

Report of FY 2024 Survey of Forage Materials for PFAS

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that have been used in various consumer, commercial, and industrial products since the 1940s. Due to their ability to resist grease, oil, water, and heat, these chemicals can be found in stain- and water-resistant clothing and carpeting, non-stick cookware, cleaning products, and fire-fighting foams. PFAS do not breakdown easily or quickly and are known to persist in the environment, including in air, water, and soil. There is increasing evidence that these “forever chemicals,” some of which have been linked to serious health effects, bioaccumulate in humans and animals due to their potential presence in food and water. Because of these concerns, FDA’s Center for Veterinary Medicine (CVM) is gathering information to gain a better understanding of the extent of PFAS contamination in food for animals.

During fiscal year (FY) 2023, FDA surveyed a limited number of plant-based animal food ingredients for the presence of 30 PFAS. The plant-based animal food ingredients included corn grain, corn silage, and alfalfa hay collected from states where these commodities are typically grown. All 30 PFAS analytes were found to be below their respective limits of quantitation (LOQ) in all 54 samples.

In follow-up to FDA’s FY 2023 Survey of Animal Food Ingredients for PFAS, during FY 2024, FDA continued its survey of plant-based animal food ingredients for the presence of PFAS. This FY 2024 survey included a limited number of forage commodities that can be fed to beef and dairy cattle: specifically, various grass and legume silage products as well as grass and legume hays. Forage samples were collected across the U.S. from fields, bunkers, silos, and retail locations between April and September 2024. To prevent potential cross-contamination of samples from PFAS-containing equipment, PFAS-free sampling kits were provided along with sample collection instructions.

A total of 140 samples were sent to an FDA laboratory and analyzed for the same 30 PFAS as in FY 2023. Of these 140 samples, 19 were silage samples (12 corn and 7 grass), and 121 were hay samples (55 grass hays, 40 legume hays, 14 mixed grass hays, and 12 grass/legume mixed hays) as shown in Table 1. The samples were analyzed using a liquid chromatography with tandem mass spectrometry (LC-MS/MS) method developed and validated by FDA for the determination of 30 PFAS in various human and animal foods.

Table 1. Number of Forage Samples Collected and Analyzed by Commodity Type

Sample Description	Commodity Type	Number of Samples Collected and Analyzed
Corn	Silage	12
Grass	Silage	7
Bermuda	Hay, Grass	29
Brome	Hay, Grass	15
Oats	Hay, Grass	1
Orchard	Hay, Grass	2
Sudan	Hay, Grass	5

Sample Description	Commodity Type	Number of Samples Collected and Analyzed
Timothy	Hay, Grass	2
Not Specified	Hay, Grass	1
Mixed	Hay, Mixed Grass	14
Alfalfa	Hay, Legume	36
Sweet Clover	Hay, Legume	2
Birdsfoot Trefoil	Hay, Legume	2
Clover/Sudan	Hay, Mixed Grass and Legume	1
Alfalfa/Brome	Hay, Mixed Grass and Legume	6
Not Specified	Hay, Mixed Grass and Legume	5
Total		140

FDA has completed its examination of the sample results. In total, PFAS were detected above the method detection limit (MDL) in 6 samples as shown in Table 2. Of these six samples, three samples were not collected or packaged with FDA's PFAS-free sampling kit. Because the equipment used to collect and store these three samples cannot be verified as PFAS-free, it cannot be ruled out that the detection of PFAS in these samples is from cross contamination. For the remaining three samples where PFAS were detected, one was a corn silage sample, one was a sample of birdsfoot trefoil hay, and one was a mixed grass hay. PFHxA was detected in the corn silage sample at 79 ppt. PFOA and PFOS were detected in the birdsfoot trefoil hay at 67 ppt and 293 ppt, respectively. PFAS was not detected in a second sample of birdsfoot trefoil hay collected and analyzed under this survey. Lastly, PFBS was detected in the mixed grass hay at 87 ppt.

Table 2. Forage Samples with PFAS Detected Above the Method Detection Limit

Sample Description	Commodity Type	Collected with PFAS-Free Sampling Kit	PFHxA	PFHpA	PFOA	PFBS	PFPeS	PFHxS	PFOS
Corn Silage	Silage, Corn	Yes	79	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL
Legume Hay Birdsfoot Trefoil	Hay, Legume	Yes	NR	<MDL	67	<MDL	<MDL	<MDL	293
Grass Hay Brome, Timothy	Hay, Mixed Grass	Yes	NR	<MDL	<MDL	87	<MDL	<MDL	<MDL
Legume Hay Alfalfa	Hay, Legume	No	NR	56	161	1117	68	267	470
Sudan, Silage	Silage, Grass	No	<MDL	<MDL	<MDL	62	<MDL	<MDL	<MDL
Milo, Silage	Silage, Grass	No	<MDL	<MDL	<MDL	41	<MDL	<MDL	<MDL
MDL (ppt)			65	27	30	29	32	31	28

Measured concentrations are in parts per trillion (ppt = ng/kg).

NR = Not Reportable. PFHxA did not meet method validation criteria for these samples.

MDL = Method Detection Limit. The Method Detection Limit is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

The primary objectives of this survey were to obtain additional information on the presence of PFAS in certain animal food ingredients and to use the findings to support bioaccumulation modeling efforts. No definitive conclusions can be drawn from this limited survey; however, the results provide FDA with a better idea of the extent of PFAS contamination in certain ingredients used in foods for animals.