Supplemental Table 1: Characteristics of enrolled RCTs

Study, Year, Country	Population	Population characteristics	Intervention	Control	Follow-up	Outcomes	Notes
Bliss et al. 1996, USA	Chronic renal failure	n=16 Age=20-72 Men(%)=62.50	Prebiotic 50 g/day gum arabic fiber (n=16)	Placebo (n=16)	1 month	Scr (mg/dl) BUN (mg/dl)	Single-blind, crossover Dropout rate 20.00%
Hassan et al. 2006, France	Chronic renal failure	n=9 Age=67.7±11.5 Men(%)=33.33	Prebiotic 40 g/day Fermentable Carbohydrate (n=9)	Placebo (n=9)	1.25 months	Scr (mg/dl) BUN (mg/dl)	Double-blind, crossover Dropout rate 0%
Ranganathan et al. 2009 USA	stage 3-4 CKD(eGFR 15 - 59mL/min/1.73m^2)	n=13 Age=55±8.8 Men(%)=27.27 Hypertension(%)=84.62	Probiotic (L.acidophilus KB31, B. longum KB35, and S. thermophilus KB27) 3*10^10 CFU/day (n=13)	Placebo (n=13)	3 months	Scr (mg/dl) BUN (mg/dl) CRP (mg/dl)	Double-blind, crossover Dropout rate 18.75%
B Guida et al. 2014, Italy	stage 3-4 CKD(eGFR 15 - 60mL/min/1.73 m^2)	n=30 Age=59.5±13.1 Men (%)=86.67 BMI (kg/m^2)=27.20±3.02	Synbiotic with probiotics 1.9*10^10 CFU/day and prebiotic (2.2g/day of inulin and 1.3 g resistant starch) (n=18)	Placebo (n=12)	1 month	p-CS (mg/L)	Double-blind No dropouts
Daniela et al. 2014, Mexico	HD≥ 3 months	n=35 Age=39.84±19.40 Men (%)=72.73	Synbiotic with probiotics 11*10^6 CFU/day and 2.31 g prebiotic	Placebo (n=15)	2 months	BUN (mg/dl) Scr (mg/dl) Albumin (g/dl)	Double-blind Dropout rate = 16.67%

		HTN(%)=6.82 DM(%)=16.67 HD vintage (years) = 5.03±2.80	inulin and 1.3 g resistant starch (n=20)			CRP (mg/dl) IL-6 (pg/mL) TC (mg/dl) TG (mg/dl) HDL (mg/dl) LDL (mg/dl)	
Ranganathan et al. 2014 USA	HD patients	n=22 Age=54±13.09 Men(%)=69.23 SBP(mmHg)=146.87±23.04 DBP(mmHg)=77.70±15.19	Probiotic (S.thermoophilus KB 19, L.acidophilus KB 27; B. longum KB 31) 30 billion CFU/day (n=22)	Placebo (n=13)	2 months	CRP (mg/dl)	Double-blind, crossover Dropout rate 21.43%
Tammy et al. 2014, USA	HD	n=40 Age=56±13.49 Men (%)=60 HD vintage (years) =~4 BMI (kg/m^2)=29±6.44 DM (%)=45	Prebiotics 15 g of high-amylose corn starch with 40% digestible starch and 60% resistant starch) (n=20)	Placebo (n=20)	1.5 months	BUN (mg/dl) Albumin (g/dl) p-CS (mg/dl) IS (mg/dl) CRP (mg/dl)	Single-blinded Dropout rate = 21.15%
Mikiko et al. 2015 Japan	HD≥ 6 months	n=29 Age=66.87±8.78 Men(%)=65.52 BMI (kg/m^2)= 22.02±4.04 HD vintage (years) = 9.13±8.27	Prebiotic 10g polydextrose/day (n=16)	Placebo (n=13)	1 month	Scr (mg/dl) BUN (mg/dl) TC (mg/dl) TG (mg/dl) HDL (mg/dl) LDL (mg/dl) Albumin (mg/dl)	Double-blind Dropout rate 23.68%

Wang et al. 2015, China	PD≥ 1 month	n=39 Age=50.16±13.56 Men (%)=46.15 HTN(%)=82.05 DM(%)=20.51 PD vintage(years)=3.44 (0.17-10.33) BMI(kg/m^2)=22.75 (19.8 to 25.8)	probiotics 4*10^9 CFU/day (n=21)	Placebo (n=18)	6 m	BUN (mg/dl) Scr (mg/dl) IL-6 (pg/ml)	Double-blind Dropout rate = 17.02%
Megan et al. 2016 Australia	Predialysis adult participants with CKD (eGFR=10 – 30 ml/min per 1.73 m2)	n=31 Age=69±10 Men(%)=56.76 BMI (kg/m^2)= 29±6 Hypertension(%)=100.00 Hyperlipidemia(%)=78.00	Symbiotic (inulin, fructo-oligosaccharides, and GOS and Lactobacillus, Bidifobacteria, and Streptococcus genera) 90 bllion CFU/day (n=31)	Placebo (n=31)	1.5 months	Scr (mg/dl) IS (mg/L) p-CS (mg/L) IL-6 (pg/mL)	Double-blind, crossover Dropout rate 16.22%
Hamideh et al. 2016 Iran	stage 3-4 CKD(eGFR 15 - 59mL/min/1.73m^2	n=66 Age=61.00±7.65 Men(%)=75.76 BMI (kg/m^2)= 28.52±4.06 Hypertension(%)=83.33 Hyperlipidemia(%)=80.30	Synbiotic 500mg (7 strains of probiotics and prebiotics Fructooligosaccharides) (n=31)	Placebo (n=35)	1.5 months	Scr (mg/dl) eGFR (ml/min/1.73 m^2) BUN (mg/dl)	Double-blind Dropout rate 12.00%
Alireza et al. 2017, Iran	HD≥ 12 months	n=60 Age=56.7±16.1 Men (%)=66.67 BMI (kg/m^2)=26.25±6.01 HD vintage (years) = 3.55±1.1	Probiotics 6*10^10 CFU/g/day (n=30)	Placebo (n=30)	3 months	eGFR(ml/min/1.73 m^2) BUN (mg/dl) Scr (mg/dl) Albumin (g/dl) TAC (mmol/L)	Double-blind Dropout rate = 8.33%

		CVD(%)=21.67 CAD(%)=78.33 HTN(%)=96.7				MDA (umol/L) TC (mg/dl) TG (mg/dl) HDL (mg/dl) LDL (mg/dl)	
Zahra et al. 2017, Brazil	>17 years of age, undergoing 3-4h dialysis/week	n=34 Age 33-46 and 47-60 > 60 years Men (%)=55.6 HD vintage(years): 1-5.5	Probiotic 500mg/day; 3.09*10^10 CFU /day (n=17)	Placebo (n=17)	3 months	CRP	Double-blind Dropout rate = 5.56%
Christiane et al 2018, Brazil	CKD with eGFR <45mL/min/1.73 m^2	n=46 Age=57.31±14.65 Men (%)=54 BMI (kg/m^2)=27.61±4.95	Prebiotic (FOS, 12g/day) (n=23)	Placebo (n=23)	3 months	eGFR (ml/min/1.73 m^2) BUN (mg/dl) Scr (mg/dl) Albumin (g/dl) p-CS (mg/dl) IS (mg/dl) IAA (ug/L) TC (mg/dl) TG (mg/dl) HDL (mg/dl) LDL (mg/dl)	Double-blind Dropout rate = 8%
Farzad et al. 2018, Iran	HD≥ 3 months	n=42 Age=58.36±14.39 Men (%)=76.19 HD vintage (years) = 2 BMI (kg/m^2)=24.46±4.60 DM (%)=30.95 HTN (%)=40.48	Probiotic (Lactobacillus Rhamnosus) 1.6*10^7 CFU/day (n=21)	Placebo (n=21)	1 month	p-CS (mg/L)	Triple-blind Dropout rate = 28.81%

Hamid et al. 2018, Iran	ESRD, HD≥ 6 months	n=44 Age=56±13 Men(%)=63.6 BMI (kg/m^2)= 23.58±2.07 HD duration(years)=4.95±1.51 SBP(mmHg)=120±27.62 DBP(mmHg)=77±10.14	Prebiotic 20 g/day in first 4 weeks 25 g/day in second 4 weeks (n=22)	Placebo (n=22)	2 months	Scr (mg/dl) BUN (mg/dl) Albumin (mg/dl) IS (mg/L) IL-6 (ng/mL) TAC (mmol/L) MDA (umol/L) TC (mg/dl) TG (mg/dl) HDL (mg/dl)	Double-blind Dropout rate 4.35%
Marta et al. 2018, Brazil	HD≥ 6 months	n=31 Age=54.71±9.70 Men(%)=58.06 BMI (kg/m^2)=26.60±5.14 HD vintage(years)= 3.93±2.64	Prebiotic 16 g/day (n=15)	Placebo (n=16)	1 month	Scr (mg/dl) BUN Albumin (mg/dl) p-CS (mg/L) IS (mg/L) IL-6 (pg/mL)	Triple-blind Dropout rate 18.42%
Natália et al 2018, Brazil	HD≥ 6 months	n=33 Age=51.90±9.78 Men (%)=63.64 HD vintage (years) =~3.99 BMI (kg/m^2)=25.25±5.12	Probiotic 9*10^8 CFU /day (n=16)	Placebo (n=17)	3 months	SCr (mg/dl) BUN (mg/dl) p-CS (mg/L) IS (mg/L) IAA (ug/L) CRP (mg/dl) IL-6 (pg/mL)	Triple-blind Dropout rate. 28.26%.
Rita et al. 2018, Brazil	HD≥ 3 months	n=58 Age=63.10±10.87 Men (%)=65.52 BMI (kg/m^2) = 24.00±7.39	Probiotic 100 mL of dairy drink with 40 g of extruded sorghum flakes (n=29)	Placebo (n=29)	1.75 months	CRP (mg/dl) IL-6 (pg/mL) MDA (nmol/g ptn) TAC (Mm trolox)	Blinded Dropout rate = 41.41%

		DM (%)=44.83 HTN (%)=50.00					
Alireza et al. 2019, Iran	Diabetic patients undergoing HD	n=60 Age=62.80±13.67 Men (%)=70 HD vintage (years) = 3.75±1.15 BMI (kg/m^2)=26.65±5.03	Synbiotic containing probiotics 6*10^9 CFU/day and 0.8g/day of a prebiotic inulin (n=30)	Placebo (n=30)	3 months	TAC (mmol/L) MDA (umol/L) TC (mg/dl) TG (mg/dl) HDL (mg/dl) LDL (mg/dl)	Double-blind No dropouts
Mariadelina et al. 2019, Italy	CKD3a	n=28 Age=59.75±5.83 Men (%)=54 BMI (kg/m^2)=25.7±2.90	Probiotic x 1 week then Bifiselle & Ramnoselle x 2 weeks then Bifiselle & Ramnoselle 2/day x 3 months (n=14)	Placebo (n=14)	3.75 months	eGFR (ml/min/1.73 m^2) CRP (mg/dl) TC (mg/dl) TG (mg/dl) HDL (mg/dl)	Double-blind No dropouts
Li et al. 2020 China	PD≥ 3 months	n=15 Age=35.48±15.39 Men(%)=56.25 BMI (kg/m^2)= 20.11±2.80 PD duration=2.27±2.64y	Prebiotic 10 g/day inulin-type fructans. (n=15)	Placebo (n=15)	3 months	Scr (mg/dl) eGFR (ml/min/1.73 m^2) IS (mg/L) p-CS (mg/L) Albumin (mg/dl)	Double-blind, crossover Dropout rate 16.67%
Lim et al. 2020, China	HD≥ 6 month	n=50 Age=58.89±11.56 Men (%)=40.00 HTN(%)=66.00 DM(%)=50.00 HD vintage(years)= 5.94(0.5-14.25) BMI(kg/m^2)=24.5±4.17	Probiotics Lactococcus lactis subsp. Lactis LL358, Lactobaccillus salivarius LS159, and Lactobaccillus pen- tosus LPE588 at high dose (100 billion CFU/day) (n=25)	Placebo (n=25)	6 m	Scr (mg/dl) Albumin (g/dl) p-CS (mg/dl) IS (mg/l) CRP (mg/l) IL-6 (pg/mL) TC (mg/dl) TG (mg/dl)	Double-blind Dropout rate = 10.71%

BMI, body mass index; BUN, blood urea nitrogen; CAD, coronary artery disease; CVD, cerebrovascular disease; DBP, diastolic blood pressure; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; ESRD, end-stage renal disease; Hb, Hemoglobin; HD, hemodialysis; HDL, high-density lipoprotein; HTN, hypertension; p-CS, p-cresol sulfate; IAA, indole-3-acetic acid; IS, indoxyl sulfate; LDL, low-density lipoprotein MDA, malondialdehyde; PD, peritoneal dialysis; SBP, systolic blood pressure; Scr, serum creatinine; TAC, total anti-oxidative capacity; TG, triglyceride; UA, uric acid