

Supporting Information for

Detection of Various Microplastics in Patients Undergoing Cardiac Surgery

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Supplementary Table 1 | Summary of plastic products that were used during cardiac surgery. All consumables and equipments related to plastic were collected and collated. A total of 8 types of plastic were involved in cardiac surgeries, and PMMA was the only plastic that was not associated with cardiac surgeries.

Type of plastic material	Relevant medical applications
PVC	Extracorporeal circulation tubing, arterial cannula tubing, chest tube tubing, anesthetic mask, venous cannula, cardioplegia cannula, syringe barrel, blood storage bag, tracheal tube.
PC	Extracorporeal circulation tube connector, chest tube connector, arterial cannula connector, transparent dressing, annuloplasty ring holder.
PP	Syringe barrel, annuloplasty ring holder, intravenous bag, surgical face mask, anesthetic mask , disposable surgical cap, nonabsorbable suture.
PET	Cardiac patch, annuloplasty ring, nonabsorbable suture, sterile blister tray.
PE	Extracorporeal circulation filter, operating medical light handle cover.
PU	Surgical incision protective film.
PA	Blood bag filter, nonabsorbable suture.
PS	Sterile blister tray.

Supplementary Table 2 | Patient Clinical Characteristics. Clinical characteristics of the patients recruited in the study. The normal reference values in our hospital are 9-50 U/L for ALT and 57-111 $\mu\text{mol/L}$ for Serum creatinine.

Patient ID	Age (yr)	Gender	Province/Municipality	ALT (U/L)	Serum creatinine ($\mu\text{mol/L}$)	Type of surgery
1	63	Male	Hebei	39	87.2	CABG
2	66	Male	Shanxi	42	61.6	CABG
3	63	Male	Beijing	13	60.7	CABG
4	58	Male	Hebei	13	70.8	CABG, MVR
5	66	Male	Liaoning	11	99.1	ARR
6	58	Male	Liaoning	5	96.7	AFSA, MVR, TVP
7	63	Female	Shandong	34	69.6	AFSA, MVR, TVP
8	75	Female	Shanxi	12	73.7	AFSA, MVR, TVP
9	66	Male	Hubei	9	87.1	AFSA, MVR, TVP
10	53	Female	Shaanxi	23	89.4	AFSA, MVR, TVP
11	52	Female	Inner Mongoria	21	48.0	AFSA, MVR, TVP
12	57	Female	Beijing	21	68.9	CABG, MVR, TVP, AFSA, ARR
13	50	Male	Beijing	14	75.1	MVR
14	63	Male	Shanxi	24	65.1	CABG
15	41	Male	Jiangsu	44	84.7	AFSA, MVR, TVP

Abbreviations: ALT, alanine aminotransferase; CABG: coronary artery bypass graft; MVR: mitral valve replacement; ARR: aortic root replacement; AFSA: atrial fibrillation surgical radiofrequency ablation; TVP: tricuspid valvuloplasty.

Supplementary Table 3 | Results about the abundance and type of microplastic among tissue samples from patients who received cardiac surgery.

Patient ID	Type of sample	Sample Mass (gram)	Microplastic count (particles per gram of sample mass)								
			PP	PET	PS	PE	PA	PC	PVC	PU	PMMA
			(0.33%)	(76.78%)	(0.21%)	(1.17%)	(2.23%)	(0.10%)	(0.40%)	(12.29%)	(6.51%)
1	Pericardium	0.079	-	74116	-	126	-	126	-	1136	-
2	EAT	0.116	172	86	-	259	-	-	-	-	-
	Pericardium	0.036	-	-	-	-	-	-	-	-	-
3	EAT	0.089	113	113	-	226	564	-	-	113	113
	PAT	1.839	-	-	-	-	-	-	-	-	-
4	EAT	0.032	-	9317	-	-	311	-	-	-	-
	Myocardium	0.259	-	-	-	-	-	-	-	-	-
	PAT	0.179	-	13043	-	56	334	-	111	390	-
5	PAT	0.189	-	-	-	-	-	-	-	-	-
6	LAA	0.531	-	-	-	56	56	-	-	-	19
	PAT	3.236	-	-	-	-	3	-	-	-	-
7	LAA	0.291	-	34	-	138	103	-	-	2621	276
	PAT	0.260	-	-	38	38	-	-	-	5923	1269
8	LAA	0.080	125	125	-	125	250	-	125	2125	-
	PAT	0.843	-	36	-	-	130	-	-	1661	1400
9	Myocardium	1.021	-	-	-	10	-	-	-	-	-
10	LAA	0.652	15	15	-	-	62	-	15	-	-
	PAT	0.400	-	-	-	-	-	-	-	1325	900

11	LAA	0.080	-	250	-	125	250	-	-	250	4375
	PAT	0.711	-	-	-	-	14	-	-	-	-
12	Pericardium	0.856	-	913	228	342	-	-	-	228	-
	EAT	0.088	-	-	-	-	-	-	-	-	-
13	PAT	0.548	-	-	-	-	-	-	-	-	-
	Pericardium	0.537	-	-	-	-	-	-	-	-	-
14	PAT	0.533	-	-	-	-	-	-	-	-	-
	EAT	0.465	-	-	-	-	-	-	-	-	-
	Pericardium	0.039	-	256	-	-	256	-	256	-	-
15	PAT	0.671	-	-	-	-	-	-	-	-	-
	EAT	0.126	-	-	-	-	80	-	-	-	-
	Pericardium	0.048	-	207	-	-	415	-	-	-	-
	Myocardium	0.678	-	30	-	-	30	-	-	-	-

Abbreviations: EAT: epicardial adipose tissue; PAT: pericardial adipose tissue; LAA: left atrial appendage; PP: polypropylene; PET: polyethylene terephthalate; PS: polystyrene; PE: polyethylene; PA: polyamide; PC: polycarbonate; PVC: polyvinyl chloride; PU: polyurethane; PMMA: polymethyl methacrylate. %: proportions of total counts of microplastic. The identifying results with match similarities larger than 0.8 were considered as positive.

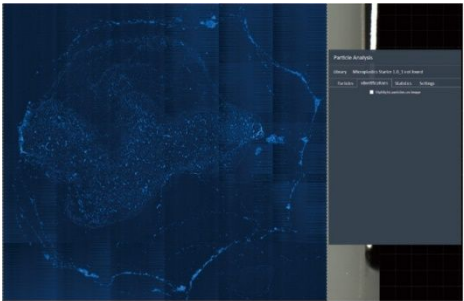
Supplementary Table 4 | Results about the abundance and type of microplastic among venous blood samples before and after cardiac surgery. The identifying results with match similarity larger than 0.8 were considered as positive.

Patient ID	Type of sample	Microplastic count (particles per mL of sample volume)								
		PP	PET	PS	PE	PA	PC	PVC	PU	PMMA
		(11.93%)	(22.02%)	(5.50%)	(2.75%)	(48.62%)	(0.92%)	(1.83%)	(5.50%)	(0.92%)
7	pre-surgery blood	-	2	-	2	2	-	-	-	2
	post-surgery blood	-	8	2	-	2	-	-	-	-
8	pre-surgery blood	-	4	-	-	-	-	-	-	-
	post-surgery blood	2	6	-	-	10	-	-	2	-
10	pre-surgery blood	-	4	-	-	-	-	-	-	-
	post-surgery blood	2	8	2	-	8	-	-	-	-
11	pre-surgery blood	-	14	-	-	-	-	-	-	-
	post-surgery blood	4	2	8	2	84	2	2	10	-
13	pre-surgery blood	-	-	-	-	-	-	2	-	-
	post-surgery blood	2	-	-	2	-	-	-	-	-
14	pre-surgery blood	2	-	-	-	-	-	-	-	-
	post-surgery blood	4	-	-	-	-	-	-	-	-
15	pre-surgery blood	2	-	-	-	-	-	-	-	-
	post-surgery blood	8	-	-	-	-	-	-	-	-

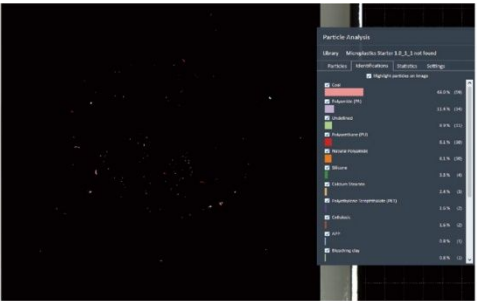
Supplementary Table 5 | Results about the abundance and size of microplastic among venous blood samples before and after cardiac surgery. The identifying results with match similarity larger than 0.8 were considered as positive.

Patient ID	Type of sample	Microplastic count (particles per mL of sample volume)				
		20-30 (43.12%)	30-50 (34.86%)	50-100 (18.35%)	100-200 (4.59%)	200-300 (0%)
7	pre-surgery blood	-	6	-	2	-
	post-surgery blood	6	2	2	2	-
8	pre-surgery blood	-	4	-	-	-
	post-surgery blood	10	6	4	-	-
10	pre-surgery blood	-	4	-	-	-
	post-surgery blood	8	6	2	4	-
11	pre-surgery blood	2	6	6	-	-
	post-surgery blood	64	34	14	2	-
13	pre-surgery blood	-	2	-	-	-
	post-surgery blood	-	2	2	-	-
14	pre-surgery blood	-	-	2	-	-
	post-surgery blood	2	-	2	-	-
15	pre-surgery blood	-	2	-	-	-
	post-surgery blood	2	2	4	-	-

Supplementary Figure 1 | Representative detection results from blank, venous blood samples, and tissue sample using laser direct infrared chemical imaging technique. To increase sensitivity, we chose a matching degree above 0.6 for positive identification in quality control, none of which detected microplastics.



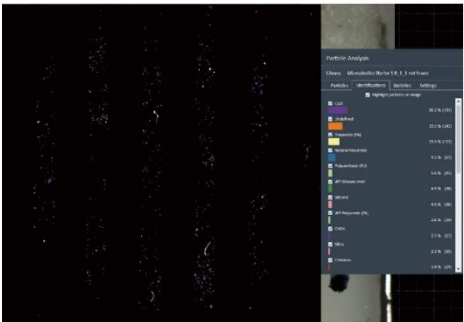
Quality Control



Pre-surgery blood

Patient ID:

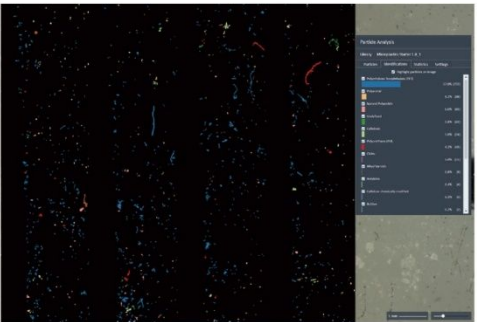
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Post-surgery blood

Patient ID:

10

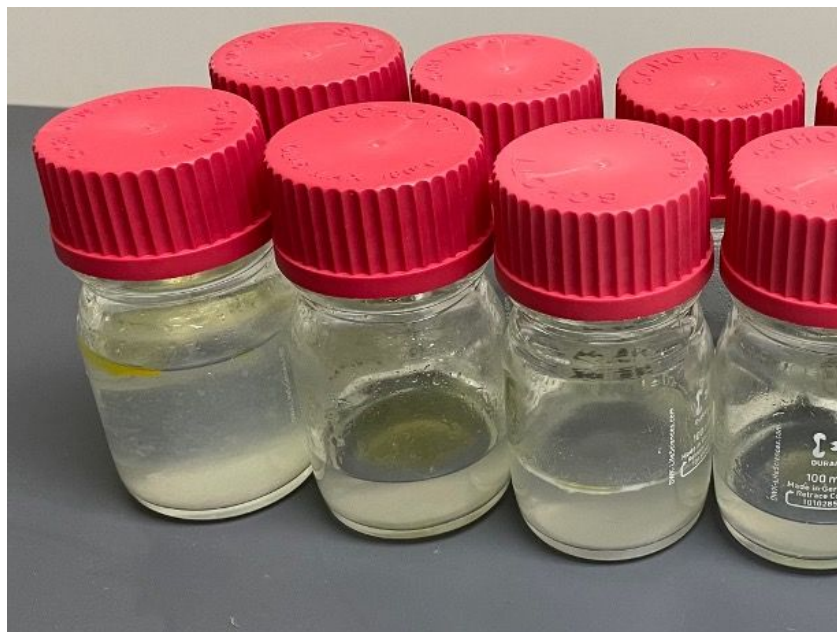


Pericardium

Patient ID:

1

Supplementary Figure 2 | Schematic representation of the collected specimens. The figure presents the sample bottles used during the collection of tissues and blood samples from patients undergoing cardiac surgery. Tissue samples were treated with 30 wt% H₂O₂ (at least 5 times the sample volume) for pre-digestion.



Supplementary Figure 3 | The contribution of each patient to the MP counts in different types of tissue and MP. a, in different tissues; b, in different MP types.

