Monitoring the Sodium Content of Foods as the Food Industry Reformulates

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Abstract

In its 2010 report "Strategies to Reduce Sodium Intake in the United States", the Institute of Medicine recommended monitoring the sodium content of the US food supply. Therefore, a monitoring plan has been developed by the USDA's Nutrient Data Laboratory (NDL) and the Food Surveys Research Group, in close collaboration with the Centers for Disease Control and the FDA. To achieve this goal, 125 Sentinel Foods have been identified for tracking as primary indicators of changes in the sodium content of foods and population sodium intake. These foods accounted for approximately one-third of the total sodium intake of the population and include commercial/packaged (75%) and restaurant (25%) items. All Sentinel Foods have been analyzed since 2010 at commercial laboratories under contract as part of NDL's National Food and Nutrient Analysis Program. Foods will be reanalyzed on a rotating schedule based upon frequency of consumption, potential for possible reduction, and history of change in the marketplace in order to monitor changes in sodium content. Comparing these values with those obtained earlier, results indicate for about 70% of the 125 Sentinel Foods, the new sodium values were at least ±10% lower. Although some sodium values were higher, others did not change. Catsup showed a significant sodium reduction ($p<0.001$) of 210 mg/100g from 1114±98.87 to 904±38.34 mg/100g (mean±SD). For a 2 packet serving this results in a reduction of 42 mg or approximately 1% of mean daily intake. Two brands of fast food french fries showed no significant change in sodium content (170±34.08 to 189±49.45 and 172±57.32 to 219±29.35 mg/100g), while one showed a decrease from 455±50.42 to 279±56.49 mg/100g ($p<0.05$). As the food industry reformulates foods to reduce sodium content, it is critical that food composition databases are expanded and maintained to provide public health professionals and policy maker's accurate and comprehensive information.

Introduction

The Nutrient Data Laboratory (NDL) at ARS has been monitoring nutrient profiles, including sodium, for selected commercial packaged and restaurant food items sampled under the USDA National Food and Nutrient Analysis Program (NFNAP)[1]. Initiated in 1997, NFNAP is an ongoing collaboration between NDL and various institutes and offices of the NIH to improve the quantity and quality of data in the USDA National Nutrient Database for Standard Reference (SR). The Centers for Disease Control and the Food and Drug Administration also support his program.

To prioritize analysis, approximately 125 foods were identified to serve as indicators for assessment of change in the sodium content in the food supply.

- Mainly commercial packaged and restaurant foods, selected based on the dietary data from the national survey What We Eat In America (WWEIA), NHANES[2].
- Termed as Sentinel Foods, these foods were determined through careful examination of the mainly commercial packaged and restaurant foods consumed by the survey respondents, including evaluation of the sodium content, frequency of consumption, and potential for possible reduction in sodium content of the food.
- Sentinel Foods accounted for approximately 36% of total sodium intake in WWEIA, NHANES 2007-2008.
- The project of identifying the Sentinel Foods was led by Food Surveys Research Group (FSRG), ARS, in close co-operation with NDL.

Foods were selected for this presentation to illustrate changes in the food supply as industry reformulates to lower the sodium content of their products.

Methods

The Sentinel Foods are being monitored through nationwide sampling and analysis, using methods standardized as part of the NFNAP program. NFNAP employs statistically valid sampling plans, comprehensive quality control, and USDA analytical oversight as part of the program to generate new and updated analytical data for food components in the SR. The sampling design for the NFNAP employs a three-stage, probability-proportional-to-size sample selection process[3], specifically selection of: 1) county and city (population density, current US Census); 2) retail locations (e.g., supermarkets) within the cities (annual sales, ACNielsen/Trade Dimensions) and; 3) and specific food brands (market shares as weight consumed, ACNielsen).

Sample units are processed at the Food Analysis Laboratory Control Center (FALCC), Virginia Tech (Blacksburg, VA), and at Texas Tech University's Animal and Food Sciences laboratory (Lubbock, TX). Foods are analyzed for nutrient content using valid, approved analytical methods at commercial laboratories under contact to USDA. Sodium is analyzed by ICP, using AOAC method 985.01 (3.2.06) + 984.27 (50.1.15). A rigorous QC program including analysis of in-house control materials and Standard Reference Materials is employed to ensure results over the duration of the project. Data are reviewed by a panel of food specialists and chemists from USDA and FALCC or Texas Tech.

Statistics: Nutrient values were statistically evaluated using Wilcoxon Rank Sum Test $p<0.05$.

Table 1. Sodium content of catsup (1983 – 2000 .vs. 2012 sampling)

Year	Mean ± SD	Median	N	Range
1983 – 2000 [a]	1114± 98.87	1115	54	880 - 1280
2012 [b]	904± 38.34	908	18	836– 967
Brand 1 [a]	932 ± 24.86	928	6	907 – 967
Brand 2 [a]	911 ± 30.61	913	6	868 – 948
Brand 3 [a]	868 ± 30.91	858	6	836 – 912

Pairs with the same letter are not statistically different ($p<0.05$)

Table 2. Sodium content of dill pickles (1987 – 2005 .vs. 2013 sampling)

Year	Mean ± SD	Median	N	Range
1987 - 2005 [a]	875 ± 157.39	910	35	550– 1200
2013 [a]	781 ± 215.67	697	18	502 – 1170
Brand 1 [a]	1057 ± 91.55	1075	6	929 – 1170
Brand 2 [b]	670 ± 65.41	684	6	564 – 748
Brand 3 [b]	615 ± 78.19	615	6	502 – 703

Pairs with the same letter are not statistically different ($p<0.05$)

Table 3. Sodium content of fast food french fried potatoes

Brand	Year	Mean ± SD	Median	N	Range
1	2002 [a]	455 ± 50.43	459	4	390 - 513
	2012 [b]	279 ± 56.49	281	6	213 - 363
2	2002 [c]	170 ± 34.07	180	4	124 – 198
	2012 [c]	189 ± 49.45	199	6	115 - 251
3	2002 [d]	172 ± 57.31	178	4	103 - 227
	2012 [d]	219 ± 29.35	213	6	178 - 262

Pairs with the same letter are not statistically different ($p<0.05$)

Table 4. Sodium content of home prepared french fried potatoes (2002 vs. 2013 sampling)

Year	Mean ± SD	Median	N	Range
All Brands (includes store)				
2002 [a]	388 ± 97.67	391	6	251 – 494
2013 [a]	337 ± 82.55	347	11	185 – 480
Store Brands				
2002 [a]	303 ± 45.71	327	3	251 – 333
2013 [a]	311 ± 72.67	333	8	185 – 409

Pairs with the same letter are not statistically different ($p<0.05$)

Results

Catsup – 1983 to 2000 compared to 2012 (Table 1)

- Sodium content decreased significantly between the earlier data (1983 to 2000) used in SR26 and the 2012 data used in SR27.
- There was no significant difference in sodium content between brands in 2012. Sugar profiles are different as one company uses high-fructose corn syrup and another uses sugar.

Dill Pickles– 1987 to 2005 compared to 2013 (Table 2)

- There was no significant difference between samples collected from 1987 to 2005 compared with those collected in 2013.
- Brand 1 dill pickles were significantly different from brands 2 and 3.

Fast Food French Fried Potatoes - 2002 compared to 2012 (Table 3)

- There was no significant difference between all brands collected in 2002 compared with all brands collected in 2012 due to high variability.
- However, for brand 1 there was a significant difference between samples collected in 2002 compared with those collected in 2012. For brands 2 and 3 there was no significant difference between the two samplings.

Home Prepared, Oven-heated, Frozen, French Fried Potatoes – 2002 compared to 2013 (Table 4)

- Although the sodium content dropped 13% from 2002 to 2013), the difference was not statistically significant.
- Looking at store brands only, as there were insufficient samples of major brands to conduct a statistical analysis, the sodium content increased slightly. Again, there was no significant difference between samples collected in 2003 and those collected in 2013.

Conclusion

The sodium in some foods, such as catsup, and one brand of fast food french fried potatoes have decreased significantly in the years examined. For others, such as dill pickles, the other brands of fast food french fried potatoes, and home prepared frozen french fried potatoes, though the sodium values changed, they were not significantly different. In addition to sodium, other nutrients (proximates, minerals, sugars, and fatty acids), are also monitored, as they may be affected by reformulations undertaken to reduce the sodium content. These observations provide values for nutrient monitoring in several types of high-consumption foods and also provide current, accurate data USDA databases[4].

References

1. Haytowitz, DB, Pehrsson, PR, and Holden, JM. 2008. The National Food and Nutrient Analysis Program: A Decade of Progress. Journal of Food Composition and Analysis 21(Supp. 1):S94-S102
2. Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS). 2010. National Health and Nutrition and Examination Survey 2007-08 (NHANES 2007-2008). http://wwwn.cdc.gov/nchs/nhanes/search/nhanes07_08.aspx
3. Perry CR, Pehrsson PR, and Holden J. A Revised Sampling Plan for Obtaining Food Products for Nutrient Analysis for the USDA National Nutrient Database. 2003. Proceedings of the American Statistical Association, Section on Survey Research Methods [CD-ROM], Alexandria, VA: American Statistical Association, San Francisco, CA.
4. Nutrient Data Laboratory (NDL), Agricultural Research Service, US Department of Agriculture. 2013. USDA National Nutrient Database for Standard Reference, Release No.26. NDL Web site: http://www.ars.usda.gov/nutrient data.