**Additional file 1**

Table of lysosomal enzymes assays: substrates, buffers, conditions and references

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| Enzyme | Substrate and concentration (Vendor) | Reaction buffer | Serum (µL) | Reference |
| α-L-iduronidase (EC 3.2.1.76) | 4-MU\* α-L-idopyranoside, 2 mM(Toronto Research Chemicals, Canada) | 0.4 M Sodium formate pH 4.4 | 15 | [28] |
| arylsulfatase B(EC 3.1.6.12) | 4-MU sulfate potassium salt, 5 mM(Glycosynth, Warrington, United Kingdom)  | 50 mM Sodium acetate pH 5.0 | 10 | [29] |
| β-glucuronidase(EC 3.2.1.31) | 4-MU β-D-glucuronide, 10 mM(Glycosynth, Warrington, United Kingdom) | 0.1 M Sodium acetatepH 4.8 | 10 | [28] |
| α-D-mannosidase(EC 3.2.1.24) | 4-MU α-D-mannopyranoside, 5 mM(Sigma-Aldrich, St Louis, MO, USA) | 0.2 M Citrate phosphate pH 4.4 | 1 | [28] |
| α-D-fucosidase(EC 3.2.1.51) | 4-MU α-L-fucoside, 1 mM(Sigma-Aldrich, St Louis, MO, USA) | 0.2 M Citrate phosphate pH 5.2 | 10 | [20] |
| N-acetyl-β-D-glucosaminidase(EC 3.2.1.30) | 4-MU β-D-GlcNAc, 10 mM(Sigma-Aldrich, St Louis, MO, USA) | 0.2 M Citrate phosphate pH 4.4 | 5 | [20] |

\*4-MU: 4-Methylumbelliferone