PESTICIDE RESEARCH UPDATES

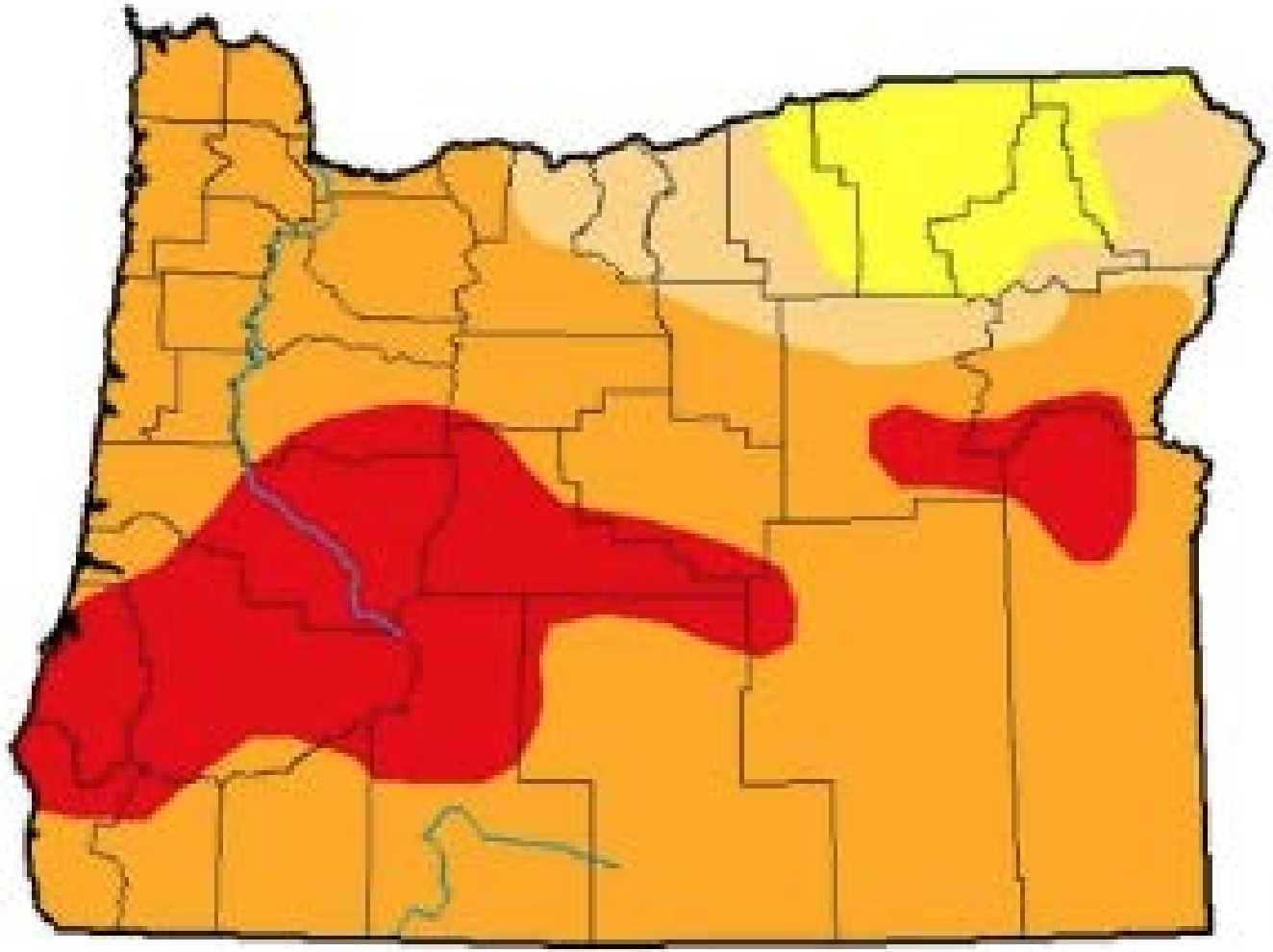
2018

KACI BUHL, ASSOCIATE PROFESSOR OF PRACTICE

OREGON STATE UNIVERSITY


Drought conditions are serious or
extreme in Oregon

“Like spring, even if we got some rain this winter, we're going to see some trees dying,” Shaw says.



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	93.65	83.81	21.58	0.00
Last Week 09-25-2018	0.00	100.00	93.65	79.13	6.18	0.00
3 Months Ago 06-05-2018	9.50	90.50	45.30	18.36	0.00	0.00
Start of Calendar Year 01-02-2018	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 09-26-2017	39.23	60.77	28.57	0.00	0.00	0.00
One Year Ago 09-05-2017	22.33	77.67	13.56	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Miskus
NOAA/NWS/NCEP/CPC

https://nbc16.com/news/local/even-if-we-got-some-rain-this-winter-were-going-to-see-some-trees-dying Sept. 6, 2018

The Bulletin
Serving Central Oregon since 1903
The Bend Bulletin 24, 2018

Forest Service to cut hundreds of ponderosa pines near Sisters killed by herbicide

ODOT, Forest Service planning dead tree removal near U.S. Highway 20

STEPHEN HAMWAY
THE BULLETIN
@Shamway1
View stories and bio

https://www.bendbulletin.com/localstate/6207843-151/hundreds-of-trees-accidentally-killed-by-pesticide

News | Forestry | Local

Oregon Bans Tree-Killing Herbicide Amid Sweeping Investigation

by **Emily Cureton** Follow OPB Oct. 1, 2018 12:17 p.m. I Updated: Oct. 1, 2018 1:48 p.m.

The herbicide is called aminocyclopyrachlor.

In Central Oregon, she said trees were poisoned in at least four locations. ODA has prohibited the use of products with aminocyclopyrachlor until April, and lasting regulation could be established.

The label for Perspective has long included a warning about tree exposure, and a list of species vulnerable to small amounts of the herbicide, including Ponderosa pines.

Agricultural Health Study
2018 FINDINGS

Over 89,000 pesticide applicators/spouses have participated in the 25-year study

- From 1993 – 1997, 99% were farmers, and they averaged 11 years of experience applying pesticides.
- Their average age was 45 years.
- From 2012 – 2015, their average age was 65 years.
- About half had used pesticides in the last year.
- Two-thirds still practice agricultural activities.

Agricultural Health Study

2018 FINDINGS

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed

Advanced

Format: Abstract

Send to

Sleep Health. 2018 Feb;4(1):20-26. doi: 10.1016/j.sleh.2017.08.006. Epub 2017 Sep 28.

Sleep apnea and pesticide exposure in a study of US farmers.

Baumert BO[1], Carnes MU[1], Hoppin JA[2], Jackson CL[1], Sandler DP[1], Freeman LB[3], Henneberger PK[4], Umbach DM[5], Shrestha S[1], Long S[6], London SJ[7].

Author information

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DISC
2009 for most agricultural purposes but persists in the environment and remains in use in some other countries.

CONCLUSIONS: We conducted the first epidemiological study investigating the association of pesticide exposure and sleep apnea. Our results in a male agricultural population suggests that exposure to carbofuran is positively associated with sleep apnea.

Published by Elsevier Inc.

CONCLUSIONS:

Our results in a male agricultural population suggest that exposure to carbofuran is positively associated with sleep apnea.

Carbofuran uses were cancelled in 2009

J Natl Cancer Inst. 2018 Sep 1;110(9):950-958. doi: 10.1093/jnci/djy005.

Alachlor Use and Cancer Incidence in the Agricultural Health Study: An Updated Analysis.

Lerro CC[1], Andreotti G[1], Koutros S[1], Lee WJ[2], Hofmann JN[1], Sandler DP[3], Parks CG[3], Blair A[1], Lubin JH[4], Beane Freeman LE[1].

Author information

Abstract

BACKGROUND: The herbicide alachlor has been widely used in US agriculture since its introduction in 1969. Experimental animal studies show that alachlor causes tumors in vivo; however, few epidemiologic studies have examined associations with human cancer risk. We evaluated alachlor use and cancer incidence in the Agricultural Health Study, updating an earlier analysis that suggested associations with lymphohematopoietic cancers with an additional 540 142 person-years of follow-up and 5113 cancer cases.

e at enrollment (1993-1997) and follow-up (1999-
relative risks (RRs) and 95% confidence intervals
13(IA). Models adjusted for age, tobacco, alcohol,

xposed cancers. The relative risks of laryngeal
d (RR = 6.04, 95% CI = 2.44 to 14.99), and fourth
with no use (Ptrend = .001). Risk of myeloid
nsity-weighted days of use (RR = 1.82, 95% CI =

geal cancer and a weaker association with myeloid
that long-term occupational exposure to alachlor
may be a risk factor for laryngeal cancer. This first report requires confirmation.

CONCLUSIONS:
We observed a strong positive association with the use of alachlor and laryngeal cancer…. Long-term occupational exposure may be a risk factor for laryngeal cancer.

PMID: 29471327 PMCID: PMC6136926 DOI: 10.1093/jnci/djy005

Occup Environ Med. 2018 Feb;75(2):79-89. doi: 10.1136/oemed-2017-104431. Epub 2017 Aug 3.

Occupational pesticide exposure and subclinical hypothyroidism among male pesticide applicators.

Lerro CC[1], Beane Freeman LE[1], DellaValle CT[1,2], Kibriya MG[3], Aschebrook-Kilfoy B[3], Jasmine F[3], Koutros S[1], Parks CG[4], Sandler DP[4], Alavanja MCR[1,5], Hofmann JN[1], Ward MH[1].

Author information

Abstract

OBJECTIVES: Animal studies suggest that exposure to pesticides may alter thyroid function; however, few epidemiologic studies have examined this association. We evaluated the relationship between individual pesticides and thyroid function in 679 men enrolled in a substudy of the Agricultural Health Study, a cohort of licensed pesticide applicators.

ghted lifetime days were
(eg, use of personal protective
ase (anti-TPO) autoantibodies
nd 95% CIs for subclinical
/e also examined pesticide

no exposure) was positively
14.82, p_{trend} <0.01), higher TSH
h subclinical hypothyroidism
l anti-TPO positivity
ssociated with T4 (p_{trend}=0.01).

CONCLUSIONS: Our results suggest that long-term exposure to aldrin, pendimethalin and methyl bromide may alter thyroid function among male pesticide applicators.

KEYWORDS: agriculture; hypothyroidism; pesticides; thyroid disease; thyroid stimulating hormone

PMID: 28775130 PMCID: PMC5771820 [Available on 2019-02-01] DOI: 10.1136/oemed-2017-104431

CONCLUSIONS:

Our results suggest that long-term exposure to aldrin, pendimethalin and methyl bromide may alter thyroid function among male pesticide applicators.

Environ Int. 2018 Sep;118:282-292. doi: 10.1016/j.envint.2018.05.041. Epub 2018 Jun 13.

Incident thyroid disease in female spouses of private pesticide applicators.

Shrestha S[1], Parks CG[1], Goldner WS[2], Kamel F[1], Umbach DM[3], Ward MH[4], Lerro CC[4], Koutros S[4], Hofmann JN[4], Beane Freeman LE[4], Sandler DP[5].

Author information

Abstract

BACKGROUND: Little is known about modifiable risk factors for thyroid disease. Several pesticides have been implicated in thyroid disruption, but clinical implications are not clear.

OBJECTIVE: We assessed associations between pesticide use and other farm exposures and incident hypothyroidism and hyperthyroidism

idence intervals for risk of thyroid

he fungicides benomyl,
ge the insecticides parathion and
om 1.56-2.44. Conversely, the insecticide
anging 0.63-0.73), as were long-term
ecticide diazinon, the fungicides
.35-2.01) and the herbicide trifluralin with

n and hyperthyroidism, although some
fungicides, are consistent with results

CONCLUSIONS:
Several pesticides were associated with increased risk of hypothyroidism and hyperthyroidism, although some were associated with decreased risk. Some findings, particularly associations with fungicides, are consistent with results of prevalent diseases among spouses in the AHS.

PMID: 29908479 DOI: 10.1016/j.envint.2018.05.041

J Natl Cancer Inst. 2017 Nov 9. doi: 10.1093/jnci/djx233. [Epub ahead of print]

Glyphosate Use and Cancer Incidence in the Agricultural Health Study.

Andreotti G[1], Koutros S[1], Hofmann JN[1], Sandler DP[1], Lubin JH[1], Lynch CF[1], Lerro CC[1], De Roos AJ[1], Parks CG[1], Alavanja MC[1], Silverman DT[1], Beane Freeman LE[1].

Author information

Abstract

BACKGROUND: Glyphosate is the most commonly used herbicide worldwide, with both residential and agricultural uses. In 2015, the International Agency for Research on Cancer classified glyphosate as "probably carcinogenic to humans," noting strong mechanistic
lies. A previous evaluation in the Agricultural
n glyphosate use and cancer at any site.

a and Iowa. Here, we updated the previous
na)/2013 (Iowa). Lifetime days and intensity-
t (1993-1997) and follow-up questionnaires
Poisson regression, controlling for potential

cancer cases (79.3% of all cases). In
e. However, among applicators in the
d with never users (RR = 2.44, 95% CI =
IL were similar with a five-year (RRQuartile 4
CI = 1.05 to 3.97, Ptrend = .04).

CONCLUSIONS: In this large, prospective cohort study, no association was apparent between glyphosate and any solid tumors or lymphoid malignancies overall, including NHL and its subtypes. There was some evidence of increased risk of AML among the highest exposed group that requires confirmation.

CONCLUSIONS:

In this large, prospective cohort study, no association was apparent between glyphosate and any solid tumors or lymphoid malignancies overall, including NHL and its subtypes.

Jurors give $289 million to a man they say got cancer from Monsanto's Roundup weedkiller

By Holly Yan, CNN

Updated 9:28 PM ET, Sat August 11, 2018

Judge reads final verdict in Monsanto case 01:32

More from CNN

Reality star Lyric McHenry dies at 26

Camping for the first time in Airstream's tiny new luxury trailer

International Agency for Research on Cancer

World Health Organization

Can it cause cancer?

United States Environmental Protection Agency

Can it cause cancer? + What level of exposure is expected? = Is that exposure level likely to result in cancer?

Environmental Topics | Laws & Regulations | About EPA

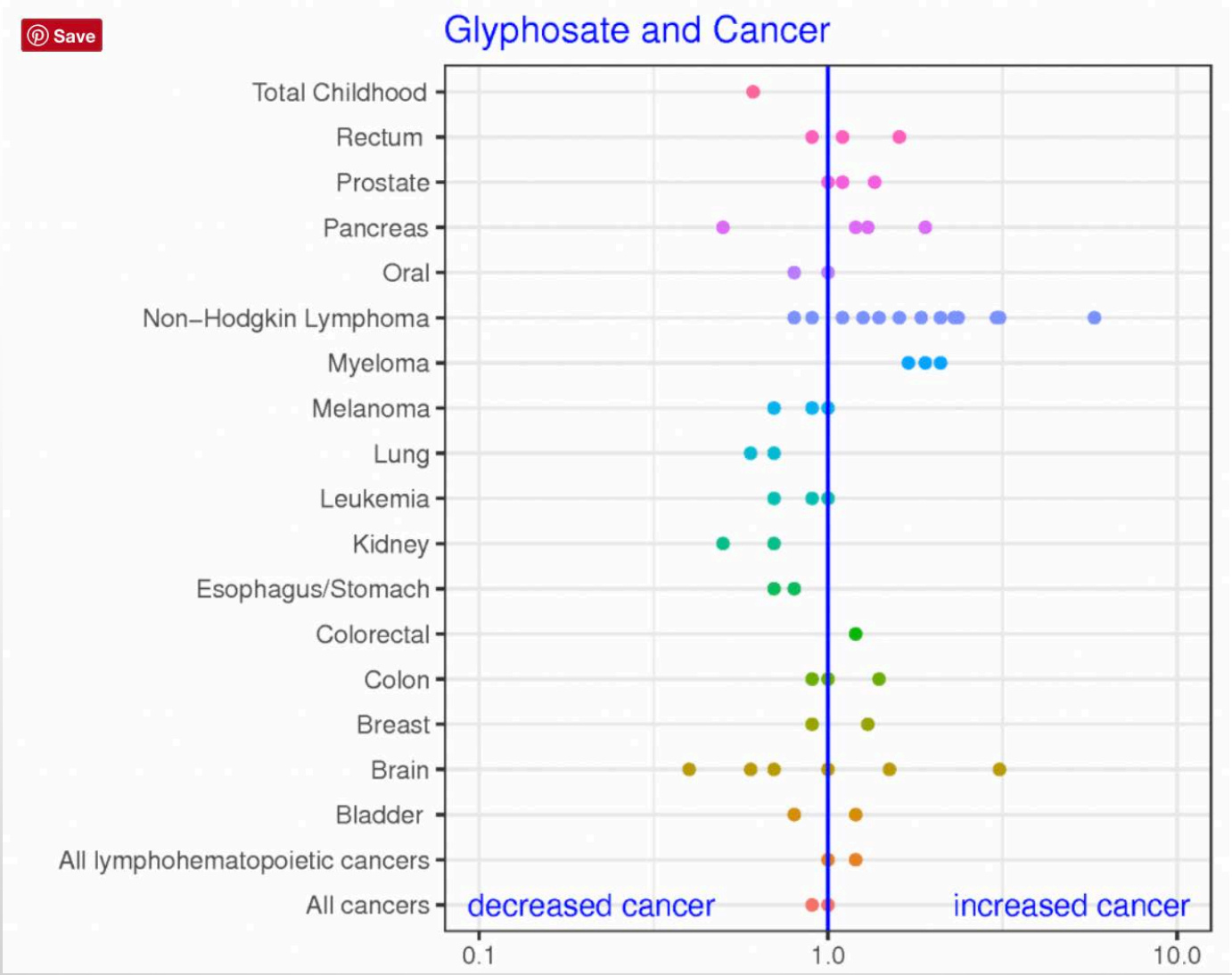
EPA Releases Draft Risk Assessments for Glyphosate

For Release: December 18, 2017

CONCLUSIONS:

The draft human health risk assessment concludes that glyphosate is not likely to be carcinogenic to humans.

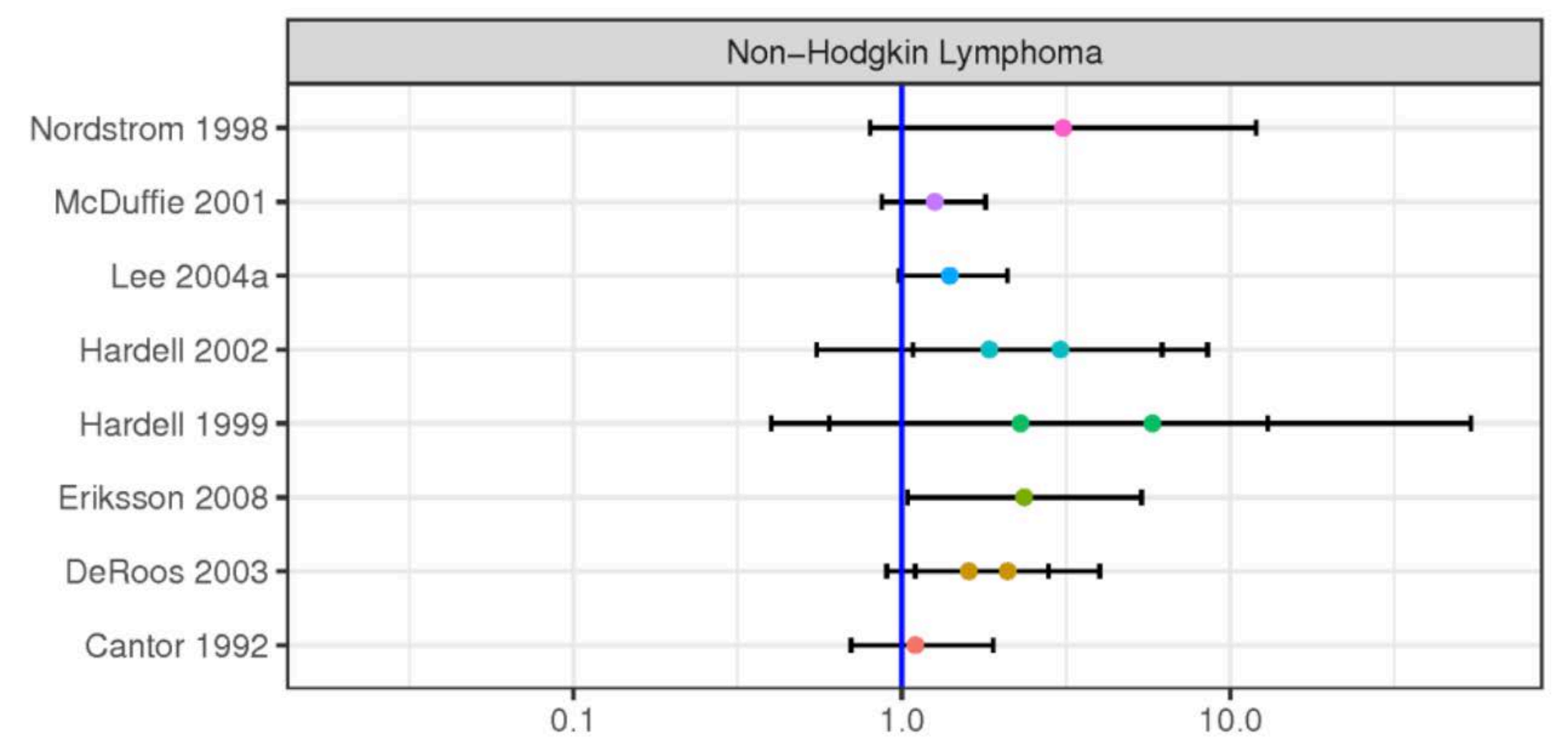
humans. The Agency's assessment found no other meaningful risks to human health when the product is used according to the pesticide label. The Agency's scientific findings are consistent with the conclusions of science reviews by a number of other countries as well as the 2017 National Institute of Health Agricultural Health Survey.



HERBICIDES / RESEARCH

Glyphosate and cancer – revisited

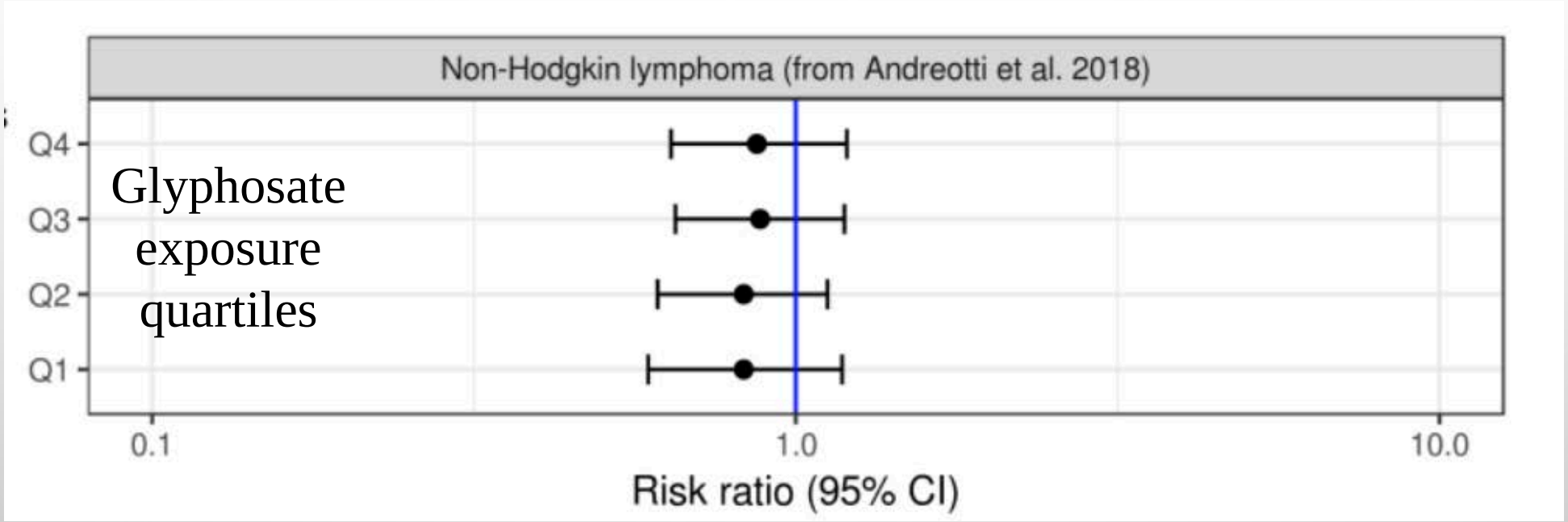
August 11, 2018 - by **Andrew Kniss**



HERBICIDES / RESEARCH

Glyphosate and cancer – revisited

August 11, 2018 - by **Andrew Kniss**



HERBICIDES / RESEARCH

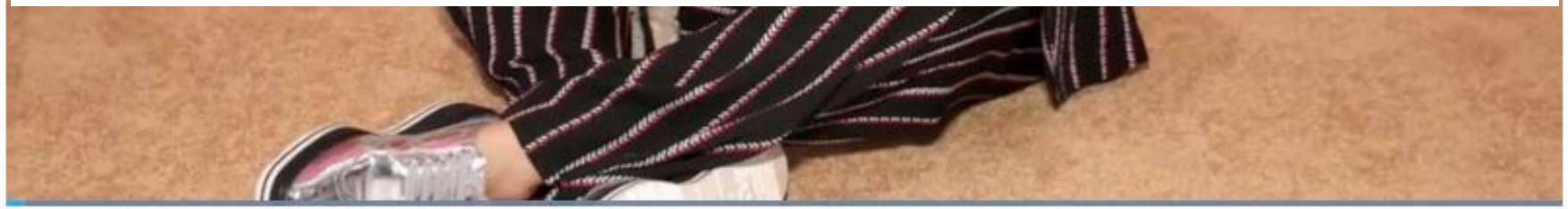
Glyphosate and cancer – revisited

August 11, 2018 - by Andrew Kniss

RETAIL • PET FOOD

A $5 Million Lawsuit Claims Rachael Ray's Dog Food Brand Contains a Potentially Harmful Ingredient

A man from New York is suing Rachael Ray's "natural" dog food brand, Nutrish, for allegedly containing the "potentially harmful" herbicide glyphosate. In the $5 million class action lawsuit, Bronx resident Markeith Parks argues that it is deceiving for Nutrish to market its food as natural.



WEED KILLER INGREDIENT FOUND IN CHEERIOS, QUAKER OATS AND OTHER BREAKFAST CEREALS

BY **CAMMY HARBISON** ON 8/15/18 AT 11:59 PM

Fri, Aug 17, 2018

Newsweek

The agency discovered that more than 53 percent of samples had no detectable pesticide residues, and all the residues found in the corn and soybean samples were below the tolerance levels set by EPA.
No amounts of glyphosate or glufosinate were found in milk or eggs.

First ever FDA glyphosate study finds weed killer exposure 'not concerning for public health'

Liz Crampton | Politico | October 2, 2018

The research, published in the journal Proceedings of the National Academy of Sciences, finds that honeybees exposed to glyphosate, the active ingredient in the Monsanto weed killer, lose some of the beneficial bacteria in their guts, thereby becoming more susceptible to infection and death from harmful bacteria.

By ASHLEY WELCH / CBS NEWS / *September 26, 2018, 4:45 PM*

Roundup weed killer may play role in widespread bee deaths, study finds

Glypohsate concentrations in run-off are a million times smaller after real-world applications

PNAS

Glyphosate perturbs the gut microbiota of honey bees

Erick V. S. Motta[a,1], Kasie Raymann[a,2], and Nancy A. Moran[a,1]

[a]Department of Integrative Biology, University of Texas at Austin, Austin, TX 78712

Edited by Margaret J. McFall-Ngai, University of Hawaii at Manoa, Honolulu, HI, and approved August 21, 2018 (received for review March 6, 2018)

Glyphosate, the primary herbicide used globally for weed control, targets the 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) enzyme in the shikimate pathway found in plants and some microorganisms. Thus, glyphosate may affect bacterial symbionts of animals living near agricultural sites, including pollinators such

herbicide is known to affect the growth of microorganisms (13–15), and the health of bees is intrinsically related to their distinct gut microbial community (16, 17). The honey bee gut microbiota is dominated by eight bacterial species: *Lactobacillus* spp. Firm-4, *Lactobacillus* spp. Firm-5 (phylum Firmicutes), *Bifidobacte-*

HOW TO WASH THE CLOTHING YOU BRING HOME?

DO HIGH-EFFICIENCY WASHING MACHINES WORK AS WELL AS THE OLD-FASHIONED AGITATOR MACHINES?

Thia Walker
Colorado State University

THE EPA LABEL REVIEW MANUAL STATES,

"ALL END-USE OCCUPATIONAL USE PRODUCTS (WPS OR NON-WPS) NEED TO HAVE THE MINIMUM BASELINE LABEL-REQUIRED WORK CLOTHES FOR HANDLERS CONSISTING OF LONG-SLEEVED SHIRT, LONG PANTS, SOCKS AND SHOES. TECHNICALLY THESE WORK CLOTHES ITEMS ARE NOT CONSIDERED PPE, BUT THEY CAN BE REQUIRED ON LABELS (40 CFR 170.240 (B))"

A REVIEW OF 1,868 LABELS EPA-REGISTERED PESTICIDE PRODUCTS,

1,583 (84%)

REQUIRED LONG-SLEEVED SHIRT AND LONG PANTS

Shaw A., C. Harned. "Analysis of Personal Protective Equipment Requirements on Labels of Pesticides for Agricultural Use," Journal of Pesticide Safety Education, Volume 15 (2013). Online: http://maxpond.ext.vt.edu/ojs2/index.php/jpse/article/view/70/79.

OLD LAUNDRY RECOMMENDATIONS

(BASED ON 1980'S- EARLY 1990'S RESEARCH)

- DON'T PACK CLOTHES TOO TIGHTLY.
- PREWASH OR PRESOAK USING HOT WATER, IF POSSIBLE.
- USE LONGEST OR HEAVY DUTY WASH CYCLE, HIGHEST WATER LEVEL.
- EXTRA RINSE USING HOT WATER, IF POSSIBLE.
- USE HEAVY DUTY LIQUID DETERGENT.

- **COLORADO/WYOMING** (WALKER, T. J. EDWARDS, 2014) 525 RESPONDENTS

  78% REPORTED THEY HAD A PESTICIDE EXPOSURE: 57% FROM MIST, 53% DIRECT

  40% WEAR COTTON, 43% WEAR COTTON/POLYESTER BLENDS

  74% LAUNDER AFTER USE, 36% LAUNDER ONCE A WEEK

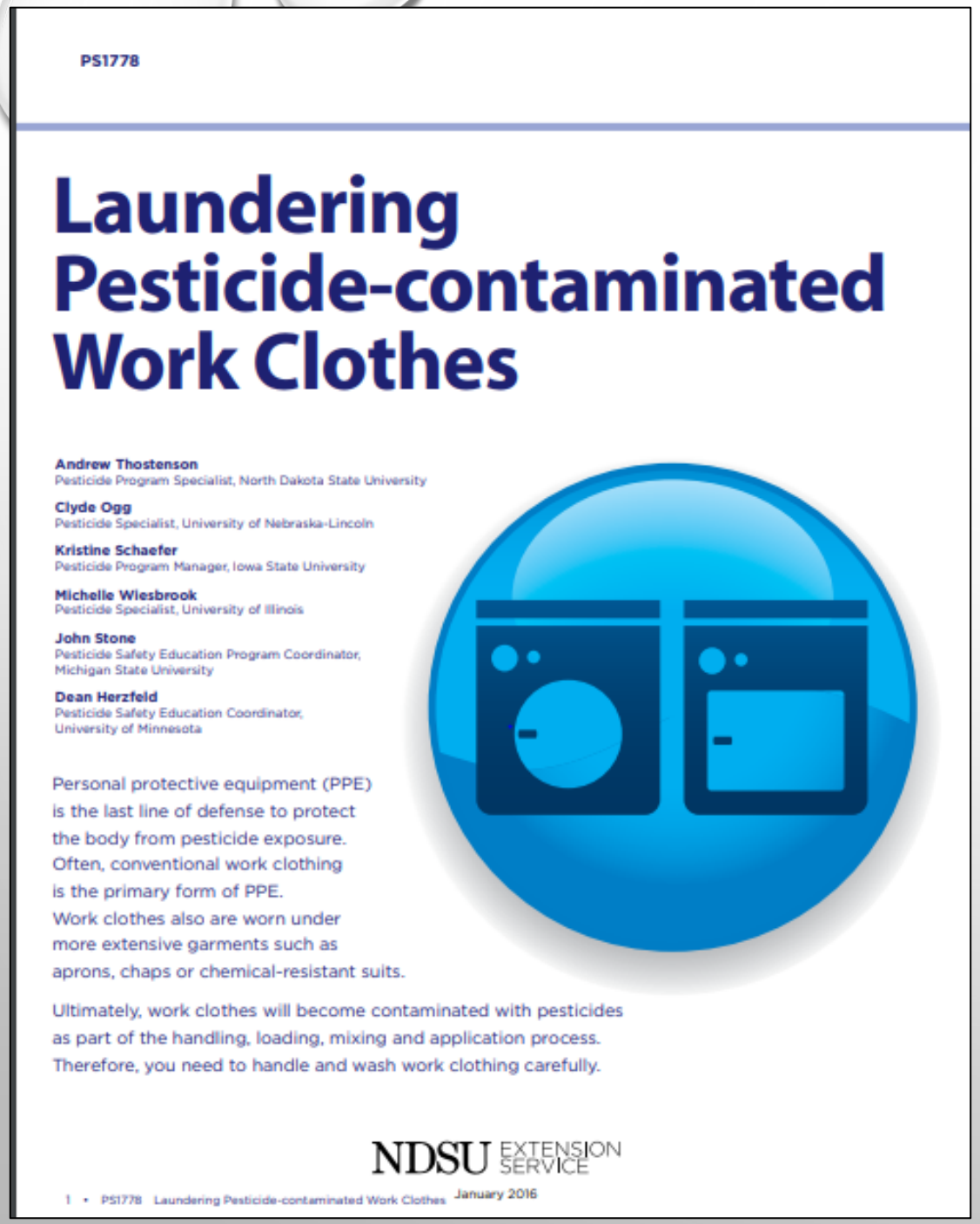
  91% LAUNDER AT HOME, 22% OF THEM NOT SEPARATE FROM OTHER CLOTHES

  51% USE AGITATOR, 13% TOP-LOAD HE, 36% FRONT-LOAD HE

- **MULTI-STATE** (SHAW, A., C. BLACK, K. SCHAEFER, L. BLECKER, T. WALKER, A. BROWN, 2018)

  78% WASH AT HOME, 15% AT WORK

  43% USE AGITATOR, 27% USE TOP- LOAD HE AND 30% USE FRONT-LOAD HE



PS1778

Laundering Pesticide-contaminated Work Clothes

Andrew Thostenson
Pesticide Program Specialist, North Dakota State University

Clyde Ogg
Pesticide Specialist, University of Nebraska-Lincoln

Kristine Schaefer
Pesticide Program Manager, Iowa State University

Michelle Wiesbrook
Pesticide Specialist, University of Illinois

John Stone
Pesticide Safety Education Program Coordinator, Michigan State University

Dean Herzfeld
Pesticide Safety Education Coordinator, University of Minnesota

Personal protective equipment (PPE) is the last line of defense to protect the body from pesticide exposure. Often, conventional work clothing is the primary form of PPE. Work clothes also are worn under more extensive garments such as aprons, chaps or chemical-resistant suits.

Ultimately, work clothes will become contaminated with pesticides as part of the handling, loading, mixing and application process. Therefore, you need to handle and wash work clothing carefully.

NDSU EXTENSION SERVICE

Provides information on handling & washing contaminated clothing.

And recognized:

- Laundry detergents have changed
- Lack of information on efficacy of front- or top-load HE machines
- Mandated energy saving settings (cold water rinses, water saving settings)
- Lack of information on synthetic or ‘breathable’ fabrics

DOES TYPE OF MACHINE MATTER?

Agitator

- USES 34-49 GAL H_20
- USE ANY TYPE OF SOAP
- BETTER CONTROL OVER H_20 TEMPS AND H_20 LEVELS

Jacobsen, R.L. 1999. Low water Laundering. *Journal of Surfactants & Detergents*. 2(4):559-562

DOES TYPE OF MACHINE MATTER?

High-Efficiency (HE)

- USES 15-32 GAL H_20
  REQUIRES LOW SUDSING SOAP
- LOWER WASHING TEMPS –WATER COOLS AS IT ENTERS
- HIGH CLOTHES:WATER RATIO – MEANS HIGHER CONCENTRATION OF THINGS LIKE DYE (OR PESTICIDES) TO TRANSFER TO OTHER CLOTHES

Jacobsen, R.L. 1999. Low water Laundering. *Journal of Surfactants & Detergents*. 2(4):559-562

GRANT FROM SYNGENTA

- FUNDED BY SYNGENTA THROUGH A 2016 NATIONAL STAKEHOLDER TEAM FOR PESTICIDE SAFETY EDUCATION PROGRAM FUNDING GRANT (~$105K)
- TO COMPARE HIGH EFFICIENCY (HE) WASHERS AND 'OLD-FASHIONED' AGITATOR (AG) WASHERS
- **USING 3 PESTICIDES AT 2 RATES (1X AND 9X)**
  - 2,4-D
  - CARBARYL
  - PERMETHRIN

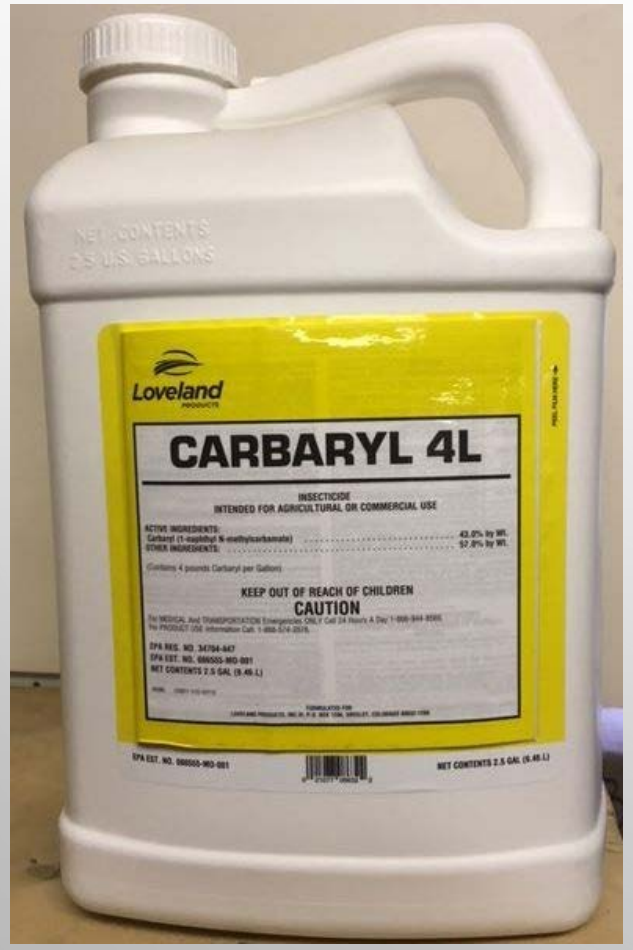
  USE DIFFERENT TYPES OF CLOTHING

COMPARISONS WE WANTED TO MAKE

- EFFECTIVENESS OF AGITATOR VS HE WASHERS .
- WASH TEMPERATURES.
- CLOTHING TYPES.
- TRANSFERENCE TO OTHER CLOTHING?
- PESTICIDE REMOVAL FROM CLOTHING IN WASH/RINSE WATER.
- WHETHER RESIDUES REMAIN IN WASHERS / DRYERS AFTER WASHING AND DRYING.
- MACHINE DRYING VS LINE DRYING

CARBARYL 4L

LABELED FOR USE ON CEREAL GRAIN CROPS, FORAGE CROPS, VEGETABLES, ROOT AND TUBER CROPS, SMALL FRUITS AND BERRIES, TREE FRUIT AND NUT CROPS, FOREST AREAS AND RANGELAND, TURF AND ORNAMENTAL



GROUP 1A INSECTICIDE

Loveland PRODUCTS

CARBARYL 4L

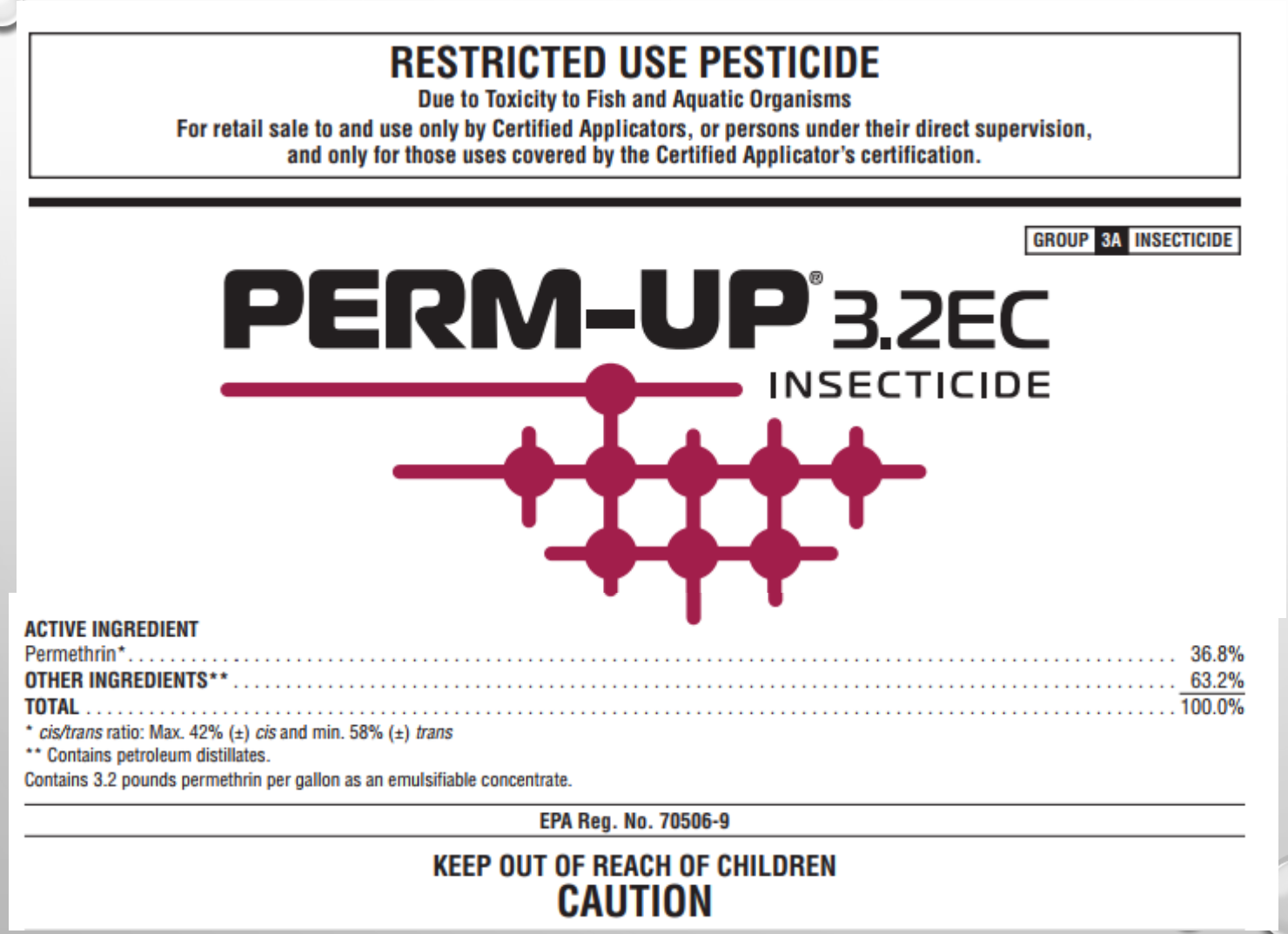
INSECTICIDE
INTENDED FOR AGRICULTURAL OR COMMERCIAL USE

ACTIVE INGREDIENTS:
Carbaryl (1-naphthyl N-methylcarbamate) ..... 43.00% by Wt.
OTHER INGREDIENTS: ..... 57.00% by Wt.

(Contains 4 pounds Carbaryl per Gallon)

KEEP OUT OF REACH OF CHILDREN
CAUTION

PERMETHRIN – PERM-UP 3.2 EC



RESTRICTED USE PESTICIDE

Due to Toxicity to Fish and Aquatic Organisms

For retail sale to and use only by Certified Applicators, or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification.

GROUP 3A INSECTICIDE

PERM-UP® 3.2EC

INSECTICIDE

ACTIVE INGREDIENT	
Permethrin*	36.8%
OTHER INGREDIENTS**	63.2%
TOTAL	100.0%

* *cis/trans* ratio: Max. 42% (±) *cis* and min. 58% (±) *trans*

** Contains petroleum distillates.

Contains 3.2 pounds permethrin per gallon as an emulsifiable concentrate.

EPA Reg. No. 70506-9

KEEP OUT OF REACH OF CHILDREN

CAUTION

LABELED SITES INCLUDE VEGETABLE CROPS, TREE FRUIT AND NUT CROPS, ALFALFA, CORN, MUSHROOMS, SOYBEANS, LAWN AND ORNAMENTAL USES, PREMISE SPRAYS AND TREATMENT OF PRECONSTRUCTION LUMBER AND LOGS

Lepidopterans, thrips, true bugs, leafminers , weevils, some borers, fleas, aphids, ants, Japanese beetle, etc.

SHREDDER 2,4-D LV4 (ESTER)

LABELED FOR USE IN CORN, SOYBEAN (PREPLANT ONLY), GRAIN SORGHUM, SMALL GRAINS, FALLOW, CRP, NON-CROP, TURF AND ORNAMENTAL SITES

ACTIVE INGREDIENT:
2-ethylhexyl ester of 2,4-dichlorophenoxyacetic acid*.....66.2%
OTHER INGREDIENTS:**.....33.8%
Total.....100.0%

*Isomer Specific by AOAC Method No. 6.275 (13th edition) 1980 * 2,4-Dichlorophenoxyacetic acid equivalent 44.0%.
**Contains petroleum distillates.
Contains 3.8 lbs. of 2,4-Dichlorophenoxyacetic acid per gallon.

KEEP OUT OF REACH OF CHILDREN

CAUTION

PESTICIDE RATES

- 1X TO REPRESENT A SINGLE APPLICATION AT MAX RATE.
- 9X TO REPRESENT MULTIPLE APPLICATIONS OR A SPILL OF DILUTED SPRAY.

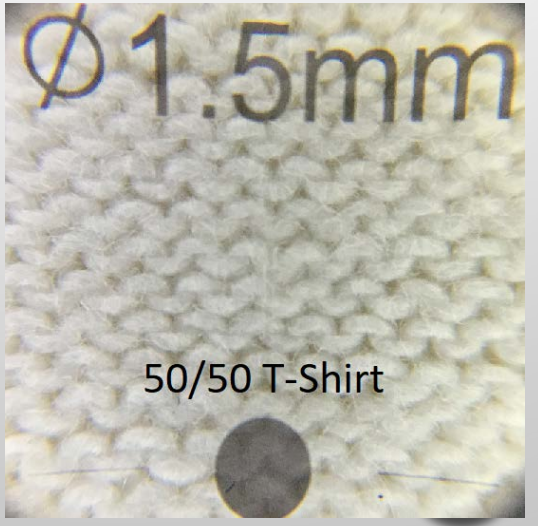
CLOTHING TYPES

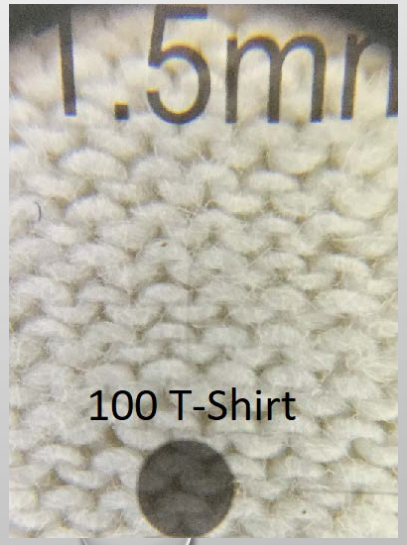
- 100% Cotton long-sleeved **Work Shirt**
- 100% Cotton **Jeans**
- 50% Cotton 50% Poly long-sleeved **T-Shirt**
- 100% Cotton long-sleeved **T-Shirt**
- 100% Cotton **Onesie**

FABRIC DETAILS

- 100% COTTON LONG-SLEEVED **WORK SHIRT**
- 100% COTTON **JEANS**
- 50% COTTON 50% POLY LONG-SLEEVED **T-SHIRT**
- 100% COTTON LONG-SLEEVED **T-SHIRT**
- 100% COTTON **ONESIE**

Clothing Article	Test Sample Wt (g)	Article Wt (oz/yd)	Threads per inch (TPI)
Workshirt	2.591	7.4	176
Jeans	4.758	13.5	99
5050 T	2.203	6.3	40
100 T	2.054	5.8	40
Onsie	1.694	4.8	40





OUR WASHERS

- AGITATOR WASHER
  - 34.1 GAL USED
    - 24.6 GAL COLD WATER
    - 9.5 GAL HOT WATER

- HIGH EFFICIENCY WASHER
  - 14.2 GAL WATER USED
    - 11.9 GAL COLD
    - 2.3 GAL HOT

CHOOSING THE DETERGENT

Rank	Laundry detergent for HE and standard washers	price/oz	Overall Score (0-100)	Type
1	**Persil** ProClean Power Liquid 2 in 1	$0.25	85	Liquid
2	**Tide** Plus Ultra Stain Release	$0.25	81	Liquid
3	**Tide** HE Plus Bleach Alternative	$0.23	81	Powder
4	**Persil** ProClean Power Liquid	$0.20	74	Liquid
5	**Members Mark** Ultimate Clean (Sam's Club)	$0.12	74	Liquid

Consumer Reports: Laundry Detergent Ratings

7/26/2016

WASHING CYCLES USED

AGITATOR WASHER

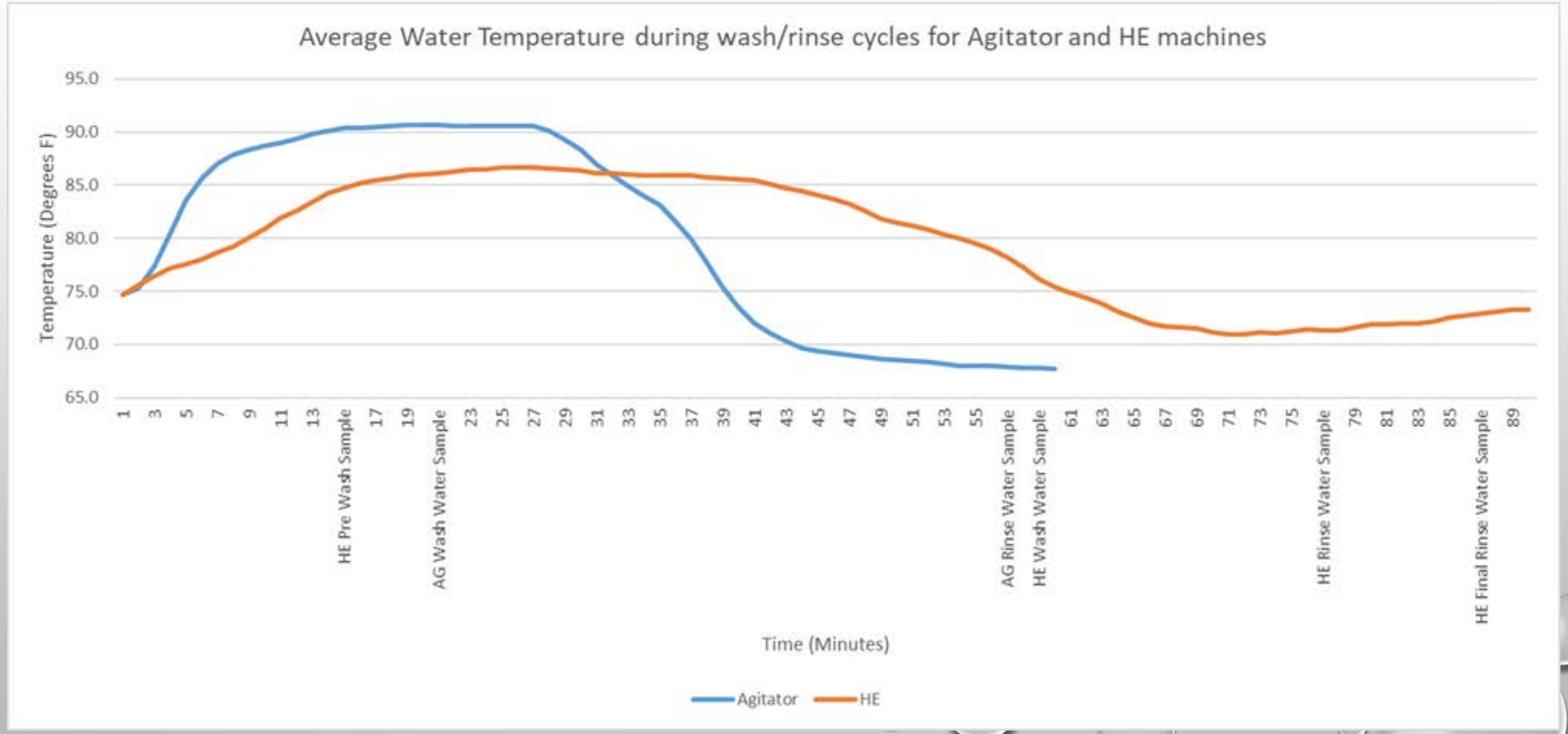
- SUPER, HOT, HEAVY SOIL
- 95 ML PERSIL

HIGH EFFICIENCY WASHER

- PRE-WASH
- WHITES, HEAVY SOIL, HOT WATER
- EXTRA RINSE
- 95 ML PERSIL

Each machine was ‘cleaned’ after the wash cycle by running an empty load using detergent and ½ cup of bleach

WHAT IS THE DEFINITION AND REALITY OF A HOT WASH CYCLE?



DRYING METHODS

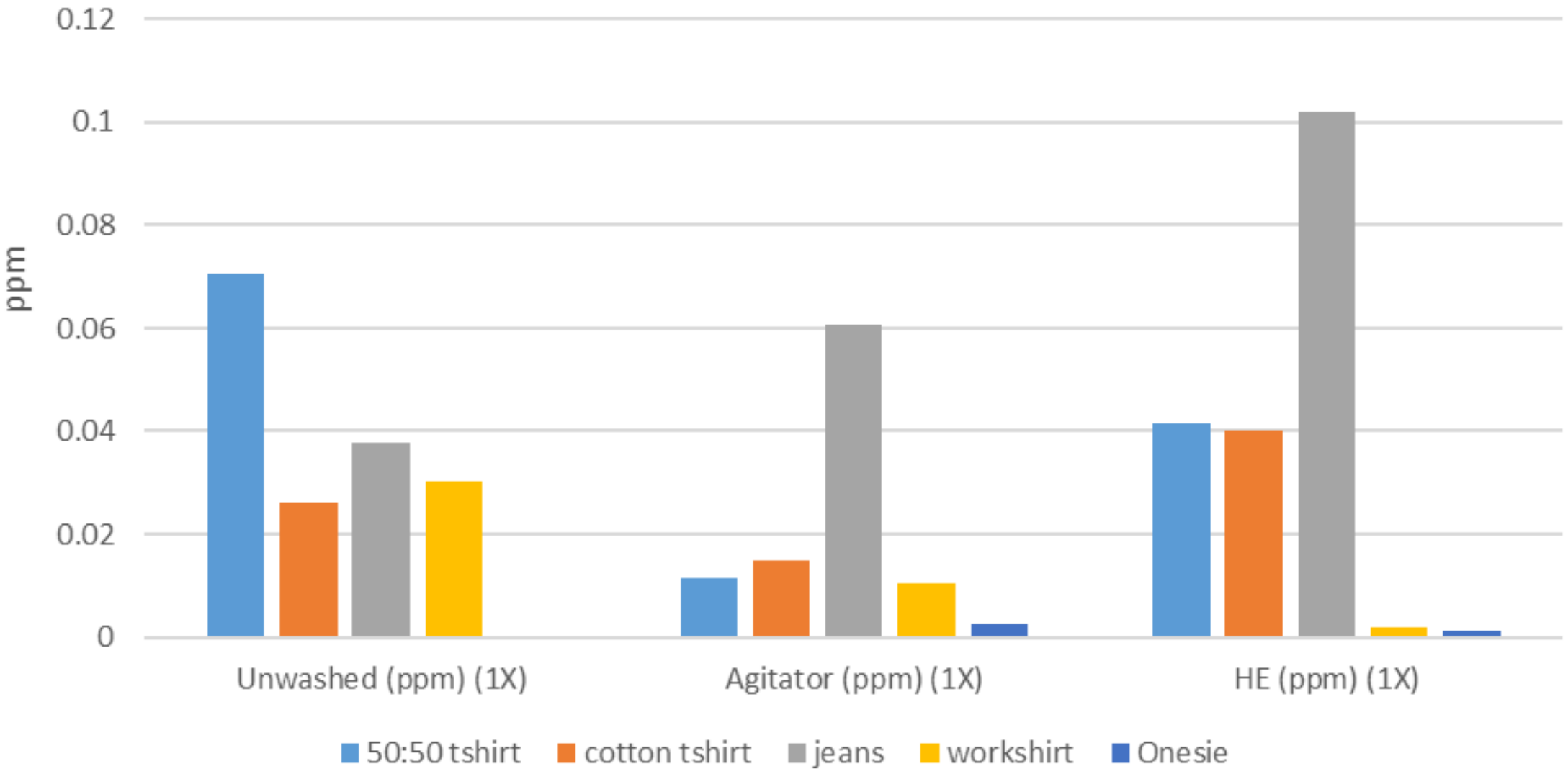
MACHINE DRYING

- HIGH HEAT.
- 40 MINUTES OR UNTIL DRY.
- DRYER SWABBED AFTER CYCLE.

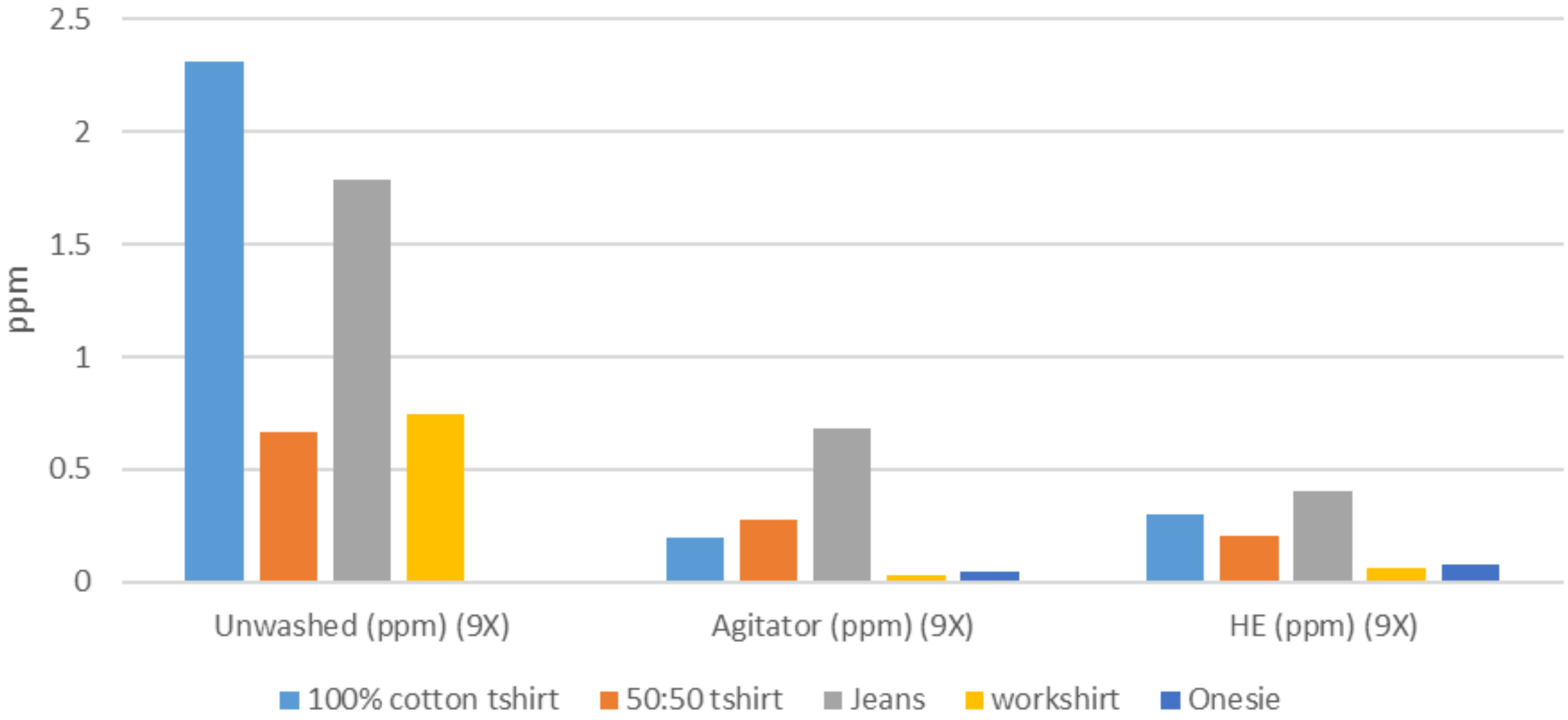
LINE DRYING

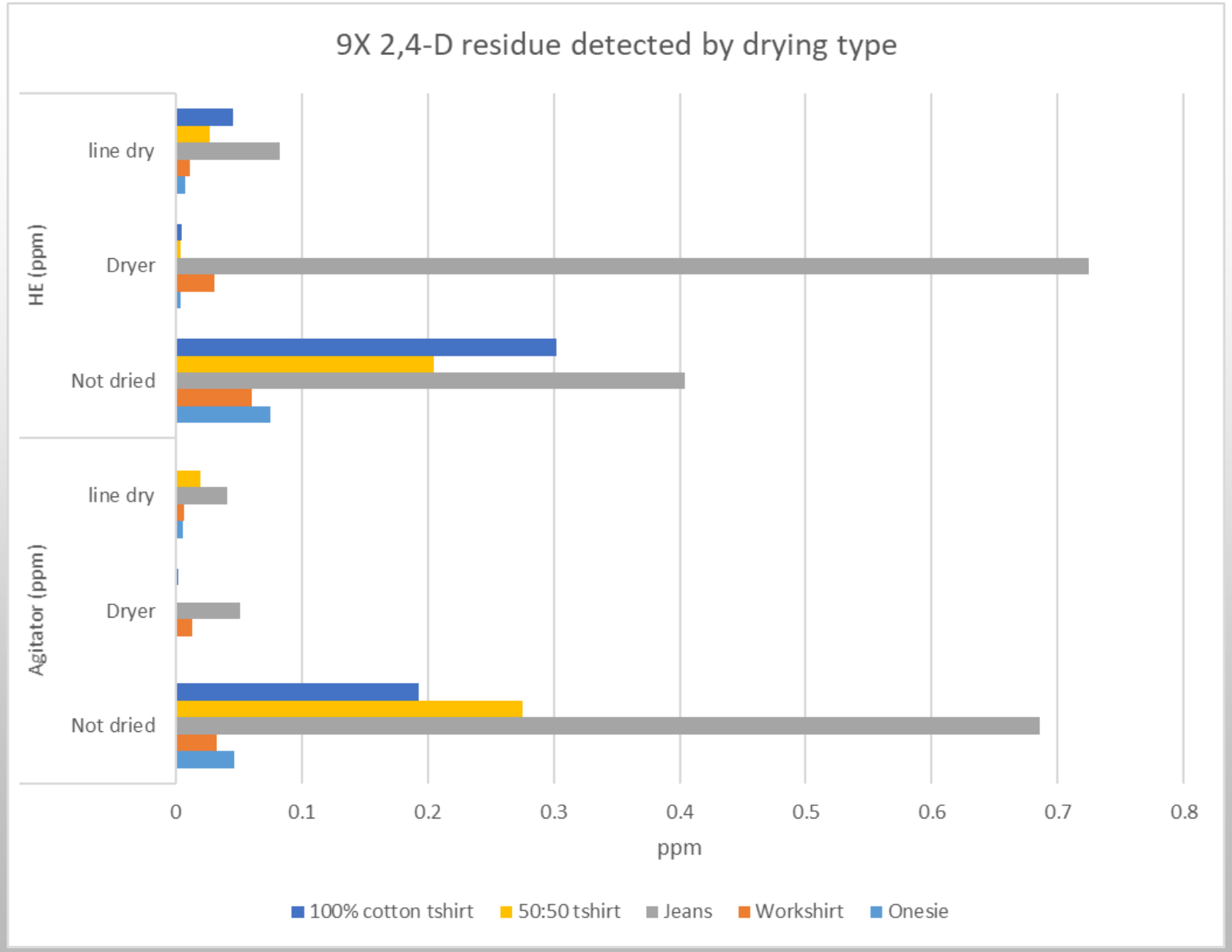
- DRIED FOR SAME AMOUNT OF TIME AS DRYER SAMPLE.

Actual detected 2,4-D residue (ppm) removed from clothing type - 1X Rate



Actual detected 2,4-D residue (ppm) from removed from clothing type - 9X Rate

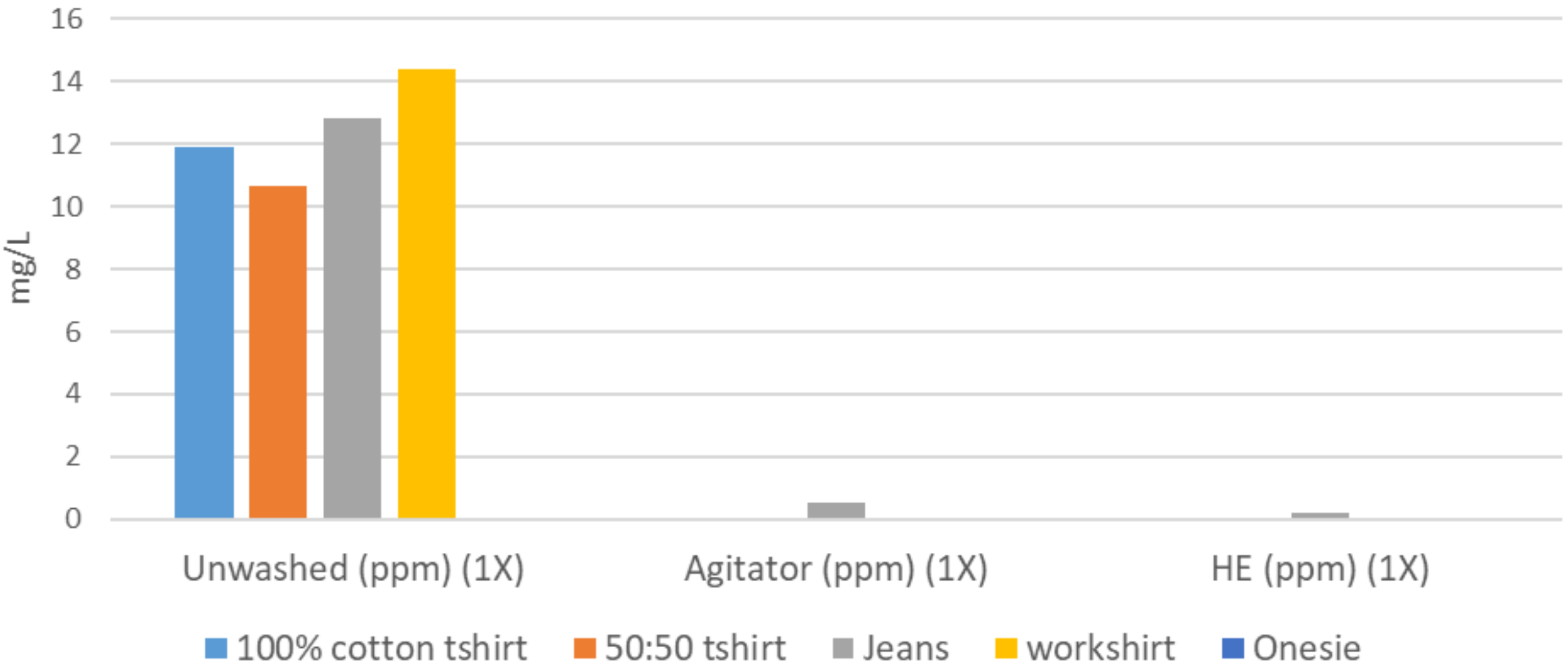



9X 2,4-D residue detected by drying type
HE (ppm)
line dry
Dryer
Not dried
Agitator (ppm)
line dry
Dryer
Not dried
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ppm
100% cotton tshirt
50:50 tshirt
Jeans
Workshirt
Onesie

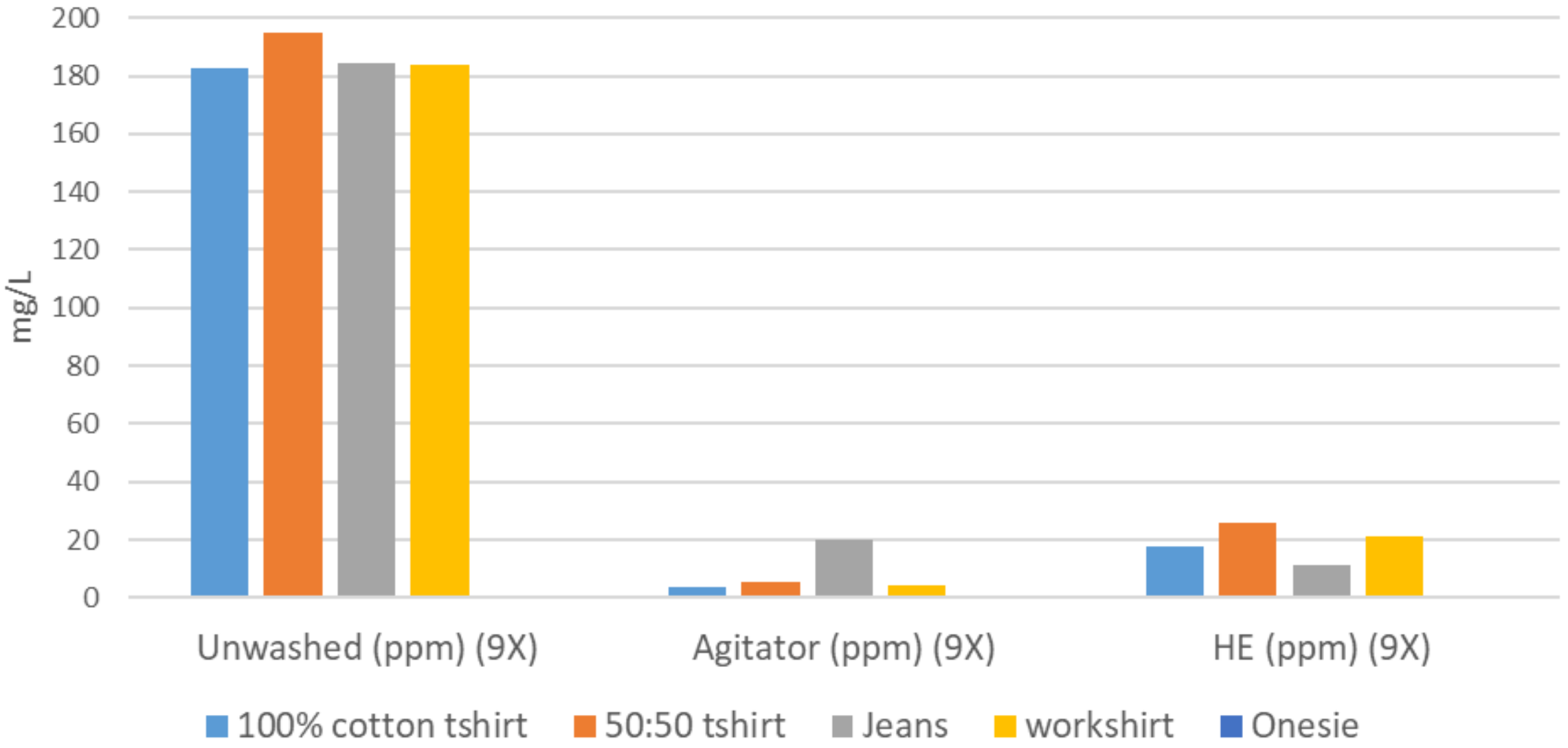
ALLOWABLE 2,4-D RESIDUE IN SELECTED FOODS

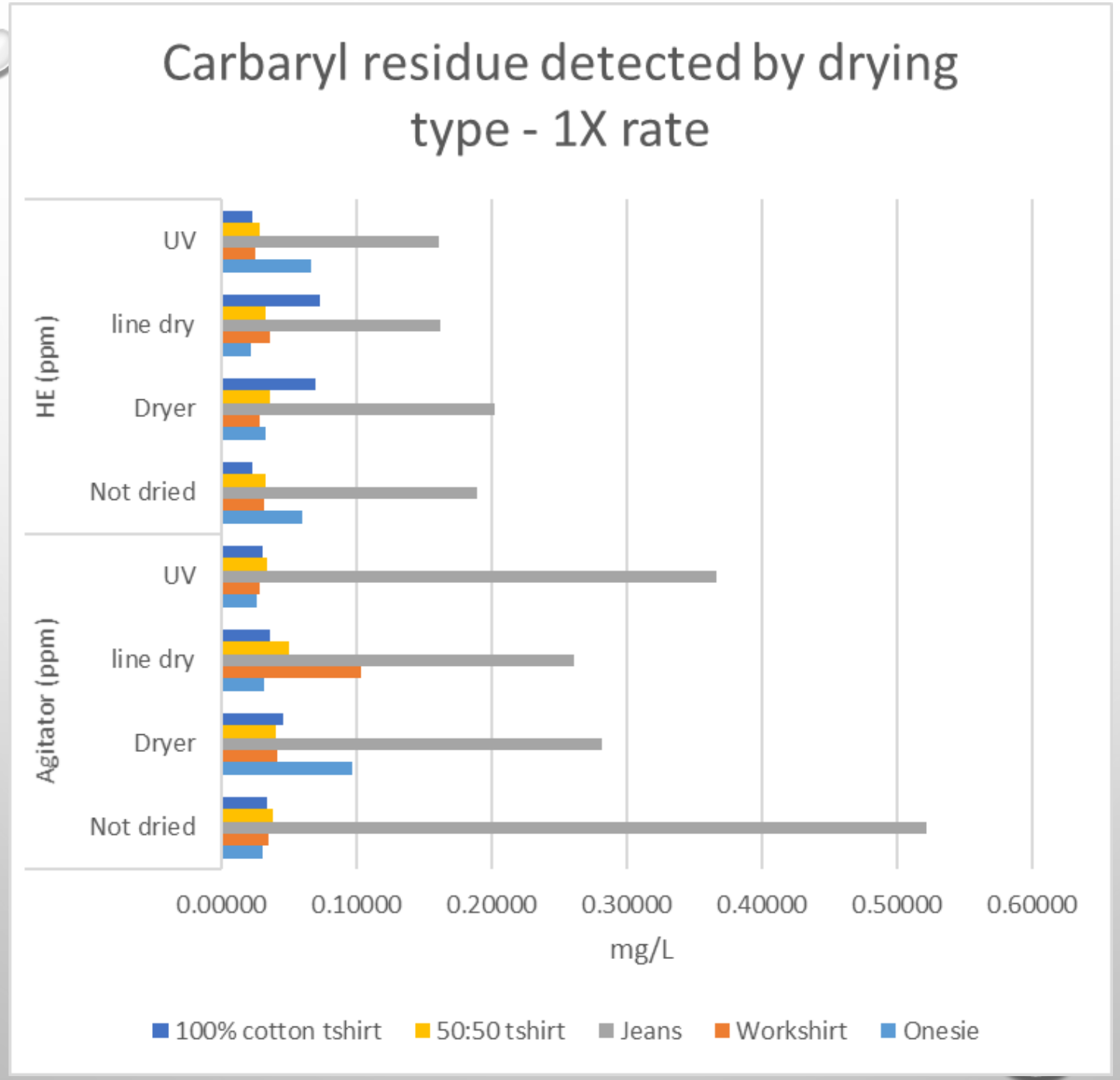
5 PPM	ASPARAGUS
0.5 PPM	CRANBERRIES
0.05 PPM	GRAPES

Detected carbaryl residue (ppm) from clothing type - 1X rate

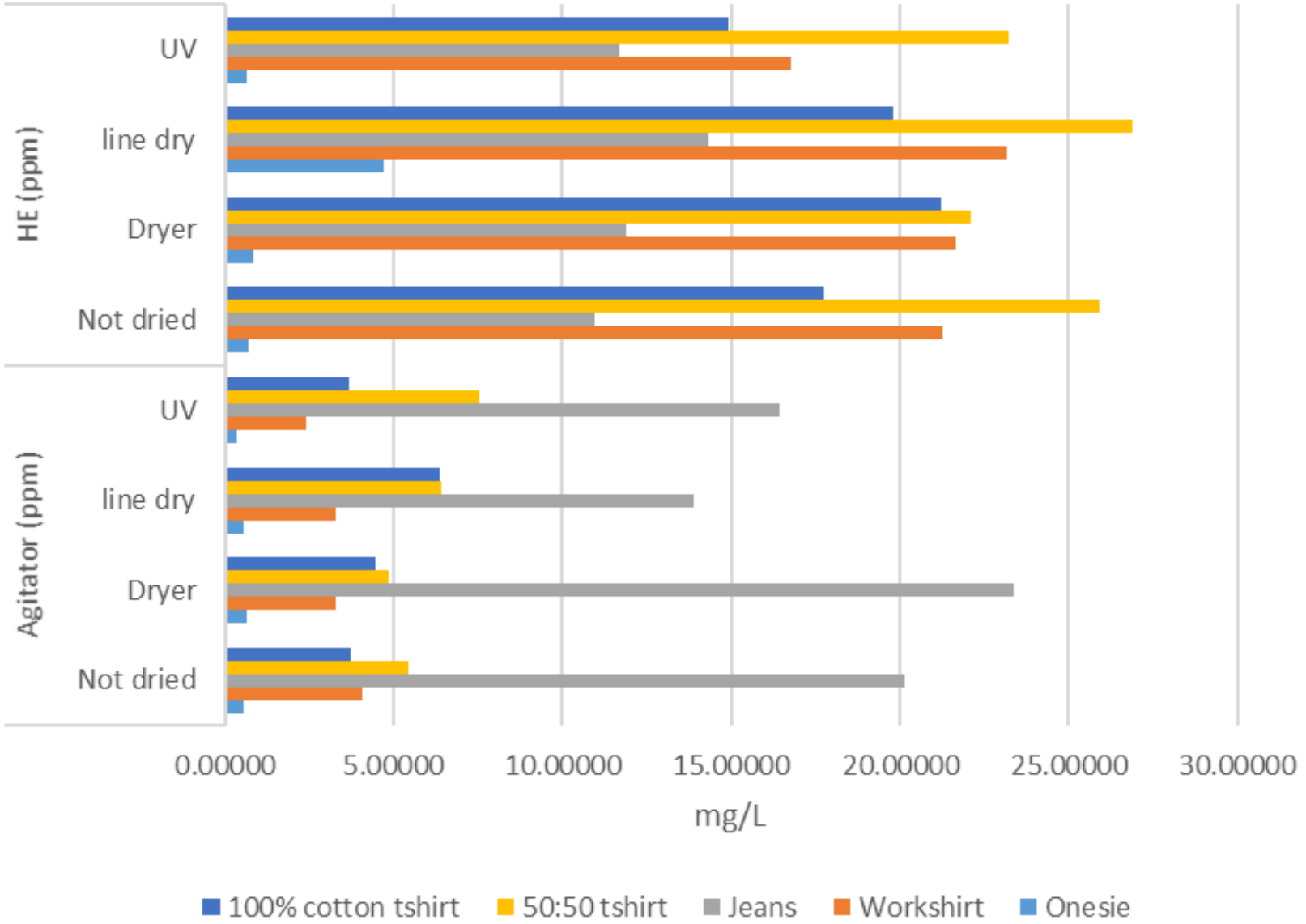


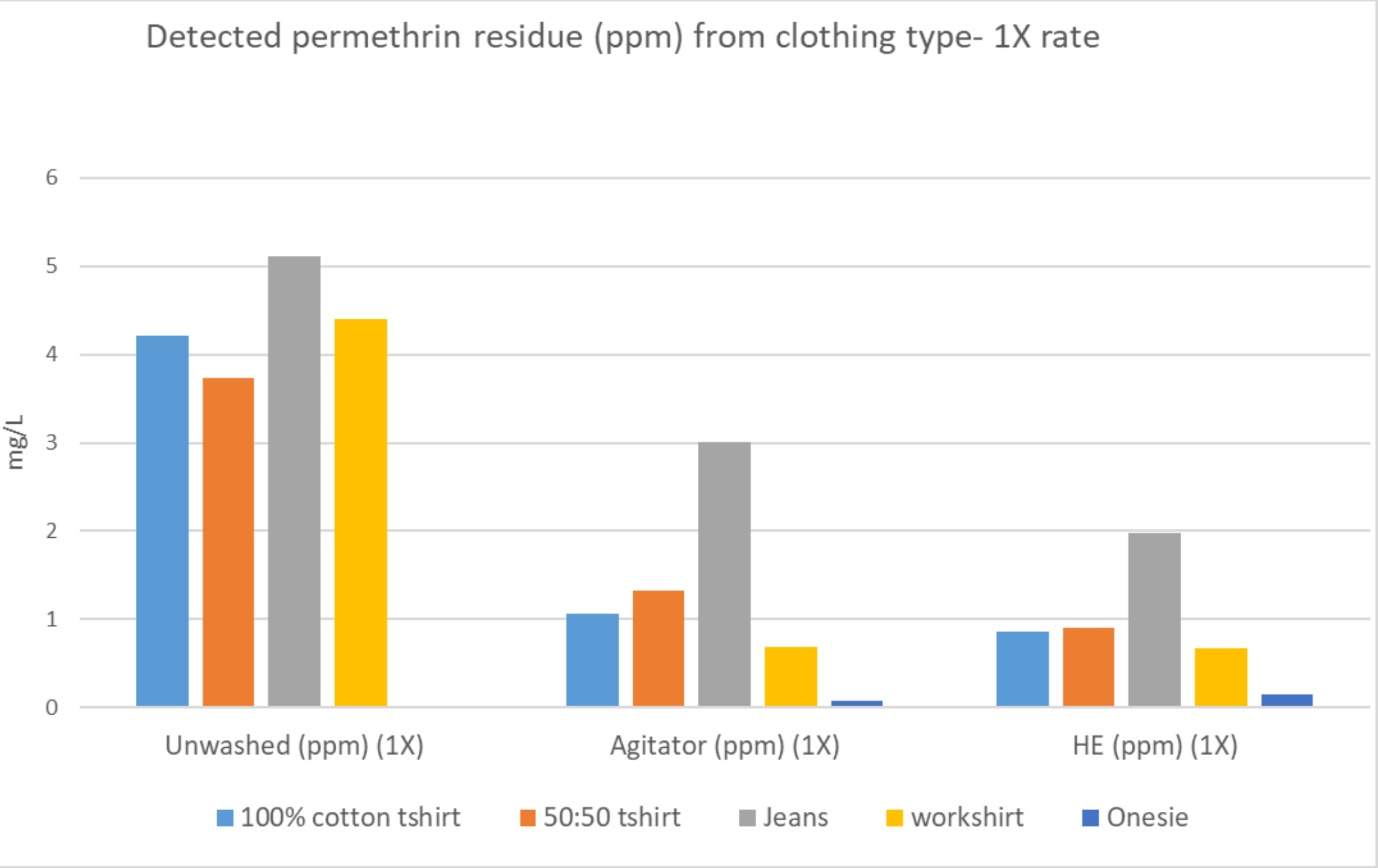
Detected carbaryl residue (ppm) from clothing type - 9X rate

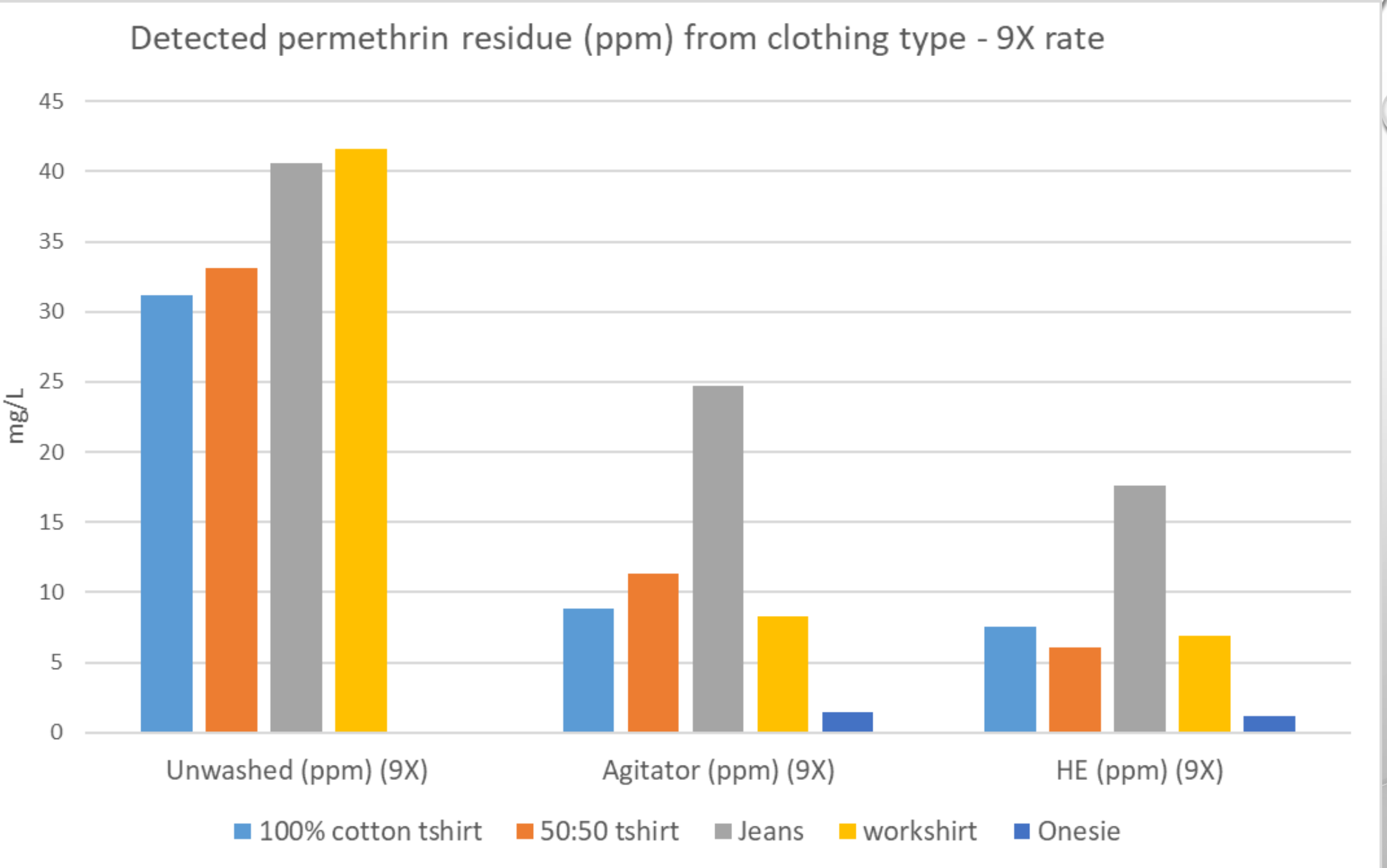


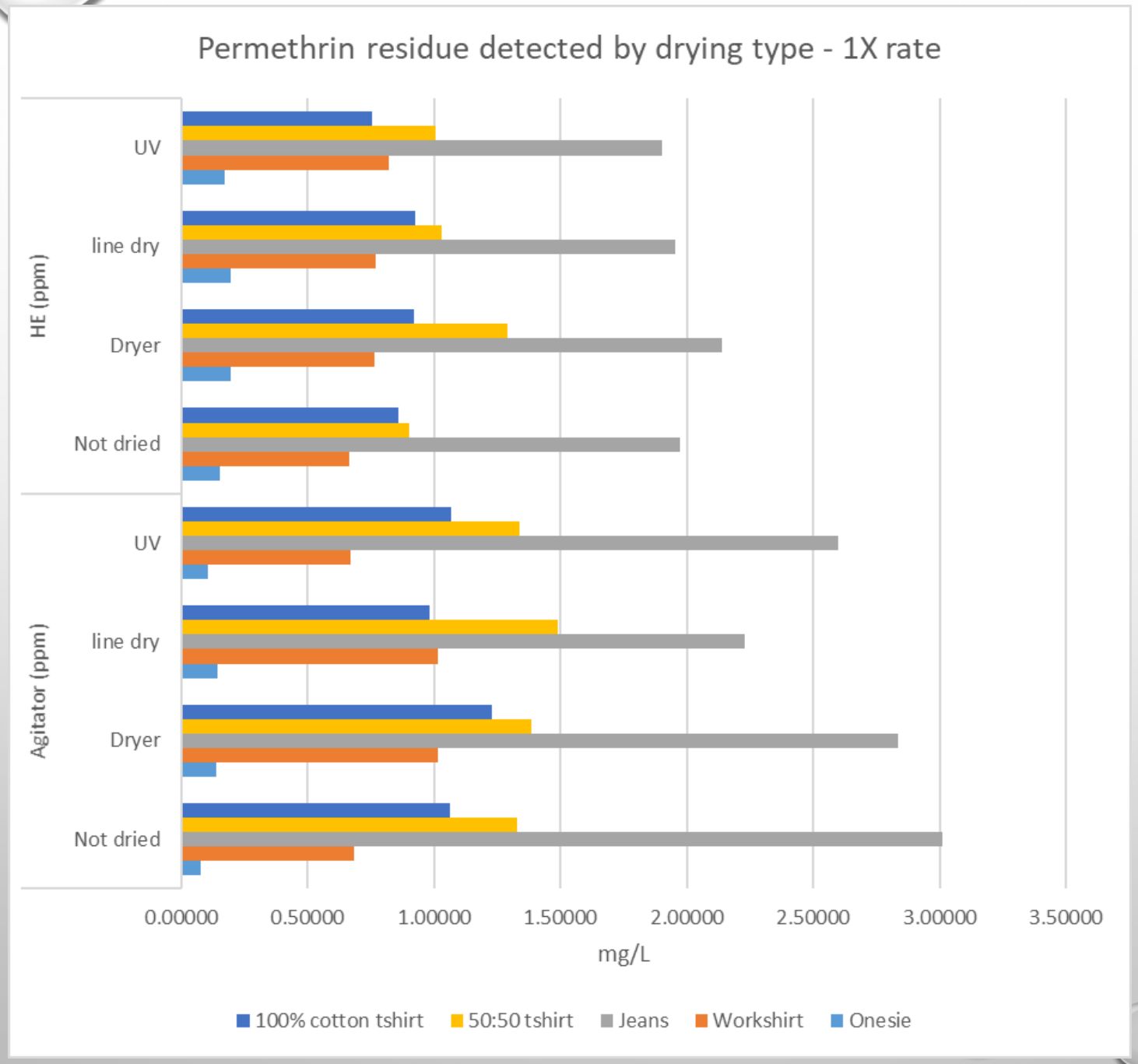

Carbaryl residue detected by drying type - 1X rate
HE (ppm)
UV
line dry
Dryer
Not dried
Agitator (ppm)
UV
line dry
Dryer
Not dried
0.00000
0.10000
0.20000
0.30000
0.40000
0.50000
0.60000
mg/L
100% cotton tshirt
50:50 tshirt
Jeans
Workshirt
Onesie

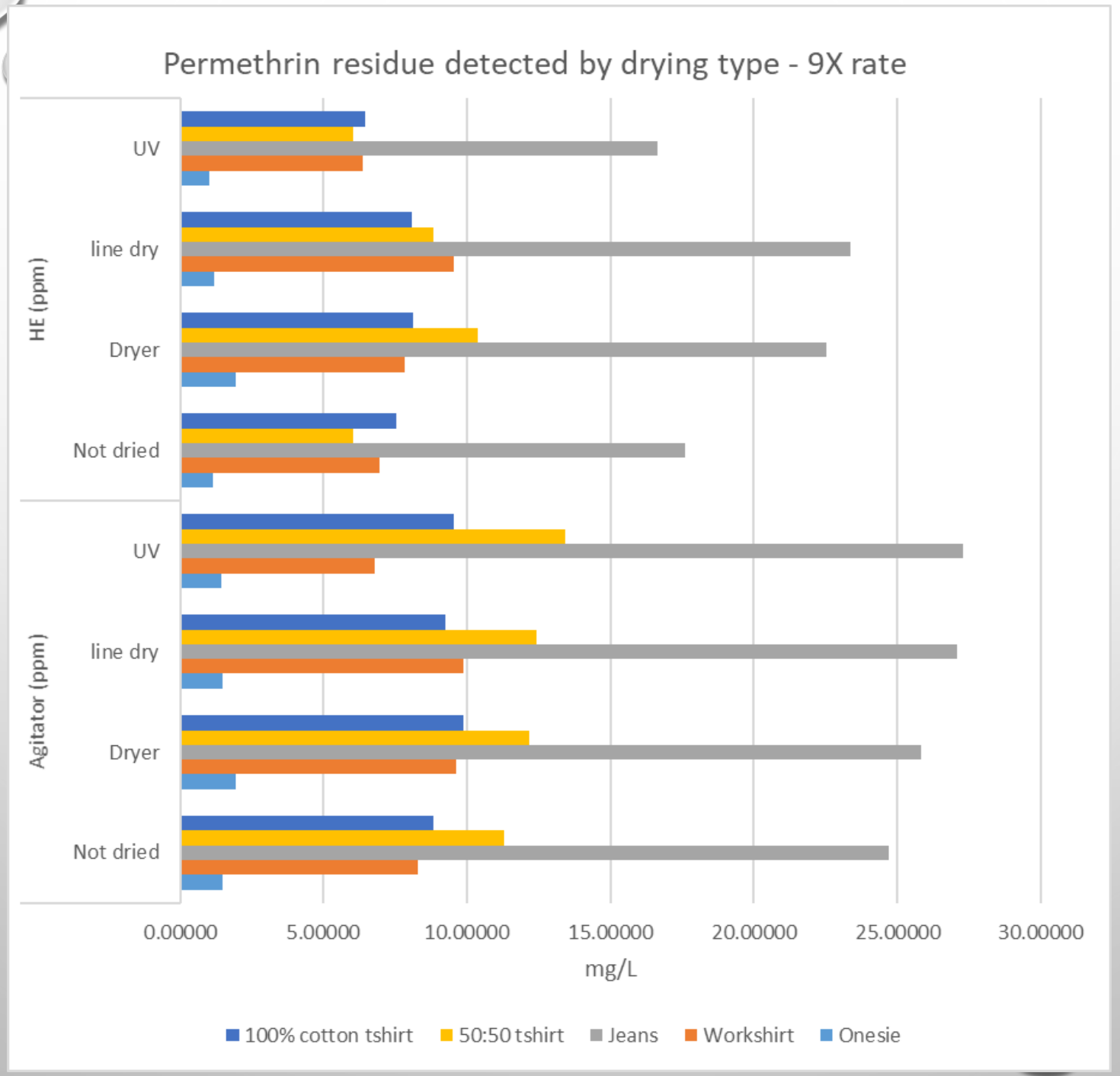
Carbaryl residue detected by drying type - 9X rate

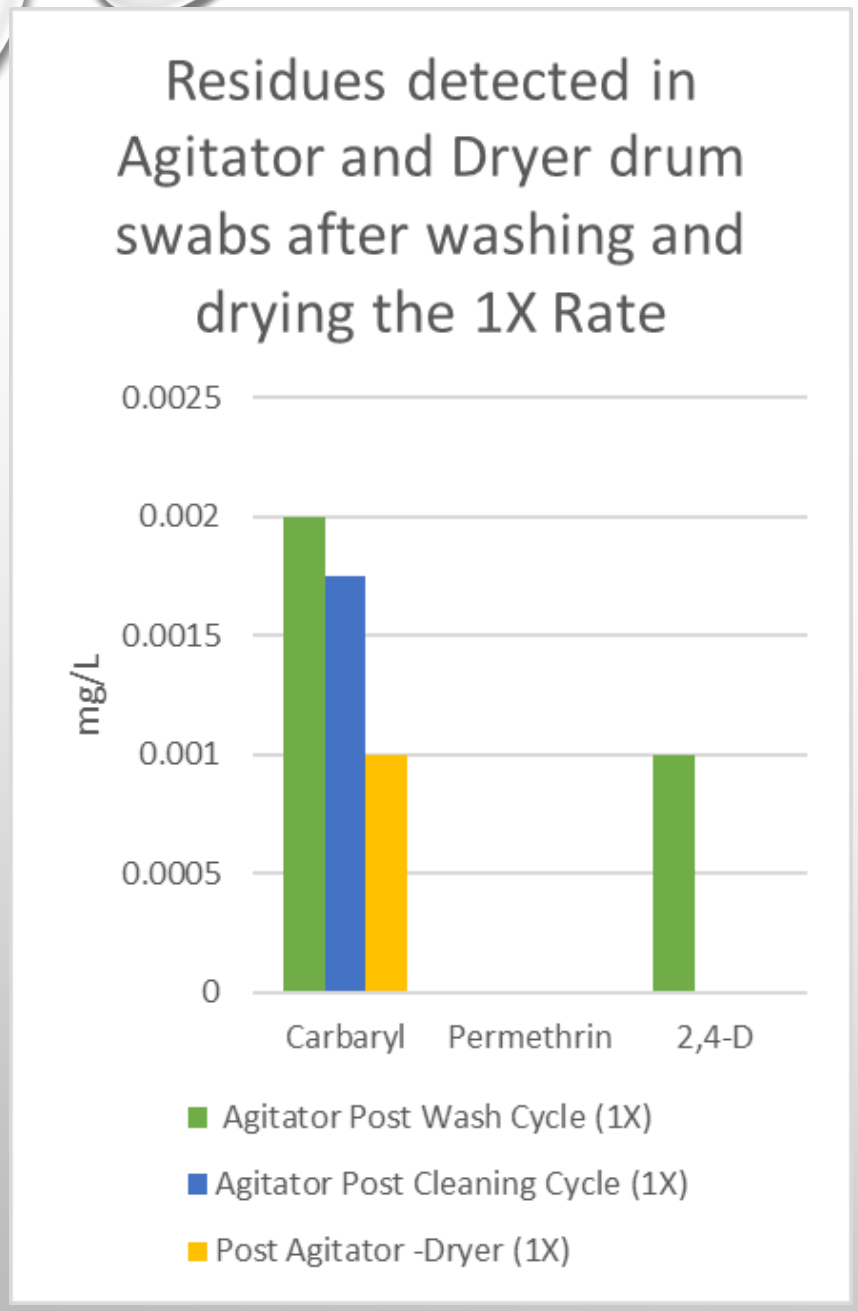


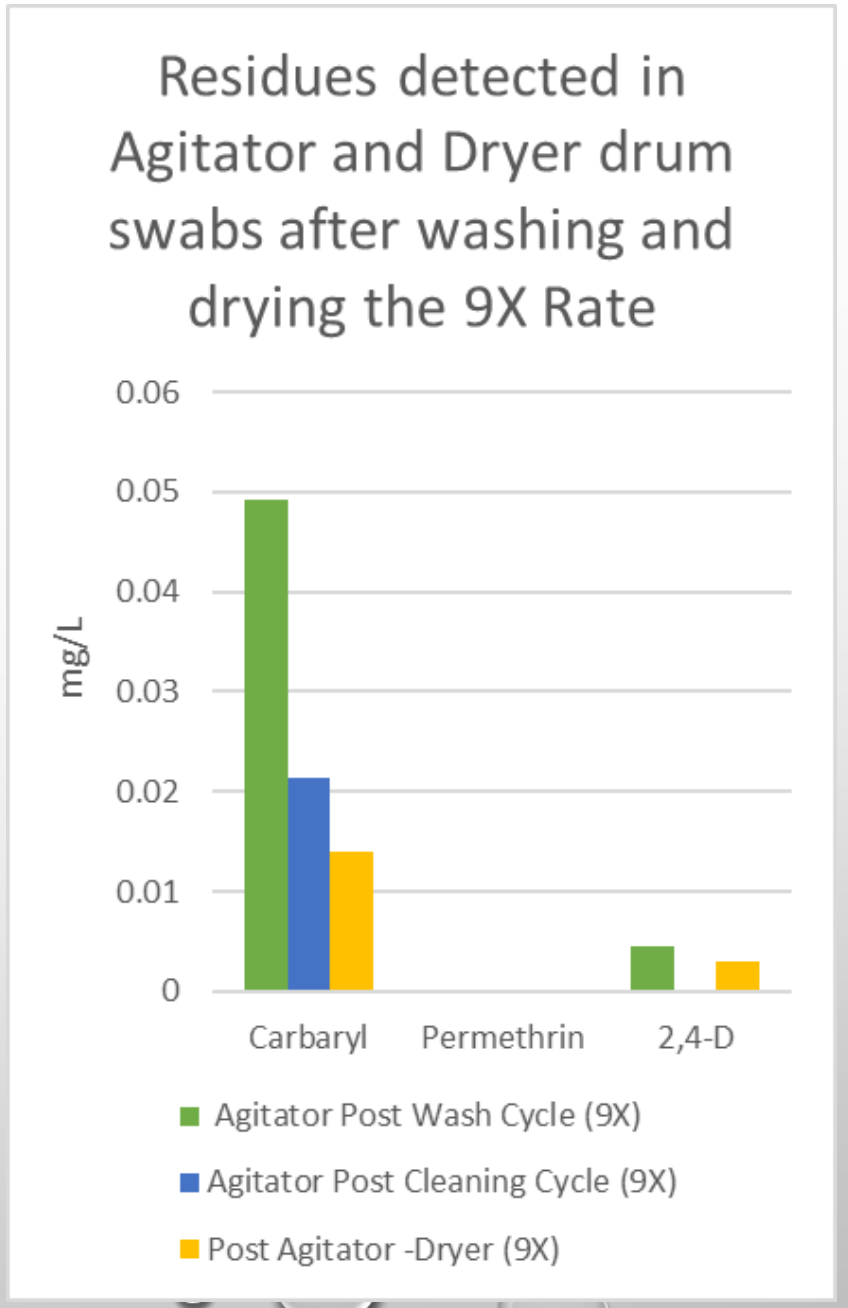

Detected permethrin residue (ppm) from clothing type- 1X rate
mg/L
6
5
4
3
2
1
0
Unwashed (ppm) (1X)
Agitator (ppm) (1X)
HE (ppm) (1X)
100% cotton tshirt
50:50 tshirt
Jeans
workshirt
Onesie


Detected permethrin residue (ppm) from clothing type - 9X rate
45
40
35
30
25
20
15
10
5
0
mg/L
Unwashed (ppm) (9X)
Agitator (ppm) (9X)
HE (ppm) (9X)
100% cotton tshirt
50:50 tshirt
Jeans
workshirt
Onesie


Permethrin residue detected by drying type - 1X rate
HE (ppm)
UV
line dry
Dryer
Not dried
Agitator (ppm)
UV
line dry
Dryer
Not dried
0.00000
0.50000
1.00000
1.50000
2.00000
2.50000
3.00000
3.50000
mg/L
100% cotton tshirt
50:50 tshirt
Jeans
Workshirt
Onesie


Permethrin residue detected by drying type - 9X rate
HE (ppm)
UV
line dry
Dryer
Not dried
Agitator (ppm)
UV
line dry
Dryer
Not dried
0.00000
5.00000
10.00000
15.00000
20.00000
25.00000
30.00000
mg/L
100% cotton tshirt
50:50 tshirt
Jeans
Workshirt
Onesie


Residues detected in Agitator and Dryer drum swabs after washing and drying the 1X Rate
0.0025
0.002
0.0015
0.001
0.0005
0
mg/L
Carbaryl
Permethrin
2,4-D
Agitator Post Wash Cycle (1X)
Agitator Post Cleaning Cycle (1X)
Post Agitator -Dryer (1X)


Residues detected in Agitator and Dryer drum swabs after washing and drying the 9X Rate
0.06
0.05
0.04
0.03
0.02
0.01
0
mg/L
Carbaryl
Permethrin
2,4-D
Agitator Post Wash Cycle (9X)
Agitator Post Cleaning Cycle (9X)
Post Agitator -Dryer (9X)

SUMMARY

- **CARBARYL, PERMETHRIN & 2,4-D**
  - BOTH MACHINES ARE EFFECTIVE BUT EFFICACY DEPENDS ON FABRIC
- **CARBARYL, PERMETHRIN & 2,4-D**
  - IF PRESENT, WASH/BLEACH CYCLE REMOVED MORE RESIDUES FROM THE WASHER DRUM.
- **2,4-D :** DRYING HELPS BREAK DOWN RESIDUES REMAINING AFTER WASHING, BUT SIGNIFICANT DIFFERENCES EXIST BASED ON METHOD! (GREATER CONCENTRATION DETECTED IN UV?).
- **TRANSFERENCE** OF PESTICIDES TO OTHER CLOTHING DID OCCUR FOR ALL RATES OF PERMETHRIN AND 2,4-D AND 9X RATE OF CARBARYL!

GENERAL RECOMMENDATIONS

- BOTH MACHINES ARE EFFECTIVE (HEAVY DUTY, HOT/LOTS OF WATER)
- WASH CONTAMINATED CLOTHING AS SOON AS POSSIBLE.
- RUN A 'CLEANING CYCLE' BEFORE USING THE WASHING MACHINE FOR OTHER CLOTHING.
- **DO NOT** WASH PESTICIDE-CONTAMINATED CLOTHING WITH ANY OTHER CLOTHING!!

RECOMMENDATIONS – BASED ON 9X

- IF YOU SPILL ON CLOTHING, REMOVE CLOTHING IMMEDIATELY AND DISCARD! PESTICIDE STILL REMAINS AFTER WASHING.
- IF MAKING MULTIPLE APPLICATIONS IN ONE DAY, CONSIDER WEARING ADDITIONAL PROTECTIVE CLOTHING (9X)
  - WATER PROOF RAIN PANTS
  - CHEMICAL RESISTANT CHAPS
  - TYVEK

PS1778

Laundering Pesticide-contaminated Work Clothes

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Pesticide Safety Education Coordinator, University of Minnesota

Personal protective equipment (PPE) is the last line of defense to protect the body from pesticide exposure. Often, conventional work clothing is the primary form of PPE. Work clothes also are worn under more extensive garments such as aprons, chaps or chemical-resistant suits.

Ultimately, work clothes will become contaminated with pesticides as part of the handling, loading, mixing and application process. Therefore, you need to handle and wash work clothing carefully.

NDSU EXTENSION SERVICE

HOW TO WASH THE CLOTHING YOU BRING HOME?

DO HIGH-EFFICIENCY WASHING MACHINES WORK AS WELL AS THE OLD-FASHIONED AGITATOR MACHINES?

Thia Walker
Colorado State University

PESTICIDE RESEARCH UPDATES

2018

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