Electronic Supplementary Material (ESI):

Table 1 Summary of the acquisition parameters.

ICP-MS (Element XR)	
RF plasma source power	1350 W
Plasma gas flow	15 L min^{-1} Ar
Auxiliary gas flow	0.8 L min^{-1} Ar
Transport gas flow	0.8 L min^{-1} Ar
Mass resolution ($m/\Delta m$)	300
Scanning mode	E scan
Sample time	2 ms
LA system (New Wave 213)	
Wavelength	213 nm
Helium gas flow	1 L min^{-1}
Laser energy	0.20 - 0.25 mJ
Laser spot sizes	200 µm
Scan speeds	200 µm s^{-1}
Repetition frequency	20 Hz
Ablation mode	Scanning line per line
Analysis time	1 – 2 h

Table 2 Results of the liquid ICP-MS of solubilized NC-membrane slices (normalized to a size of 1 mm²) printed with indium spiked ink.

	Square 1	**Square 2**	**Square 3**	**Square 4**
^{115} In [cps]	2.29E+04	2.31E+04	2.30E+04	2.14E+04
^{114}Pr [cps]	4.59E+06	4.69E+06	4.69E+06	4.79E+06
norm. ^{115}In (^{115}In/^{141}Pr) [cps]	4.99E-03	4.92E-03	4.91E-03	4.47E-03
m (membrane slice) [g]	1.30E-03	1.33E-03	1.42E-03	1.17E-03
norm. ^{115}In/m [cps/g]	3.84E+00	3.70E+00	3.46E+00	3.82E+00
average [cps/g]	3.70E+00			
RSD [cps]	1.76E-01			
relative RSD [%]	5			

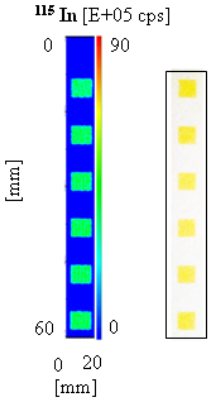

Figure 1 Images of the NC membrane. Left: ^{115}In intensity time profile of a printed NC membrane, right: photographic scan of identical area .

Table 3 Reproducible raw data of the six printed squares measured with LA-ICP-MS (See Figure 1, ESI).

squares	^{115}In Peakarea
1	8.78E+07
2	9.13E+07
3	9.21E+07
4	9.29E+07
5	9.17E+07
6	9.31E+07
average [counts]	9.15E+07
RSD [counts]	1.93E+06
relative RSD [%]	2

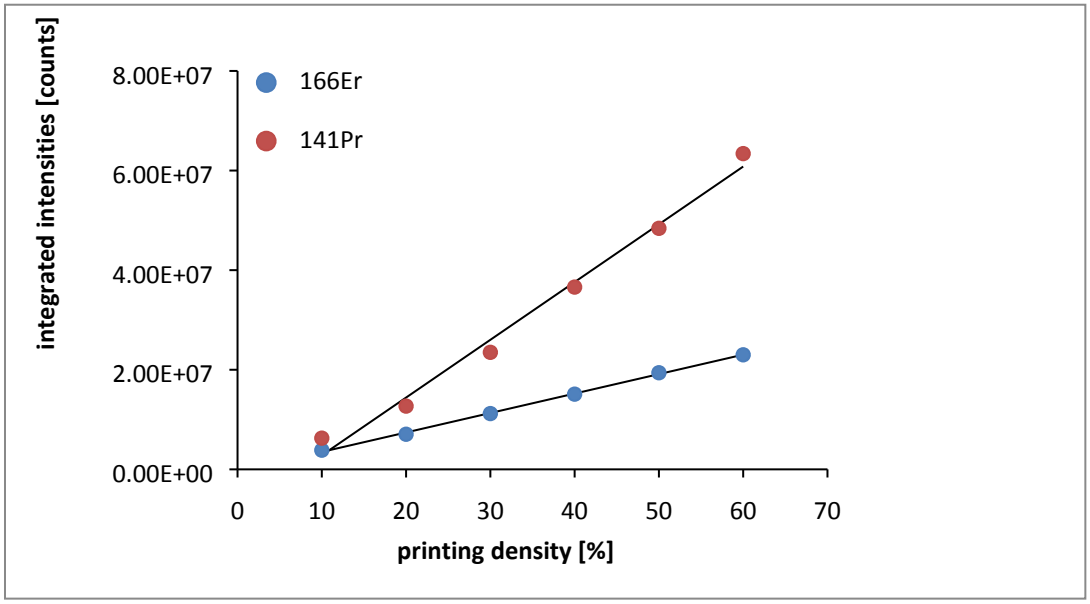

Figure 2 Linearity of the printed calibration standards detected via LA-ICP-MS. Calibration graph for the LA-ICP-MS integrated peak area [counts] vs printing density for 50 mg L^{-1} spiked ink (^{166}Er,^{141}Pr).

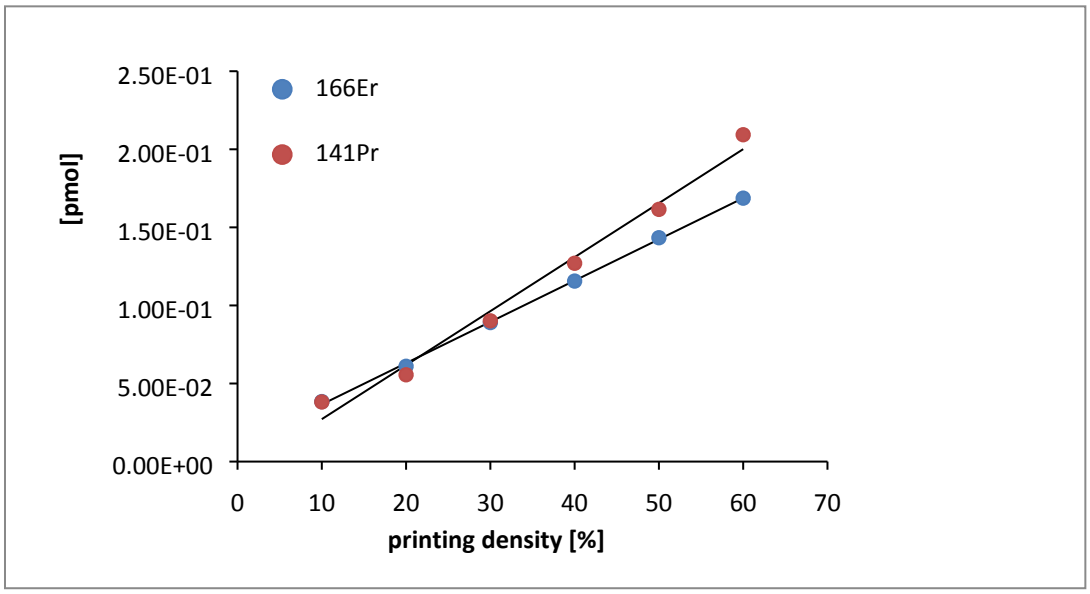

Figure 3 Linearity of the printed calibration standards detected via liquide-ICP-MS. Calibration graph for the liquide-ICP-MS integrated peak area [pmol] vs printing density for 50 mg L^{-1} spiked ink. Calibration graph for the liquide-ICP-MS [pmol] vs printing density for 50 mg L^{-1} spiked ink (^{166}Er,^{141}Pr).

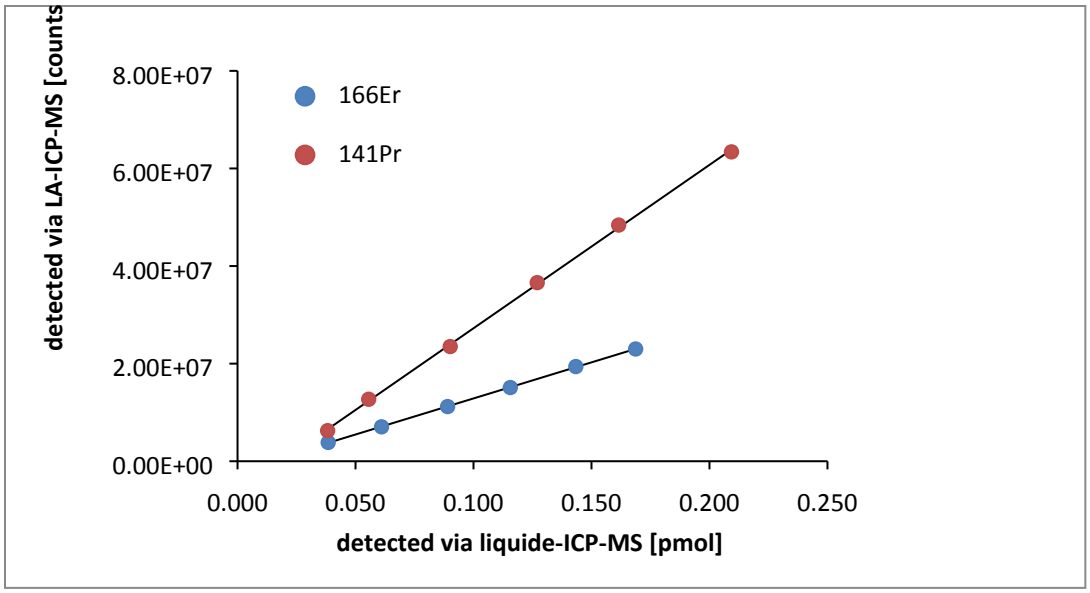

Figure 4 Calibration graph consisting of integrated data of LA-ICP-MS [counts] on the abscissa and the absolute metal amount determined by liquid-ICP-MS [pmol] on the ordinate of the printed calibration squares with the 50 mg L^{-1} spiked ink (^{166}Er,^{141}Pr).

Table 4 Protein quantification via erbium tagged protein molecular weight.

LA-ICP-MS	**serum albumin (bovine)**	**ovalbumin (chicken)**	**lysozym (chicken)**
lanthanide	Er	Er	Er
integrated peak area (1) [counts]	8.06E+07	6.52E+06	1.77E+07
integrated peak area (2) [counts]	7.96E+07	6.01E+06	1.72E+07
difference in percent [%]	1	8	3
average [counts]	8.01E+07	6.27E+06	1.75E+07
calibration curve (50 mg/L ink; ^{166}Er)	y [counts] = 1.48E+08 x [pmol] -1.91E+06; R^2=0.9999		

n (Er) [pmol]	0.52	0.06	0.10

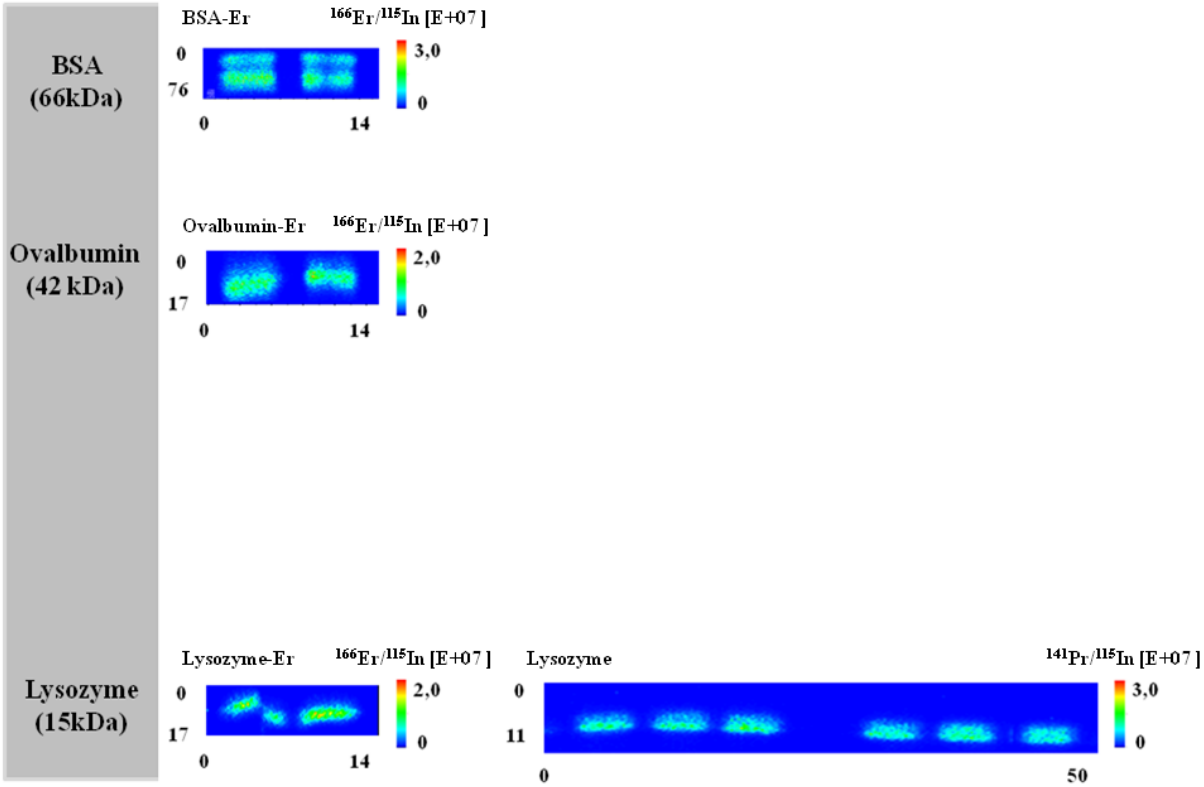

Figure 5 Left: MeCAT tagged standard proteins. Right: Multiplex immunoassay with MeCAT tagged antibodies and its respective antigens detected via LA-ICP-MS.