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Excellence in Science

When Things Get Rough You Need New Stuff

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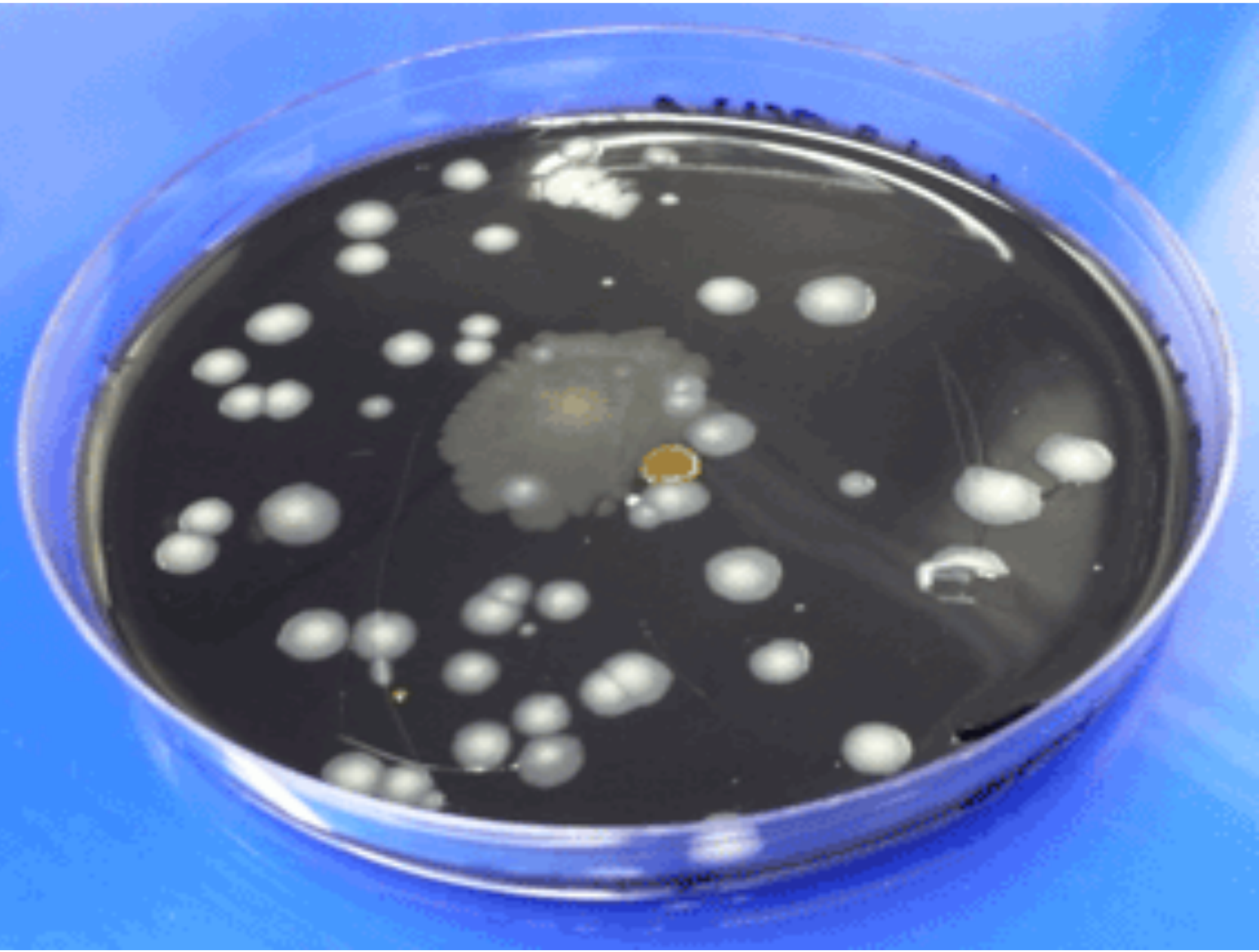
DON'T BE
AFRAID OF CHANGE.

It’s out there

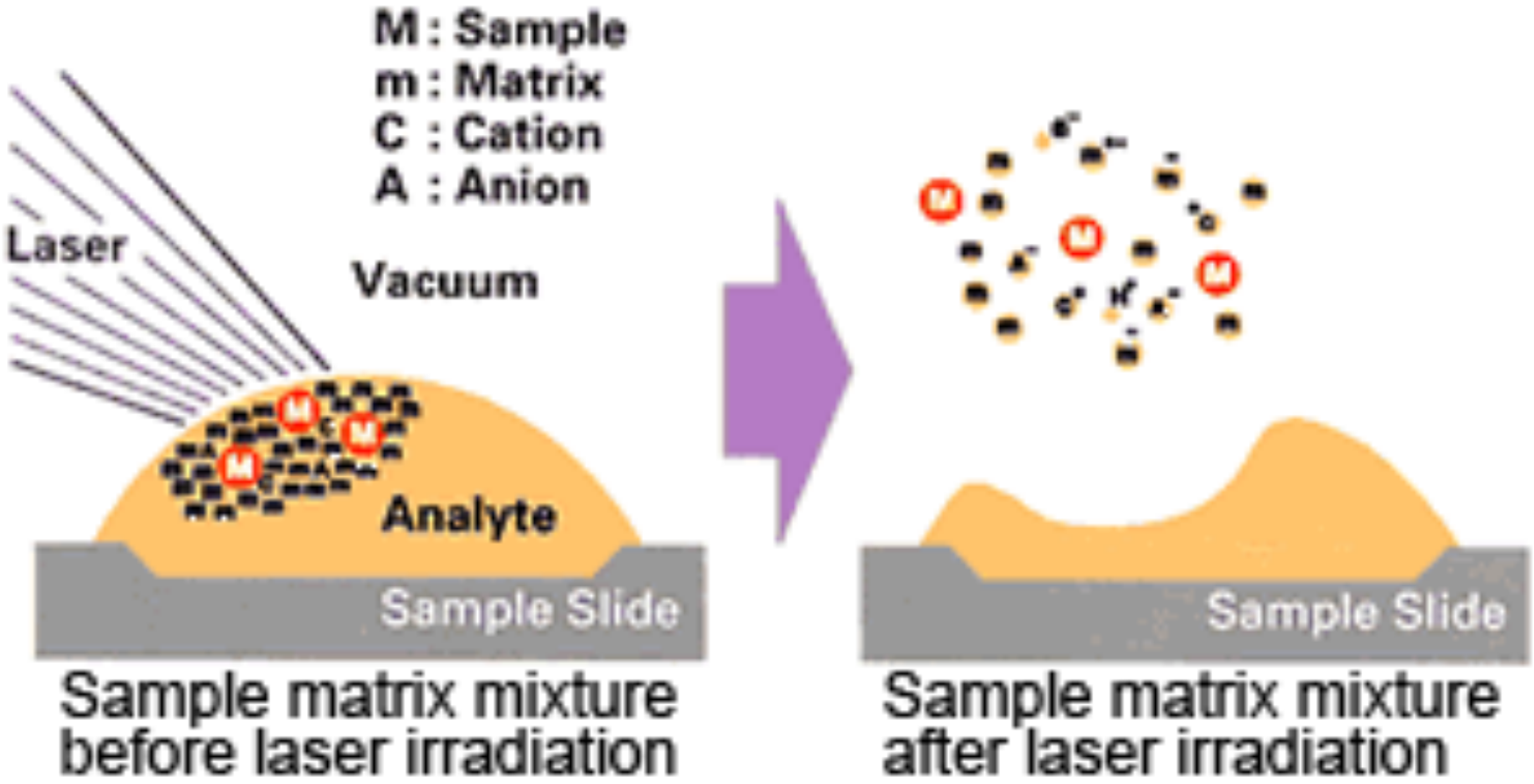
It's coming to get you

Are you ready?

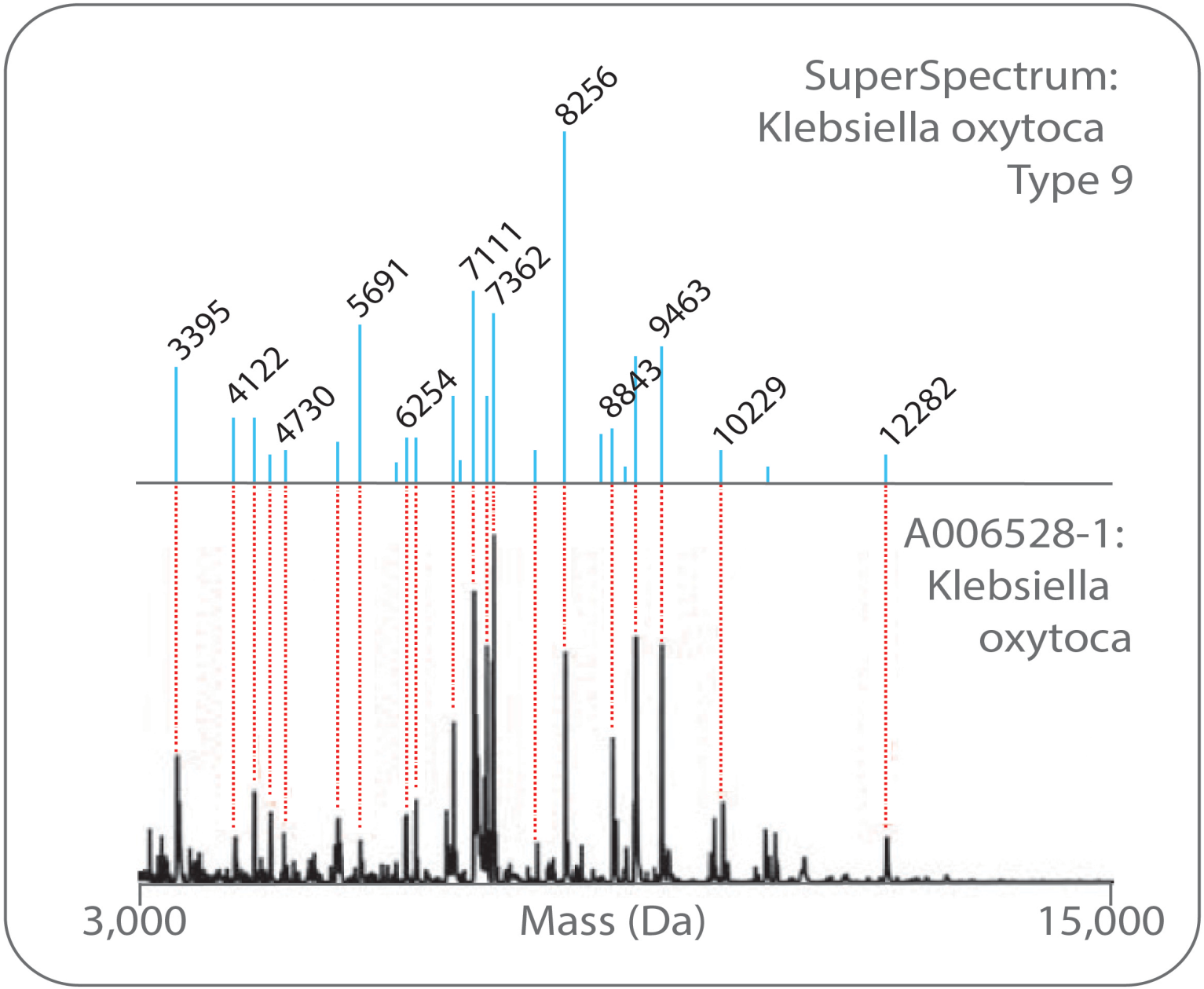
How will you detect it, and are your methods fast enough?



MALDI-TOF Mass Spectrometry can identify sub-species in under 2 minutes

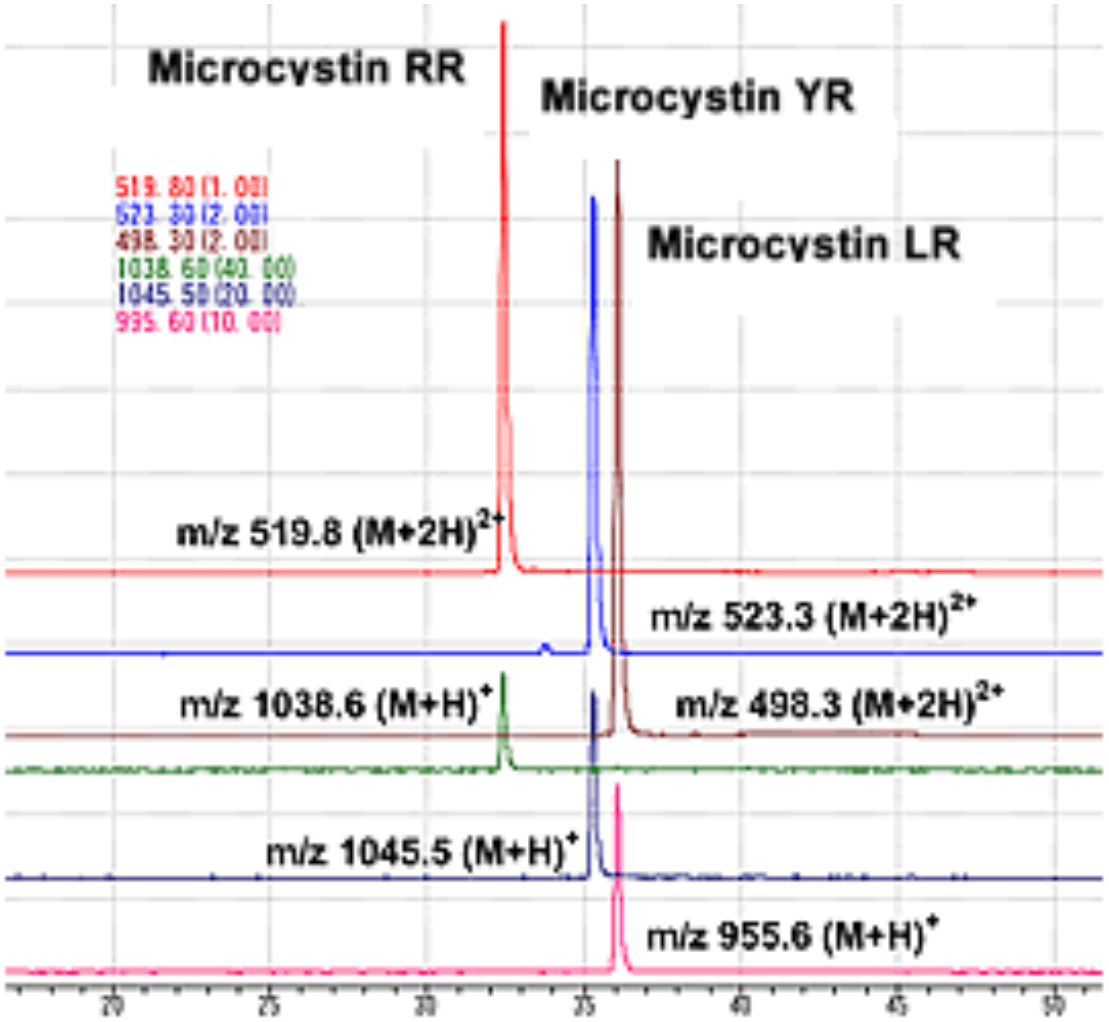


Red lines indicating a spectrum match



Algae is toxic and it Kills

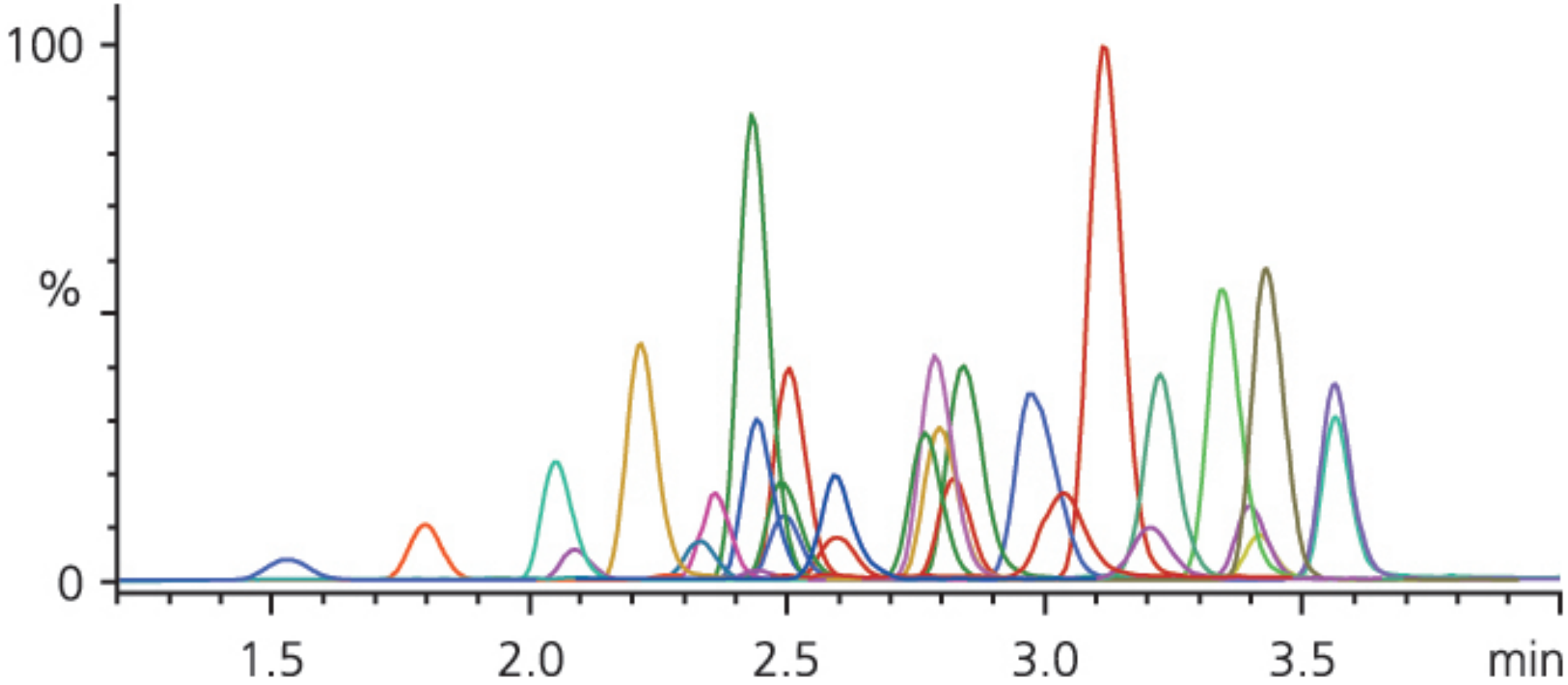
LCMSMS Analysis of Microcystins



Analysis of Algal Bloom

Polar pesticides and herbicides are difficult by GC

Analyze pesticides and herbicides by LCMSMS, with very little sample prep



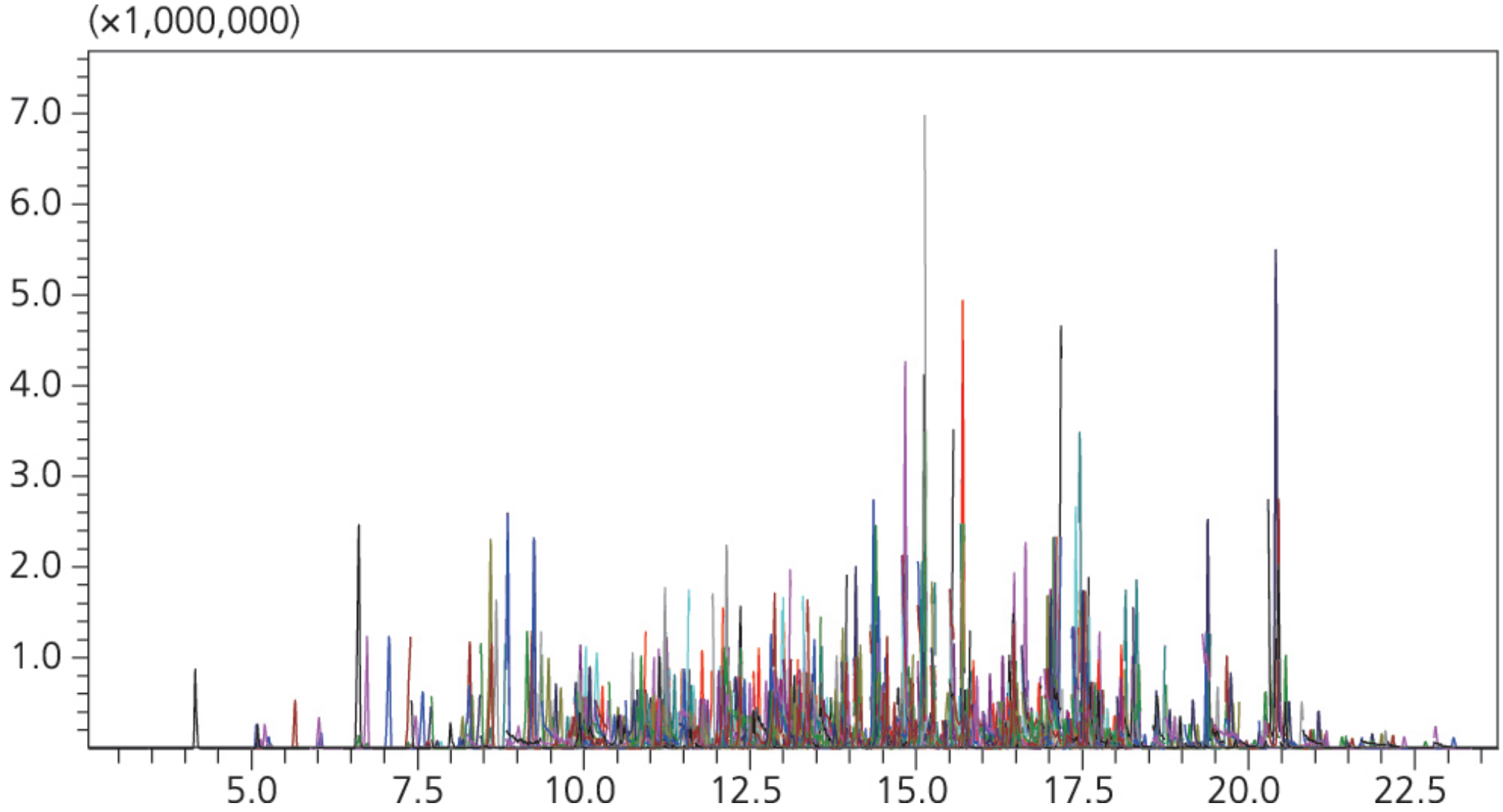
Analyze pesticides and herbicides by LCMSMS, with very little sample prep

No	Compound	LOQ pg/mL	1/100 of target pg/mL*
1	Thiuram	2.0	200
2	Bentazone	3.9	2000
3	Carbofuran	1.6	50
4	2,4-D	46.7	300
5	Triclopyr	45.3	60
6	Iprodione	1.7	3000
7	Asulam	2.3	2000
8	Bensulide	4.8	1000
9	Mecoprop (MCPP)	6.1	50
10	Carbaryl (NAC)	2.3	500
11	Carpropamid	1.3	400
12	Fenthion (MPP)	3.1	10
13	MPP sulfoxide	1.7	10
14	MPP sulfone	5.1	10
15	MPP oxon	4.9	10

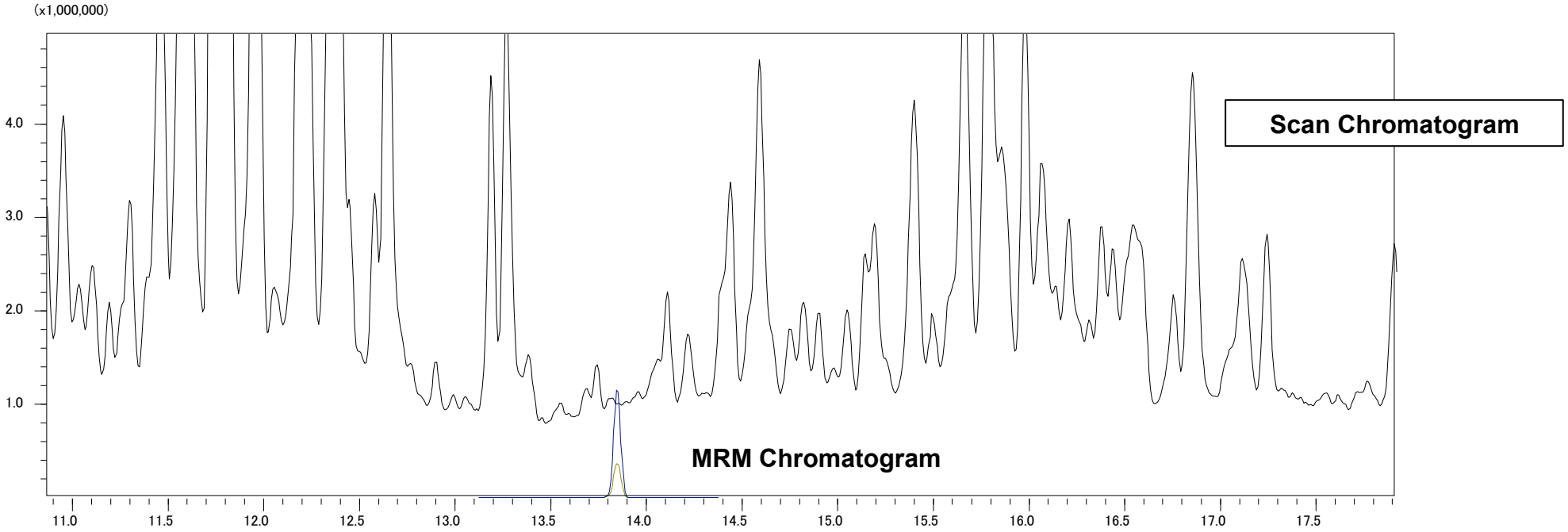
No	Compound	LOQ pg/mL	1/100 of target pg/mL*
16	MPP oxon sulfoxide	4.2	10
17	MPP oxon sulfone	5.7	10
18	Dymron	0.65	8000
19	Methomyl	2.3	300
20	Probenazole	5.2	500
21	Diuron (DCMU)	0.7	200
22	Bensulfuron-methyl	4.4	4000
23	Tricyclazole	2.7	800
24	Azoxystrobin	2.7	5000
25	Halosulfuron-methyl	0.52	3000
26	Flazasulfuron	0.47	300
27	Thiodicarb	3.4	800
28	Siduron	0.82	3000
29	Fipronil	4.7	5

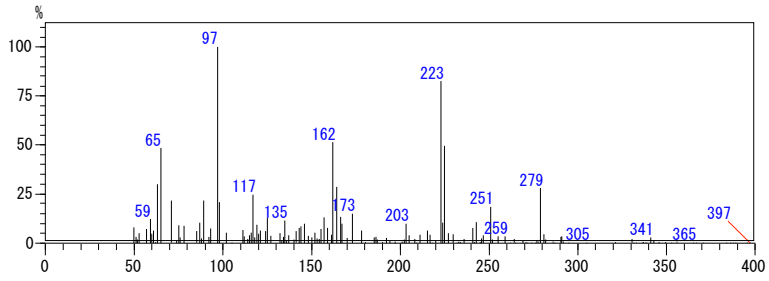
*Note: Official analytical methods require detection to 1/100th of regulatory targets.

We can analyze hundreds more pesticides with high selectivity and sensitivity by GCMSMS

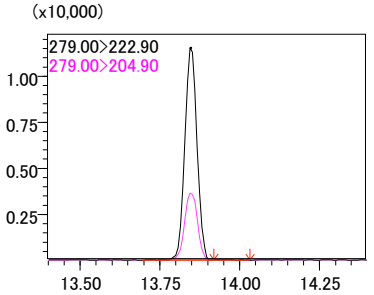


Methods can retain full scan capability and add MRM for greater selectivity and sensitivity





Qualification

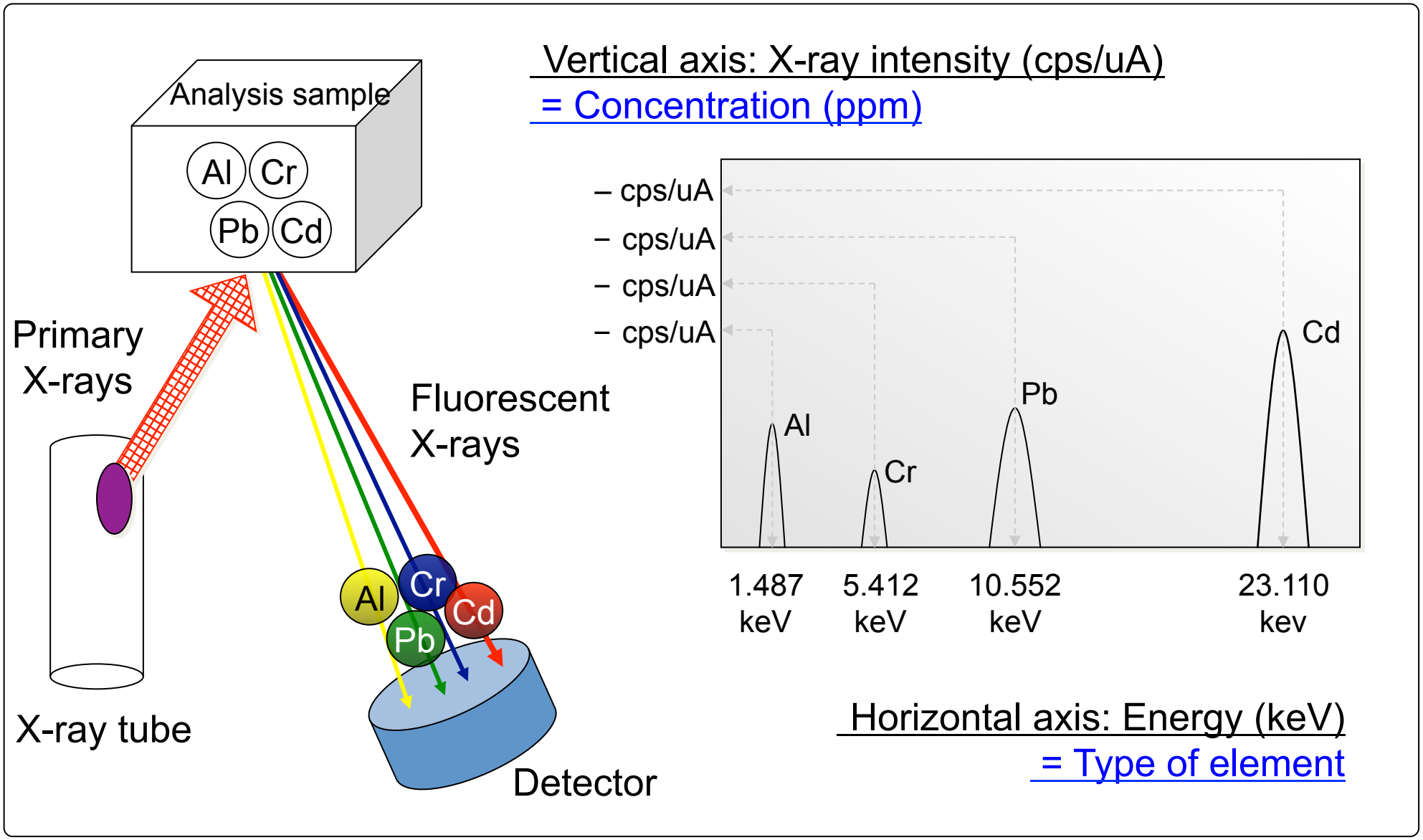


Quantification

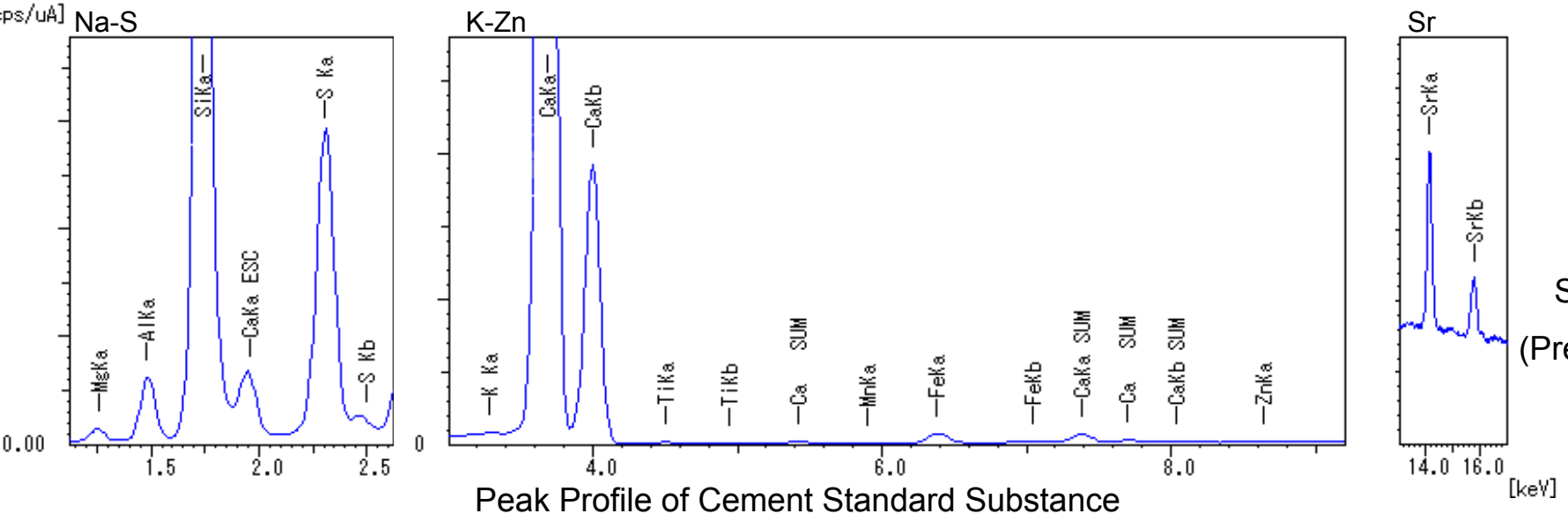
Analysis of solid waste for metals requires acid digestion and instrumental analysis,

Or,

And create new methods that use XRF



An example of a whole rock quantitative analysis of cement



Peak Profile of Cement Standard Substance

Sample Appearance

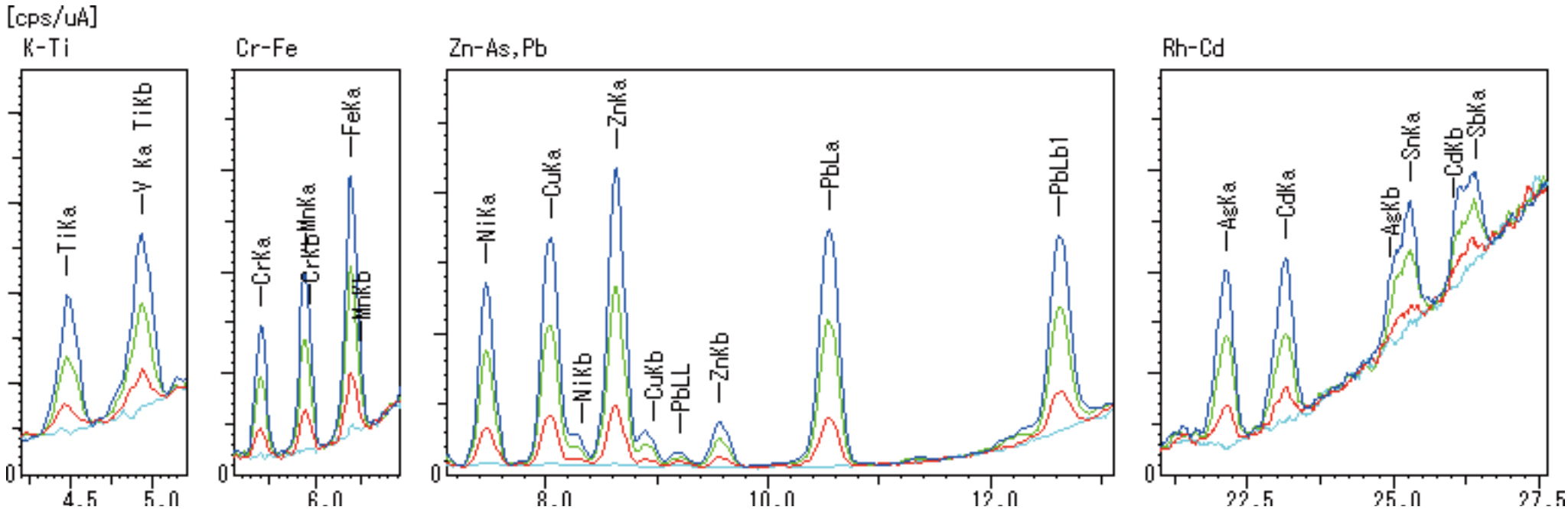
(Press-formed at 250 kN for 30 sec)

	% MgO	% Al_2O_3	% SO_3	% CaO
XRF	1.75	3.95	21.9	69.6
CRM	1.93	3.88	22.4	67.9

Just place liquids, slurry samples, and emulsions in a sample cell

Sample cell, film, and 5 mL oil

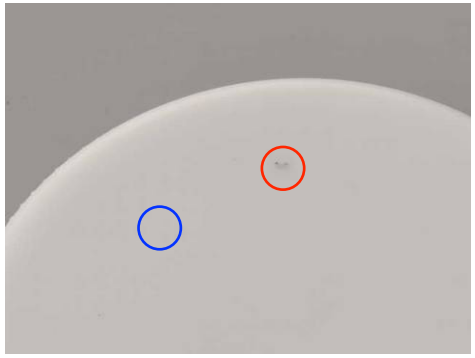
Elements in Waste Oil (0, 10, 30, and 50 ppm of each element)



Overlaid Profiles of Heavy Elements in Waste Oil

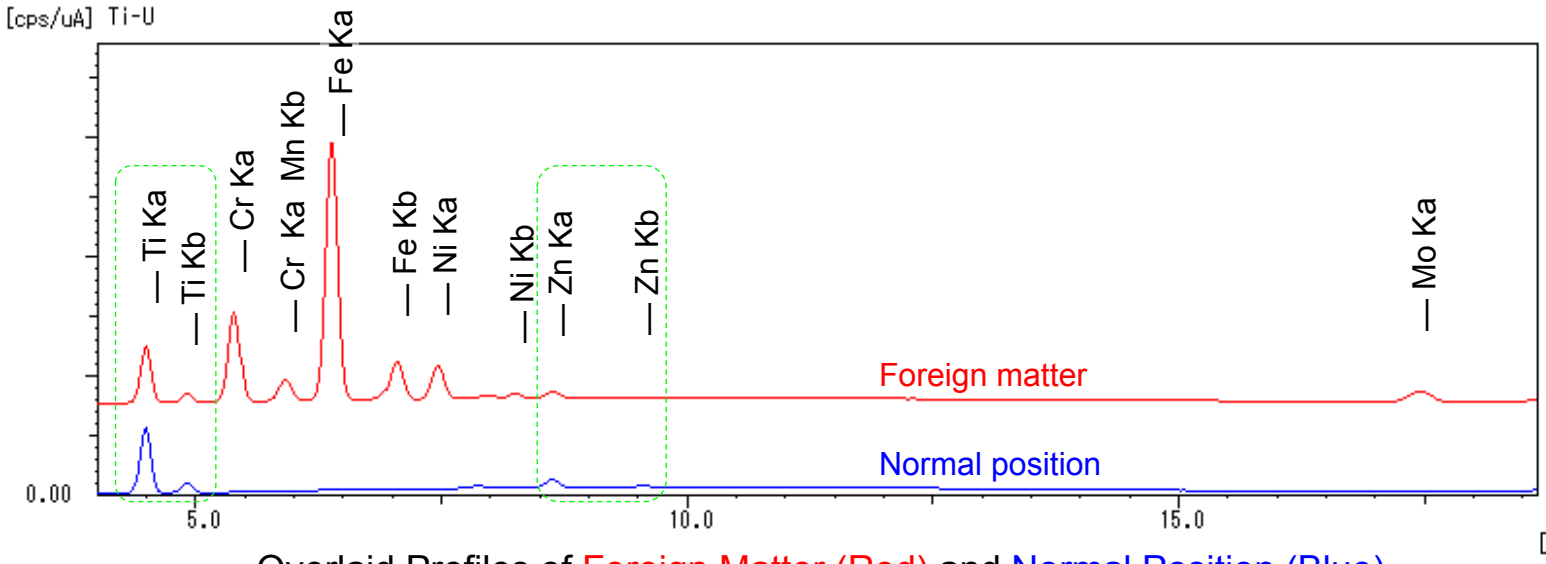
Blank Sample — **10 ppm** — **30 ppm** — **50 ppm**

Foreign Matter Adhering to a Plastic Extruded Part



Sample Appearance

Red circle: Foreign matter
Blue circle: Normal position



Overlaid Profiles of Foreign Matter (Red) and Normal Position (Blue)

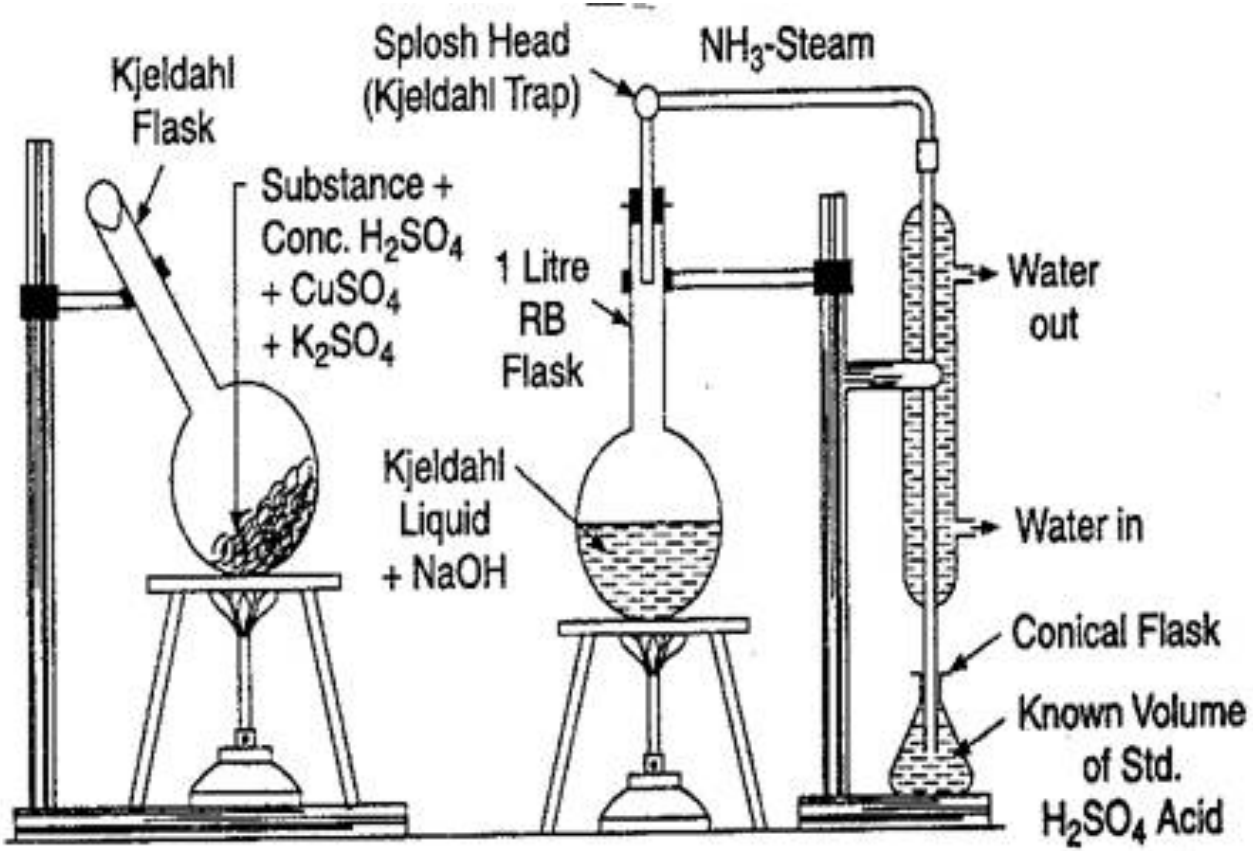
Analyte	Result	
Fe	68.287	%
Cr	16.166	%
Ni	11.424	%
Mo	2.505	%
Mn	1.619	%

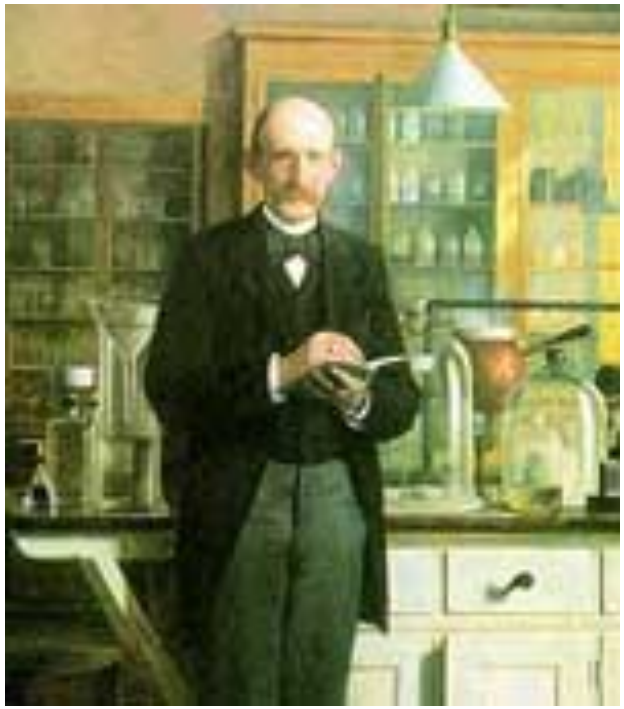
Let’s reduce toxic chemicals

Replace toxic cadmium with reductase for NOx

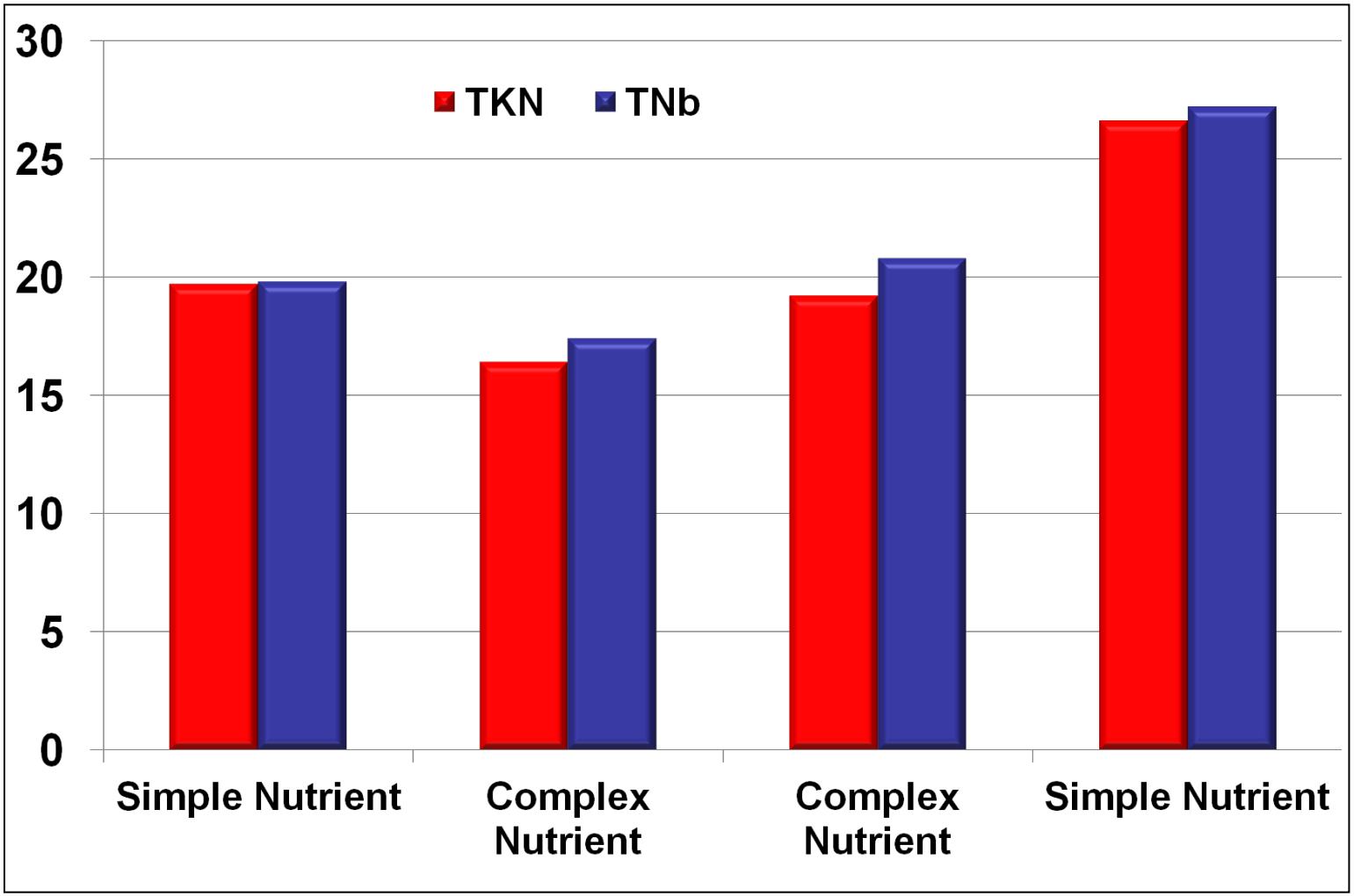
Sample #	Commercial Laboratory Results, Analysis Method EPA 335.2 (mg NO_3+NO_2-N/L)	Analysis by Reductase (mg NO_3+NO_2-N/L)
1	0.8	0.94
2	<0.1	0.05
3	<0.1	0.24
4	0.66	0.68
5	11.8	11.6
6	0.78	0.79
7	2.4	3.11

Should we continue with the Kjeldahl Method for TKN?





Or use HTCO methods and obtain near equal results with TKN



Technology is advancing faster than the methods

It's time for some new stuff

- **MALDI TOF – New, faster way to confirm bacteria**
- **LCMSMS – Emerging Contaminants not visible before**
- **GCMSMS – more sensitive, higher throughput**
- **XRF – no digestions, higher throughput**
- **NOx – safer, non toxic reagents**
- **TN – safer and higher throughput than TKN**

Thank You, for more information contact me

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