Supplemental File

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Table S1 Search strategy

Pubmed	# 1	"Gout"[Mesh]
	#2	(Gout[Title/Abstract]) OR (Gouts[Title/Abstract])
	#3	# 1 or #2
	#4	"Metabolomics"[Mesh]
	#5	((Metabolomic[Title/Abstract]) OR (Metabonomics[Title/Abstract])) OR (Metabonomic[Title/Abstract])
	#6	((((((((((((((((((((Metabolomic*[Title/Abstract]) OR (Metabonomic*[Title/Abstract])) OR (Metabolit*[Title/Abstract])) OR (Metabolome[Title/Abstract])) OR (h nmr[Title/Abstract])) OR (nuclear magnetic resonance spectroscopy[Title/Abstract])) OR (proton nmr[Title/Abstract])) OR (proton nuclear magnetic resonance[Title/Abstract])) OR (gas chromatogra[Title/Abstract])) OR (gcms[Title/Abstract])) OR (gas chromatograph-mass spectrometry[Title/Abstract])) OR (gctofms[Title/Abstract])) OR (gas chromatography/time-of-flight mass spectrometry[Title/Abstract])) OR (liquid chromatogra[Title/Abstract])) OR (lc ms[Title/Abstract])) OR (triple quadrupole mass spectrometry[Title/Abstract])) OR (uplc[Title/Abstract])) OR (ultra performance liquid chromatograph[Title/Abstract])) OR (ultra-performance liquid chromatograph[Title/Abstract])) OR (high performance liquid chromatograph[Title/Abstract])) OR (ultraperformance liquid chromatography quadruple time-of-flight mass spectrometer[Title/Abstract])) OR (uhplctqms[Title/Abstract])) OR (ultra-high performance liquid chromatography triple quadrupole mass
	#7	#4 or#5 or#6
	#8	#3 and #7
	#9	"Animals"[Mesh]
	# 10	"Humans"[Mesh]
	# 11	("Animals"[Mesh]) NOT ("Humans"[Mesh])
	# 12	#8 not #11
Embase	# 1	'gout'/exp
	#2	gout :ti,ab,kw OR gouts :ti,ab,kw
	#3	# 1 OR #2
	#4	'metabonomics'/exp
	#5	metabolomic*:ti,ab,kw OR metabonomic*:ti,ab,kw OR metabolit*:ti,ab,kw OR metabolome:ti,ab,kw OR breathomics:ti,ab,kw OR degradomics:ti,ab,kw OR fluxomics:ti,ab,kw OR metabonomics:ti,ab,kw OR nutrimetabolomics:ti,ab,kw OR 'h nmr':ti,ab,kw OR 'nuclear magnetic resonance spectroscopy':ti,ab,kw OR 'proton nmr':ti,ab,kw OR 'proton nuclear magnetic resonance':ti,ab,kw OR 'gas chromatogra':ti,ab,kw OR 'gc ms':ti,ab,kw OR 'gas chromatograph-mass spectrometry':ti,ab,kw OR 'gc tof ms':ti,ab,kw OR 'gas chromatography/time-of-flight mass spectrometry':ti,ab,kw OR 'liquid chromatogra':ti,ab,kw OR 'lc ms':ti,ab,kw OR 'triple quadrupole mass spectrometry':ti,ab,kw OR uplc:ti,ab,kw OR 'ultra performance liquid chromatograph':ti,ab,kw OR 'ultra-performance liquid chromatograph':ti,ab,kw OR 'high performance liquid chromatograph':ti,ab,kw OR 'ultraperformance liquid chromatography quadruple time-of-flight mass spectrometer':ti,ab,kw OR 'uhplc tq ms':ti,ab,kw OR 'ultra-high performance liquid chromatography triple quadrupole mass spectrometry':ti,ab,kw

	#6	#4 OR #5
	#7	#3 OR #4
	#8	#7 AND [humans]/lim
Web of science	# 1	TS=(“gout” OR “gouts”)
	#2	TS= (“Metabolomic*” OR “Metabonomic*” OR “Metabolit*” OR Metabolome OR “h nmr” OR “nuclear magnetic resonance spectroscopy” OR “proton nmr” OR “proton nuclear magnetic resonance” OR “gas chromatogram” OR “gc ms” OR “gas chromatograph- mass spectrometry” OR “gc tof ms” OR “gas chromatography/time-of-flight mass spectrometry” OR “liquid chromatogram” OR “lc ms” OR “triple quadrupole mass spectrometry” OR uplc OR “ultra performance liquid chromatograph” OR “ultra- performance liquid chromatograph” OR “high performance liquid chromatograph” OR “ultraperformance liquid chromatography quadruple time-of-flight mass spectrometer” OR “uhplc tq ms” OR “ultra-high performance liquid chromatography triple quadrupole mass spectrometry”)
	#3	# 1 AND #2
	#4	TS=(Animals) NOT TS= (Humans)
	#5	(#3) NOT #4
The Cochrane Library	# 1	MeSH descriptor: [Gout] explode all trees
	#2	(Gout or Gouts):ti,ab,kw
	#3	# 1 or #2
	#4	MeSH descriptor: [Metabolomics] in all MeSH products
	#5	(Metabolomics or Metabonomic or Metabonomics or Metabolomic):ti,ab,kw
	#6	MeSH descriptor: [Metabolomics] in all MeSH products
	#7	(Metabolome or Metabolomes or Profile, Metabolic or Metabolic Profile or Metabolic Profiles or Profiles, Metabolic):ti,ab,kw
	#8	MeSH descriptor: [Gas Chromatography- Mass Spectrometry] explode all trees
	#9	(Gas Chromatography- Mass Spectrometry or Gas Liquid Chromatography Mass Spectrometry or Gas- Liquid Chromatography- Mass Spectrometry or Chromatography- Mass Spectrometry, Gas- Liquid or Chromatography, Gas Liquid Mass Spectrometry or Spectrometry, Gas- Liquid Chromatography- Mass or Chromatography, Gas- Liquid- Mass Spectrometry or Spectrometry- Gas Chromatography, Mass or Mass Spectrometry Gas Chromatography or Gas Chromatography Mass Spectrometry or Chromatography, Mass Spectrometry- Gas or Spectrometry, Gas Chromatography- Mass or Chromatography, Gas Mass Spectrometry or Spectrometry, Mass- Gas Chromatography or Spectrometries, Mass- Gas Chromatography or Spectrum Analysis, Mass Gas Chromatography or Chromatography- Mass Spectrometry, Gas or Chromatography, Gas- Mass Spectrometry or Spectrum Analysis, Mass- Gas Chromatography or GCMS or Spectrometry, Mass Gas Chromatography or Mass Spectrometry- Gas Chromatography):ti,ab,kw
	#10	MeSH descriptor: [Chromatography, High Pressure Liquid] explode all trees
	#11	(High- Performance Liquid Chromatographies or Chromatography, High Performance Liquid or Chromatography, High Speed Liquid or Liquid Chromatography, High- Performance or HPLC or Chromatography, Liquid, High Pressure or High Performance Liquid Chromatography or High- Performance Liquid Chromatography or Chromatography, High- Performance Liquid):ti,ab,kw
知网	# 1	(SU %= '痛风' OR TKA= '痛风' OR SU%= '高尿酸血症' OR TKA= '高尿酸血症' OR SU %='HUA' OR TKA='HUA') AND (SU % = '代谢组学' OR TKA= '代谢组' OR TKA = 'NMR' OR TKA = '核磁共振' OR TKA= 'proton NMR' OR TKA = '质子 NMR' OR TKA = 'GC-MS' OR TKA = '气相色谱-质谱联用' OR TKA = 'GC-TOF-MS' OR TKA = '气相色谱-飞行时间质谱' OR TKA = 'LC-MS' OR TKA = '液相色谱-质谱联用'

		OR TKA= 'TQ MS' OR TKA = '三重四极杆液质联用' OR TKA= 'UPLC' OR TKA = '超高 效液相色谱' OR TKA = 'HPLC' OR TKA = '高效液相色谱' OR TKA = 'UHPLC-MS/MS' OR TKA = '超高效液相色谱- 串联质谱' OR TKA = 'UPLC-QTOF-MS' OR TKA = '超高效液相色谱- 四极 杆-飞行时间串联质谱' OR TKA = 'UHPLC-TQ-MS' OR TKA = ' 超高效液相色谱三重四极杆质谱')
万方	#1	(主题:(“痛风”) or 题名或关键词:(“痛风”) or 主题:(“高尿酸血症”) or 题名或关键词: (“高尿酸血症”) or 主题:(“HUA”) or 题名 或关键词 :(“HUA”)) and (主题 :(“ 代谢组学”) or 题名或关键 词 :(“ 代谢组”) or 题名或关键词 :(“H NMR”) or 题名或关键 词:(“核磁共振”) or 题名或关键词:(“proton NMR”) or 题名或关 键词:(“质子 NMR”) or 题名或关键词:(“GC-MS”) or 题名或关键 词:(“气相-联用”) or 题名或关键词:(“GC-TOF-MS”)or 题名或关 键词:(“气相-飞行时间”) or 题名或关键词:(“LC-MS”) or 题名或关键词:(“液相-联用”) or 题名或关键词:(“TQ MS”) or 题名或关 键词:(“三重四极杆液质联用”) or 题名或关键词:(“UPLC”) or 题 名或关键词:(“HPLC”) or 题名或关键词:(“高效液相”)or 题名或 关键词 :(“UHPLC-MS/MS”) or 题名或关键词:(“高效- 串联”) or 题名或关键词:(“UPLC-QTOF-MS”) or 题名或关键词:(“高效- 四 极- 飞行”) or 题名或关键词:(“UHPLC-TQ-MS”) or 题名或关键 词:(“高效三重四极杆”))
VIP	#1	((M=“痛风” OR “高尿酸血症” OR “HUA”) OR (R=“痛风” OR “高尿酸血症” OR “HUA”)) AND ((M=“代谢组学” OR “代谢组” OR “NMR” OR “核磁共振” OR “proton NMR” OR “质子 NMR OR GC-MS” OR “气相色谱- 质谱联用” OR “GC-TOF-MS” OR “气相色谱- 飞行时间质谱” OR “LC-MS” OR “液相色谱-质谱联 用” OR “TQ MS” OR “三重四极杆液质联用” OR “UPLC” OR “超高效液相色谱” OR “HPLC” OR “高效液相色谱” OR “UHPLC-MS/MS” OR “超高效液相色谱-串联质谱” OR “UPLC-QTOF-MS” OR “超高效液相色谱- 四极杆-飞行时间串联 质谱” OR “UHPLC-TQ-MS” OR “超高效液相色谱三重四极杆质 谱”) OR (R=“代谢组学” OR “代谢组” OR “NMR” OR “核磁共 振” OR “proton NMR” OR “质子 NMR OR GC-MS” OR “气相色 谱-质谱联用” OR “GC-TOF-MS” OR “气相色谱- 飞行时间质谱” OR “LC-MS” OR “液相色谱-质谱联用” OR “TQ MS” OR “三重 四极杆液质联用”OR “UPLC” OR “超高效液相色谱” OR “HPLC” OR “高效液相色谱” OR “UHPLC-MS/MS” OR “超高效 液相色谱- 串联质谱” OR “UPLC-QTOF-MS” OR “超高效液相色 谱- 四极杆- 飞行时间串联质谱” OR “UHPLC-TQ-MS” OR “超高 效液相色谱三重四极杆质谱”))

Table S2 The molar mass of each small-molecule metabolite was used for the transformed units

	PubChem CID	molecular formula	Molecular Weight (g/mol)
Inosine	135398641	C10H12N4O5	268.23
Adenosine	60961	C10H13N5O4	267.24

Table S3 Formula 1 for converting median and interquartile range (IQR) into mean and standard deviation (SD)(A).

Item	Formulas
Median	Median = Mean
IQR	IQR = 1.35 SD

Table S3 Formula for combining mean and SD(B).

	Group 1	Group 2	Combined Group
Sample Size	N_1	N_2	$N_1 + N_2$
Mean	M_1	M_2	$\frac{N_1 M_1 + N_2 M_2}{N_1 + N_2}$

SD	SD_1	SD_2	$\sqrt{\frac{(N_1-1)\ SD_1^2 + \ (N_2-1)\ SD_2^2 + \frac{N_1 N_2}{N_1+N_2}\ (M_1^2+M_2^2-2M_1M_2)}{N_1+N_2-1}}$

Table S4 Characteristics of each small-molecule metabolite

Bile acid species	Year	Author	Data soure	Original Unit	If skewed [a]
Inosine	2013	Yun Liu	Digit	mg/L	0
Adenosine	2013	Yun Liu	Digit	mg/L	0

Table S5 The NOS assessment scale for every study

Study		Selection				Comparability	Exposure			Scores
		S1	S2	S3	S4	C1	E1	E2	E3	
2018	Fanghui Qiu	A*	A*	B	A*	A**	A*	B	B	6
2013	Tingtng Yin	A*	A*	A*	A*	A**	E	A*	C	7
2020	Zheng Zhong	A*	A*	B	A*	A**	A*	A*	C	7
2019	Yitao Li	A*	A*	C	A*	A**	E	B	C	5
2020	Shang lv	A*	A*	B	A*	A**	A*	A*	A*	8
2013	Tie Zhao	A*	A*	B	A*	A**	A*	B	B	6
2013	Meijiao Wang	A*	A*	C	A*	A**	E	B	C	5
2013	Yun Liu	A*	A*	A*	A*	A**	D	A*	C	7
2016	Jiao Chen	A*	A*	B	A*	A**	A*	A*	C	7
2021	Mingmei Zhang	A*	A*	C	A*	A**	E	A*	C	6
2016	Xuefeng Yu	A*	A*	A*	A*	A**	E	A*	C	7
2015	Jiyuan Zhao	A*	A*	C	A*	A**	D	A*	C	6
2021	Tingting Yin	A*	A*	B	A*	B	E	A*	C	4
2019	Fansu Sun	A*	A*	C	A*	A**	C	A*	C	6
2014	Qilin Huang	A*	A*	B	A*	A**	A*	A*	C	7
2017	Tiejuan Shao	A*	A*	B	A*	A**	E	A*	A*	7
2021	Yuqi Chen	A*	A*	C	A*	A**	A*	A*	C	7
2017	Li Cui	A*	A*	B	A*	A**	A*	A*	C	7
2020	Yefei Huang	A*	A*	B	A*	A**	A*	A*	C	7
2021	Lu Kang	A*	A*	B	A*	A**	A*	A*	C	7
2011	Yun Liu	A*	A*	B	B	B	E	A*	C	3
2019	Ying Luo	A*	A*	B	A*	A**	A*	A*	C	7
2012	Yun Liu	A*	A*	B	A*	A**	A*	A*	C	7
2022	Shang Lyu	A*	A*	B	A*	A**	E	A*	C	6
2018	Yannan Zhang	A*	A*	B	A*	A**	A*	A*	C	7
2014	Lisa K. Stamp	A*	A*	A*	A*	A**	A*	A*	C	8
2019	YAN-ZI ZHANG	A*	A*	C	A*	A**	A*	A*	C	7
2022	Shijia Liu	A*	A*	B	A*	A**	A*	A*	C	7
2013	Miao Jiang	A*	A*	A*	A*	A**	A*	A*	C	8
2021	Xia Shen	A*	A*	A*	A*	A**	A*	A*	C	8
1999	Marian Kovalancfk	A*	A*	A*	A*	A**	A*	A*	C	8
2018	Qianqian Li	A*	A*	C	A*	B	E	A*	C	4

Note:

S1: Is the case definition adequate?

S2: Representativeness of the cases.

S3: Selection of Controls.

S4: Definition of Controls.

C1: Comparability of cases and controls on the basis of the design or analysis.

E1: Ascertainment of exposure.

E2: Same method of ascertainment for cases and controls.

E3: Non-Response rate.

* and ** mean score.