Syndecan-1 is expressed in interendothelial junctions and is not associated with peritoneal solute transport

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INTRODUCTION

The capillary wall represents the main barrier to the transport of solutes and water during peritoneal dialysis (PD). Its permeability is partly dependent on the endothelial glycocalyx, which coats the luminal side of all blood vessels and extents into the intercellular clefts. Syndecan-1 is a heparan sulfate proteoglycan expressed by the endothelial cells and therefore, might affect peritoneal transport. Circulating syndecan-1 is thought to be derived from the endothelium, and increased plasma levels were found in PD patients.

AIM

Here, syndecan-1 expression in the peritoneal microcirculation was investigated in relation to peritoneal transport in experimental chronic kidney failure (CKD) and after exposure to dialysis solutions (PDF).

METHODS

Forty-four Wistar rats were grouped as follows:
- **NKF**: normal kidney function (n=8)
- **CKD**: chronic kidney failure induced by 70% nephrectomy (n=12)
- **CKD+PDF**: CKD + daily peritoneal infusions with either Dianeal 4.25% or Physioneal 3.86% (n=24)

After 16 weeks the following investigations were performed:
- **plasma samples:** syndecan-1 (ELISA)
- **Standard Peritoneal Permeability Analysis** adapted for rats (SPARa), using Dextran 70: solute transport parameters
- **tissue specimens** (mesentery) were collected for the immunostaining of Syndecan-1

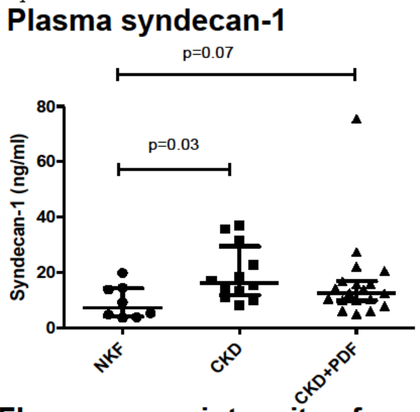
RESULTS

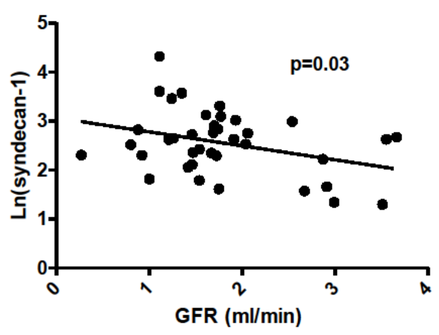
Renal function and peritoneal transport parameters after 16 weeks

Parameter	NKF (n=2)	CKD (n=3)	CKD+PDF (n=8)
Renal function			
Creatinine clearance (ml/min)*	4.3 ± 0.7	1.8 ± 0.5	2.1 ± 0.6
Peritoneal transport parameters			
D/P creatinine*	0.4 ± 0.06	0.5 ± 0.03	0.6 ± 0.1
Glucose absorption (%)*	58 ± 6	59 ± 1	67.6 ± 2.3
Albumin Clearance (µl/min)	1.3 ± 0.1	1.9 ± 0.9	2.8 ± 0.4
IgG clearance(ml/min)x1000*	0.4 ± 0.1	0.6 ± 0.1	0.8 ± 0.1

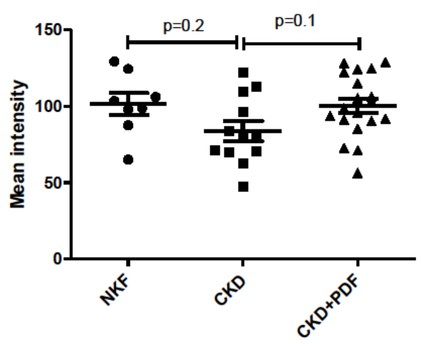
*p<0.05

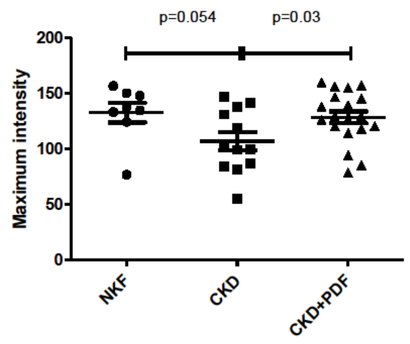
Plasma syndecan-1





Fluorescence intensity of syndecan-1 immunostaining in the interendothelial junctions of the peritoneal microvasculature

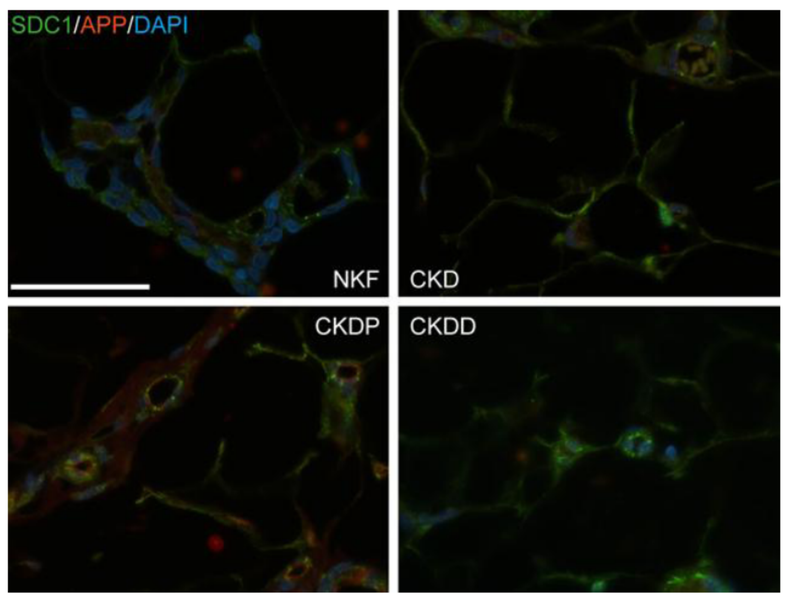




No relationships with peritoneal transport parameters are present.

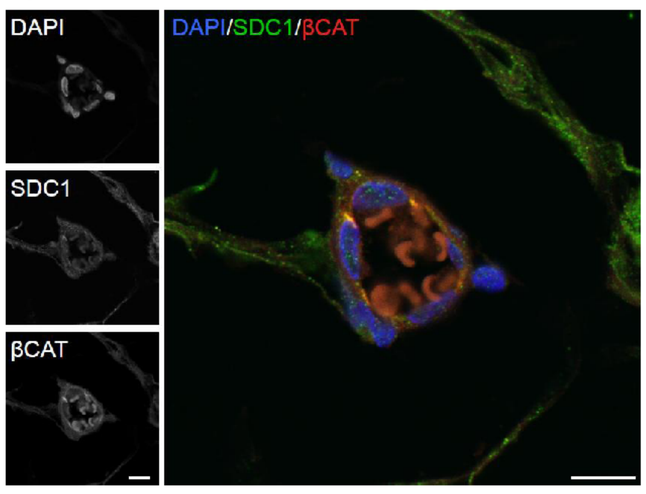
No difference was found between the groups exposed to different dialysis solutions.

Syndecan-1 immunostaining in the mesentery



SDC1: syndecan-1; APP: aminopeptidase P (endothelial marker); DAPI: 4',6-diamidino-2-phenylindole (nuclear stain). Scale bar 50 µm.

Syndecan-1 colocalizes with β-catenin



SDC1: syndecan-1; βCAT: β-catenin; DAPI: 4',6-diamidino-2-phenylindole (nuclear stain). Scale bar 10µm.

CONCLUSIONS

- **Syndecan-1 is present in the interendothelial junctions of the peritoneal microvasculature but is absent on the luminal side of the endothelium.**
- **CKD leads to decreased expression of SDC-1 in the interendothelial junctions. After exposure to both types of dialysis solutions, the expression of SDC-1 is indistinguishable from that in rats with NKF.**
- **Junctional syndecan-1 expression is not related to peritoneal transport parameters.**
- **Plasma levels of Syndecan-1 are high in rats with CKD, and are related to renal function.**

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Carmen A.

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