

Protein intake for ESKD patients



Andrew Davenport
UCL Centre for Kidney & Bladder Health
Royal Free Hospital
University College London



Diet for chronic kidney disease stage 5



WHO

1. minimum protein requirement 0.55 g/kg/d for the general population
2. protein requirement of 97.5% of the adult adult population 0.75 g/kg/d



Diet for chronic kidney disease stage 5



Rosman 1984
228 CKD patients 149 followed for 18 months
better "renal" survival with 0.6 g/kg/d

Locatelli 1991 - 253 patients - 2 years
carefully screened stable study population
low protein diet of 0.55-0.6 g/kg/d, or 0.6-0.8
g/kg/day if diabetic and 35 kcal/d vs
"normal" protein diet

- no difference in weight (data not shown)
- only 222-442 $\mu\text{mol/L}$ better renal survival



Diet for chronic kidney disease stage 5



Hansen 2002 - 82 type 1 diabetics - 4 years
0.6 g/kg/d vs usual protein diet
decline in GFR not different
Composite dialysis/death lower with LPD (p=0.042)
No differences in weight (data not shown)

Cianciaruso 2009 - 423/753 CKD patients - 32 mo
0.55 g/kgd vs 0.8 g/kg/d
death and dialysis start unaffected by the diet
no difference in change of weight/albumin
Protein calorie malnutrition in 3 patients



Transition to dialysis

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Hanafusa et al CJASN 2017, Fouque et al 2016, Ikizler et al AmJKidDis 2020

Protein restriction
0.6 -0.8 g/kg/day
0.3-0.4 g/kg/day
keto analogue
essential aa supplements

KDOQI
Protein 1.0-1.2 g/kg/day

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Spontaneous Dietary Protein Intake

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Creatinine Clearance (ml/min)	DPI (g/kg/day)
>50	~1.0
25-50	~0.8
10-25	~0.7
<10	~0.5

Ikizler JASN 1995; 6: 1386-91

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Targets for dietary intake






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Year	Guideline	Protein Intake (g/kg/d)	CrCl (ml/min)
2000	KDOQI Nutrition in Chronic Renal Failure	0.6	<25
2010	Academy of Nutrition and Dietetics	0.6-0.8	<50
2010	Academy of Nutrition and Dietetics	0.3-0.5	<20
2012	KDIGO Clinical Practice Guideline for the Evaluation and Management of CKD	0.8	<30
2019	United Kingdom Kidney Association	0.8-1.0	<30
2020	KDOQI Guidelines on Nutrition in CKD	0.55-0.6	<60


Obeid et al, Kidney360, 2022

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Sodium restriction








Phosphate restriction - protein




Foods High in Phosphorus

- Meat
- Fast Food
- Cheese
- Milk
- Seeds
- Canned Fish
- Cola
- saucers (DOLMIO CALO)

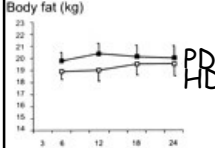
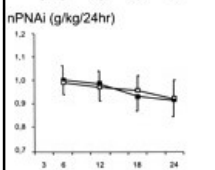


Changes in body composition starting dialysis




NECOSADS study

Handwritten: PB HB





Time after the start of dialysis, months

Jager et al JASN 2001 12(6):1272-1279

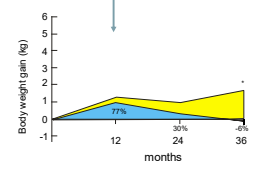


Peritoneal Glucose absorption

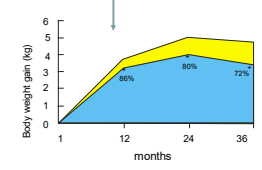


- Fat mass gain
- Lean body mass gain


Icodextrin group



Non-icodextrin group



Cho KH et al. Nephrol Dial Transplant 25: 593-599, 2010



Malnutrition is common in PD

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	Study	Pts	% Malnourished	
SGA	Young	224	40	Subjective Global Assessment
	Kawaguchi	217	26	
	Cianciaruso	215	42	
	Enia	23	39	
	Fenton	118	23	
	CANUSA	680	55	
Biochemical	Harty	147	69	
	Marckmann	16	56	
	Passlick-Deetjen	183	73	

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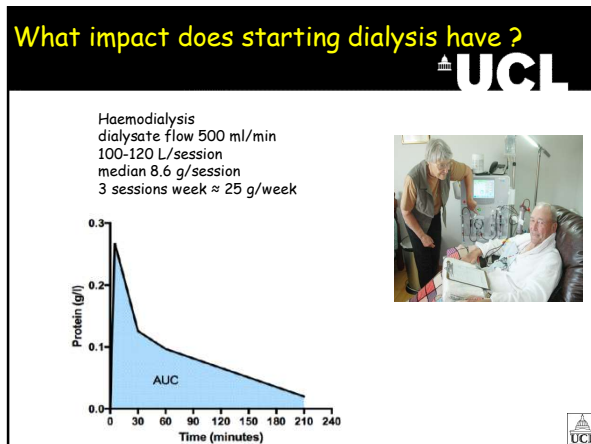
Protein balance

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Protein balance

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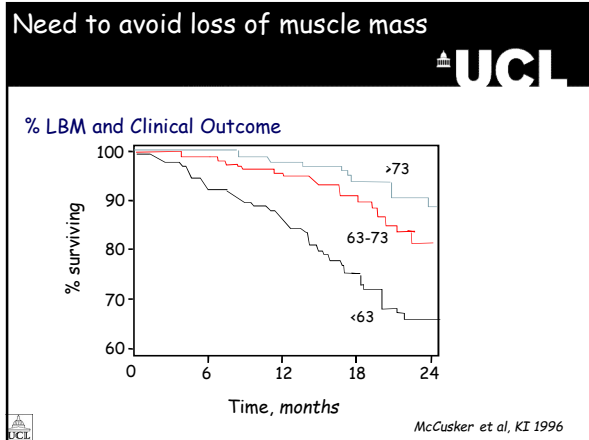


Comparison of peritoneal and HDF dialysis

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	Peritoneal	HDF
Protein loss	4.2 (3.2-5.8)	8.6 (5.5-10.4)
Na loss	61 (35-130)	312 (124-599)
Ca loss mmol	0.3 (-0.3 to 0.8)	7.4 (4.9-10.1)
Pi loss mmol	5.7 (4.1-7.9)	19.5 (13.6-26.5)***

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What should we advise ?

Multiple reviews advocating Low protein diet and less frequent dialysis

Few actual published studies

7 patients
 Mean age 45
 1 x week HD (7 hours Kiil dialyser)
 6-8 weeks protocol 0.96 ± 0.12 g/kg.day
 Or 0.4 g/kg.day plus 10 g/day essential aa

Mitch & Safir KidInt 1981

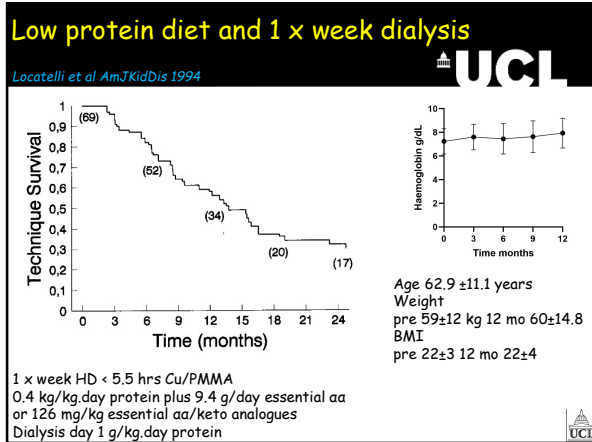
Low protein diet and 1 x week dialysis

Locatelli et al AmJKidDis 1994

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    graph TD
      A[273 Patients] --> B[84 (31%) included on IDDP]
      A --> C[189 (69%) excluded]
      B --> D[15 withdrawn]
      B --> E[69 entered the experimental phase]
      E --> F[56 drop-outs]
      E --> G[32 with follow-up > 1 year]
      G --> H[28 extensively studied]
    
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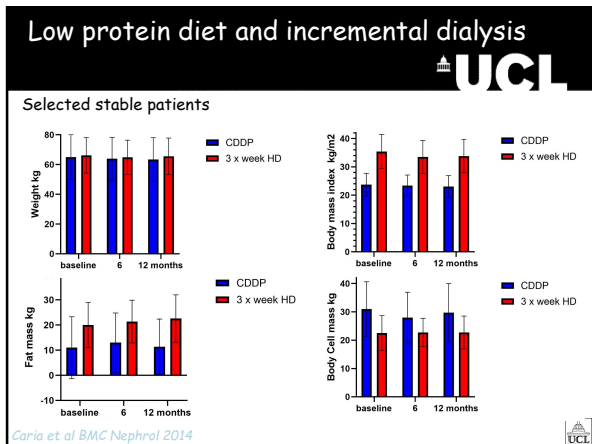
1 x week HD < 5.5 hrs Cu/PMMA
 0.4 kg/kg.day protein plus 9.4 g/day essential aa
 or 126 mg/kg essential aa/keto analogues
 Dialysis day 1 g/kg.day protein



Low protein diet and incremental dialysis

	CDDP group (n = 38)	THD group (n = 30)	p	CCDP 1 x wk HD 0.6 g/kg.day
Male/females	25/13	19/11		
Age, years	64.5 ± 13.2	65.2 ± 11	0.82	THD
Body weight (kg)	65.5 ± 15.1	66.2 ± 11.9	0.73	3xwk HD
BMI (kg/m ²)	23.7 ± 4.0	25.6 ± 4.13	0.03	
Urine volume output (mL/24 h)	1983 ± 651	1472.6 ± 433	<0.001	selected stable patients
GFR (mL/min × 1.73 mq b.s)	7.8 ± 1.9	9.2 ± 4.2	<0.01	
EPO (IU/kg/week)	104 ± 108	184 ± 84	<0.001	
CRP <5 mg/dl, %	89	66.6	<0.01	
iPTH, >300 pg/mL, %	31.5	50	<0.01	
Charlson comorbidity index score	5.5 ± 2.5	3.8 ± 2.5	0.004	

Caria et al BMC Nephrol 2014



Incremental peritoneal dialysis

Vintage 2.3±0.9 mo	incremental	standard
Serum urea mmol/L	21.9 (17.7-26.8)	17.9 (14.2-26.6)***
Creatinine umol/L	520(432-647)	598(458-755) ***
CrCl mL/min	8.1 (5.0-13.0)	7.5 (3.7-11.5)***
Creatinine/L/wk	87.9 ±40.8	85.6 ±36.3
nPNA g/kg.day	0.91 (0.75-1.09)	0.86 (0.73-1.04)
Urine mL/day	1476 ±782	1201±832 ***
Urine protein g/day	1.63±1.69	1.83±1.9
PD protein g/day	3.8 (2.8-5.1)	4.2 (3.2-5.8) *

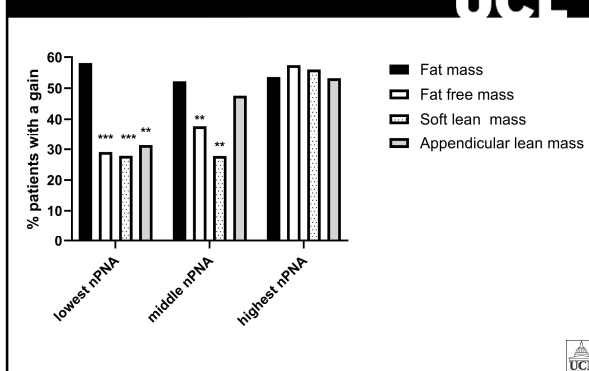
Incremental peritoneal dialysis

Vintage 2.3±0.9 mo	incremental	standard
number	230	615
age	64±15	56±16 ***
Male	24.3%	75.7%*
Ethnicity W/A/B	31/30/17%	69/70/83% *
Frailty CFS	3 (3-4)	3 (2-4) ***
weight	73.6±16.8	74.3±16.3
BMI	27.0±5.7	26.8±7.4
Fat Free mass	50.2±11.8	52.7±12.6*
Fat mass %	30.9 ±10.7	28.9±11.3*

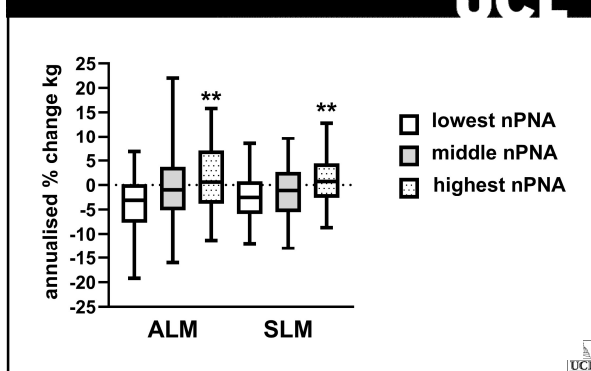
Targets for dietary intake

- UK Renal Association CPG recommendations
- Dietary protein intake
 - Pre-dialysis at least 0.75 g kg⁻¹day⁻¹
 - HD at least 1.0 g kg⁻¹day⁻¹
 - PD at least 1.2 g kg⁻¹day⁻¹
- Calorie intake
 - All groups at least 35 kcal/kg/day
 - 30 kcal/kg/day may be adequate if age 60+
- (WHO normal 0.75 g protein and 30-40 kcal /kg/day)


Changes in body composition over 12 months




Effect of dietary protein



Reducing protein bound toxins




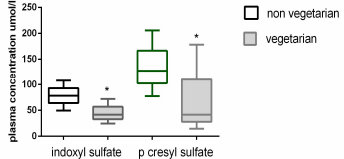


👍 **PROS**

AND

👎 **CONS**







plasma concentration $\mu\text{mol/l}$


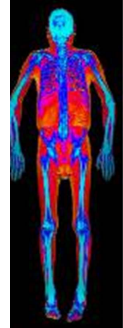
indoxyl sulfate p-cresyl sulfate

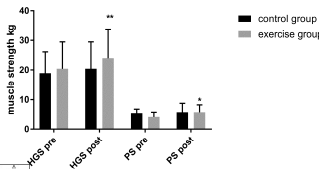
□ non vegetarian
■ vegetarian



Exercise










muscle strength kg


WGS pre WGS post PS pre PS post

■ control group ■ exercise group




Individualising dialysis






Patient 1

- 80 year old male
- ❖ 60 kg Frailty 6
 - ✓ BMI 22 kg/m²
 - ✓ % body fat 25.5
 - ✓ ALMI 5.8 kg/m²
- ❖ HDF 2 x wk 3 hrs
 - ✓ Urine 890 mL/day
 - ✓ B2M 18
 - ✓ Albumin 39 g/L
 - ✓ Creatinine 680 $\mu\text{mol/L}$



Individualising dialysis



Patient orientated treatment

- Dosing dialysis and diet
 - ❖ adjusted for
 - ✓ residual renal function
 - ✓ Resting energy expenditure
 - ✓ Active energy expenditure

