

Table S1. Relative differences in identified metabolite levels in mice.

	Relative ion intensity (10 ⁵)										P values										Class
	Control		CdCl ₂		Cd-Cit		Cd-GSH		Cd-MT		Control	CdCl ₂		Cd-Cit		Cd-GSH		Cd-MT			
	C	8610	Cd	Cd8	Cit	Cit8	GSH	GSH8	MT	MT8	C-8610	Cd-C	Cd8-Cd	Cit-C	Cit8-Cit	GSH-C	GSH8-GSH	MT-C	MT8-MT		
A1	128	83	128	114	100	142	136	121	126	127	0.129	0.936	0.109	0.027	0.031	0.751	0.692	0.927	0.971	Amines	
A2	181	136	187	146	166	144	166	177	198	167	0.170	0.784	0.183	0.379	0.290	0.699	0.769	0.091	0.025		
A3	45	37	33	54	46	46	28	59	31	27	0.689	0.344	0.256	0.932	0.972	0.232	0.029	0.284	0.346		
A4	108	62	97	78	67	60	64	91	70	100	0.086	0.666	0.439	0.008	0.644	0.212	0.396	0.024	0.054		
A5	137	122	182	191	217	189	140	152	151	163	0.665	0.042	0.883	0.039	0.546	0.921	0.745	0.510	0.637		
A6	418	267	259	234	301	240	245	229	195	172	0.059	0.050	0.421	0.103	0.130	0.041	0.708	0.017	0.646	amino acid	
A7	896	792	1,027	1,042	1,521	1,781	1,066	1,713	1,251	1,753	0.571	0.455	0.880	0.027	0.317	0.704	0.217	0.155	0.144		
A8	363	404	389	510	593	618	570	572	439	530	0.394	0.544	0.078	0.001	0.719	0.106	0.985	0.354	0.349		
A9	1,477	1,481	1,100	2,286	2,107	2,121	2,094	1,595	1,202	1,124	0.990	0.080	0.086	0.016	0.939	0.161	0.287	0.193	0.698		
A10	386	410	338	601	633	615	586	496	372	404	0.756	0.354	0.052	0.008	0.796	0.022	0.275	0.843	0.698	amino acid derivative	
A11	163	195	168	231	171	273	260	280	265	299	0.258	0.702	0.257	0.642	0.025	0.194	0.816	0.067	0.547		
A12	21,621	24,485	18,075	21,671	19,906	16,794	13,984	13,720	16,737	16,399	0.137	0.158	0.375	0.641	0.545	0.151	0.949	0.047	0.833	fatty acid	
A13	96	78	82	80	68	54	52	64	66	60	0.287	0.236	0.775	0.044	0.090	0.010	0.158	0.161	0.710		
A14	4,937	4,200	3,318	3,265	3,446	2,770	2,925	2,553	3,150	2,607	0.316	0.001	0.816	0.061	0.377	0.124	0.695	0.059	0.471		
A15	1,677	1,439	978	795	1,198	872	1,080	728	950	679	0.415	0.025	0.159	0.175	0.365	0.315	0.520	0.077	0.416		
A16	19,094	17,233	9983	12,094	11,614	9,882	9,533	10,177	12,278	8,594	0.437	0.003	0.141	0.004	0.398	0.025	0.795	0.106	0.313		
A17	2,024	1,575	1,350	1,025	1,126	935	857	942	1,607	777	0.069	0.005	0.018	0.002	0.142	0.019	0.758	0.364	0.118		
A18	29,404	25,705	20,120	25,506	27,281	25,050	21,652	18,123	21,604	17,035	0.354	0.003	0.069	0.312	0.698	0.177	0.466	0.042	0.161		
A19	6,624	7,093	4,935	5,741	5,158	4,001	3,731	4,213	5,284	4,064	0.478	0.047	0.329	0.072	0.115	0.006	0.354	0.218	0.238		
A20	75,714	72,186	58,943	70,000	64,905	56,763	51,155	54,146	58,631	51,387	0.528	0.020	0.120	0.173	0.454	0.069	0.748	0.047	0.306		
A21	1,435	1,154	1,191	949	1,046	739	733	944	964	878	0.314	0.235	0.348	0.060	0.030	0.009	0.116	0.145	0.742		

A22	517	477	487	477	423	422	445	461	450	424	0.248	0.371	0.754	0.020	0.958	0.268	0.793	0.111	0.497	
A23	132	170	88	141	158	153	130	128	119	113	0.331	0.053	0.040	0.214	0.803	0.872	0.898	0.264	0.560	Carboxylic Acids
A24	70	32	26	31	25	15	10	13	78	17	0.176	0.133	0.671	0.129	0.035	0.068	0.589	0.916	0.414	
A25	36	41	63	64	76	75	55	76	58	70	0.252	0.000	0.837	0.024	0.926	0.157	0.109	0.230	0.484	phospho sugar
A26	24	25	39	16	17	12	13	19	28	21	0.929	0.301	0.166	0.274	0.026	0.128	0.320	0.754	0.557	
A27	2,105	1,537	2,350	1,580	1,358	1,459	1,533	1,760	2,078	1,774	0.152	0.414	0.022	0.050	0.808	0.356	0.697	0.966	0.623	Vitamins
A28	158	96	130	158	132	139	118	119	91	122	0.108	0.277	0.329	0.212	0.789	0.219	0.955	0.020	0.079	
A29	8,473	6,966	9,598	8,266	9,511	9,596	8,906	9,233	8,767	9,443	0.521	0.486	0.022	0.560	0.941	0.822	0.827	0.888	0.728	uronic acid
A30	57	53	52	53	54	43	45	57	46	61	0.651	0.404	0.913	0.606	0.017	0.082	0.125	0.116	0.014	
A31	72	113	161	184	139	116	184	124	69	104	0.089	0.137	0.658	0.027	0.335	0.299	0.542	0.896	0.136	indoles
A32	100	118	42	205	192	214	147	143	159	89	0.775	0.315	0.036	0.170	0.662	0.413	0.958	0.410	0.228	alcohol
A33	82	85	58	48	53	24	37	58	47	56	0.810	0.247	0.621	0.204	0.191	0.030	0.134	0.022	0.599	Cresols
A34	4,319	5,473	3,365	5,642	5,866	5,891	4,329	5,507	4,205	4,744	0.210	0.028	0.057	0.060	0.980	0.988	0.316	0.776	0.193	Eicosanoids
A35	817	511	730	698	553	663	384	590	703	602	0.201	0.408	0.803	0.025	0.224	0.138	0.424	0.445	0.489	purines
A36	1,899	1,679	1,074	1,521	949	1,273	828	1,286	1,200	940	0.475	0.053	0.170	0.024	0.282	0.015	0.109	0.064	0.406	D-Galactose
A37	565	498	615	516	526	452	478	473	493	630	0.100	0.150	0.030	0.314	0.129	0.392	0.961	0.197	0.105	Sulfuric Acids

The differently shaded cells of the table meant to represent the difference of relative ion intensity. A1, 3-Methylhistamine; A2, Acetylcholine; A3, Histamine; A4, Spermidine; A5, Sphingosine; A6, Citrulline; A7, L-Arginine; A8, L-Glutamic acid; A9, L-Methionine; A10, Methionine sulfoxide; A11, Taurine; A12, 16-Hydroxy hexadecanoic acid; A13, 2-Furoic acid; A14, 8,11,14-Eicosatrienoic acid; A15, Adrenic acid; A16, Docosaehaenoic acid; A17, Eicosapentaenoic acid; A18, Elaidic acid; A19, Ethyl dodecanoate; A20, Ethyl tetradecanoate; A21, Oxoglutaric acid; A22, Pelargonic acid; A23, Ginkgoic acid; A24, Urocanic acid; A25, Beta-D-Fructose 6-phosphate; A26, Ribose 1-phosphate; A27, L-Acetylcarnitine; A28, Pantothenic acid; A29, L-Norleucine; A30, Beta-D-Glucopyranuronic acid; A31, Indoxyl sulfate; A32, Corticosterone; A33, 2,6-Di-tert-butyl-4-hydroxymethylphenol; A34, 11,12-EpETrE; A35, Uric acid; A36, D-Galactose; A37, Sulfate.

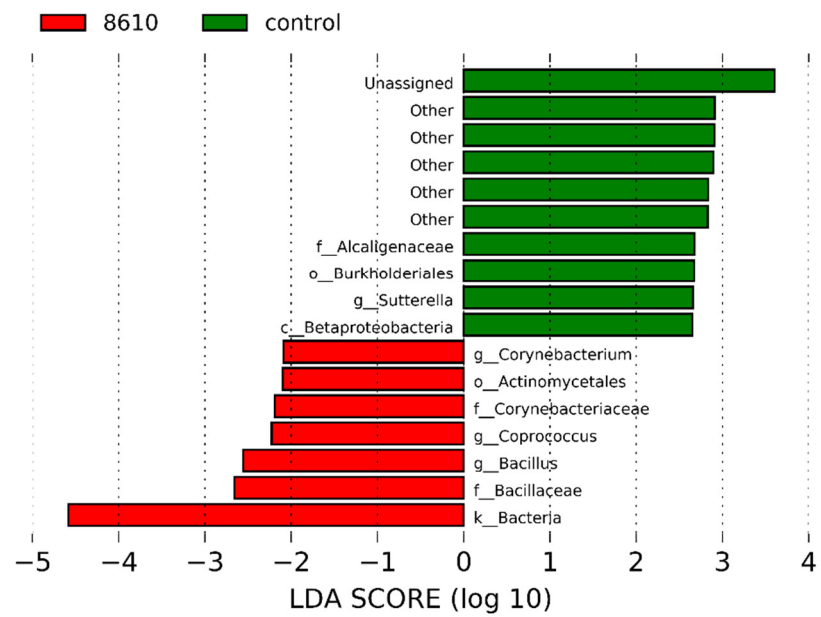


Figure S1. LDA effect size (LEfSe) analysis results of fecal microbiota in CCFM8610 treated groups.

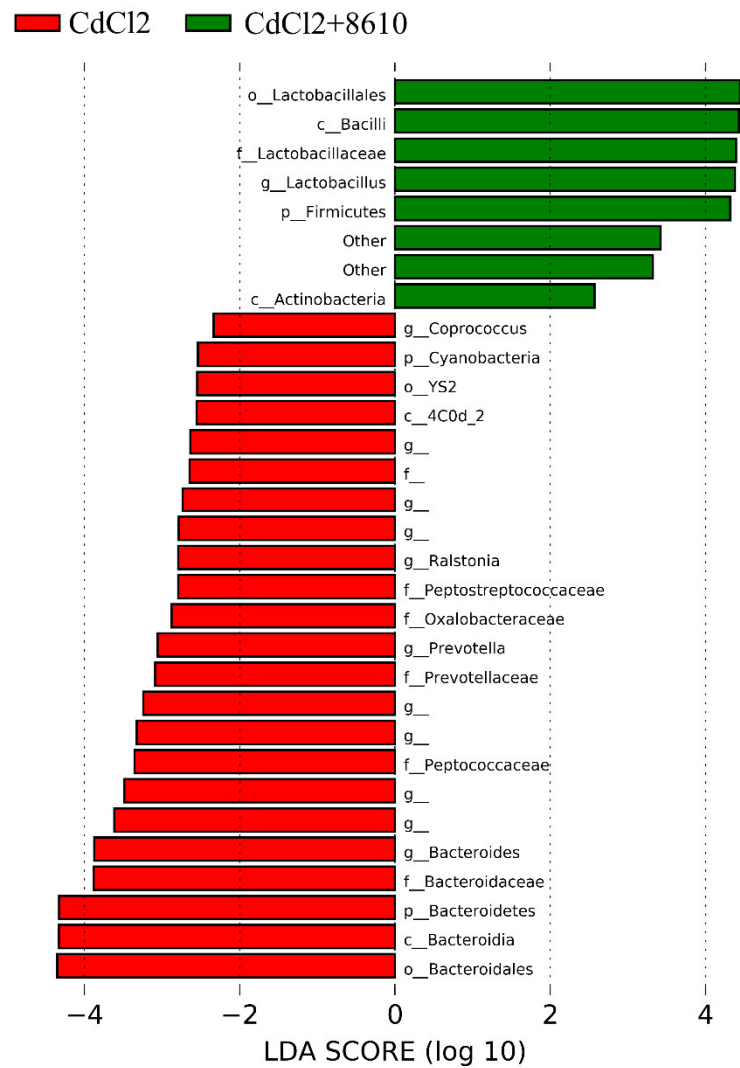


Figure S2. LDA effect size (LEfSe) analysis results of fecal microbiota in CdCl₂ treated groups.

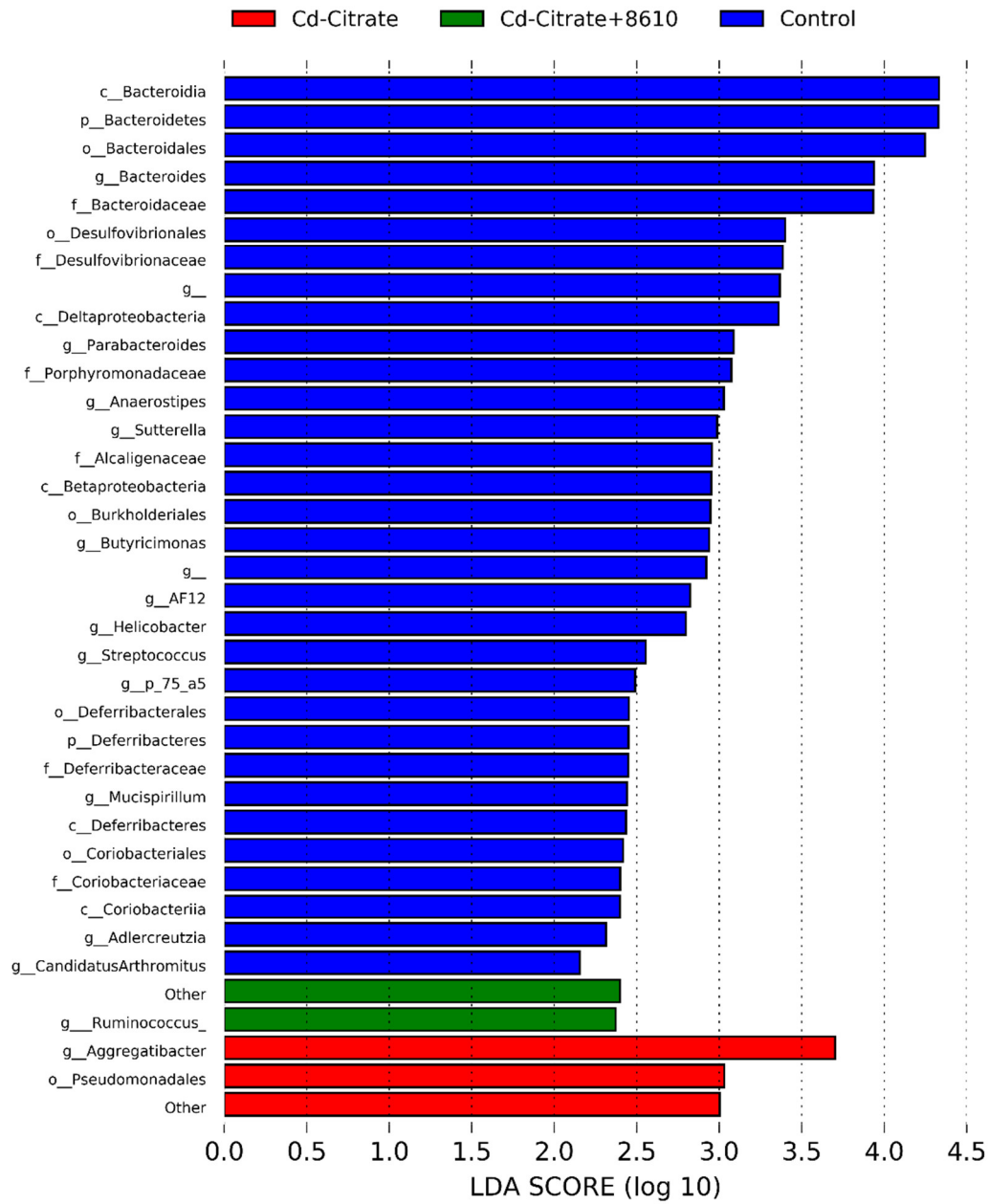


Figure S3. LDA effect size (LEfSe) analysis results of fecal microbiota in Cd-Citrate treated groups.

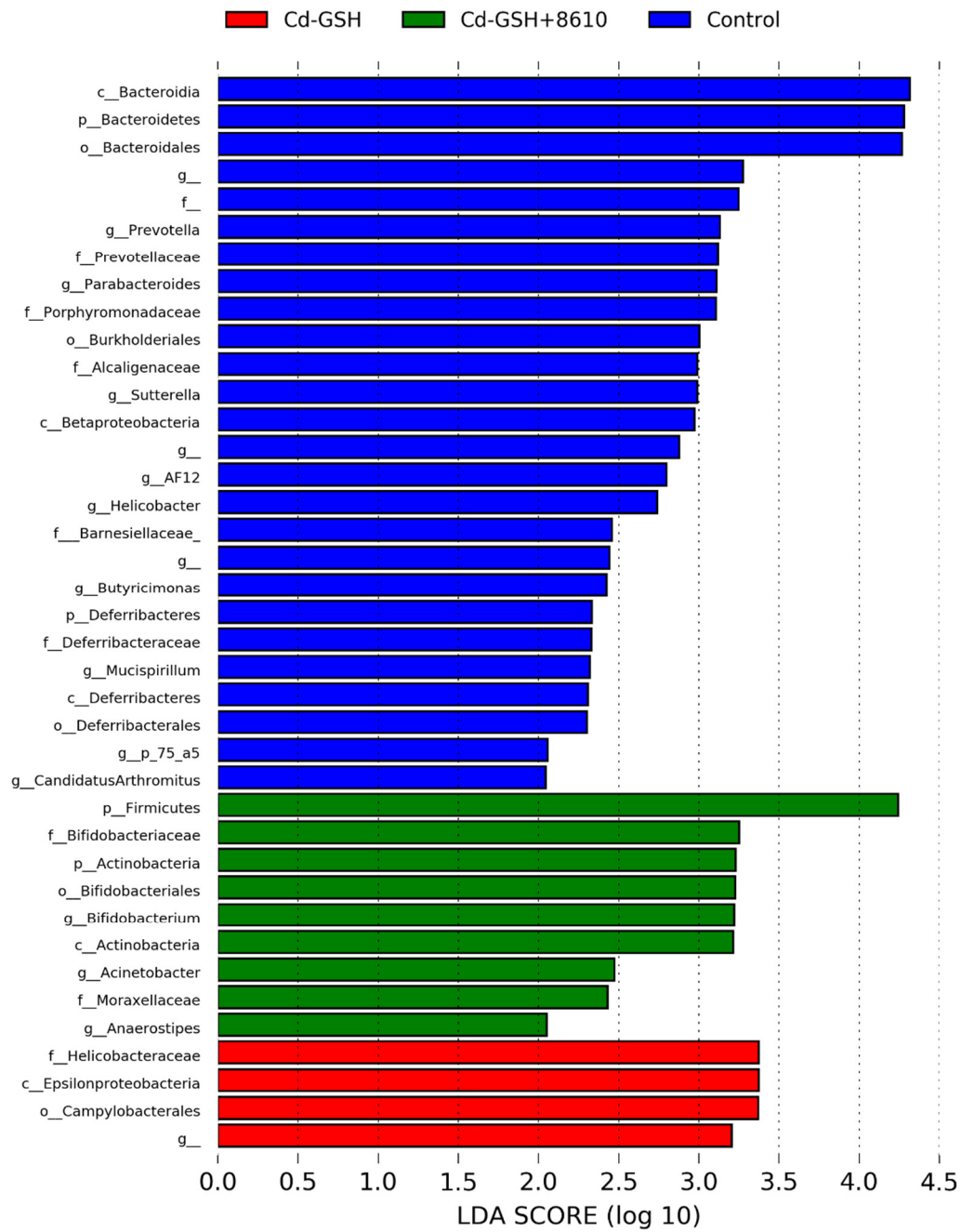


Figure S4. LDA effect size (LEfSe) analysis results of fecal microbiota in Cd-GSH treated groups.

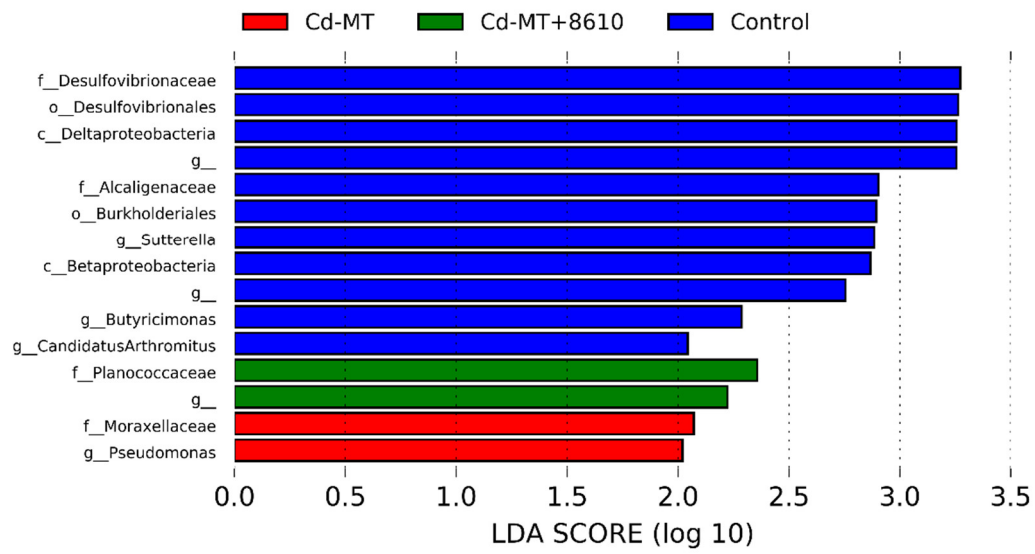


Figure S5. LDA effect size (LEfSe) analysis results of fecal microbiota in Cd-MT treated groups.