



STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
PFAS RESPONSE PROGRAM
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DATE: June 24, 2025
TO: PFAS Response Program FILE
FROM: Meagan Hennessey, Director
SUBJECT: Chicken Egg Action Level – Overview and Rationale

The State of Maine Department of Agriculture, Conservation and Forestry (DACF) first adopted an Action Level for milk in 2017 set at 210 parts-per-trillion (ppt) for perfluorooctane sulfonic acid (PFOS). The DACF then adopted an Action Level for beef in 2020, set at 3.4 parts-per-billion (ppb) for PFOS. **As of June 24, 2025, the DACF is adopting a third Action Level for chicken eggs, set at 4.7 parts-per-billion (ppb) or nanograms per gram (ng/g) for PFOS.** Chicken eggs that are tested at or above 4.7 ppb PFOS will be considered adulterated and unfit for commercial sale. This memo summarizes the rationale for this chicken egg Action Level.

The Action Level for chicken eggs is based on the derivation of the existing Action Level for beef in Maine and represents a modification to the existing beef action level, namely adjusting for differences in consumption rates for eggs as compared to beef. Further information and details related to this derivation can be found in the following memo from the Maine Center for Disease Control and Prevention (Maine CDC) State Toxicologist, Dr. Andrew Smith: “Action Level for PFOS in chicken eggs based on an adjustment of the 2020 Action Level for beef.” In the years since establishing the beef (2020) and milk (2017) Action Levels, DACF staff have assisted farms with PFAS-impacted products other than beef and milk. By 2025, DACF determined that producers would benefit from a formalized Action Level for eggs. By establishing the chicken egg Action Level at 4.7 ppb PFOS, DACF is extending its current methodology for addressing PFAS in food products to this class of product. The establishment of this current chicken egg Action Level follows the existing process by DACF of utilizing the Maine Food Law when deeming a particular product “adulterated” by PFAS. *See 22 MRS §2155-A(1)(a).*

Action Levels are subject to change as science evolves, and new policies and regulations are established. Public Law 2025, Chapter 65, giving DACF the authority to establish maximum levels for PFAS in food commodities outside of Title 22, becomes law in late September 2025. Thereafter, DACF can move forward with rulemaking that may include new or updated Action Levels following a process that allows for public comment.

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Memorandum

To: Nancy McBrady, Deputy Commissioner, Maine Department of Agriculture, Conservation and Forestry

cc: Meagan Hennesey, Director, PFAS Response Program, Maine Department of Agriculture, Conservation and Forestry

From: Andrew Smith, SM, ScD, State Toxicologist, Maine Center for Disease Control and Prevention

Date: August 5, 2024

Re: Action Level for PFOS in chicken eggs based on an adjustment of the 2020 Action Level for beef

The Department of Agriculture, Conservation and Forestry (DACF) has a need for an action level for the presence of perfluorooctane sulfonate (PFOS) in chicken eggs. DACF has requested an adulterated action level for PFOS in eggs that aligns with the same toxicological basis as the current, 2020 beef action level. There are currently no action levels or tolerance limits for PFOS in chicken eggs or other foods available from the U.S. Food and Drug Administration (FDA). In 2020, at DACF's request, the Maine Center for Disease Control and Prevention (Maine CDC) develop a PFOS action level to be used as a threshold for considering a food commodity adulterated that provides DACF authority to restrict the sale of contaminated beef in the commercial market if this action level is exceeded. Maine CDC derived an action level for PFOS in beef following standard risk assessment methodology using the U.S. Environmental Protection Agency (EPA) Office of Water's published toxicity information for PFOS available at that time and daily beef consumption rates for high-end consumers on a body weight basis (Maine CDC 2020). Action levels were developed for children and adults with the lower action level based on a young child's exposure recommended as the final action level. After accounting for additional background PFOS exposure the beef action levels are:

PFOS Beef Action Level (nanograms/gram, ng/g)*	
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Children (1 to <6 years old)	3.4
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Adults (20+ years old)	7.3
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*Applies to raw, uncooked beef

The only term in the mathematical equation used to derive the beef action level that is food commodity specific is the daily consumption rate (see Maine CDC 2020). An egg action level that is on the same basis as the current beef action level can be obtained by multiplying the current beef action level by the ratio of daily beef consumption to daily egg consumption on a gram of food per kilogram body weight per day basis (g/kg/day).

$$PFOS\ egg\ action\ level, Child = PFOS\ beef\ action\ level, child \times \frac{beef\ consumption\ rate, child}{egg\ consumption\ rate, child}$$

$$PFOS\ egg\ action\ level, Adult = PFOS\ beef\ action\ level, adult \times \frac{beef\ consumption\ rate, adult}{egg\ consumption\ rate, adult}$$

Beef consumption rate

Maine CDC previously calculated values for daily beef consumption on a body weight basis using beef consumption and body weight data from U.S. Department of Agriculture (USDA) Food Patterns Equivalents Database (FPED) and U.S. Centers for Disease Control and Prevention's (U.S. CDC) National Health and Nutrition Examination Survey (NHANES) (USCDC, 2020 and USDA, 2019). NHANES is a nationally representative sampling of the population of the United States, and provides food consumption data collected using 2 day, 24-hour recall surveys under the What We Eat in America (WWEIA) food survey. NHANES also provides demographic and body measures data including age, gender, and body weight for individuals participating in the dietary recall surveys. USDA FPED provides the daily amount of various foods, including beef consumed, for each individual participating in the NHANES dietary recall surveys.

The details of the derivation of the beef consumption rates are presented in the 2020 Maine CDC memorandum on the derivation of a beef action level (Maine CDC 2020). The mean and 90th percentile beef consumption rates were calculated for young children and adult age groups (Table 1)¹.

Table 1. Mean and 90th percentile consumer-only daily beef consumption rates.

Age group (years)	Sample size	As consumed, cooked (g/kg bw/day)		Raw, uncooked (g/kg bw/day)*	
		Mean (95% confidence interval)	90 th Percentile (95% confidence interval)	Mean	90 th Percentile
Child: 1 to <6	1426	1.7 (1.6-1.8)	3.5 (3.2-3.8)	2.3	4.7
Adult: 20+	6876	0.8 (0.79-0.83)	1.6 (1.6-1.7)	1.1	2.2

* Raw, uncooked mean and 90th percentile estimates were calculated by multiplying the as consumed, cooked mean and 90th percentile estimates by 1.35 to account for average percent cooking yield.

¹ Mean and percentile distribution estimates were calculated following NHANES analytic guidelines - <https://wwwn.cdc.gov/nchs/nhanes/analyticguidelines.aspx#analytic-guidelines>

Egg consumption rates

Egg consumption rates can be derived in a similar manner to beef. The *Eggs (chicken, duck, goose, quail) and egg substitutes (oz. eq.)* component in the USDA FPED individual daily consumption dataset was used to calculate egg consumption rates for survey years 2005-2018. No apparent trends were observed in chicken egg consumption over this time period. The individual daily consumption dataset was used rather than the total daily consumption dataset in order to exclude individual dietary entries that were not chicken eggs, e.g., duck, goose, quail eggs. Dietary entries where the food description contained 'duck', 'goose', 'quail', or 'substitute' were excluded from the egg consumption rate calculations. Egg consumption for individuals reporting eggs or foods with eggs were summed for each survey day. The 2-day average in ounces was converted to grams where one oz equivalent egg is equal to 50 grams (Bowman et al. 2020). Cooking loss for chicken eggs is minimal, only 2 to 12% for fried, poached, scrambled, or French omelet preparations (USDA 2020). No cooking loss occurs for hard or soft boiled or pickled eggs. Due to minimal or no loss depending on the preparation method, the egg consumption rates were not adjusted for preparation/cooking loss.

Table 2. Mean and 90th percentile consumer-only daily chicken egg consumption rates.

Age group (years, sex)	Sample size	Mean (95% confidence interval)	90 th Percentile (95% confidence interval)
Child: 0 to 6, male/female	6308	1.2 (1.15-1.27)	3.4 (3.25-3.52)
Adult 20+, male/female	26937	0.4 (0.38-0.40)	1.0 (0.97-1.03)

Egg Action Level calculations based on adjustment of the 2020 beef Action Level

The FDA typically uses the 90th percentile of a daily intake to represent a high-end consumer (FDA, 2006) and Maine CDC has used the 90th percentile food consumption rates to represent daily consumption for high-end consumers in prior derivations of beef and milk action levels. Using the 90th percentile consumption rates for a child for beef and eggs, the current beef action level for PFOS can be adjusted to yield an action level for eggs accordingly:

$$PFOS \text{ egg action level, child} = 3.4 \text{ ng/g} \times \frac{4.7 \text{ (g/kg body weight/day)}}{3.4 \text{ (g/kg body weight/day)}} = 4.7 \text{ ng/g}$$

$$PFOS \text{ egg action level, adult} = 7.3 \text{ ng/g} \times \frac{2.2 \text{ (g/kg body weight/day)}}{1.0 \text{ (g/kg body weight/day)}} = 16.1 \text{ ng/g}$$

References

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- USCDC. 2020. National Center for Health Statistics. National Health and Nutrition Examination Survey. <https://wwwn.cdc.gov/nchs/nhanes/default.aspx>
- USDA. 2019. Agricultural Research Service. Beltsville Human Nutrition Research Center. Food Surveys Research Group. FPED databases. Last accessed 07.14.20. <https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fped-databases/>