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Table S1. Composition (g/L, unless otherwise indicated) and pH of surrogate biofluids; gastric (Stopford et al., 2003) , GLY-gastric (Drexler and Brattin, 2007); artificial lysosomal fluid (ALF) (Stopford et al., 2003), Glycerol LY-ALF (Thelohan and Demeringo, 1994); sweat (EN, 2009)

Reagents	gastric	GLY-gastric	ALF	GLY-ALF	sweat
HCl	0.07N	0.07N	—	—	—
NaCl	—	—	3.21	3.21	5
NaOH	—	—	6	6	—
Citric acid	—	—	20.8	20.8	—
$CaCl \cdot 2H_2O$	—	—	0.128	0.128	—
$NaHPO_4$ dibasic	—	—	0.071	0.071	—
Na_2SO_4	—	—	0.039	0.039	—
$MgCl_2$ hexahydrate	—	—	0.106	0.106	—
Glycerol also called Glycerine ($C_3H_8O_3$)	—	—	0.059	—	—
Glycine (NH_2CH_2COOH)	—	30.03	—	0.059	
$C_6H_5Na_3O_7 \cdot 2H_2O$ (Na_3 citrate $\cdot 2H_2O$)	—	—	0.077	0.077	—
$C_4H_4O_6Na_2 \cdot 2H_2O$ (Na_2 tartrate $\cdot 2H_2O$)	—	—	0.09	0.09	—
$C_3H_5NaO_3$ (Na lactate, 60% in water)	—	—	0.065 mL	0.065 mL	—
$C_3H_5O_3Na$ (Na pyruvate)	—	—	0.086	0.086	—
Formaldehyde	—	—	1 mL	1 mL	—
Urea	—	—	—	—	1
Lactic acid (90% soln)	—	—	—	—	0.926 mL
pH	1.2	1.2	4.5	4.5	6.5

[a]Also called glycerol ($C_3H_8O_3$). The pH of the biofluid solutions were adjusted to within ± 0.5 pH units of the designated pH using hydrochloric or sodium hydroxide.

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Table S2. Metal Concentration in Biofluid Extract (µg metal in extract / mL fluid)

Alloy / [a]grade	Biofluid	Cobalt	Chromium	Copper	Iron	Manganese	Nickel	Zinc
Carbon steel NIST 14g	gastric	<0.0054	<0.0038	<0.0055	186 158 157 170 147	1.0 0.79 0.79 0.89 0.75	<0.015	<0.016
	ALF	<0.0054	2.1 2.0 1.9	0.56 0.71 0.82	1390 1360 1280	9.2 8.9 8.2	0.85 0.84 0.79	<0.016
	sweat	<0.0054	<0.0038	<0.0055	0.93 0.33 0.41	0.15 0.17 0.17	<0.015	<0.016
SS 304L NIST101g	gastric	<0.0054	1.9 1.3 1.1 1.5 0.80	<0.0055	7.6 5.3 4.4 5.8 3.2	<0.0014	1.1 0.78 0.67 0.86 0.46	<0.016
	ALF	<0.0054	<0.0038	<0.0055	<0.013	0.013 0.013 0.023	<0.015	<0.016
	sweat	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	<0.015	<0.016
SS 304	gastric	<0.0054	0.058 0.071 0.063	<0.0055	1.1 1.3 1.2	<0.0014	0.19 0.22 0.20	<0.016
	ALF	<0.0054	0.46 0.45	<0.0055	1.2 1.1	0.013 0.013	4.1 3.9	<0.016
	sweat	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	<0.015	<0.016
SS 316	gastric	<0.0054	0.20 0.22 0.21	<0.0055	2.3 2.6 2.5	<0.0014	0.43 0.50 0.46	<0.016
	ALF	<0.0054	0.50 0.50	<0.0055	2.2 1.9	0.081 0.068	0.54 0.57	<0.016
	sweat	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	<0.015	<0.016
Monel	gastric	<0.0054	0.024	20	0.070	<0.0014	32	0.24

(Ni-Cu)			0.024 0.021	29 19	0.046 0.049		53 31	0.40 0.23
	ALF	5.6 5.4	0.52 0.92	250 98	<0.013	0.014 0.091	502 190	4.4 2.0
	sweat	<0.0054	<0.0038	12 13	<0.013	<0.0014	15 15	0.15 0.16
Inconel (Ni-Cr)	gastric	<0.0054	0.16 0.18 0.16	<0.045	0.15 0.16 0.14	<0.0014	1.0 1.1 1.0	<0.016
	ALF	<0.0054	0.47 0.46	1.1 0.56	<0.013	0.0092 0.011	2.1 0.95	<0.016
	sweat	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	<0.015	<0.016
Co metal	gastric	270 340 330	<0.0038	<0.0055	60 63 66	<0.0014	<0.015	<0.016
	ALF	630 570	<0.0038	<0.0055	<0.013	<0.0014	5.3 5.1	<0.016
	sweat	36 42	<0.0038	<0.0055	<0.013	<0.0014	<0.015	<0.016
Mn metal	gastric	<0.0054	<0.0038	<0.0055	135 135 126	1300 1570 1530	<0.015	<0.016
	ALF	<0.0054	<0.0038	<0.0055	<0.013	400 401	<0.015	<0.016
	sweat	<0.0054	<0.0038	<0.0055	<0.013	25 (n=1)	<0.015	<0.016
Ni metal	gastric	<0.0054	<0.0038	<0.0055	61 61 60	<0.0014	23 14 20	0.16 0.081 0.13
	ALF	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	380 606	16 24
	sweat	<0.0054	<0.0038	<0.0055	<0.013	<0.0014	2.3 2.6	<0.016

[a]American Iron and Steel Institute; residence time: 2h (gastric), 72 hours (ALF, sweat); < = below method detection limit

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Table S3 Metal Concentration in Material (µg metal in extract / g alloy material); n = 2 to 5

Alloy / [a]grade	Biofluid	Cobalt Avg±SD	Chromium Avg±SD	Copper Avg±SD	Iron Avg±SD	Manganese Avg±SD	Nickel Avg±SD	Zinc Avg±SD
Carbon steel NIST 14g	gastric	<2.7	60 ± 7	<2.8	8.2 ± 0.7	420 ± 52	<7.5	<8.0
	ALF	<2.7	100 ± 40	350 ± 60	6.7e5 ± 3e4	4400 ± 300	410 ± 18	<8.0
	sweat	<2.7	<1.9	<2.8	280 ± 200	81 ± 5	<7.5	<8.0
SS 304L NIST101g	gastric	<2.7	650 ± 200	<2.8	2600 ± 800	<0.70	390 ± 100	<8.0
	ALF	<2.7	<1.9	<2.8	<6.5	8.1 ± 3	<7.5	<8.0
	sweat	<2.7	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
SS 304	gastric	<2.7	32 ± 3	<2.8	590 ± 40	<0.70	101 ± 7	<8.0
	ALF	<2.7	230 ± 2	<2.8	560 ± 40	6.6 ± 0.1	<7.5	<8.0
	sweat	<2.7	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
SS 316	gastric	<2.7	105 ± 7	<2.8	1200 ± 86	<0.70	230 ± 20	<8.0
	ALF	<2.7	250 ± 0.9	<2.8	1000 ± 100	38 ± 5	280 ± 10	<8.0
	sweat	<2.7	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
Monel (Ni-Cu)	gastric	<2.7	11 ± 0.8	1.1e4 ± 3e3	27 ± 7	<0.70	1.9e4 ± 6e3	150 ± 50
	ALF	2770 ± 71	360 ± 100	8.6e4 ± 5e4	<6.5	26 ± 30	1.7e5 ± 1e5	1600 ± 800
	sweat	<2.7	<1.9	6200 ± 80	<6.5	<0.70	7300 ± 100	79 ± 4
Inconel (Ni-Cr)	gastric	<2.7	83 ± 6	<2.8	74 ± 3	<0.70	505 ± 30	<8.0
	ALF	<2.7	230 ± 3	410 ± 200	<6.5	5.1 ± 0.8	760 ± 400	<8.0
	sweat	<2.7	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
Co metal	gastric	1.6e5 ± 4e3	<1.9	<2.8	3.2e4 ± 800	<0.70	<7.5	<8.0
	ALF	4210 ± 460	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
	sweat	1.9e4 ± 2e3	<1.9	<2.8	<6.5	<0.70	<7.5	<8.0
Mn metal	gastric	<2.7	<1.9	<2.8	6.6e4 ± 3e3	7.3e5 ± 1e4	<7.5	<8.0
	ALF	<2.7	<1.9	<2.8	<6.5	2.0e5 ± 2e3	<7.5	<8.0
	sweat	<2.7	<1.9	<2.8	<6.5	13000 (n=1)	<7.5	<8.0
Ni metal	gastric	<2.7	<1.9	<2.8	3e4 ± 300	<0.70	9500 ± 2000	62 ± 20
	ALF	<2.7	<1.9	<2.8	<6.5	<0.70	2.5e5 ± 8e4	9900 ± 3000
	sweat	<2.7	<1.9	<2.8	<6.5	<0.70	1200 ± 100	<8.0

[a]American Iron and Steel Institute; residence time: 2h (gastric), 72 hours (ALF, sweat); < = below method detection limit; µg metal in extract / g alloy material is calculated by multiplying the concentration in the biofluid extract (µg/mL, see table S2) by 50 mL (final extract volume) and dividing by 0.1 g (mass of alloy and metal powder in the extract solution).

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Table S4. Metal Bioaccessibility as Percentage of Alloy ($\%_{alloy}$, [µg metal in extract / µg alloy] · 100) in biofluids; n = 2 to 5

Alloy / [a]grade	Bio-fluid	Cobalt Avg±SD	Chromium Avg±SD	Copper Avg±SD	Iron Avg±SD	Manganese Avg±SD	Nickel Avg±SD	Zinc Avg±SD
Carbon steel NIST 14g	gastric	<0.00027	0.0060 ± 0.0007	<0.00028	15 ± 5	0.042 ± 0.005	<0.00075	<0.00080
	ALF	<0.00027	0.10 ± 0.005	0.035 ± 0.007	67 ± 3	0.44 ± 0.03	0.041 ± 0.002	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	0.028 ± 0.02	0.0081 ± 0.0005	<0.00075	<0.00080
SS 304L NIST101g	gastric	<0.00027	0.0653 ± 0.02	<0.00028	0.26 ± 0.08	<0.000070	0.039 ± 0.01	<0.00080
	ALF	<0.00027	<0.00019	<0.00028	<0.00065	0.00081 ± 0.0003	<0.00075	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
SS 304	gastric	<0.00027	0.0032 ± 0.0003	<0.00028	0.059± 0.004	<0.000071	0.010 ± 0.0007	<0.00080
	ALF	<0.00027	0.023 ± 0.0002	<0.00028	0.056 ± 0.004	0.00066 ± 0.0001	<0.00075	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
SS 316	gastric	<0.00027	0.011 ± 0.0007	<0.00028	0.12 ± 0.009	<0.000070	0.023 ± 0.002	<0.00080
	ALF	<0.00027	0.025 ± 0.001	<0.00028	0.10 ± 0.01	0.0037 ± 0.001	0.028 ± 0.001	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
Monel (Ni-Cu)	gastric	<0.00027	0.0011 ± 0.0001	1.1 ± 0.3	0.0027 ± 0.001	<0.000070	1.9 ± 0.6	0.015 ± 0.005
	ALF	0.28 ± 0.007	0.036 ± 0.01	8.7 ± 5	<0.00065	0.0026 ± 0.003	17 ± 10	0.16 ± 0.08
	sweat	<0.00027	<0.00019	0.62 ± 0.008	<0.00065	<0.000070	0.73 ± 0.01	0.0079 ± 0.0004
Inconel (Ni-Cr)	gastric	<0.00027	0.0083 ± 0.001	<0.00028	0.0074 ± 0.0003	<0.000070	0.051 ± 0.003	<0.00080
	ALF	<0.00027	0.024 ± 0.001	0.041 ± 0.02	<0.00065	0.00051 ± 0.0001	0.076 ± 0.04	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
Co metal	gastric	16 ± 2	<0.00019	<0.00028	3.2 ± 0.1	<0.000070	<0.00075	<0.00080
	ALF	30 ± 2	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
	sweat	1.9 ± 0.2	<0.00019	<0.00028	<0.00065	<0.000070	<0.00075	<0.00080
Mn metal	gastric	<0.00027	<0.00019	<0.00028	6.6 ± 0.2	73 ± 7	<0.00075	<0.00080
	ALF	<0.00027	<0.00019	<0.00028	<0.00065	20 ± 0.2	<0.00075	<0.00080
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	1.3 (n=1)	<0.00075	<0.00080
Ni metal	gastric	<0.00027	<0.00019	<0.00028	3.0 ± 0.03	<0.000070	0.95 ± 0.2	0.0062 ± 0.002
	ALF	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	25 ± 8	0.99 ± 0.3
	sweat	<0.00027	<0.00019	<0.00028	<0.00065	<0.000070	0.12 ± 0.01	<0.00080

[a]American Iron and Steel Institute; residence time: 2h (gastric), 72 hours (ALF, sweat); < = below method detection limit; $\%_{alloy}$ calculated by multiplying µg metal in extract / g alloy material (see table S3) by a g to µg conversion factor (1e-6) and converting to percentage

Detection limits ranged from 0.0014 to 0.016 ug/mL in the biofluid extract, from 0.70 to 8.0 ug/g in the metal and from 0.000070 to 0.00080 relative to % metal bioaccessibility; Supplemental Information, Tables S2 to S4.