



Determination of total and single species of all uronic acid-bearing glycosaminoglycans in urine of newborns of 2-3 days of age for a possible early diagnosis of mucopolysaccharidoses



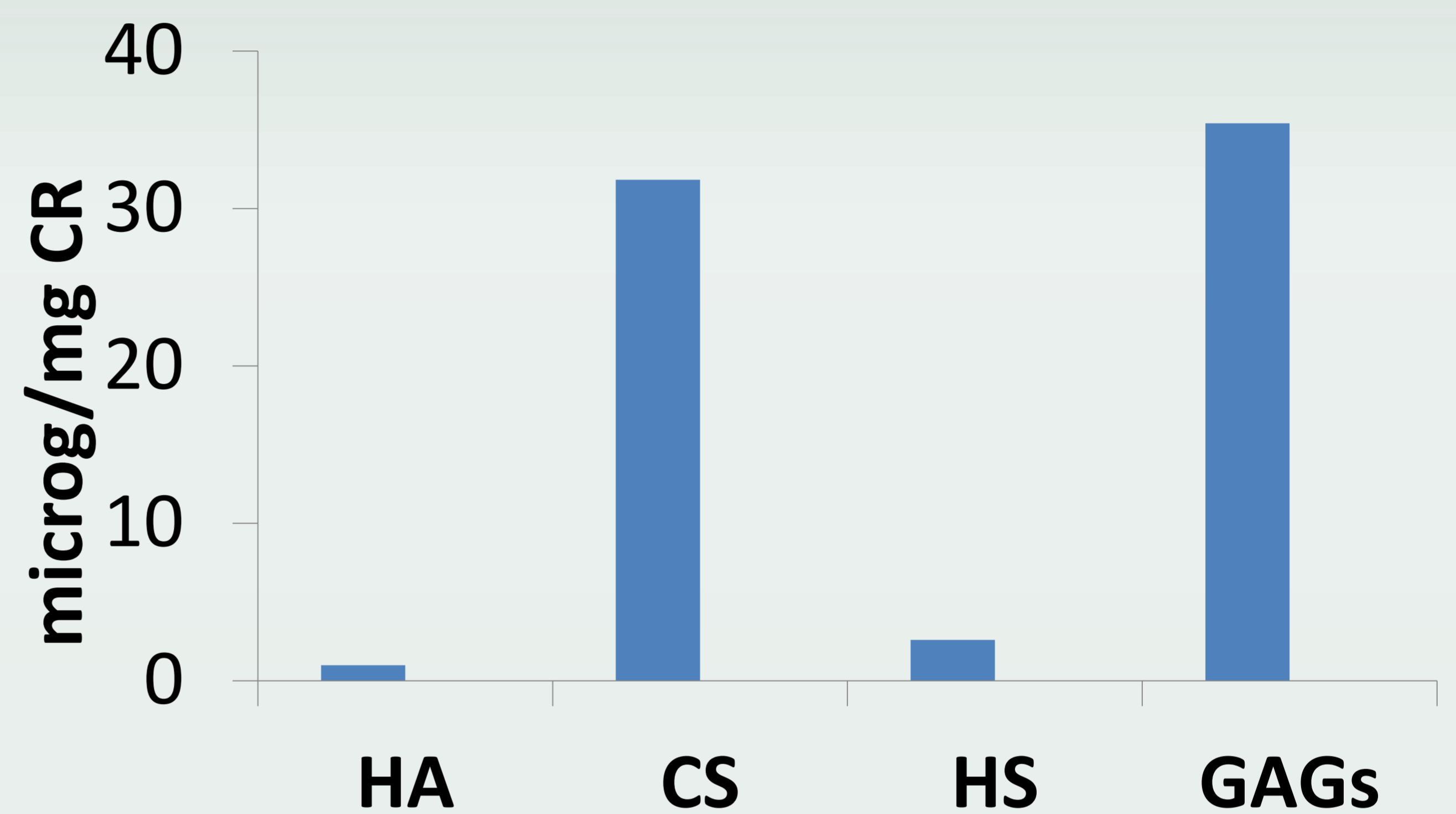
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Background

We developed a high-throughput analytical assay able to measure total and single species of all uronic acid-bearing urinary glycosaminoglycans (GAGs), i.e. hyaluronic acid (HA), chondroitin sulfate (CS), dermatan sulfate (DS), heparin/heparan sulfate (HS), applied to healthy newborns of 2-3 days of age.

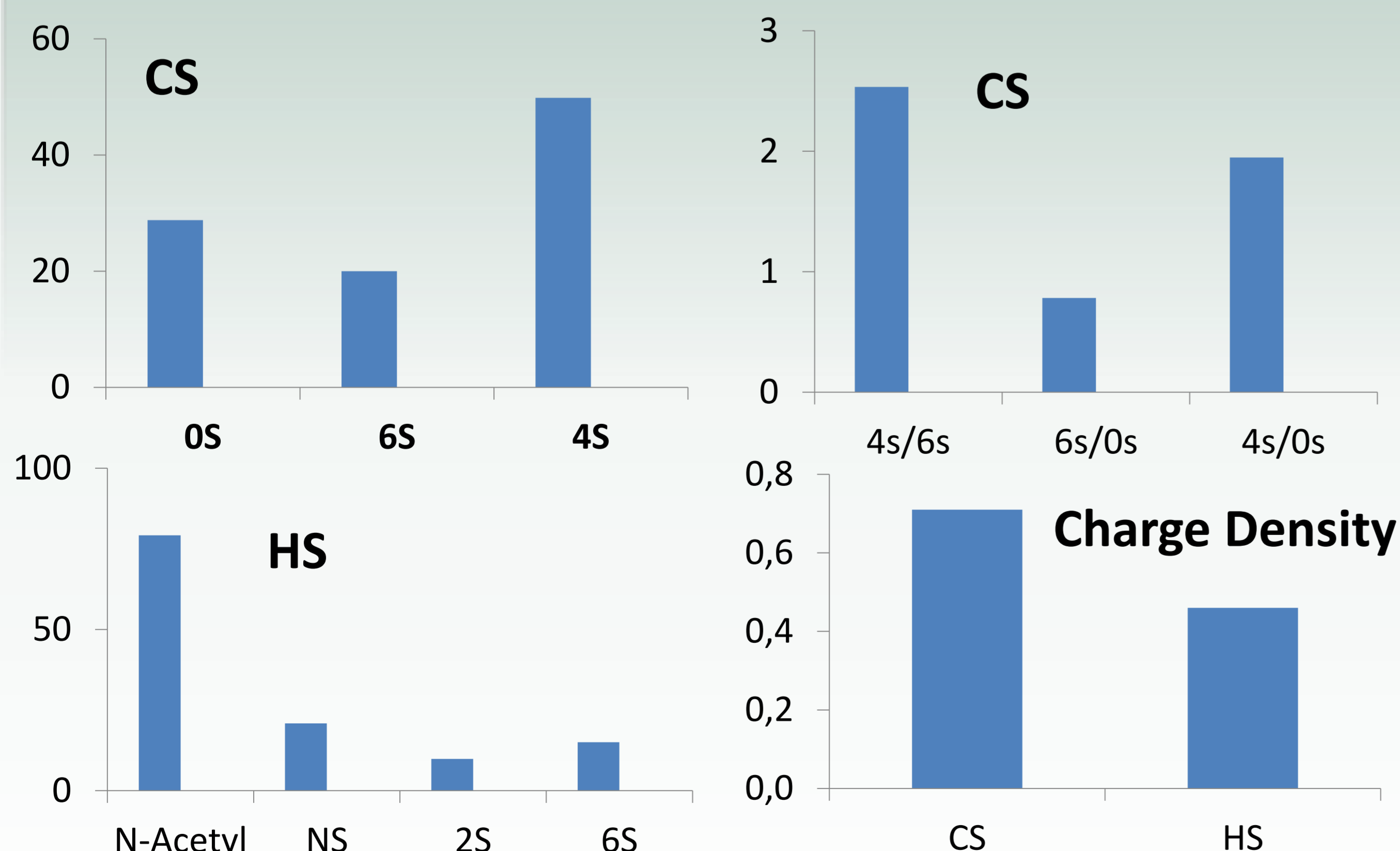
Methods

The GAGs of urine of 331 healthy newborns having 2-3 days of age were rapidly extracted by precipitation with ethanol and treated with specific enzymes in the order to generate unsaturated disaccharides belonging to single type of GAG. After derivatization with a fluorescence tag, disaccharides were separated by capillary electrophoresis (CE) equipped with a laser induced fluorescence (LIF) detector.



Results

In newborns of 2-3 days of age, HA was 1.0 $\mu\text{g}/\text{mL creat}$, CS 31.8 $\mu\text{g}/\text{mL}$, HS 2.6 $\mu\text{g}/\text{mL}$ with trace-amounts of DS and heparin. Total GAGs were 35.4 $\mu\text{g}/\text{mL}$. The relative % of HA was 3%, CS 87.8% and HS 9.3%. Moreover, urinary CS was found to be composed of 50% 4-sulfated disaccharide, 20% 6-sulfated disaccharide and 29% disaccharide not-sulfated with a charge density of 0.71. HS was mainly formed of 79% *N*-acetyl-groups, 21% *N*-sulfated groups, 10% 2-sulfated uronic acid residues and 15% 6-sulfated disaccharides for an overall charge density of 0.46.



Discussion

The illustrated procedure is able to measure the total content and single species of all urinary known uronic acid-bearing GAGs with possible future application in MPS early diagnosis. In fact, the relative percentages of single species of GAGs as such as its total content are known to change with MPS diseases also in relation to single type of MPS.

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