

Supplementary Table 1 Group information of GSE65127 and GSE75819

Lesion	Non.lesion
GSM1587719	GSM1587729
GSM1587720	GSM1587730
GSM1587721	GSM1587731
GSM1587722	GSM1587732
GSM1587723	GSM1587733
GSM1587724	GSM1587734
GSM1587725	GSM1587735
GSM1587726	GSM1587736
GSM1587727	GSM1587737
GSM1587728	GSM1587738
GSM1968435	GSM1968434
GSM1968437	GSM1968436
GSM1968439	GSM1968438
GSM1968441	GSM1968440
GSM1968443	GSM1968442
GSM1968445	GSM1968444
GSM1968447	GSM1968446
GSM1968449	GSM1968448
GSM1968451	GSM1968450
GSM1968453	GSM1968452
GSM1968455	GSM1968454
GSM1968457	GSM1968456
GSM1968459	GSM1968458
GSM1968461	GSM1968460
GSM1968463	GSM1968462

Supplementary Table 2 Relative abundance of vitiligo mice and no-induction mice with ABX treated

Classification	Lineage	Tax	No induction-ABX001	No induction-ABX002	No induction-ABX003	No induction-ABX004	No induction-ABX005	No induction-ABX006	Vitiligo-ABX001	Vitiligo-ABX002	Vitiligo-ABX003	Vitiligo-ABX004	Vitiligo-ABX005
<i>superkingdom</i>	<i>sk__Bacteria</i>	<i>Bacteria</i>	1	1	1	1	1	1	1	1	1	1	1
<i>phylum</i>	<i>sk__Bacteria p__Bacteroidetes</i>	<i>Bacteroidetes</i>	9.10913E-05	0.000113882	0.001419716	0.002600162	0.00040659	0.001844461	0.001135858	0	0.002256088	0.002554666	0.001311841
<i>phylum</i>	<i>sk__Bacteria p__Proteobacteria</i>	<i>Proteobacteria</i>	0.999617417	0.999609547	0.998320336	0.995893647	0.999503057	0.995615627	0.998434358	0.994234438	0.991196833	0.995929855	0.995938685
<i>phylum</i>	<i>sk__Bacteria p__Firmicutes</i>	<i>Firmicutes</i>	0.000163964	6.50756E-05	9.998E-05	0.000919569	9.03533E-05	0.001874698	0.000168844	0.000104828	0.000132711	0.000368045	0.000646935
<i>phylum</i>	<i>sk__Bacteria p__Verrucomicrobia</i>	<i>Verrucomicrobia</i>	0	8.13445E-05	0	0.000523203	0	0.000559386	0.000230241	0.005534939	0.006215302	0.001082485	0.001940805
<i>phylum</i>	<i>sk__Bacteria p__Actinobacteria</i>	<i>Actinobacteria</i>	7.2873E-05	0.000130151	0.000119976	0	0	6.04741E-05	3.06989E-05	8.38627E-05	8.8474E-05	6.49491E-05	0.000161734
<i>phylum</i>	<i>sk__Bacteria p__Saccharibacteria</i>	<i>Saccharibacteria</i>	0	0	0	0	0	0	0	0	0	0	0
<i>phylum</i>	<i>sk__Bacteria p__Cyanobacteria</i>	<i>Cyanobacteria</i>	0	0	0	0	0	0	0	0	0	0	0
<i>phylum</i>	<i>sk__Bacteria p__Tenericutes</i>	<i>Tenericutes</i>	0	0	0	0	0	0	0	0	0	0	0
<i>phylum</i>	<i>sk__Bacteria p__Deferribacteres</i>	<i>Deferribacteres</i>	0	0	0	0	0	0	0	0	0	0	0
<i>phylum</i>		unclassified	5.46548E-05	0	3.9992E-05	6.34186E-05	0	4.53556E-05	0	4.19314E-05	0.000110593	0	0

Supplementary Table 3 The mean concentration of fecal metabolite classes in vitiligo and no-induction mice via targeted qualified metabolomics (nmol/g)

Class	No Induction	Vitiligo	%-No Induction	%-Vitiligo
Amino Acids	853.9869264	1500.18632	8.87%	10.63%
Benzenoids	17.10265	47.18808167	0.18%	0.33%
Benzoic Acids	167.0599867	179.52211	1.74%	1.27%
Bile Acids	312.6947337	254.860887	3.25%	1.81%
Carbohydrates	607.3068134	985.7972791	6.31%	6.98%
Carnitines	5.97872675	4.261819967	0.06%	0.03%
Fatty Acids	215.6658332	298.0293078	2.24%	2.11%
Imidazoles	33.07976667	207.79388	0.34%	1.47%
Indoles	7.61325	8.975704667	0.08%	0.06%
Organic Acids	533.0936318	640.3120608	5.54%	4.54%
Peptides	45.27815417	66.6157625	0.47%	0.47%
Phenols	377.3636844	430.2598678	3.92%	3.05%
Phenylpropanoids	52.30727286	55.80423689	0.54%	0.40%
Pyridines	226.5309333	373.6168383	2.35%	2.65%
SCFAs	6168.328987	9063.258229	64.10%	64.20%

Supplementary Table 4 The mean concentration of serum metabolite classes in vitiligo and no-induction mice via targeted qualified metabolomics (μmol/l)

Class	No Induction	Vitiligo	%-No Induction	%-Vitiligo
Amino Acids	155.1087332	122.048541	24.99%	24.37%
Benzenoids	0.271345833	0.234716667	0.04%	0.05%
Benzoic Acids	0.396488889	2.517288889	0.06%	0.50%
Bile Acids	0.588311778	0.580281111	0.09%	0.12%
Carbohydrates	4.963110784	4.133801961	0.80%	0.83%
Carnitines	5.938552381	4.374224921	0.96%	0.87%
Fatty Acids	16.4921922	16.39806745	2.66%	3.27%
Imidazoles	0.596083333	0.49915	0.10%	0.10%
Indoles	2.211738889	3.889372222	0.36%	0.78%
Organic Acids	412.3523925	317.3359856	66.43%	63.35%
Peptides	3.066016667	2.2298375	0.49%	0.45%
Phenols	0.118216667	0.147483333	0.02%	0.03%
Phenylpropanoids	1.820754524	2.549309286	0.29%	0.51%
Pyridines	0.675491667	0.680916667	0.11%	0.14%
SCFAs	16.11211667	23.28183833	2.60%	4.65%

Supplementary Table 5 The mean concentration of skin metabolite classes in vitiligo and no-induction mice via targeted qualified metabolomics (nmol/g)

Class	No Induction	Vitiligo	%-No Induction	%-Vitiligo
Amino Acids	1377.429937	1441.422316	60.40%	62.80%
Benzenoids	3.495079167	10.1706375	0.15%	0.44%
Benzoic Acids	2.66458	4.505731667	0.12%	0.20%
Bile Acids	0.280555556	0.161561111	0.01%	0.01%
Carbohydrates	42.63796083	57.2575605	1.87%	2.49%
Carnitines	15.87976667	15.97176429	0.70%	0.70%
Fatty Acids	106.4375258	119.8367134	4.67%	5.22%
Imidazoles	3.414116667	2.965333333	0.15%	0.13%
Indoles	1.172625	1.635995833	0.05%	0.07%
Organic Acids	597.8560644	490.4851428	26.21%	21.37%
Peptides	9.042586667	8.967776667	0.40%	0.39%
Phenols	1.103175	1.2233	0.05%	0.05%
Phenylpropanoids	1.891304762	2.469697619	0.08%	0.11%
Pyridines	1.282091667	1.32575	0.06%	0.06%
SCFAs	116.0855875	136.9956125	5.09%	5.97%

Supplementary Table 6 Baseline characteristics of vitiligo patients versus healthy volunteers

Variable	Healthy Volunteer (n=15)	Vitiligo Patient (n=15)	<i>P</i> -Value
Age (years)	38.3±9.2	37.0±12.4	.753 [*]
Male, n (%)	12 (80.0)	8 (53.3)	.121 [†]
Disease Duration (months)	N/A	12 (2-60)	N/A
HA Concentration (μmol/L)	1.3 (0.6-1.8)	2.4 (1.1-3.2)	.019 [‡]
8-OHdG Concentration (pg/mL)	206.8 (158.7-248.1)	268.5 (186.8-361.5)	.026 [‡]
IL-1β Concentration (pg/mL)	1.4±0.9	2.9±2.0	.016 [*]

Notes: ^{*}Student's t test; [†]Chi-squared test; [‡]Mann-Whitney U test.

Abbreviations: *HA* , Hippuric Acid; *Interleukin-1β*, 8-hydroxy-2'-deoxyguanosine; *N/A* , Not Applicable; *8-OHdG* , 8-hydroxy-2'-deoxyguanosine.

**Supplementary Table 7 T_m Values of Proteins (NOS2, MPO and MAPK14)
Bound to Hippuric Acid**

Protein	Hippuric Acid	T _m (°C)	ΔT _m (°C)
MAPK14	0μM	50.00	
	10μM	54.85	4.85
	50μM	57.76	7.76
	100μM	60.41	10.41
	500μM	60.89	10.89
MPO	0μM	52.46	
	10μM	55.97	3.51
	50μM	56.04	3.58
	100μM	56.14	3.68
	500μM	56.44	3.98
NOS2	0μM	42.26	
	10μM	44.94	2.68
	50μM	44.95	2.69
	100μM	45.07	2.81
	500μM	45.20	2.94

Supplementary Table 8 Affinity data of proteins (NOS2 and MAPK14) with small molecule Hippuric acid

Protein	KD (M)	R_{max} (RU)	offset (RU)	Chi² (RU²)
MAPK14	1.42E-05	5.08	3.148	0.347
NOS2	3.21E-05	2.034	0.5139	0.185