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SUPPLEMENTARY MATERIAL

Assessment of different physicochemical parameters of leachates from two locally unbranded yogurt containers in Erbil City, Kurdistan Region, Iraq

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Key words: yogurt container, leaching chemicals, health risk.

Supplementary Table 1. Detailed information on the attending Kurdish parents' profiles, lifestyles, and yogurt intake.

The participants' information (n = 100)	**Frequency (%)**				
Gender of the participating parent	35 % male, 65 % female				
The average number of the participating family members (mean ± SD)	4.7±1.6 members/family ≈ 5 members/family				
Eating local yogurt for breakfast	100 % yes 0.0 % no				
Favorite product: type of yogurt	78 % only local product, 22 % both products, and 0.0 % only imported				
Yogurts availability at breakfast per week	67 % daily 12 % for 3 days a week 15 % for 2 days a week 6 % for 1 day/week				
The mean intake of yogurt consumption per family per week (n-kg/family.week) The mean intake of yogurt per person	3.250 ± 1.5 kg/family.week *Assume* 5 members/family ∴ 0.650 kg (650 g)/person.week 93 g/person.day *Finally, assume that* 100 g-yogurt intake per person per day 100 g yogurt ≈ 100 mL yogurt Because density = 1.01±0.02 g/mL (n = 6)				
Preferable type of container	7 % only WPC 53 % only ALC 40 % Both				
After buying, yogurts are stored in the home refrigerator with the ... till finishing	78 % Same container 22 % Home utensils				
Eating period days after buying yogurt till	21 % Few days, 79 % Finishing on the same day/week				
Selected as the most preferable kind of local yogurt	67 % Sheep	33 % Cow	0.0 % Goat	0.0 % Buffalo	
Like eating each kind of the local yogurts selected by participants	86 % Sheep	63 % Cow	41 % Goat	20 % Buffalo	18 % All
Consuming more yogurt during summer.	7 % No, 42 % Yes, 51 % Yes doublet				
Store yogurts in the same container in the freezer for another season	5 % Usually, 19 % Sometimes, 76 % Never				
Reuse containers for other home necessities	13 % Usually, 50 % Sometimes, 37 % Never				

Supplementary Table 2. Leached levels of some HMs (µg/L) for a 100 cm² sheet of ALC for both sides per 100 mL simulant.

Leaching Medium		Data	Leached HMs level (µg/L) for 100 cm² of ALC/100mL simulant solution								
Simulant Solution	**Cond.**		**Cd**	**Co**	**Cu**	**Fe**	**Mn**	**Ni**	**Pb**	**Zn**	**TLML (µg/L)**
3 % **Acetic acid (AAc-1)** **pH ≈ 2.5**	**1stC**	Av.	0.31	BDL	BDL	117.7	BDL	1.99	51.44	35.21	206.6
		SD	0.02	-	-	5.43	-	0.20	5.03	1.33	
	3rdC	Av.	1.72	BDL	BDL	69.52	1.69	9.62	72.63	59.50	214.7
		SD	0.01	-	-	2.63	0.23	1.21	8.92	11.52	
Lactic Acid (LAc-1) **pH ≈ 2.5**	**1stC**	Av.	BDL	0.88	BDL	44.93	3.23	5.44	12.26	54.90	121.6
		SD	-	0.16	-	5.52	0.29	2.51	2.32	6.39	
	3rdC	Av.	13.48	0.91	BDL	52.07	1.81	4.85	92.82	32.49	198.4
		SD	3.15	0.52	-	2.66	0.04	1.52	28.40	1.43	
Lactic Acid (LAc-2) **pH ≈ 4**	**1stC**	Av.	BDL	BDL	6.99	5.83	2.75	1.66	5.94	21.05	44.2
		SD	-	-	1.83	1.18	0.14	0.11	3.63	11.55	
	3rdC	Av.	0.52	0.49	1.26	9.53	0.95	2.35	8.51	40.60	64.2
		SD	0.02	0.11	0.11	3.58	0.40	1.99	0.56	8.75	
8 % **Ethanol** **pH ≈ 7**	**1stC**	Av.	BDL	BDL	BDL	84.24	1.75	2.50	BDL	63.87	152.4
		SD	-	-	-	7.23	0.72	0.43	-	1.89	
	3rdC	Av.	BDL	BDL	2.28	7.99	0.14	BDL	BDL	94.65	105.1
		SD	-	-	0.40	4.26	0.06	-	-	8.09	
Distilled Water (DW) **pH ≈ 7**	**1stC**	Av.	BDL	BDL	BDL	100.52	5.28	5.01	12.26	20.45	143.5
		SD	-	-	-	36.75	2.50	0.17	6.02	7.32	
	3rdC	Av.	BDL	BDL	BDL	94.50	0.40	BDL	46.47	9.79	151.2
		SD	-	-	-	10.61	0.28	-	21.81	0.70	
0.9 % Sodium Chloride **pH ≈ 7**	**1stC**	Av.	BDL	BDL	1.78	97.69	4.63	5.85	19.89	57.42	187.3
		SD	-	-	0.32	24.54	2.26	3.35	11.17	18.02	
	3rdC	Av.	0.44	BDL	10.52	38.29	0.61	4.18	23.66	151.61	229.3
		SD	0.06	-	0.73	1.86	0.13	1.73	5.18	11.01	
5 % Sodium Carbonate **pH ≈12.5**	**1stC**	Av.	82.67	1.30	5.79	441.02	12.75	16.20	1534.4	11.09	2105.2
		SD	7.83	0.20	2.53	8.86	2.77	2.85	8.75	2.96	
	3rdC	Av.	81.62	1.52	5.26	337.96	5.28	4.99	1407.9	123.14	1967.6
		SD	8.11	0.03	0.08	10.70	2.18	0.76	138.88	19.48	

BDL; below the method detection limit, SD; standard deviation, Av.; average, ALC TLML; excepting Al, Cond.; Condition, 1stC; First Condition (4±1 ℃ for 72 hrs.), 3rdC; Third Condition (60±2 ℃ for 2h hrs.)

Supplementary Table 3. Leached levels of some HMs (µg/L) for a 100 cm^2 sheet of WPC for both sides per 100 mL simulant.

Leaching Medium		Data	Leached HMs level (µg/L) for 100 cm^2 of WPC/100mL simulant solution							
Simulant Solution	**Cond.**		**Co**	**Cu**	**Fe**	**Mn**	**Ni**	**Pb**	**Zn**	**TLML (µg/L)**
3 % Acetic acid **(AAc-1) pH ≈ 2.5**	**1stC**	Av.	BDL	13.48	82.68	5.86	7.47	20.11	118.0	247.6
		SD	-	0.36	26.14	0.13	0.75	0.27	28.07	
	3rdC	Av.	BDL	12.75	BDL	0.08	2.36	BDL	67.50	82.69
		SD	-	1.96	-	0.06	0.77	-	22.83	
Lactic Acid (LAc-1) pH ≈ 2.5	**1stC**	Av.	0.98	2.17	61.44	3.24	3.60	BDL	153.2	223.7
		SD	0.02	0.17	1.41	1.21	0.35	-	16.03	
	3rdC	Av.	BDL	3.20	33.13	1.53	3.75	BDL	35.59	77.2
		SD	-	0.13	9.35	1.88	1.23	-	2.81	
Lactic Acid (LAc-2) pH ≈ 4	**1stC**	Av.	BDL	6.39	70.46	2.34	3.14	4.20	146.7	233.3
		SD	-	1.02	10.55	1.20	0.19	0.28	49.06	
	3rdC	Av.	BDL	BDL	11.94	1.15	1.03	BDL	31.90	46.18
		SD	-	-	3.38	0.54	0.04	-	2.69	
8 % Ethanol pH ≈ 7	**1stC**	Av.	BDL	2.31	20.53	16.05	1.50	17.07	32.80	90.26
		SD	-	0.77	6.46	1.94	0.25	2.79	7.49	
	3rdC	Av.	BDL	BDL	11.01	0.31	3.73	BDL	32.15	47.20
		SD	-	-	11.36	0.25	3.83	-	3.78	
Distilled Water (DW) pH ≈ 7	**1stC**	Av.	BDL	2.01	BDL	3.37	1.44	4.41	BDL	11.23
		SD	-	0.00	-	0.10	0.62	0.42	-	
	3rdC	Av.	BDL	BDL	BDL	BDL	1.17	BDL	BDL	1.17
		SD	-	-	-	-	1.44	-	-	
0.9 % Sodium Chloride **pH ≈ 7**	**1stC**	Av.	1.12	4.08	18.32	8.77	2.87	14.64	22.26	70.94
		SD	0.13	0.11	4.17	2.26	0.46	0.91	0.60	
	3rdC	Av.	BDL	0.41	6.11	0.12	1.18	BDL	61.73	69.55
		SD	-	0.06	2.12	0.00	0.24	-	2.98	
5 % Sodium Carbonate **pH ≈12.5**	**1stC**	Av.	BDL	2.97	49.99	0.93	0.00	44.47	13.76	112.1
		SD	-	0.39	3.82	BDL	BDL	9.15	5.80	
	3rdC	Av.	0.87	4.22	15.81	-	-	17.48	46.38	83.89
		SD	1.07	1.46	4.41	BDL	BDL	1.29	3.56	

BDL; below detection limit, SD; standard deviation, Av.; average, WPC: white plastic container, TLML; total leached metals load

Supplementary Table 4. Recorded data including change in the pH, optical density, and oxidizable matter level for different leachates obtained after leaching ALC and PC sheets in different conditions.

Simulant Solution	**Initial approx. pH**	**$\pm\Delta pH$ of the simulant solution included 50 cm^2 of YC per 100 mL simulant**					
		ALC Sheet Condition			**WPC Sheet Condition**		
		1stC	**2ndC**	**3rdC**	**1stC**	**2ndC**	**3rdC**
3 % Acetic acid (**AAc-1**)	2.5	0.03	0.10	0.07	0.03	0.04	0.05
Lactic Acid (LAc-1)	2.5	0.01	0.11	0.03	0.03	0.04	0.06
Acetic acid (**AAc-2**)	4	0.18	0.04	0.06	0.02	0.03	0.14
Lactic Acid (LAc-2)	4	0.14	0.25	0.20	0.06	0.08	0.16
8 % Ethanol	7	1.11	1.90	0.35	0.13	0.34	0.73
DW	7	0.13	1.36	0.15	0.11	0.16	0.22
0.9 % Sodium Chloride	7	0.50	1.22	0.30	0.12	0.15	0.18
5 % Sodium Carbonate	11.5	0.03	0.06	0.12	0.03	0.01	0.04
Simulant solution	**Initial approx. pH**	**Difference in the Volume (mL) of the Titrant (0.01 N $Na_2S_2O_3$) Consumed with 20 mL Simulant**					
		ALC Sheet Condition			**WPC Sheet Condition**		
		1stC	**2ndC**	**3rdC**	**1stC**	**2ndC**	**3rdC**
3 % Acetic acid (**AAc-1**)	2.5	0.80	0.60	1.20	0.40	0.60	1.50
Lactic Acid (LAc-1)	2.5	0.50	0.40	0.30	0.50	0.20	1.00
Lactic Acid (LAc-2)	4	0.30	0.20	0.30	0.60	1.40	0.20
8 % Ethanol	7	1.10	1.00	0.90	0.30	0.80	0.20
DW	7	0.30	2.80	1.10	1.25	0.80	0.70
0.9 % Sodium Chloride	7	0.80	0.90	0.90	0.35	1.10	0.80
5 % Sodium Carbonate	11.5	1.80	1.50	5.10	2.75	2.50	2.60
Simulant Solution	**Initial approx. pH**	**Absorbance, OD (λ max, nm) for the examined WPC solvents leachate**					
		WPC Sheet Condition					
		1stC	**2ndC**	**3rdC**			
3 % Acetic acid (**AAc-1**)	2.5	0.002 (307)	0.033 (308)	0.063 (260)			
Acetic acid (**AAc-2**)	4	0.005 (310)	0.002 (307)	0.077 (262)			
Lactic Acid (LAc-1)	2.5	0.481 (233)	0.750 (233) 0.007 (273)	0.013 (358) 0.054 (264)			
Lactic Acid (LAc-2)	4	0.024 (278)	0.200 (228) 0.281 (264)	0.061 (260) 0.015 (365)			

YC; Yogurt Container, OD; Optical Density, 1stC; (4±1 ℃ for 72 hrs.), 2ndC; (25±2 ℃ for 24h hrs.), 3rdC; (60±2 ℃ for 2h hrs.)