Norway spruce galactoglucomannan attenuates symptoms of nonbacterial chronic prostatitis/chronic pelvic pain syndrome in rat model

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Introduction & Objectives

Lower urinary tract symptoms are common in men suffering from chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS), and age-related hormonal changes in androgen to estrogen ratio is one possible cause. Despite the high prevalence of the syndrome there is still lack of efficient and safe treatment. Galactoglucomannan (GGM) extracted from Norway spruce wood has shown immunomodulating activities in preclinical studies, but it has not been evaluated in the CP/CPPS.

The aim of this study was to assess for the first time if orally administered GGM has therapeutic efficacy in the experimental model for CP/CPPS associated with enlarged prostate and obstructive lower urinary tract symptoms.

Materials and Methods

CP/CPPS with obstructive voiding was induced in male Wistar rats (n=12/group) by testosterone (daily release 833 µg) and 17β-estradiol (83 µg) s.c. implant (IRA, FL, USA) exposure to mimic an unbalanced hormonal milieu. GGM was extracted from Norway spruce wood using hot-water extraction method and further precipitated with ethanol. 2% GGM diluted in water was given as treatment during study weeks 13 to 18 and tap water was given as vehicle to control group animals. Pelvic pain assessment was performed using von Frey filaments at study weeks 6, 13 and 18.

Urodynamical measurements were performed at the end of the treatment period under anaesthesia (chloral hydrate and urethane). Transvesical cystometry was performed by inserting a 20G cannula into the bladder lumen and continuously infusing saline into the bladder at rate 10 ml/h. Urine flow rates were measured continuously from the distal part of the urethra with an ultrasonic flow probe and flow meter (Transonic Systems Inc., NY USA). The pressure and urine flow signals were recorded with Biopac-system and Acq Knowledge 3.5.3 software (Biopac Systems Inc., CA, USA).

Prostate tissues were weighted and histopathological prostate inflammation assessment was performed from sequential H&E stained tissue sections by scoring of perivascular, stromal/ periglandular and glandular inflammation.

Results

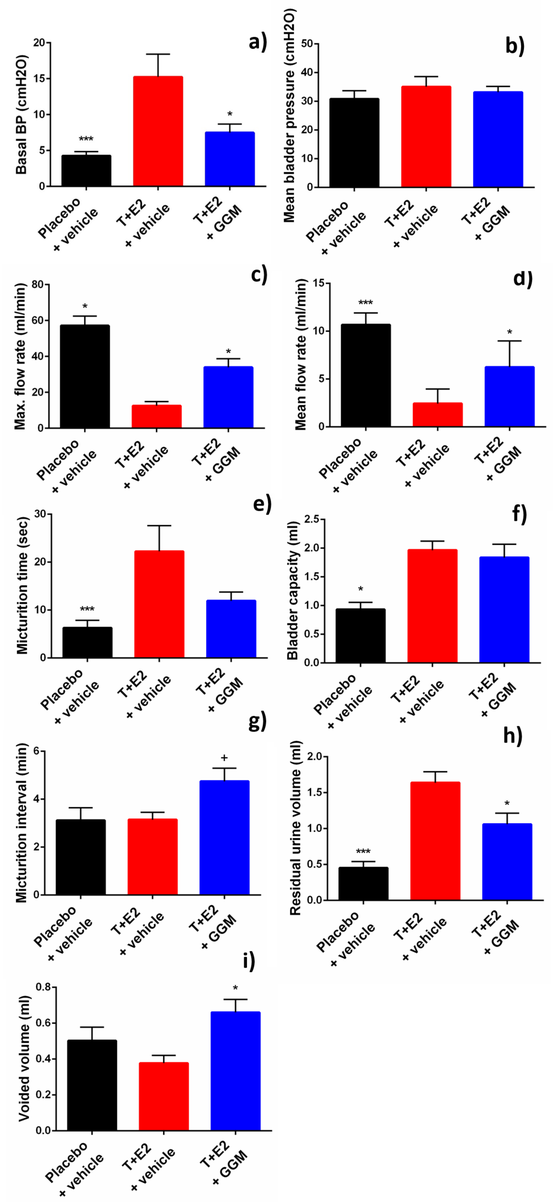

Figure 1: Outcome of urodynamical measurements: basal bladder pressure between micturition cycles (a), mean bladder pressure during micturition (b), maximal flow rate (c), mean flow rate (d), micturition time (e), bladder capacity (f), micturition interval (g), residual urine volume (h), and voided volume (i). *** P= <0.001, *P<0.05, + P <0.100 statistical comparison against T+E2 + veh group.

Results

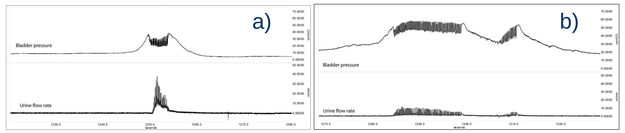

Figure 2. Typical (a) normal micturition pattern seen in rat under anesthesia. Obstructed micturition pattern after 18 weeks of hormonal exposure (b).

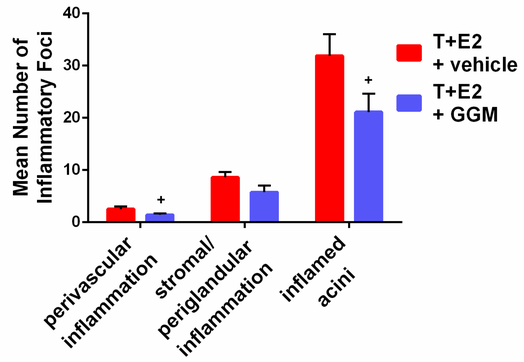

Figure 4. Mean number of inflamed perivascular, stromal/periglandular and acini in the dorsolateral prostate lobe. Statistical difference in treatment groups using T-test: +P= 0.089 for perivascular inflammation, P= 0.111 for stromal/glandular infiltration, +P= 0.064 for number of inflamed acini.

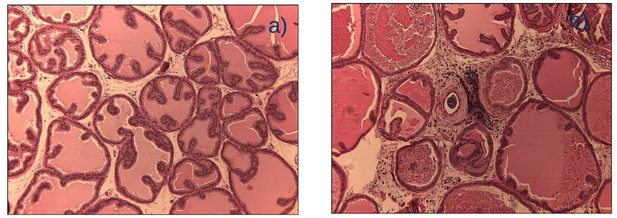

Figure 3: HE-stained section from an untreated rat prostate (a) and prostatic inflammation in dorsolateral lobe induced by hormone-treatment (b).

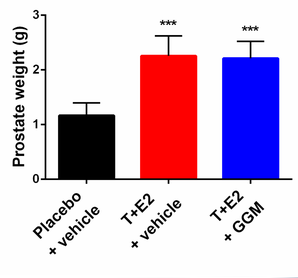

Figure 4:
Weights of prostate-urethra complex showing significant prostate enlargement due to hormonal exposure. GGM had no effect on prostate size. ANOVA *** P= <0.001.

Results

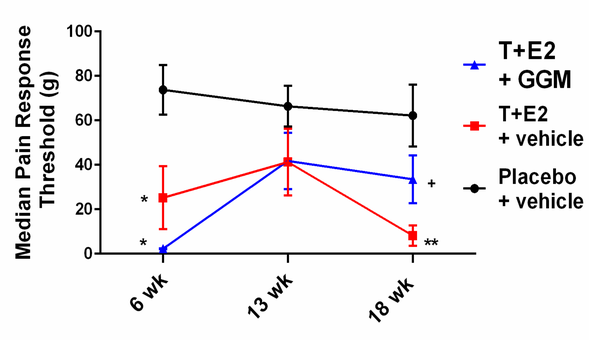

Figure 5. Median pain response threshold measured on study weeks 6, 13 and 18. Statistical analysis for data of 3 and 6 weeks using ANOVA on Ranks *= P<0.05. 18 week data were normalized using log10 transformation, ANOVA: ** P=<0.01, +P=0.058.

Conclusions

GGM attenuated obstructive voiding and relieved pelvic pain in the model for CP/CPPS. GGM had no effect on the prostate weight and minor effect on histopathological prostate inflammation which may indicate prostate-independent direct effects on the lower urinary tract.

The results indicate that orally administered GGM has potential to improve lower urinary tract function and pelvic pain associated with CP/CPPS, and further efficacy studies should be performed.

References

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