

# Supplementary Tables

**Table 1. Clinical characteristics of DKD. Related to Figure 1-2 and 5.**

Control group (n = 15) for serum samples analysis											
Number	Age (year)	Sex	SCr(μmo l/L)	BUN (mmol/	FBG (mmol/ L)	HbA1c (%)	CHO (mmol/ L)	TG (mmol/L)	HDL-C(mm ol/L)	LDL-C(mmол/L)	
1	61	M	106	8.1	5.01	NA	4.1	0.74	1.44	2.63	
2	83	M	76	8.05	4.77	NA	5	1.57	1.29	3.38	
3	50	F	63	4.01	5.29	NA	4.92	0.89	1.45	3.45	
4	51	M	93	5.22	5.39	NA	4.39	1.01	1.18	2.98	
5	44	F	45	3.15	5.86	NA	3.72	1.25	1.49	1.73	
6	45	F	45	4.34	4.88	NA	3.68	0.46	1.42	1.85	
7	27	M	81	3.30	4.67	NA	3.70	0.68	1.39	2.28	
9	59	M	84	4.9	4.76	NA	4.52	1.31	1.24	2.86	
10	45	F	73	6.1	5.07	NA	3.3	0.52	1.32	1.65	
12	23	F	52	3.04	5.22	NA	NA	NA	NA	NA	
14	36	M	96	5.01	4.30	NA	4.37	0.97	1.34	2.46	
15	42	F	57	4.43	4.35	NA	4.8	1.1	1.41	2.85	
mean ± SD	47.17 ±15.93		72.58 ± 20.39	4.97 ± 1.71	4.96 ± 0.44		4.23 ± 0.57	0.95 ± 0.34	1.36 ± 0.10	2.56 ± 0.63	
DKD group (n = 18) for serum samples analysis and immunohistochemical staining of renal biopsies specimens											
Number	DRG	(year)	Sex	SCr (μmol/L)	BUN (mmol/ L)	FBG (mmol/ L)	HbA1c (%)	CHO (mmol/ L)	TG (mmol /L)	HDL-C (mmol/ L)	LDL-C (mmol/L)
1	II	66	M	94	8.44	4.24	7.58	4.53	2.36	1.12	2.95
2	II	63	F	36.21	5.03	17.47	9.26	6.05	3.02	2.01	3.29
3	II	61	M	105.57	8.1	4.79	6.5	4.34	2.37	1.37	2.69
4	II	52	F	44.47	3.01	4.03	5.8	6.21	1.85	1.68	3.95
5	II	67	M	81	3.8	5.01	5.91	3.35	1.59	1.16	1.66
6	III	62	M	292.61	20.01	3.46	5.6	3.9	1.1	1.19	2.58
7	III	72	M	130	8.02	4.19	NA	3.64	1.03	1.05	2.14
8	III	51	M	77	5.0	9.57	NA	3.72	1.89	0.9	2.21
9	III	46	M	281.56	13.44	13.98	NA	2.91	1.42	0.95	1.59
10	III	61	M	189.24	8.54	5.18	5.2	5.1	3.38	1.01	3.4
11	III	53	M	74.18	12.28	NA	8.1	6.27	0.68	1.34	4.03
12	IV	46	M	361.41	8.23	5.79	6.7	6.01	4.96	0.66	3.77
13	IV	66	M	240	25.5	11.58	7.2	3.94	1.14	1.46	2.21

14	IV	42	F	525.6	16.47	6.57	NA	10.32	14	1.12	3.97
15	IV	52	F	894.5	40.97	10.76	5.4	4.46	1.6	0.99	3.02
16	IV	53	M	826.87	26.51	NA	NA	5.09	1.41	1.83	2.93
17	IV	51	F	334.32	13.72	6.18	6.1	3.93	1.8	0.98	2.65
18	IV	38	F	268.36	11.74	NA	7	4.42	1.28	0.96	2.55
mean $\pm$ SD		55.67 $\pm$ 9.49		269.83 $\pm$ 252.10	13.27 $\pm$ 9.73	7.52 $\pm$ 4.20	6.64 $\pm$ 1.18	4.90 $\pm$ 1.69	2.60 $\pm$ 3.02	1.21 $\pm$ 0.35	2.87 $\pm$ 0.76

DRG, Diagnosis Related Grading; FBG, fasting blood glucose; SCr, serum creatinine; BUN, Blood urea nitrogen; CHO, total cholesterol; TG, triglyceride; LDL-C, low density lipoprotein cholesterol; HDL-C, high density, lipoprotein cholesterol; HbA1c, hemoglobin A1c; NA, not applicable/not available; F, female; M, male; DKD, diabetic kidney disease. Data are expressed as mean  $\pm$  SD.

**Table 2. Physical and biochemical parameters of *db/db* and STZ/HFD-induced diabetic mice. Related to Figure 1.**

Variables	40 weeks		HFD/STZ	
	WT	<i>db/db</i>	NCD	HFD/STZ
BW (g)	24.45 ± 2.58	43.09 ± 13.91*	27.97 ± 1.30	28.63 ± 3.68 <sup>#</sup>
FBG (mmol/L)	5.27 ± 1.23	19.15 ± 7.54*	5.77 ± 1.07	23.43 ± 7.48 <sup>#</sup>
Scr (μmol/L)	22.11 ± 5.39	31.27 ± 4.80*	21.53 ± 1.82	33.82 ± 3.48 <sup>#</sup>
TG (mmol/L)	0.98 ± 0.19	1.22 ± 0.47*	0.88 ± 0.12	1.35 ± 0.15 <sup>#</sup>

BW, body weight; FBG, fasting blood glucose; Scr, serum creatinine; TG, triglyceride. Data are expressed as means ± SD. \*P < 0.05 vs. wild type (WT) mice (n = 14) or <sup>#</sup>P < 0.05 vs. NCD mice (n = 20).

**Table 3. Primers for real-time RT-PCR and shRNA.**

Gene	Forward (5' to 3')	Reverse (5' to 3')
<i>Mus Metrn1</i>	GGAATTCCTCTTCACTGGACAT	CTTCTGCTTTCCTGTACATCCT
<i>Mus Gapdh</i>	AGGTCGGTGTGAACGGATTG	TGTAGACCATGTAGTTGAGGTCA
<i>Mus Scd1</i>	TGTCTCGGTGTGTGTCGGAGT	TGTACCACTACCTGCCTGCATG
<i>Mus CPT-1a</i>	TCAAGCCAGACGAAGAACATC	TGGTAGGAGAGCAGCACCTT
<i>Mus PGC-1a</i>	GACACGAGGAAAGGAAGACTAAA	GTCTTGAGAGTCCTGTGATATG
<i>Mus ATP5b</i>	CCAAGGTAGCGTTGGTATATGG	CCCTCCTGGTCTCTGAAGTAT
<i>Mus Ndufa10</i>	GAGTACAGCCGAGTGATAACAG	GCTTCTGGGTAGTGCTTCAT
<i>Mus Rab7</i>	CTTCTGACCAAGGAGGTGATG	TAGAAGGCCACACCAAGAGA
<i>Mus Pink1</i>	GGCTTCCGTCTGGAGGATTAT	AACCTGCCGAGATATTCCACA
<i>Mus Atg7</i>	GTTGCCCCCTTTAATAGTGC	TGAACTCCAACGTCAAGCGG
<i>Mus Ppara</i>	AGAGCCCCATCTGTCCTCTC	ACTGGTAGTCTGCAAAACCAAA
<i>Mus Acadl</i>	CTCAGGACACAGCAGAACTATT	GCTCTTGCATGAGGTAGTAGAA
<i>Mus Sirt3</i>	CTGCTTCTGCGGCTCTATAC	GACCGTGCATGTAGCTGTTA
<i>Rat Gapdh</i>	GGAGAAACCTGCCAAGTATGA	TTGAAGTCACAGGAGACAACC
<i>Rat PGC-1a</i>	GAGCTCTCGGGAACCTAAAGAAG	CCGAACACCGGAAGGTAATAA
<i>Rat TFAM</i>	CTGATGGGCTTAGAGAAGGAAG	TGTTATATGCTGATCGAGGTCTTT
<i>Rat COX2</i>	TGAGCCATCCCTTCACTAGG	TGAGCCGCAAATTTCAAG
<i>Rat β-actin</i>	CTGCTCTTTCCAGATGAGG	CCACAGCACTGTAGGGGTTT
<i>Rat PGC-1a</i> (PP1)	CAACCAACCAACCAAGCAAAA	CTGGTGTAGGTACGAGGAACC
<i>Rat PGC-1a</i> (PP2)	CAGATGCCTTCAGCCTTGAT	TAGCTGGCACTTGCTTTAACT
<i>Rat PGC-1a</i>	CACAGAATGTTGTACCATATATAAG	GGTTCCAGCAGTTAAAGCTTATT

<i>(PP3)</i>	CAG	
<i>Rat PGC-1α</i>	CTCGGGCCTCCTTTAGTTAAT	GAATCTAGACTCCCTGCGTTC
<i>(PP4)</i>		
<i>Rat PGC-1α</i>	GTTGCGGTCGTCAAGGTAA	TGTACCCAGGCACCTCTATAA
<i>(PP5)</i>		
shRNA-Metr nl(rat)	GGGCATAAACCCTTGTGAAAT	
shRNA-UCP l(rat)	GGTCAGAATGCAAGCACAAAG	

## Supplementary Tables

**Table 4. Key resources table**

Reagent or resource	Source	Identifier
<b>Antibodies</b>		
Collagen Type III Rabbit Polyclonal antibody (1:1000)	Proteintech	Cat# 22734-1-AP
Rb pAb to Fibronectin (1:1000)	Abcam	Cat# ab2413
E-cadherin Rabbit Polyclonal antibody (1:5000)	Proteintech	Cat# 20874-1-AP
Alpha Tubulin Rabbit PolyAb(1:5000)	Proteintech	Cat# 11224-1-AP
Actin mAb-HRP (1:5000)	Biopm	Cat# PMK058S
GAPDH Mouse Monoclonal Antibody(2B8)-HRP conjugated (1:5000)	Biopm	Cat# PMK053S
Pink1 Rabbit Polyclonal antibody (1:1000)	Proteintech	Cat# 23274-1-AP
Park2 Rabbit Polyclonal antibody (1:1000)	Proteintech	Cat# 14060-1-AP
AMPK Alpha 1 Rabbit Polyclonal antibody (1:1000)	Proteintech	Cat# 10929-2-AP
Phospho-AMPKa (Thr172) (D4D6D) Rabbit mAb (1:1000)	Cell Signaling technology	Cat# 50081
LC3A/B(D3U4C) XP Rabbit mAb (1:1000)	Cell Signaling technology	Cat# 12741S
Drp1(C-terminal) Rabbit PolyAb (1:1000)	Proteintech	Cat# 12957-1-AP
ADRP/Perilipin 2 Rabbit PolyAb (1:1500)	Proteintech	Cat# 15294-1-AP

Rb pAb to METRNL(1:1000)	Abcam	Cat# ab235775
Human Meteorin-like/METRNL antibody (1:1000)	R&D	Cat# MAB78672-100
UCP1 Rabbit PolyAb (1:1000)	Proteintech	Cat# 23673-1-AP
CPT1A Rabbit PolyAb (1:1000)	Proteintech	Cat# 15184-1-AP
ACOX1 Polyclonal antibody (1:1000)	Proteintech	Cat# 10957-1-AP
Mfn1 Rabbit PolyAb (1:1000)	Proteintech	Cat# 13798-1-AP
PGC-1a Mouse McAb (1:3000)	Proteintech	Cat# 66369-1-Ig
Anti-SIRT1 antibody (1:1000)	Abcam	Cat# Ab110304
Sirt2(A-5) mouse monoclonal IgG (1:300)	Santa Cruz Biotechnology	Cat# sc-28298
Sirt3 Rabbit PolyAb (1:1000)	Proteintech	Cat# 10099-1-AP
Sirt4 Mouse McAb (1:10000)	Proteintech	Cat# 66543-1-Ig
Sirt5(G-2) mouse monoclonal IgG (1:300)	Santa Cruz Biotechnology	Cat# sc-271635
Sirt6 Rabbit PolyAb (1:1000)	Proteintech	Cat# 13572-1-AP
Sirt7(C-3) mouse monoclonal IgG (1:300)	Santa Cruz Biotechnology	Cat# sc-365344
Goat anti-Rabbit IgG(H+L) HRP Conjugated (1:8000)	Biopm	Cat# PMK-014-090M
Goat anti-Mouse IgG(H+L) HRP Conjugated (1:8000)	Biopm	Cat# PMK-014-091M
GFP tag Rabbit Polyclonal antibody (1:1000)	Proteintech	Cat# 50430-2-AP

Alexa Fluor™ 488 rabbit anti-mouse IgG (H+L) (1:200)	Invitrogen	Cat# A11059
Alexa Fluor™ 555 goat anti-rabbit IgG (H+L) (1:200)	Invitrogen	Cat# A21429

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### Chemicals and Recombinant Proteins

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Recombinant Mouse Meteorin-like/METRNL Protein, CF	R&D	Cat# 6679-MN
High Fat (60 FDC) Purified Rodent Diet	Dyets	Cat# HF60
Mayer' Hematoxylin solution	Solarbio	Cat# G1080
Palmitic acid	SIGMA	Cat# P0500-10G
Protease Inhibitor Cocktail	MCE	Cat# HY-K0010
Phosphatase Inhibitor Cocktail II	MCE	Cat# HY-K0022
CL 316243	MCE	Cat# HY-116771A
3-TYP	MCE	Cat# HY-108331
Dorsomorphin	MCE	Cat# HY-13418A/CS-2487
Trizol	Invitrogen	Cat# 15596026
Hieff UNICON® Universal Blue qPCR SYBR Green Master Mix	YEASEN	Cat# 11184ES08
Hifair® III 1st Strand cDNA Synthesis SuperMix for qPCR (gDNA digester plus)	YEASEN	Cat# 11141ES60
Mounting Medium, antifading (with DAPI)	Solarbio	Cat# S2110

GTVisionTM III Detection System/Mo&Rb (Including DAB)	Geen Tech	Cat# GK500705
Oil Red O solution	Sigma-Aldrich	Cat# O0625
Nile Red	Sigma-Aldrich	Cat# 19123
RIPA Lysis Buffer	Beyotime	Cat# P0013B
Smart-ECL Enhanced	Smart-Lifesciences	Cat# H31500
Streptozocin	Yeasen	Cat# 60256ES76
Bafilomycin A1	MCE	Cat# HY-100558

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#### **Critical Commercial Assays**

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Mouse Meteorin-like protein (METRNL) ELISA kit	CUSABIO	Cat# CSB-ELO13718MO
Immuno Diagnostics Wide range mouse insulin immunoassay kit	IMD	Cat# 32100
Glycogen Periodic Acid Schiff (PAS/Hematoxylin) Stain Kit	Solarbio	Cat# G1281
Blood Urea Nitrogen (BUN) Assay (KitSpectrophotometer/icroplate Reader)	Solarbio	Cat# BC1535
Creatinine (Cr) Assay kit (sarcosine oxidase)	Nanjing Jiancheng	Cat# C011-2-1
Mouse MAU(Microalbuminuria) ELISA Kit	Elabscience	Cat# E-EL-M0792c
Tissue Cell Triglyceride (TG) Enzymatic Assay Kit	Applygen	Cat# E1013
MitoTracker Red CMXRos	Cell Signaling technology	Cat# 9082



JC-1	Beyotime	Cat# C2005
XFp Cell Mito Stress Test Kit	Agilent	Cat# 103010-100
TIANamp Genomic DNA kit	TIANGen	Cat#DP304-02
SimpleChip Kits	Cell Signaling technology	Cat# 45061
<b>Recombinant DNA</b>		
pCDH-CMV-MCS-EF1-Puro-Metrl	This paper	N/A
pCDH-CMV-MCS-EF1-Puro-Sirt3	This paper	N/A
pLK0.1-TRC-copGFP-Puro-sh-Metrl	This paper	N/A
pLK0.1-TRC-copGFP-2A-Puro-sh-UCP1	This paper	N/A
<b>Software</b>		
ImageJ	National Institutes of Health	<a href="https://imagej.nih.gov/ij/">https://imagej.nih.gov/ij/</a>
GraphPad Prism 8.0	GraphPad	<a href="https://www.graphpad.com/">https://www.graphpad.com/</a>
Adobe Illustrator	Adobe	<a href="http://ai.nbj.cn/">http://ai.nbj.cn/</a>
OlyVIA	Olympus Corporation	<a href="https://www.olympus-ims.com.cn/">https://www.olympus-ims.com.cn/</a>
Image-Pro Plus	Media Cybernetics	<a href="https://www.totalsmart.com.tw/c">https://www.totalsmart.com.tw/c</a>

n/image-pro-plus

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