

Separation of Furosine in Dairy Products, Using Reversed Phase HPLC

Analysis of furosine in milk samples prior to sale is a common practice in Europe and elsewhere. Known for its deteriorative and browning reaction in foods, furosine can be separated quickly on a SUPELCO SIL LC-8 column. Our analysis of a furosine standard and an infant milk formula, using conventional and cartridge SUPELCO SIL columns, resulted in excellent compound resolution on each column. (ChromFax: 394044)

Key Words:

• furosine • Maillard reaction • dairy products

The Maillard reaction, also known as non-enzymatic browning, is a common reaction in foods. Under mild heat treatment, proteins interact with reducing sugars, forming ϵ -deoxyfructosyllysine, which hydrolyses under acidic conditions to form furosine. Furosine has been shown to effectively indicate the extent of progression of the Maillard reaction. The furosine level is related to the extent of a food's processing as well as its storage conditions.

Some methods of quantitating furosine are cumbersome and time-consuming. Long elution times are common, and severe peak fronting on chromatograms is often experienced. We modified one method calling for a simple isocratic HPLC method to quantitatively determine furosine content (1), by using a 25cm x 4.6mm ID, 5 μ m particle SUPELCO SIL™ LC-8 reversed phase HPLC column.

We analyzed a furosine standard using a conventional SUPELCO SIL LC-8 column (Figure A1). The retention time was less than five minutes, considerably lower than observed in other analyses.

Next we separated furosine from a hydrolyzed sample of commercially available powdered infant formula (Figure A2). The sample was hydrolyzed for 22 hours in 6N hydrochloric acid at 110°C. The mixture was then diluted to 10mL with deionized water. A 1mL aliquot was removed and concentrated to dryness. The residue was then diluted in 1mL of deionized water, filtered through a 0.45 μ L syringe-tip filter, and injected onto the conventional LC-8 column. The column exhibited excellent resolution of furosine from the other sample components, as well as short retention time.

We conducted the same analyses using a SUPELCO SIL LC-8 cartridge column (Figure B). Note that, as expected, the cartridge column delivered virtually the same excellent results as the conventional column.

Figure A. Furosine Analysis on a Conventional Column

Column: SUPELCO SIL LC-8, 25cm x 4.6mm (5 μ m particles)
Cat. No.: 58297
Mobile Phase: 0.06M sodium acetate, pH 4.3 with acetic acid
Flow Rate: 2.0mL/min
Det.: UV, 280nm, 0.1 AUFS
Inj.: 0.24mg/mL furosine standard

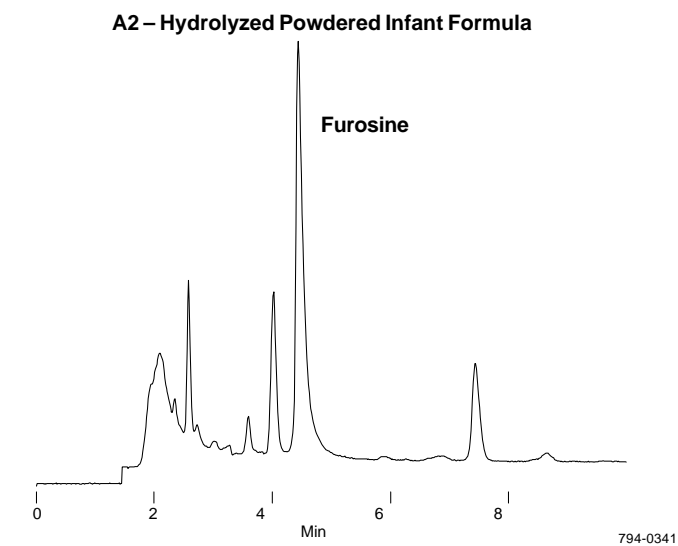
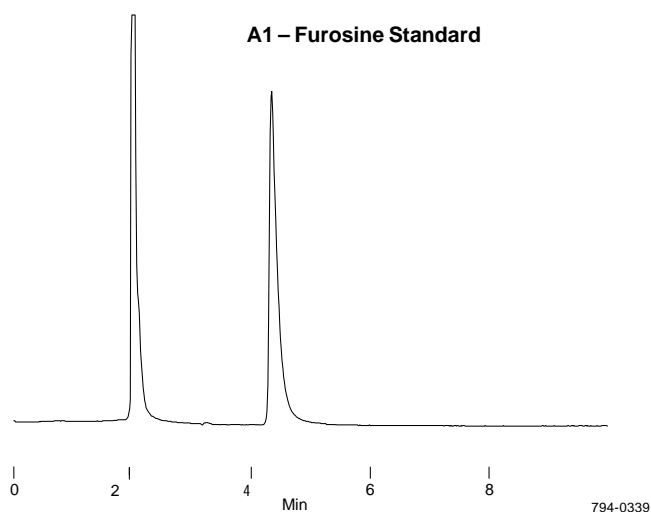
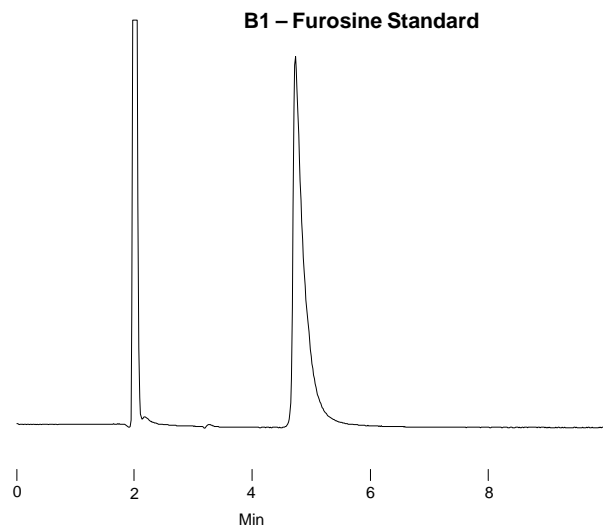
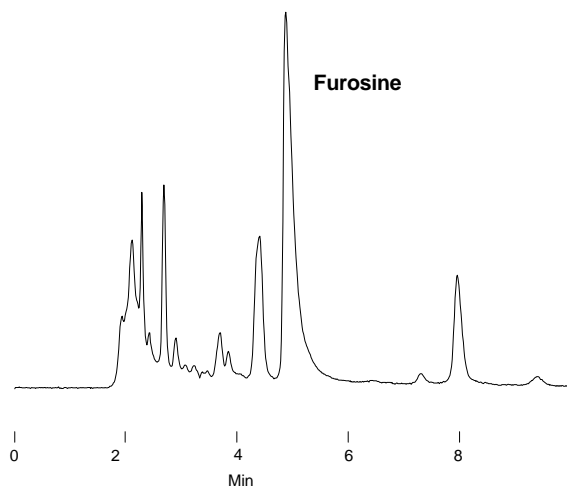


Figure B. Furosine Analysis on a Cartridge Column

Column: **SUPELCOSIL LC-8 cartridge column**
25cm x 4.6mm (5µm particles)
 Cat. No.: **55105**
 Mobile Phase: 0.06M sodium acetate, pH 4.3 with acetic acid
 Flow Rate: 2.0mL/min
 Det.: UV, 280nm, 0.1 AUFS



B2 – Hydrolyzed Powdered Infant Formula



If your food analyses include the quantitation of furosine, consider the advantages of the SUPELCOSIL LC-8 column either conventional or cartridge conformation. We strongly recommend that you use a Supelguard™ LC-8 guard column to protect your analytical column.

Ordering Information:

SUPELCOSIL LC-8 Column	25cm x 4.6mm ID, 5µm particles	58297
SUPELCOSIL LC-8 Cartridge Column	25cm x 4.6mm ID, 5µm particles	55105
	Requires reusable cartridge end fittings (Cat. No. 5-5200)	
Cartridge End Fittings	Pk. of 2	55200-U
Supelguard LC-8 Kit[▲]	2cm x 4.6mm ID	59552
Cartridge Guard Column Holder	connects guard column directly to cartridge column	55205
Supelguard LC-8 Replacement Columns	2cm x 4.6mm ID, pk. of 2	59562
Iso-Disc™ Syringe Filters	25mm ID, 0.45µm pores, Pk. of 50	59230-U

[▲]Includes a 2cm column, a reusable column holder, and column connecting hardware.

Reference

1. Chiang, G. H., *J. Agric. Food Chem.* **31**, 1373-1374 (1983).

Iso-Disc, SUPELCOSIL, and Supelguard are trademarks of Supelco, Inc.

Contact our Technical Service Department
 (phone 800-359-3041 or 814-359-3041, FAX 814-359-5468)
 for expert answers to your questions.

Note 44

For more information, or current prices, contact your nearest Supelco subsidiary listed below. To obtain further contact information, visit our website (www.sigma-aldrich.com), see the Supelco catalog, or contact Supelco, Bellefonte, PA 16823-0048 USA.

ARGENTINA · Sigma-Aldrich de Argentina, S.A. · Buenos Aires 1119 **AUSTRALIA** · Sigma-Aldrich Pty. Ltd. · Castle Hill NSW 2154 **AUSTRIA** · Sigma-Aldrich Handels GmbH · A-1110 Wien
BELGIUM · Sigma-Aldrich N.V./S.A. · B-2880 Bornem **BRAZIL** · Sigma-Aldrich Quimica Brasil Ltda. · 01239-010 São Paulo, SP **CANADA** · Sigma-Aldrich Canada, Ltd. · 2149 Winston Park Dr., Oakville, ON L6H 6J8
CZECH REPUBLIC · Sigma-Aldrich s.r.o. · 186 00 Praha 8 **DENMARK** · Sigma-Aldrich Denmark A/S · DK-2665 Vallensbaek Strand **FINLAND** · Sigma-Aldrich Finland/YA-Kemia Oy · FIN-00700 Helsinki
FRANCE · Sigma-Aldrich Chimie · 38297 Saint-Quentin-Fallavier Cedex **GERMANY** · Sigma-Aldrich Chemie GmbH · D-82041 Deisenhofen **GREECE** · Sigma-Aldrich (o.m.) Ltd. · Ilioupoli 16346, Athens
HUNGARY · Sigma-Aldrich Kft. · H-1067 Budapest **INDIA** · Sigma-Aldrich Co. · Bangalore 560 048 **IRELAND** · Sigma-Aldrich Ireland Ltd. · Dublin 24 **ISRAEL** · Sigma Israel Chemicals Ltd. · Rehovot 76100
ITALY · Sigma-Aldrich s.r.l. · 20151 Milano **JAPAN** · Sigma-Aldrich Japan K.K. · Chuo-ku, Tokyo 103 **KOREA** · Sigma-Aldrich Korea · Seoul **MALAYSIA** · Sigma-Aldrich (M) Sdn. Bhd. · Selangor
MEXICO · Sigma-Aldrich Quimica S.A. de C.V. · 50200 Toluca **NETHERLANDS** · Sigma-Aldrich Chemie BV · 3330 AA Zwijndrecht **NORWAY** · Sigma-Aldrich Norway · Torshov · N-0401 Oslo
POLAND · Sigma-Aldrich Sp. z o.o. · 61-663 Poznań **PORTUGAL** · Sigma-Aldrich Quimica, S.A. · Sintra 2710 **RUSSIA** · Sigma-Aldrich Russia · Moscow 103062 **SINGAPORE** · Sigma-Aldrich Pte. Ltd.
SOUTH AFRICA · Sigma-Aldrich (pty) Ltd. · Jet Park 1459 **SPAIN** · Sigma-Aldrich Quimica, S.A. · 28100 Alcobendas, Madrid **SWEDEN** · Sigma-Aldrich Sweden AB · 135 70 Stockholm
SWITZERLAND · Supelco · CH-9471 Buchs **UNITED KINGDOM** · Sigma-Aldrich Company Ltd. · Poole, Dorset BH12 4QH
UNITED STATES · Supelco · Supelco Park · Bellefonte, PA 16823-0048 · Phone 800-247-6628 or 814-359-3441 · Fax 800-447-3044 or 814-359-3044 · email: supelco@sial.com

H

Supelco is a member of the Sigma-Aldrich family. Supelco products are sold through Sigma-Aldrich, Inc. Sigma-Aldrich warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product for a particular use. Additional terms and conditions may apply. Please see the reverse side of the invoice or packing slip.