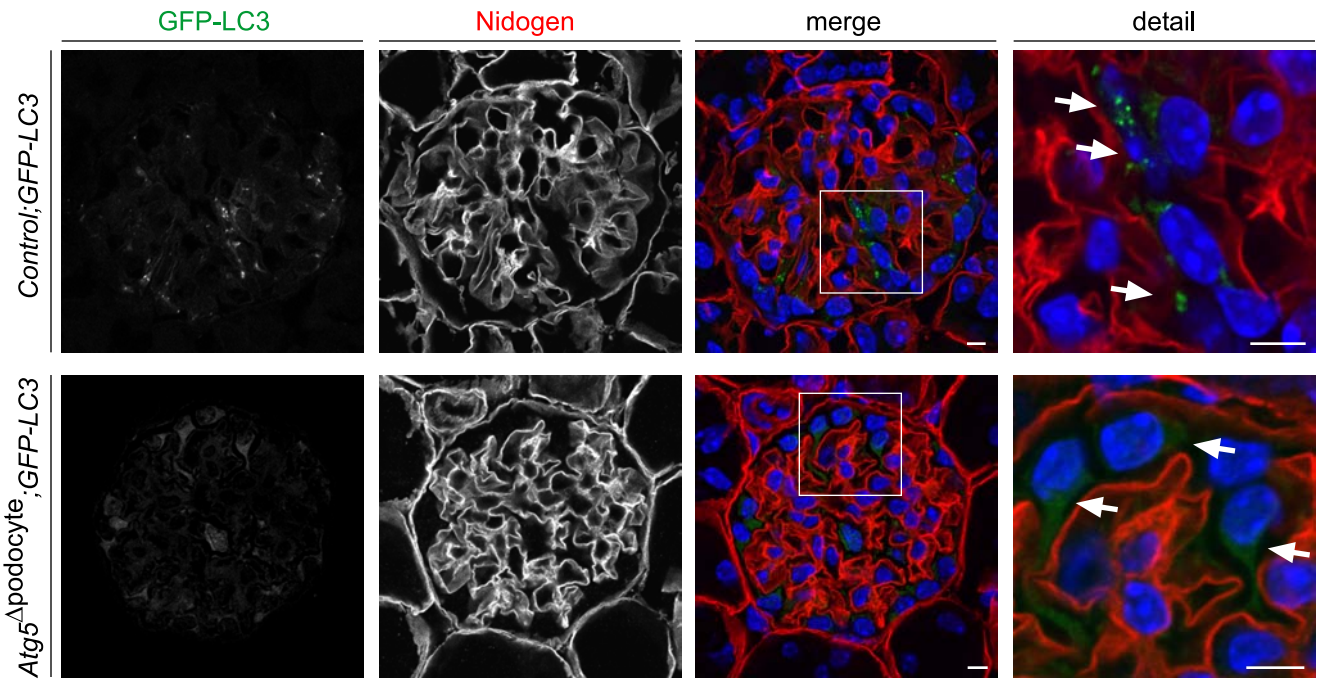
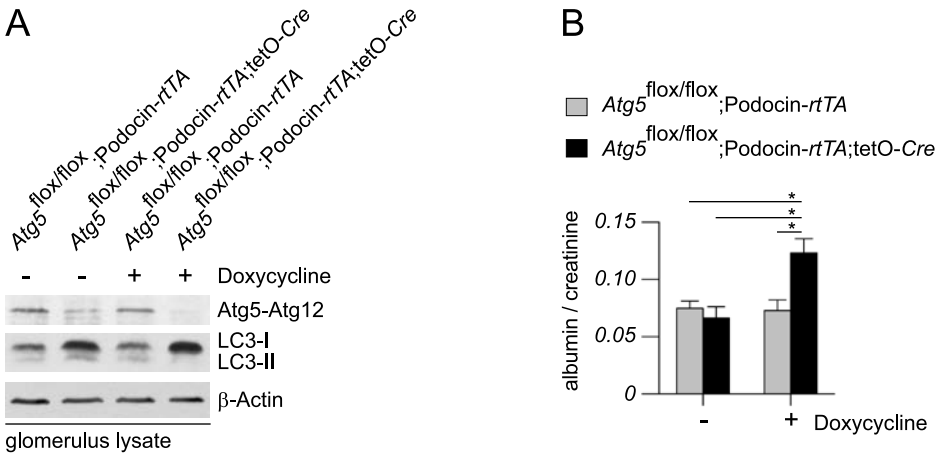
Supplemental Figure 1



Supplemental Fig. 1: Absence of GFP-LC3 positive vesicles in podocytes of *Atg5*$^{\Delta podocyte}$; *GFP-LC3* mice.

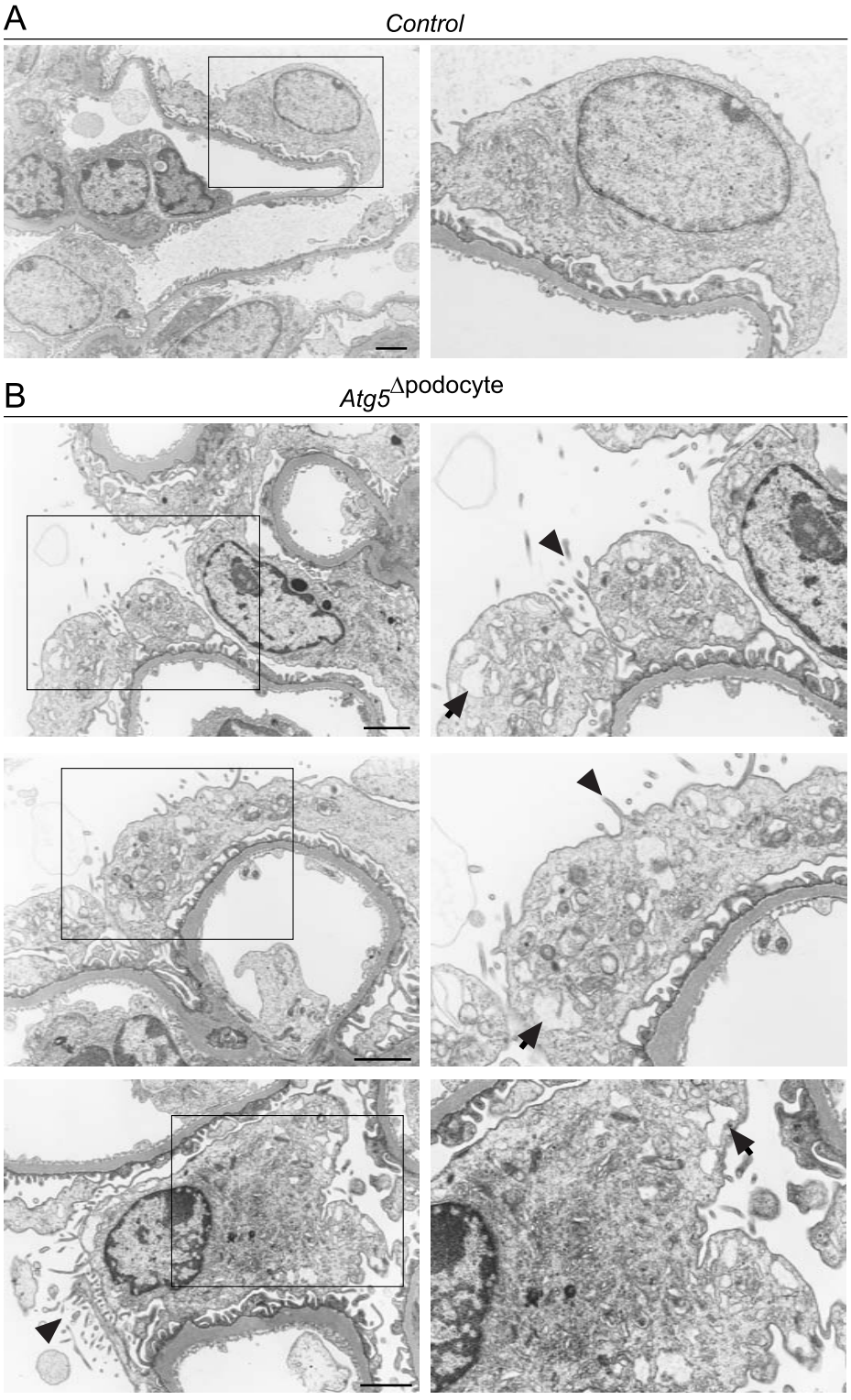
Podocyte-specific *Atg5* deficient mice (*Atg5*$^{\Delta podocyte}$) were crossed to *GFP-LC3* transgenic mice to confirm the functional ablation of autophagy. In these triple transgenic mice glomerular GFP-LC3 positive vesicles were completely absent and GFP-LC3 was diffusely distributed in the cytoplasm, while GFP-positive autophagosomes could be detected in control *GFP-LC3* mice (arrows indicate GFP-LC3 positive autophagosomes in the control condition or cytosolic GFP-LC3 signal in the *Atg5* knockout condition respectively). Scale bars: 5 μm.

Supplemental Figure 2



Supplemental Fig. 2: Doxycycline dependent induction of podocyte specific *Atg5* knockout. **(A)** *Atg5*-floxed mice (*Atg5*$^{flox/flox}$) were crossed with Podocin-*rtTA;*tetO-*Cre* to generate Doxycycline-inducible podocyte-specific *Atg5* knockout mice (*Atg5*$^{flox/flox}$;Podocin-*rtTA*$^{+}$;tetO-*Cre*$^{+}$); tetO -*Cre*$^{-}$ littermates served as control. Western blot analysis of isolated glomeruli from *Atg5*$^{flox/flox}$;Podocin-*rtTA*$^{+}$;tetO-*Cre*$^{+}$ or *Atg5*$^{flox/flox}$;Podocin-*rtTA*$^{+}$ mice confirmed the absence of Atg5 after Doxycycline administration and displayed the abrogated conversion of LC3-I. **(B)** Induction podocyte-specific *Atg5* knockout in 12 weeks old mice resulted in a significant increased albuminuria (n=6 for each condition, *=two-tailed Student`s t-test $p<0.05$).

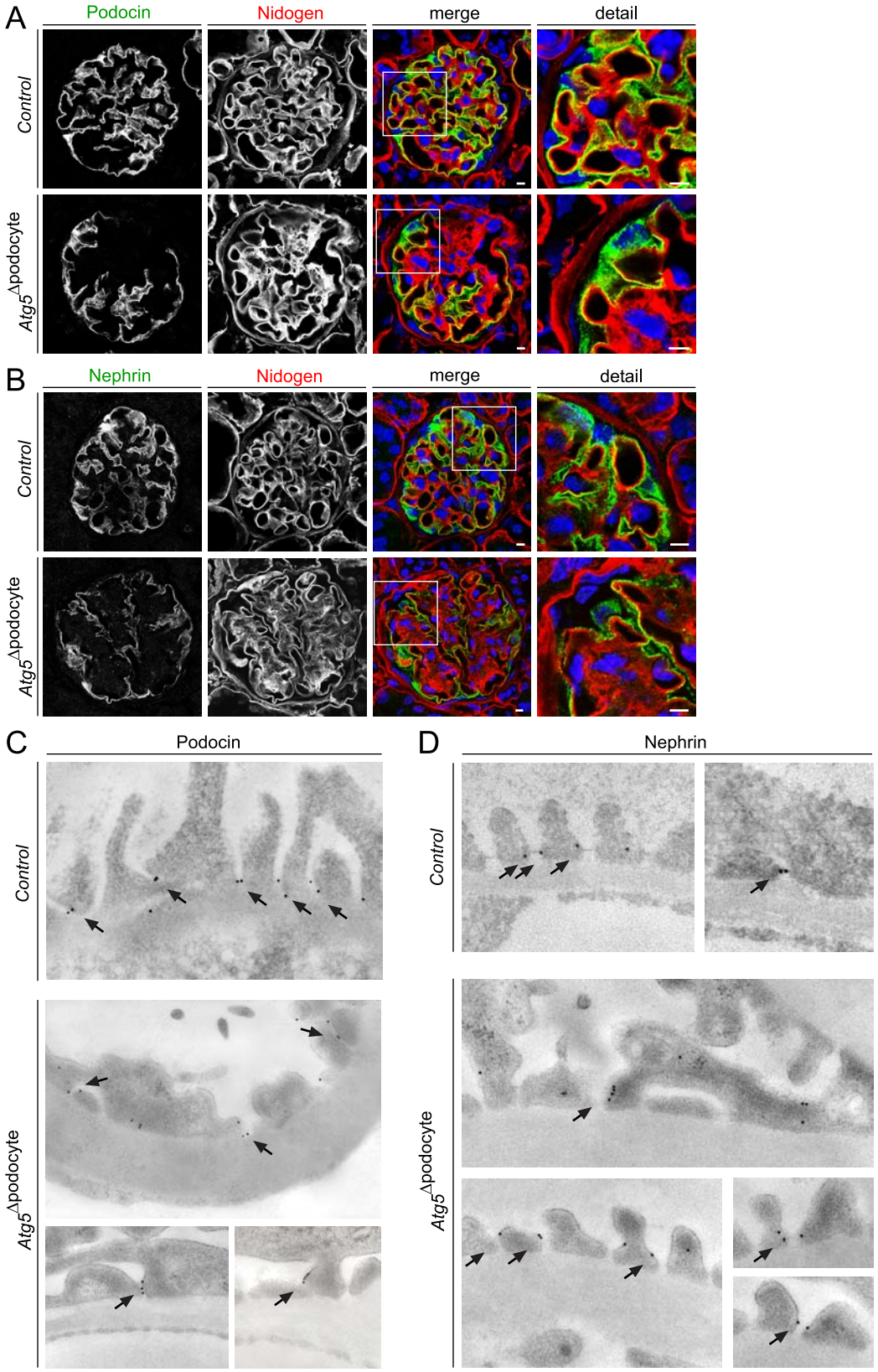
Supplemental Figure 3



Supplemental Fig. 3: Detailed EM analysis of 12 month old *Atg5*$^{\Delta podocyte}$ mice with mild albuminuria.

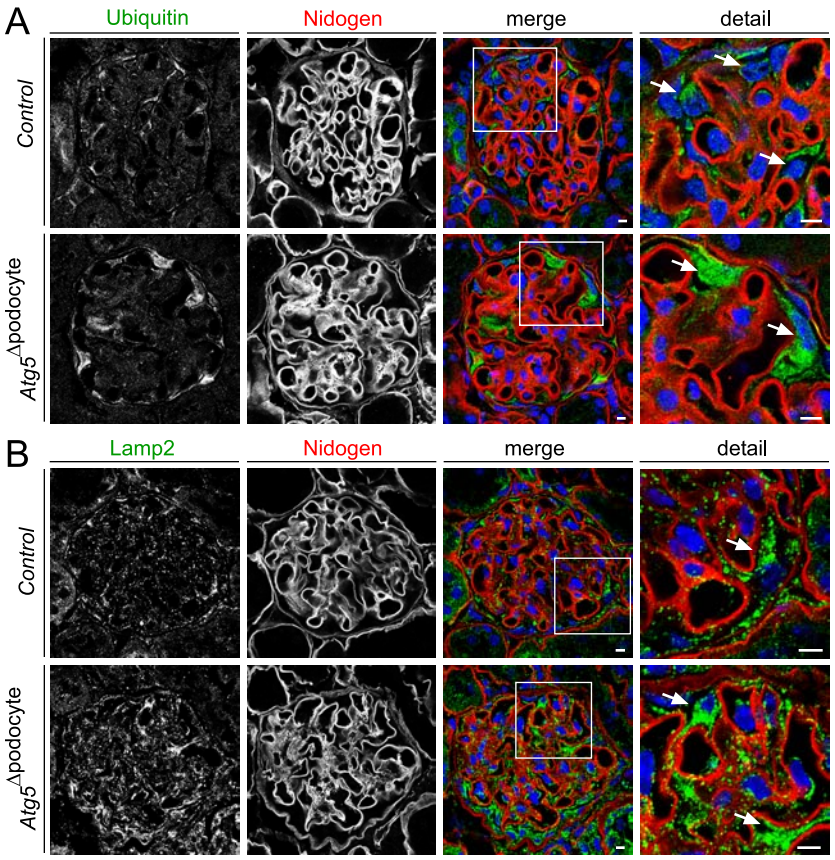
(A) Control littermates showed normal podocyte morphology with a regular foot process network. **(B)** *Atg5*$^{\Delta podocyte}$ mice displayed abnormalities such as cisternal distension of rough ER (arrows), aberrant membranous structures, and microvillus formation (arrowheads). Scale bars: 2 μm.

Supplemental Figure 4



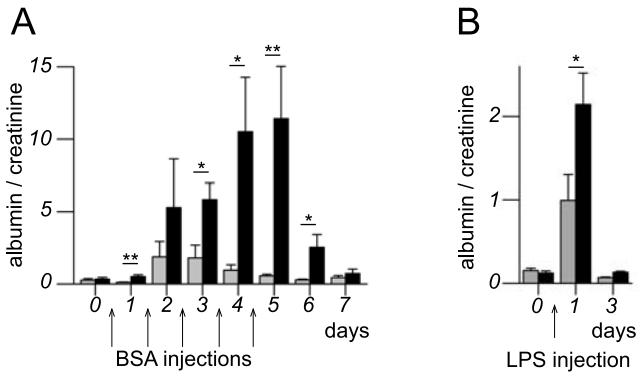
Supplemental Fig. 4: Slit diaphragm proteins in 22 month old *Atg5*$^{\Delta podocyte}$ mice. Immunofluorescence and specific immunogold stainings of the slit diaphragm proteins podocin **(A, C)** and nephrin **(B, D)** in non-sclerosed glomeruli of 22 month old *Atg5*$^{\Delta podocyte}$ and control mice. Nidogen served as basement membrane marker. Scale bars: 5 μm. Arrows indicate gold particles.

Supplemental Figure 5



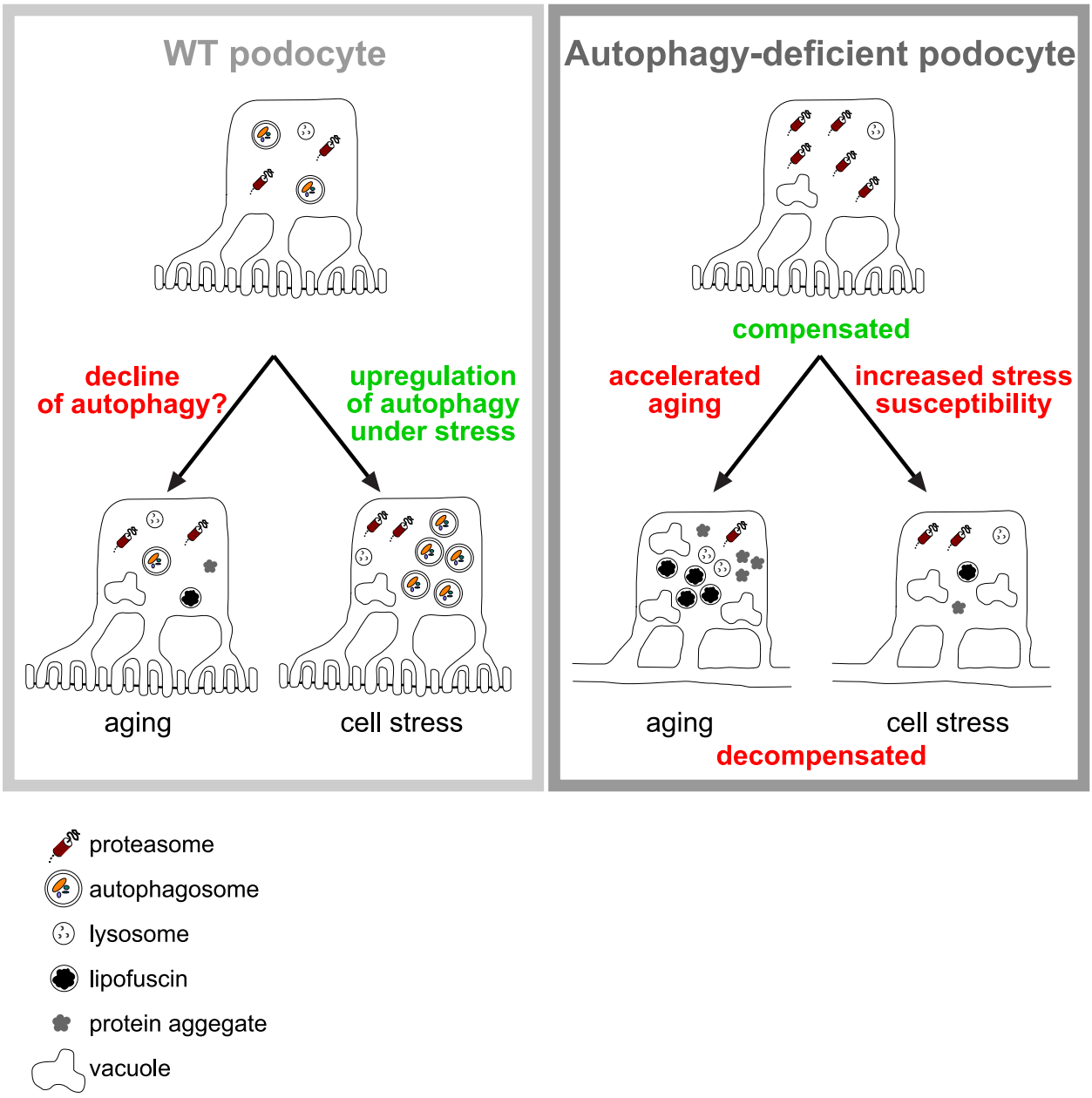
Supplemental Fig. 5: Protein degradative pathways in 22 month old *Atg5*$^{\Delta podocyte}$ mice. Confocal microscopy of kidneys from *Atg5*$^{\Delta podocyte}$ and control mice demonstrated an accumulation of ubiquitin positive aggregates **(A)** and Lamp2 positive structures **(B)** in *Atg5*$^{\Delta podocyte}$ mice. Arrows indicate podocytes. Scale bars: 5 μm.

Supplemental Figure 6



Supplemental Fig. 6: Induction of albuminuria in the BSA overload model and LPS model. Low doses of BSA **(A)** or LPS **(B)** respectively caused an significant higher transient albuminuria in *Atg5*$^{\Delta podocyte}$ mice compared to control littermates (BSA n=6 for control- and n=5 *Atg5*$^{\Delta podocyte}$ mice, LPS n=4 for control and *Atg5*$^{\Delta podocyte}$ mice, * =two-tailed Student`s t-test $p<0.05$).

Supplemental Figure 7



Supplemental Fig. 7: Autophagy controls podocyte aging, maintenance and glomerular disease susceptibility. Schematic illustration summarizing the role of autophagy for glomerular biology and glomerular disease: Autophagy is an important mechanism for podocyte homeostasis and maintenance, and a decline of autophagy might contribute to the age-related loss of glomerular function. Genetic deletion of autophagy in podocytes results in an accelerated podocyte aging and a dramatically increased susceptibility to glomerular stress. The autophagy-lysosome system and the UPS appear to be functionally coupled and *Atg5* deficient podocytes upregulate the proteasome activity to partially compensate for the loss of autophagy.