

## APPENDIX 5

Cargill Certificates of Analysis for Non-Shellfish Glucosamine HCL and Chinese Shellfish  
Glucosamine Hydrochloride - SUMMARY

Comparison of Cargill vs. Shellfish Glucosamine Certificates of Analysis.

Test	Specification	Cargill Lot GP-011	Cargill Lot GP-017C	Chinese Shellfish Glucosamine Example 1	Chinese Shellfish Glucosamine Example 2	Chinese Shellfish Glucosamine Example 3	Chinese Shellfish Glucosamine Example 4
Specific Rotation	+70.0° to +73° [a] <sup>25</sup> <sub>D</sub> (2.5%, H <sub>2</sub> O, =3.5 hrs)	+71.4	+71.5	+71.85	+71.85	+72.1	+71.5
pH	3.0 to 5.0 (20 mg/mL)	3.3	3.3	4.00	3.83	4.1	3.66
Loss on Drying	<1.0% by weight	0.7	0.6	0.04	0.03	0.038	0.08
Residue on Ignition	<0.1% by weight	0.03	0.02	0.07	0.04	0.03	0.05
Heavy Metals <sup>1</sup>	<0.001% by weight	<0.001	<0.001	("2ppm") 0.0002	("<10ppm") <0.001	("<10ppm") <0.001	("<10ppm") <0.001
Assay Arsenic <sup>1</sup>	98-102% dry basis = 3 ppm	100.3	99.4	99.83	99.79	99.7	99.3
Sulfate	<0.24%	<0.5	0.5	Not recorded	<0.5	<0.5	Not recorded
ID-IR	Matches	Matches	Matches	Not recorded	Not recorded	Not recorded	Not recorded
Spectrum ID-chloride	Meets	Meets	Meets	"16.54%"	"16.49%"	Not recorded	Not recorded
ID-HPLC retention time	Matches	Matches	Matches	Not recorded	Not recorded	Not recorded	Not recorded
Organic Volatiles <sup>2</sup>	Meets	Not Applicable	Not Applicable	Not recorded	Not recorded	Not recorded	Not recorded

<sup>1</sup> Heavy metals and arsenic were done by ICP (in the case of Cargill products). This allowed actual quantification of the amount of each element of concern, as opposed to the USP-NF qualitative test that is either pass or fail.

<sup>2</sup> The organic volatiles test is not run because it is not applicable to Cargill's process.