 3–4%. This includes over tolerance and no tolerance violations. The data reported for 2022 is consistent with previous years and continues to demonstrate the safety of produce purchased in the state of Connecticut.

The results of all analysis performed at the CAES are reported to the DCP. All regulatory enforcement of illegal residues where CT is the source are performed by the CT DCP, CT DoAg, and/or DEEP. In those cases where illegal residues are reported on samples whose source is outside of CT, the DCP will forward the results to the FDA or the United States Department of Agriculture (USDA) for enforcement. The Enforcement actions (or lack thereof) taken are not always communicated back to CAES.

### **Aflatoxins in Almond Milk Products**

For 2022, 6 almond milk products were tested for the presence of Aflatoxins B1, B2, G1, and G2. None of the samples tested contained aflatoxins above the reporting limit of 1 ug/kg (Table 2).

### **Toxic Elements Testing Program**

Heavy metals, such as arsenic, lead, chromium, and mercury, are naturally occurring elements widely found in nature and may be present in foods, depending on the environment. The FDA has issued nonbinding action level recommendations for arsenic in bottled water<sup>2</sup> and rice cereals for infants<sup>4</sup>, and draft action levels for apple juice<sup>3</sup>.

There were 260 samples tested in 2022 as part of the CAES contract with the DCP. Of these, 12 (5 %) were vinegar, 28 (11 %) were root vegetables, 26 (10 %) were spices, 26 (10 %) were boxed cereal, 28 (11 %) were infant rice cereal, 68 (26 %) were baby food, 18 (7 %) were apple juice/cider and 54 (21 %) were rice.

The FDA has issued draft guidance of 10 µg/kg (ppb) of inorganic arsenic in apple juice<sup>3</sup>. As shown in Table 9, two samples of apple juice were found above this action level. NES-17 was found to have an inorganic arsenic level of 12.2 µg/kg. NES-18 was found to have an inorganic arsenic level of 12.2 µg/kg. Rice is known to contain arsenic, and the FDA has established an action level of 100 (µg/kg) for infant rice products<sup>4</sup>. As shown in Table 7, four samples of infant rice cereal were found to be over this action level. Sample MM-76 was found to have to have an inorganic arsenic level of 102 µg/kg. Sample MM-166 was found to have to have an inorganic arsenic level of 106 µg/kg. Sample MM-178 was found to have to have an inorganic arsenic level of 113 µg/kg. Sample MM-246 was found to have to have an inorganic arsenic level of 111 µg/kg. These potentially violative results were referred to the FDA for follow up review and action.

### **CONCLUSIONS**

Nearly all the food we eat, except for organically grown produce, has been intentionally treated with pesticides during production. If pesticides used during food

production have been applied in accordance with the approved use of the product, the levels resulting on the food will be below the EPA tolerance. The results of this work allow the consumer to gain a better understanding of the prevalence and levels of pesticide residues in the food they consume.

Naturally occurring arsenic may be present in some of the foods we consume. The organic designation does not seem to be an accurate reflection of the amount of arsenic in a given sample. The amount of arsenic found in samples of baby food tested seems best correlated to the amount of rice contained in the sample. The CAES currently does perform arsenic speciation which determines both organic and inorganic arsenic in a sample. Although some values of arsenic in samples may seem high, they may not truly represent the true amount of inorganic arsenic contained in a sample.

**Table 1: Human Food Samples Tested for Pesticide Residues in 2022.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-100	Parsley	Branford	DCPA	0.069
MM-102	Organic Sweet Potatoes	Branford		
MM-103	Asparagus	Branford		
MM-104	Organic Snipped Green Beans	Branford		
MM-105	Romaine Lettuce	Branford		
MM-106	Butterhead Lettuce	Branford	Imidacloprid	0.011
			Mandipropamid	7.337
MM-107	Red Seedless Grapes	Branford	Boscalid	0.067
MM-111	Carrots	Branford	Boscalid	0.052
			Pyraclostrobin	0.01
MM-96	Organic Beets	Branford		
MM-96T	Leafy Tops of Organic Beets (Related to Sample MM-96)	Branford		
MM-99	Rutabagas	Branford		
MM-151	Baby Carrots	West Haven	Linuron	0.012
MM-153	Fresh Brazilian Ginger	West Haven	Chlorpropham	0.062
MM-157	Yellow Yam	West Haven	Dicloran	14.801
			Clomazone	0.036
			Azoxystrobin	1.086
MM-159	Premium Baking Potatoes	West Haven	Chlorpropham	6.845
MM-160	Organic Italian Parsley	West Haven	Chlorpropham	0.151
			Methomyl	0.044
MM-161	Dragon Fruit	West Haven	Thiabendazole	0.041
MM-162	Mini Cucumbers	West Haven	Fludioxonil	0.011
			Azoxystrobin	0.026
MM-163	Finger Hot Chile	West Haven	Cyromazine	0.038
			Indoxacarb	0.016
MM-164	Green Beans	West Haven		
MM-195	Ginger	Branford	Phosmet	0.028
MM-197	Sweet Potatoes	Branford	Fludioxonil	0.247
MM-199	Bagged Potatoes Nibbles	Branford	Chlorpropham	0.223
MM-201	White Potatoes	Branford	Clothianidin	0.014
			Thiamethoxam	0.011
MM-203	Carrots	Branford	Linuron	0.24
MM-204	Evercrisp Apple	Branford	Diphenylamine	0.028
			Acetamiprid	0.014
MM-205	Fresh Spring Violet Garlic	Branford		
MM-206	Sweet Onion	Branford		

**Table 1: Human Food Samples Tested for Pesticide Residues in 2022, continued.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-207	Grape Tomatoes	Branford	Bifenthrin	0.013
			Cyprodinil	0.077
			Difenoconazole	0.016
			Thiamethoxam	0.037
MM-208	Red Pepper	Branford	Chlorfenapyr	0.028
MM-251	Red Potatoes	Meriden		
MM-253	Garlic	Meriden		
MM-255	Parsnips	Meriden	Linuron	0.029
MM-257	Radishes	Meriden		
MM-259	Yuca	Meriden		
MM-261	Red Onion	Meriden		
MM-263	Garlic Pack	Meriden		
MM-265	Vidalia Onion	Meriden		
MM-267	Sweet Potatoes	Meriden	Fludioxonil	0.278
MM-269	Potatoes	Meriden	Chlorpropham	0.01
MM-271	Organic Carrots	Meriden		
MM-273	Shallot	Meriden		
MM-275	Plain Parsley	Meriden	Atrazine	0.056
			Fludioxonil	0.058
			Linuron	0.025
MM-276	Tomatoes	Meriden	Pyriproxyfen	0.01
			Bifenazate	0.013
MM-310	Raspberries	Middlefield	Tetrahydrophthalimide	0.121
			Pyraclostrobin	0.866
			Boscalid	1.161
			Fenhexamid	0.59
MM-311	Peaches	Middlefield	Acetamiprid	0.059
			Fenhexamid	0.036
			Tetrahydrophthalimide	0.227
MM-312	Blueberries	Middlefield	Boscalid	0.37
			Tetrahydrophthalimide	0.067
			Fenhexamid	0.122
			Pyraclostrobin	0.032
MM-313	Squash	Oxford		
MM-314	Cucumber	Oxford		
MM-315	Beets	Oxford		
MM-315T	Tops of Beets (related to MM-315)	Oxford		
MM-316	Carrots	Oxford	Linuron	0.045
			Pendimethalin	0.017
MM-316T	Tops of Carrots (related to MM-316)	Oxford		
MM-317	Red Onion	Oxford		
MM-318	Tomatoes	Oxford		

**Table 1: Human Food Samples Tested for Pesticide Residues in 2022, continued.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-319	Radishes	Oxford		
MM-319T	Tops of Radishes (related to MM-319)	Oxford		
MM-320	Kale	Oxford		
MM-321	Cabbage	Oxford		
MM-322	Garlic	Oxford		
MM-323	Blackberries	Glastonbury	Acetamiprid Captan Cypermethrin Phosmet	0.068 0.026 0.035 0.02
MM-324	Purple Cauliflower	Glastonbury		
MM-325	White donut peaches	Glastonbury	Captan Fenpropathrin Imidacloprid Phosmet	0.619 0.5 0.034 0.231
MM-326	White peaches	Glastonbury	Phosmet Imidacloprid Fenpropathrin Captan	0.367 0.028 0.41 0.439
MM-327	Yellow Squash	Glastonbury		
MM-328	Corn	Glastonbury		
MM-329	Tomatoes	Glastonbury	Chlorothalonil	0.019
MM-330	Blueberries	Glastonbury	Phosmet Captan Acetamiprid	0.085 0.294 0.055
MM-331	Cucumbers	Glastonbury		
MM-332	Melon	Glastonbury	Chlorothalonil Methomyl	0.053 0.011
MJM-07	Organic Bananas	Rocky Hill		
MJM-08	Bananas	Rocky Hill	Azoxystrobin Pyriproxyfen Thiabendazole	0.03 0.017 0.15
MM-333	Tomato	Glastonbury	Mandipropamid Azoxystrobin	0.03 0.011
MM-334	Yellow squash	Glastonbury		
MM-335	Corn	Glastonbury		
MM-336	Pepper	Glastonbury		
MM-337	Eggplant	Glastonbury		
MM-338	Garlic	Glastonbury		
MM-339	Cucumber	Glastonbury	Chlorothalonil	0.025
MM-340	Pickle Cucumber	Glastonbury	Chlorothalonil	0.018
MM-341	Yummy Sweet Peppers	Northford		



**Table 1: Human Food Samples Tested for Pesticide Residues in 2022, continued.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-342	Cherry Hot Peppers	Northford		
MM-343	Snow Leopard Melon	Northford	Chlorothalonil	0.65
MM-344	Acorn Melon	Northford	Chlorothalonil	0.048
MM-345	Zucchini	Northford	Endrin Chlorothalonil	0.022 0.653
MM-346	Yellow Squash	Northford		
MM-347	Delicata Squash	Northford	Chlorothalonil	0.01
MM-348	Cucumber	Northford		
MM-349	Green Bell Peppers	Northford		
MM-350	Spaghetti Squash	Northford		
MM-351	Peaches	Glastonbury	Fenpropathrin Imidacloprid Cyfluthrin Pyraclostrobin	0.172 0.018 0.022 0.089
MM-352	Nectarines	Glastonbury	Pyraclostrobin Fenpropathrin Imidacloprid Iprodione Cyfluthrin	0.059 0.137 0.027 0.015 0.027
MM-353	Tomatoes	Portland	Famoxadone Chlorothalonil Cyhalothrin, lambda	0.011 0.536 0.01
MM-354	Yellow peppers	Portland	Chlorothalonil	0.015
MM-355	Eggplant	Portland	Chlorothalonil	0.223
MM-356	Zucchini Squash	Portland	Chlorothalonil	0.042
MM-357	Bell peppers	Portland	Chlorothalonil	0.021
MM-358	Peaches	Portland	Phosmet Pyraclostrobin Captan Imidacloprid Tetrahydrophthalimide	1.913 0.035 0.502 0.011 0.268
MM-359	Ginger Gold Apples	Portland	Captan Imidacloprid Phosmet Pyraclostrobin Tetrahydrophthalimide	0.323 0.012 0.714 0.017 0.234
MM-360	Yellow Summer Squash	Portland	Chlorothalonil	0.015
MM-372	Onions	Manchester		
MM-373	Pickled cucumbers	Manchester	Acetamiprid Thiamethoxam	0.045 0.033
MM-374	Eggplant	Manchester		
MM-375	Cucumber	Manchester	Thiamethoxam	0.038
MM-376	Green Bell Pepper	Manchester		

**Table 1: Human Food Samples Tested for Pesticide Residues in 2022, continued.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-377	Italian Sweet Pepper	Manchester		
MM-378	Long Hot Peppers	Manchester	Pendimethalin	0.027
MM-379	Jalapeno Peppers	Manchester		
MM-380	Green Zucchini Squash	Manchester		
MM-381	Tomatoes	Manchester		
MM-382	Green Beans	Farmington		
MM-383	Eggplant	Farmington		
MM-384	Hot Peppers	Farmington		
MM-385	Bell Peppers	Farmington		
MM-386	Red Peppers	Farmington		
MM-387	Radishes	Farmington		
MM-387T	Tops of Radishes (associated with MM-387)	Farmington	Cyhalothrin, lambda Chlorothalonil	0.425 8.458
MM-388	Spaghetti Squash	Farmington		
MM-389	Onions	Farmington		
MM-390	Tomato	Farmington	Chlorothalonil	0.142
MM-391	Potatoes	Farmington		
MM-399	Corn	Cheshire		
MM-400	Bell peppers	Cheshire		
MM-401	Tomatoes	Cheshire		
MM-402	Pumpkin	Cheshire		
MM-403	Eggplant	Cheshire		
MM-404	Hot peppers	Cheshire		
MM-409	D-anjou Apples	Southington		
MM-410	Bartlett Apples	Southington	Fenpyroximate	0.012
MM-411	Honey Crisp Apples	Southington	Captan Chlorantraniliprole Acetamiprid Tetrahydrophthalimide	0.032 0.016 0.1 0.075
MM-412	Empire Apples	Southington	Tetrahydrophthalimide Captan	0.144 0.372
MM-413	McIntosh Apples	Southington	Spirodiclofen Acetamiprid Captan Chlorantraniliprole Tetrahydrophthalimide	0.025 0.027 0.625 0.023 0.159

**Table 1: Human Food Samples Tested for Pesticide Residues in 2022, continued.**

Sample ID	Commodity	Town Collected	Pesticide Found	Amount (mg/kg)
MM-414	Macoun Apples	Southington	Spirodiclofen	0.027
			Tetrahydrophthalimide	0.061
			Acetamiprid	0.031
			Captan	0.193
MM-415	Gala Apples	Southington	Captan	1.264
			Chlorantraniliprole	0.07
			Tetrahydrophthalimide	0.576
MM-416	Cortland Apples	Southington	Spirodiclofen	0.068
			Chlorantraniliprole	0.025
			Captan	0.246
			Acetamiprid	0.017
			Tetrahydrophthalimide	0.084
MM-417	Tomatoes	East Lyme		
MM-418	Yellow Beans	East Lyme		
MM-419	Cucumbers	East Lyme		
MM-420	Pickling cucumbers	East Lyme		
MM-421	Corn	East Lyme		
MM-422	Winter squash	East Lyme		
MM-423	Hot peppers	East Lyme		
MM-424	Jalapeno peppers	East Lyme		
MM-425	Pablano peppers	East Lyme		
MM-426	Anaheim long hot peppers	East Lyme		

**Table 2. Human food samples tested for Aflatoxins in 2022.**

Sample ID	Brand	Description	Town Collected
MM-469	Pacific Foods	Organic Almond Plant-based Beverage	Hamden
MM-470	Silk	Almond Milk	Hamden
MM-471	Blue Diamond	Almond Breeze	Hamden
NES-08	Silk	Almond Milk	Norwich
NES-09	Full Circle Market	Almond Milk	Norwich
NES-10	Blue Diamond	Almond Milk	Norwich

**Table 3: Findings of Toxic Elements in Vinegar Samples Tested in 2022**

Sample ID	Brand Name Commodity	As	Cd	Pb
		µg/kg		
MM-62	Nature's Promise Apple Cider Vinegar	2.4	< 2	3.4
MM-70	Filippo Berio Raspberry Glaze with Balsamic Vinegar of Modena	7.8	< 2	24.6
MM-71	Taste of Inspirations Balsamic Vinegar of Modena	3.5	< 2	26.6
MM-120	Great Value Apple Cider Vinegar	9.1	< 2	9.3
MM-121	Great Value Organic Apple Cider Vinegar	2.2	< 2	2.3
MM-122	White House Detox Organic Apple Cider Vinegar	< 2	< 2	< 2
MM-142	Mantova Organic Apple Glaze	18.8	< 2	9.9
MM-143	Alessi White Balsamic Vinegar	11	< 5	< 5
MM-144	Alessi Balsamic Vinegar	13.3	< 2	39.9
MM-186	Stop & Shop Apple Cider Vinegar	7	< 2	10
MM-187	Holland House Citrus White Wine Vinegar	< 3.5	< 2	9
MM-188	Pompeian Organic Red Wine Vinegar	< 3.5	< 2	3

**Table 4: Findings of Toxic Elements in Root Vegetables Samples Tested in 2022**

Sample ID	Brand Name Commodity	As	Cd	Hg	Pb
		µg/kg			
MM-101	Farm PAK Organic Sweet Potatoes	< 3.5	9.7		38.8
MM-95	Full Circle Market Organic Beets	5.9	30.8		8.7
MM-97	Grimmway Farms Carrots	< 3.5	25.7		5.3
MM-98	Laurentian Rutabagas	3.9	8.1		4.6
MM-150	Bowl & Basket Baby Carrots	< 3	25		6
MM-152	El Sol Brands Fresh Brazilian Ginger	< 3.5	< 3.5		17.6
MM-154	El Sol Brands Fresh Costa Rica Ginger	< 3.5	< 3.5		< 3.5
MM-156	El Sol Brands Yellow Yame	< 3.5	23.9		< 3.5
MM-158	Russet Burbank Potatoes Premium Baking Potatoes	< 3.5	47.4		< 3.5
MM-194	Ginger	18.3	39.3		15.9
MM-196	Scott Farms Sweet Potatoes	< 3.5	4.3		21.7
MM-198	Tasteful Selections Bagged Potatoes Nibbles	< 3.5	26.4		< 3.5
MM-200	Sun King White Potatoes	< 3.5	16.4		< 3.5

**Table 4: Findings of Toxic Elements in Root Vegetables Samples Tested in 2022, continued.**

Sample ID	Brand Name Commodity	As	Cd	Hg	Pb
		µg/kg			
MM-202	Stop and Shop Carrots	< 3.5	5.9		10.4
MM-209	Spice World Fresh Spring Violet Garlic	4.3	18.1		< 3.5
MM-210	Shuman Farms Sweet Onion	< 3.5	8.9		< 3.5
MM-252	Sunking Red Potatoes	< 3.5	10.5	< 3.5	< 3.5
MM-254	AZ Garlic	19	16.8	< 3.5	< 3.5
MM-256	Maraichers du Ruisseau Parsnips	< 3.5	27.4	< 3.5	< 3.5
MM-258	Pioneer Growers Radishes	5.2	< 3.5	< 3.5	< 3.5
MM-260	El Sol Yuca	< 3.5	4	< 3.5	22.3
MM-262	Mister P Red Onion	< 3.5	< 3.5	< 3.5	< 3.5
MM-264	Spice World Garlic Pack	< 3.5	< 3.5	< 3.5	< 3.5
MM-266	Shuman Farms Vidalia Onion	< 3.5	< 3.5	< 3.5	< 3.5
MM-268	Scott Farm Sweet Potatoes	4.6	7.2	< 3.5	9
MM-270	MVP Potatoes	< 3.5	10.8	< 3.5	< 3.5
MM-272	Earthbound Farm Organic Carrots	5.3	12.1	< 3.5	< 3.5
MM-274	Auerpak Shallot	< 3.5	5.1	< 3.5	< 3.5

**Table 5: Findings of Toxic Elements in Spice Samples Tested in 2022**

Sample ID	Brand Name Commodity	As	Cd	Cr	Hg	Pb
		µg/kg				
MM-85	Stop & Shop Lemon Pepper					< 15000
MM-86	McCormick Chipotle Chili Pepper	192.6	110.8	3522.1	< 20	687.7
MM-108	Lawry's Pollo Asado Seasoning					< 15000
MM-109	Lawry's Carne Asado Seasoning					< 15000
MM-110	McCormick Curry Powder					< 15000
MM-137	Great Value Organic Ground Mustard	18.9	38	47	< 18.5	< 18.5
MM-138	Great Value Seasoned Meat Tenderizer	< 20	< 20	225.1	< 20	< 20
MM-139	Great Value Chipotle Chili Pepper	131.9	88.7	706.8	< 20	104.5
MM-140	Great Value Organic Cayenne Pepper	23.4	35.5	685	< 20	82.3
MM-141	Great Value Organic Smoked Paprika	61.2	36.8	618.6	< 20	192.8
MM-170	McCormick Yellow Mustard Seed	12	198	62	< 20	< 20
MM-171	McCormick Ground Turmeric	125	51	4093	< 20	430
MM-172	McCormick Ground Cayenne Red Pepper	14	117	1226	< 20	44
MM-173	McCormick Smoked Paprika	87	439	2513	< 20	158
MM-174	McCormick Curry Powder	64	43	930	< 20	194
MM-214	Dash Southwest Chipotle	60.9	72.5	417.8	< 20	83.5
MM-215	Dash Lemon Pepper	39	58.1	203.3	< 20	46.5
MM-216	McCormick Smokehouse Maple	< 20	< 20	161	< 20	< 58.8
MM-217	McCormick Perfect Pinch Salad Supreme	28.9	81.9	361.4	< 20	93.3
MM-229	Badia Amarillo Yellow Coloring	< 20	< 20	75	< 20	< 35
MM-230	Badia Sazon Tropical	23.2	33.3	237.8	< 20	33.7
MM-304	Kingsford Original All-Purpose Seasoning	20.2	< 20	481.4	< 20	107.2
MM-305	Kingsford Lemon Pepper All-Purpose Seasoning	< 20	54.5	262.1	< 20	20.5
MM-306	Price Rite Paprika	155.6	43.9	4301.2	< 20	207.5
MM-307	Price Rite Chili Powder	163.3	60.9	1928.3	< 20	239.4
MM-308	Price Rite Ground Cumin	109.6	59	995	< 20	172

**Table 6: Findings of Toxic Elements in Boxed Cereal Samples Tested in 2022**

Sample ID	Brand Name Commodity	As	iAs	Cd	Cr	Hg	Pb
		µg/kg					
MM-82	Blueberry Cheerios	29.5		< 20	86.4	< 20	< 20
MM-83	Frosted Cheerios	23.3		< 20	63.5	< 20	< 20
MM-84	Multi Grain Cheerios	33.5		< 20	86.7	< 20	< 20
MM-87	Stop & Shop Crispy Rice	148.2	105	< 20	149.5	< 20	< 20
MM-88	Stop & Shop Puffed Rice	212	93	23	26	< 20	< 20
MM-89	Kellogg's Rice Krispies	144.1	101	< 20	92.9	< 20	< 20
MM-90	General Mills Honey Nut Cheerios	23.9		< 20	69.4	< 20	< 20
MM-91	General Mills Oat Crunch Cheerios	19.3		< 18	41.4	< 18	< 18
MM-92	Corn Chex	< 20		< 20	232.4	< 20	< 20
MM-93	Wheat Chex	< 20		45.4	123.9	< 20	< 20
MM-94	Rice Chex	171.3	132	< 20	130	< 20	< 20
MM-112	Great Value Rice Crisps Cereal	170.9	126	< 20	123.4	< 20	< 20
MM-175	Uncle Sam Cereal	< 20		107	55	< 20	< 20
MM-211	Blueberry Cheerios	25.3		21.1	87.1	< 20	< 20
MM-212	Frosted Cheerios	22		< 20	48	< 20	< 20
MM-213	Great Value Rice Crisps	167	112	< 20	103	< 20	< 20
MM-231	Stop & Shop Puffed Rice	150.1	56	< 20	61.3	< 20	< 20
MM-232	Kellogg's Rice Krispies	105.9	63	< 20	85.4	< 20	< 20
MM-233	General Mills Corn Chex	< 20		< 20	345	< 20	< 20
MM-234	General Mills Rice Chex	163.4	119	< 20	57.9	< 20	< 20
MM-241	Stop & Shop Crispy Rice Cereal	168	122	< 20	115	< 20	< 20
MM-242	General Mills Wheat Chex	< 20		41	58	< 20	< 20
MM-243	General Mills Honey Nut Cheerios	23.3		< 20	89.6	< 20	< 20
MM-244	General Mills Oat Crunch Almond Cheerios	21.6		< 20	68.2	< 20	< 20
MM-245	General Mills Multi Grain Cheerios	33		< 20	347	< 20	< 20
MM-298	Uncle Sam Cereal	< 20		149.5	1027.3	< 20	< 20

**Table 7: Findings of Toxic Elements in Infant Rice Cereal Samples Tested in 2022**

Sample ID	Brand Name Commodity	As μg/kg	iAs	Cd	Cr	Hg	Pb
MM-74	Baby Mum-Mum Original Rice Rusks	110.8	65	< 20			< 20
MM-75	Gerber Probiotic Rice Banana Apple	94.2		< 20			< 20
MM-76	Gerber Rice	114.1	102	< 20			< 20
MM-113	Parent's Choice Organic Strawberry Rice Rusks	110.4	82	< 20			< 20
MM-114	Parent's Choice Blueberry Rice Rusks	85.2		< 20			< 20
MM-134	Parent's Choice Organic Strawberry Rice Rusks	110.4	81				
MM-135	Baby Mum-Mum Banana Rice Rusks	83.6					
MM-136	Gerber Rice single grain cereal	112.3	89				
MM-132	Earth's Best Organic Rice Cereal	98.1					
MM-133	Gerber Teethers	50					
MM-165	Gerber Rice	122.1	95				
MM-166	Earth's Best Organic Rice	117	106	< 20			< 20
MM-177	Gerber Probiotic Rice Banana Apple Cereal	95		< 20			< 20
MM-178	Gerber Rice Cereal	119	113	< 20			< 20
MM-179	Gerber Organic Rice Cereal	48		< 20			< 20
MM-218	Parent's Choice Organic Apple Rice Rusks	74		< 20			26
MM-219	Parent's Choice Organic Banana Rice Rusks	87		< 20			18
MM-220	Baby Mum-Mum Banana Rice Rusks	92		< 20			15
MM-246	Gerber Rice	141	111	< 20	160	< 20	< 20
MM-247	Gerber Organic Rice	52		< 20	132	< 20	< 20
MM-277	Gerber Rice	124	84	< 20		< 20	< 20
MM-278	Gerber Puffs Sweet Potato	51.1		< 20		< 20	< 20
MM-279	Gerber Teethers Strawberry Apple Spinach	56.4		< 20		< 20	< 20
MM-280	Gerber Organic Teethers Blueberry Apple Beet	84.4		< 20		< 20	< 20
MM-281	Happy Baby Puffs Purple Carrot & Blueberry	186.5	67	< 20		< 20	< 20
MM-282	Happy Baby Teethers Blueberry & Purple Carrot	62.9		< 20		< 20	< 20
MM-283	Happy Baby Teethers Mango & Pumpkin	49.8		< 20		< 20	< 20
MM-284	Happy Baby Teethers Strawberry & Beet	58.1		< 20		< 20	< 20



**Table 8: Findings of Toxic Elements in Baby Food Samples Tested in 2022**

Sample ID	Brand Name Commodity	As	iAs	Cd	Cr	Hg	Pb
		µg/kg					
MM-77	Gerber Natural Banana Blueberry	< 2.5		< 2.5			< 2.5
MM-78	Gerber Natural Banana	< 2.5		< 2.5			< 2.5
MM-79	Gerber Natural Pear Zucchini	< 2.5		< 2.5			< 2.5
MM-80	Gerber Natural Pear Carrot Pea	< 2.5		< 2.5			< 2.5
MM-81	Stage 2 Baby Food Banana, Oat and Cinnamon	2.9		< 2.5			< 2.5
MM-115	Gerber Turkey and Gravy	8		< 3.5			< 3.5
MM-116	Gerber Chicken and Gravy	< 3.5		< 3.5			< 3.5
MM-117	Gerber Ham and Gravy	< 3.5		< 3.5			< 3.5
MM-118	Beech-Nut Beef + Beef Broth	< 3.5		< 3.5			< 3.5
MM-119	Beech-Nut Mixed Vegetables	< 3.5		6.6			< 3.5
MM-145	Earth's Best Carrots Organic Baby Food	4		15			62
MM-146	Earth's Best Vegetable Turkey Dinner Organic Baby Food	4		< 3			< 3
MM-147	Earth's Best Turkey & Turkey Broth Organic Baby Food	< 3		< 3			< 3
MM-148	Earth's Best Organic Orange Banana Baby Food Puree	3		< 3			< 3
MM-149	Earth's Best Organic Apple Peach Oatmeal Fruit & Grain Puree	9		< 3			< 3
MM-189	Happy Baby Pears & Kale	< 3.5		< 3.5			< 3.5
MM-190	Happy Baby Carrots & Peas	6		< 3.5			7
MM-191	Happy Baby Bananas & Strawberries	< 3.5		< 3.5			< 3.5
MM-192	Happy Baby Mangos	8		15			< 3.5
MM-193	Auerpak Happy Baby Prunes	< 3.5		< 3.5			< 3.5
MM-221	Gerber Ham	< 3.5		< 3.5	15.3	< 3.5	< 3.5

**Table 8: Findings of Toxic Elements in Baby Food Samples Tested in 2022, continued.**

Sample ID	Brand Name Commodity	As	iAs	Cd	Cr	Hg	Pb
		µg/kg					
MM-222	Gerber Turkey	10.1		< 3.5		< 3.5	< 3.5
MM-223	Gerber Beef	< 3.5		< 3.5	14	< 3.5	< 3.5
MM-224	Gerber Chicken	< 3.5		< 3.5	22.1	< 3.5	< 3.5
MM-225	Gerber Banana	< 3.5		< 3.5	22	< 3.5	< 3.5
MM-226	Bowl & Basket Apple	< 3.5		< 3.5	42.1	< 3.5	< 3.5
MM-227	Bowl & Basket Sweet Potato	5.1		< 3.5	29.4	< 3.5	< 3.5
MM-228	Bowl & Basket Mixed Vegetables	4.2		8.6	41.8	< 3.5	< 3.5
MM-361	Happy Baby Sweet Potato and Carrot Puffs	414.5	69	< 20.1		< 20.1	29
MM-362	Gerber Rice Cereal	112.7	72	< 20.8		< 20.8	< 20.8
MM-363	Happy Baby Teethers Pea & Spinach	99.2		< 20		< 20	46
MM-364	Gerber Teether Wheels	50.3		< 21.2		< 21.2	36.5
MM-365	Serenity Kids Chicken made with organic peas & carrots	3.3		< 2.7		< 2.7	< 2.7
MM-366	Earth's Best Organic Whole Grain Multi-Grain Cereal	< 18.2		28.2		< 18.2	< 18.2
MM-367	Beach Nut Organics Pear	5.6		< 3.7		< 3.7	< 3.7
MM-368	Gerber Turkey & Gravy	33.2		< 3		< 3	< 3
MM-369	Gerber Turkey & Rice	12		4.6		< 3	3.2
MM-370	Serenity Kids Beef made with organic kale & sweet potato	4.9		< 3		< 3	< 3
MM-371	Serenity Kids Turkey, organic sweet potato, pumpkin & beet	3.2		< 2.9		< 2.9	< 2.9
MM-392	Grape Pediatric Electrolyte - Grape	< 2		< 2		< 2	< 2
MM-393	Nursery Purified Water	< 2		< 2		< 2	< 2
MM-394	Gerber Apple Banana with Oatmeal Cereal	3.1		< 2.8		< 2.8	< 2.8
MM-395	Gerber Apple Juice	3.3		< 1.9		< 1.9	< 1.9
MM-396	Gerber Chicken Noodle Dinner	9.1		6.7		< 3.2	< 3.2
MM-397	Berrilyte Mixed Berry	< 2		< 2		< 2	< 2
MM-405	Parent's Choice Pear Juice	5		< 1.9		< 1.9	< 1.9
MM-406	Parent's Choice Mixed Fruit Juice	2.9		< 1.9		< 1.9	< 1.9
MM-407	Gerber White Grape Juice	11.7	8.9	< 1.9		< 1.9	3.6
MM-408	Gerber Apple Mango with Rice Cereal	12.7		< 3.3		< 3.3	< 3.3
MM-438	Gerber Apple Juice	4.9		< 2		< 2	2.5

**Table 8: Findings of Toxic Elements in Baby Food Samples Tested in 2022, continued.**

Sample ID	Brand Name Commodity	As	iAs	Cd	Cr	Hg	Pb
		µg/kg					
MM-439	Parent's Choice Mixed Fruit Juice	2.5		< 2		< 2	< 2
MM-440	Gerber Rice Cereal	119.5	93	34.6		< 16	< 16
MM-441	Parent's Choice Pear Juice	4.3		< 2		< 2	< 2
MM-442	Gerber Apple Banana with Oatmeal Cereal	< 3.6		< 3.6		< 3.6	< 3.6
MM-443	Gerber Turkey Rice Dinner	9.6		3.5		< 3.3	5.2
MM-444	Gerber Turkey and gravy	13.3		< 3.8		< 3.8	< 3.8
MM-457	Gerber Chicken Noodle	7.7		14.8		< 3.4	4.6
MM-458	Gerber Teether Wheels	61.6		13.5		< 18.3	< 18.3
MM-459	Happy Baby Puffs Sweet Potato & Carrot	174	51	< 19.2		< 19.2	21.5
MM-460	Happy Baby Teethers Pea & Spinach	136.9	66	< 17.9		< 17.9	46.1
MM-461	Earth's Best Whole Grain Multi-Grain Cereal	< 20.5		25.4		< 20.5	< 20.5
MM-462	Beech Nut Organic Pear	5.5		< 4.9		< 4.9	< 4.9
NS-01	Serenity Kids Free Range Chicken	< 3.7		< 3.7		< 3.7	< 3.7
NS-02	Serenity Kids Grass Fed Beef	11.6		< 3.4		< 3.4	< 3.4
NS-03	Serenity Kids Pasture Raised Turkey	10.8		4.1		< 4.1	< 4.1
MM-463	Nursery Purified Water	<		< 2		< 2	< 2
MM-464	Gerber White Grape	10.5	8.6	< 2		< 2	2.3
MM-465	Gerber Apple Mango with Rice Cereal	15.6		< 4		< 4	< 4

**Table 9: Findings of Arsenic in Apple Juice/Cider Samples Tested in 2022.**

Sample ID	Brand Name Commodity	As µg/kg	iAs
MM-452	Stew Leonard's Gala Apple Cider	< 1.9	< 0.7
MM-453	Stew Leonard's First Press Apple Cider	< 2	< 0.7
MM-454	Stew Leonard's Honeycrisp Apple Cider	2.4	1.4
MM-455	Stew Leonard's Organic Apple Juice	2.2	1.6
MM-456	Stew Leonard's Apple Juice	< 2	< 0.7
MM-445	Gerber Apple Juice	4.9	4.4
MM-466	Rogers' Orchards 100% Honeycrisp Sweet Cider	< 2	< 0.7
MM-467	Rogers' Orchards 100% Gala Sweet Cider	< 2	< 0.7
MM-468	Juicy Juice 100% Apple Juice	< 2	< 0.7
MM-472	Mott's Apple Cider	< 2	< 0.7
NES-15	Big Y Apple Cider	< 2	< 0.7
NES-16	Lyman Orchards Premium Apple Cider	< 2	< 0.7
NES-17	Martinelli's Gold Medal Apple Juice	13.6	12.2
NES-18	Martinelli's Gold Medal Apple Juice	13.3	12.4
NES-19	Mott's Apple Juice	< 2	< 0.7
NES-20	Food Club Apple Juice	< 2	< 0.7
NES-21	Langers Apple Juice	< 2	1
MM-437	Woodland Farms Sweet Cider	< 2	< 0.7

**Table 10: Findings of Inorganic Arsenic in Rice Samples Tested in 2022.**

<b>Sample ID</b>	<b>Brand Name Commodity</b>	<b>iAs µg/kg</b>
MM-63	Carolina Whole Grain Brown Rice	139
MM-64	Goya Brown Rice	139
MM-65	Goya Yellow Rice	160
MM-66	River Brown Rice Whole Grain	180
MM-67	Stop & Shop Brown Rice Long Grain	145
MM-68	Stop & Shop Instant White Rice	67
MM-69	Lundberg California White Basmati Gourmet Rice	64
MM-72	Bowl & Basket Long Grain Brown Rice	191
MM-73	Zatarain's Yellow Rice	119
MM-123	Goya Canilla Enriched Rice	102
MM-124	Goya Thai Jasmine Rice	84
MM-125	Goya Brown Rice	129
MM-126	Goya Medium Grain Rice	145
MM-127	Goya Organics Brown Rice	196
MM-129	Carolina Arborio Rice	96
MM-130	Bowl & Basket Black Rice	193
MM-131	Bowl & Basket Long Grain Brown Rice	140
MM-167	Big Y Enriched Long Grain Rice	90
MM-168	Carolina Enriched White Rice	79
MM-169	Carolina Whole Grain Brown Rice	142
MM-180	Stop & Shop Brown Rice	143
MM-181	Goya Brown Rice	95
MM-182	Carolina Basmati Naturally Fragrant Rice	43
MM-183	Stop & Shop White Basmati Rice	62
MM-184	Minute Brown Rice	127
MM-185	Nature's Promise Whole Grain Brown Rice	23
MM-235	Carolina Sushi Short Grain Rice	65

**Table 10: Findings of Inorganic Arsenic in Rice Samples Tested in 2022, continued.**

<b>Sample ID</b>	<b>Brand Name Commodity</b>	<b>iAs µg/kg</b>
MM-236	Carolina Risotto Arborio Rice	62
MM-237	Carolina Whole Grain Brown Rice	105
MM-238	Nature's Promise Long Grain White Rice	6
MM-239	Nature's Promise Long Grain Brown Rice	18
MM-240	Nature's Promise Basmati Rice	3
MM-248	Stop & Shop White Rice	105
MM-249	Stop & Shop Brown Rice	178
MM-250	Stop & Shop White Basmati Rice	103
MM-285	Great Value Long Grain Rice	94
MM-286	Great Value Brown Rice Instant Natural Whole Grain	84
MM-287	Great Value Natural Brown Long Grain Rice	122
MM-288	Royal Basmati Rice	53
MM-289	Success Boil-IN-Bag White Rice	91
MM-290	Success Boil-IN-Bag Brown Rice	83
MM-291	Success Boil-IN-Bag Basmati Rice	39
MM-292	Minute Jasmine Rice	42
MM-293	Food Club Instant Brown Rice	94
MM-294	Food Club Instant White Rice	74
MM-295	Food Club Long Grain Brown Rice	70
MM-296	Big Y Long Enriched Grain Rice	88
MM-297	Big Y Brown Rice Boil-IN-Bag	102
MM-299	Bowl & Basket Long Grain White Rice	108
MM-300	Bowl & Basket Long Grain Brown Rice	122
MM-301	Bowl & Basket Basmati Brown Rice	9
MM-302	Bowl & Basket Basmati Rice	5
MM-303	Bowl & Basket Rice Pilaf	75
MM-309	Goya Brown Rice	82

\* The US FDA has established an action level of 100 µg/kg of inorganic arsenic in rice.

\*\* The US FDA has proposed an action level of 10 µg/kg of inorganic arsenic in apple juice.

iAs indicates the value of inorganic As. As is total arsenic, organic and inorganic.

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