510K Summary (K094018)

Submitter:

APR 1 6 2010

Biocompatibles UK Ltd.
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Contact:

Dr. Alistair Taylor, Director of Quality and Regulatory Affairs

1 Common name, Trade name(s) & Classification

Trade name(s): LC Bead Microspheres & BeadBlock Microspheres

Common name(s) & Codes:

Vascular Embolization Device, embolization, arterial (Code: KRD)

Neurovascular Embolization Device, artificial embolization (Code: HCG)

2 510(k) Numbers and Product Codes of equivalent devices.

Biocompatibles UK Ltd
GelSpheres Microspheres
Bead Block Compressible Microspheres
510K Number: K033761
Product Code: HCG/KRD
CFR Section: 882.5950

Biocompatibles UK Ltd.
GelSpheres Microspheres
Bead Block Compressible Microspheres
510K Number(s): K042231/K083091
Product Code: HCG/KRD
CFR Section: 870.3300/882.5950

3 Indications for Use and Intended Population

"LC Bead Microspheres & Bead Block Compressible Microspheres is intended for embolization of hypervascular tumors and arteriovenous malformations."

4 Device Description

LC Bead/Bead Block are preformed, soft, deformable microspheres that occlude arteries for the purpose of blocking the blood flow to a target tissue, such as a hypervascular tumor or arteriovenous malformations (AVM's). LC Bead/Bead Block consists of a macromer derived from polyvinyl alcohol (PVA). The fully polymerized microsphere is approximately 90% water and is compressible to approximately 20-30% by diameter. Bead Block is dyed blue (LC Bead are available as blue and in natural color) to aid in the visualization of the microspheres in the delivery syringe. The microspheres can be delivered through typical microcatheters in the 1.8-5Fr range.

LC Bead is supplied sterile and packaged in sealed glass vials. Bead Block is supplied sterile and packaged in polycarbonate syringes. The product configurations are described in the table. LC Bead/Bead Block are supplied in several unit sizes covering the range from 100-1200µm diameter. At the time of use, LC Bead/Bead Block is mixed with a nonionic contrast agent, e.g. Omnipaque™, to make a 30-50% by weight solution.

Product	Volume of beads (mL)	Volume PBS (mL)	Total volume (mL)
LC Bead Microspheres	1	7	8
	2	6	8
Bead Block Compressible Microspheres	1	5	6
	2	4	6

LC Bead/Bead Block product configurations.

5 Similarities and Differences to Predicates

The intended use of LC Bead/Bead Block and the predicate device are the same and unchanged. Biocompatibles UK Ltd intend to market LC Bead with an additional SKU in the size range of 70-150µm. Only minor process modifications were made to allow for the

production of this size range. Other than the additional size range, there are no differences when comparing LC Bead/Bead Block to the predicate device.

6 Physical Properties and Characteristics

LC Bead & Bead Block are preformed, soft, deformable microspheres which consist of a macromer derived from polyvinyl alcohol (PVA). The fully polymerized microsphere is approximately 90% water and is compressible to approximately 20-30% by diameter. Compressed beads will recover to their original size (e.g. when compressed passing though a catheter, the beads will return to their original size after exiting the catheter). This Pre-Market notification adds the size range of 70-150µm for the blue dyed version of LC Bead. Both products are supplied in a variety of size ranges as follows:

Product Code	Size Range (µm)	Quantity Bead Block (mL)	Quantity PBS (mL)
EB1S103	100-300	1	5
EB1S305	300-500	1	5
EB1S507	500-700	1	5
EB1S709	700-900	1	5
EB1S912	900-1200	1	5
EB2S103	100-300	2	4
EB2S305	300-500	2	4
EB2S507	500-700	2	4
EB2S709	700-900	2	4
EB2S912	900-1200	2	4

Bead Block available size ranges

Product Code	Size Range (µm)	Quantity LC Bead (mL)	Quantity PBS (mL)
UB1V103	100-300	1	7
UB1V305	300-500	1	7
UB1V507	500-700	1	7
UB1V709	700-900	1	7
UB1V912	900-1200	1	7
UB2V103	100-300	2	6
UB2V305	300-500	2	6
UB2V507	500-700	2	6
UB2V709	700-900	2	6
UB2V912	900-1200	2	6

LC Bead (undyed) available size ranges

Product Code	Size Range (µm)	Quantity LC Bead (mL)	Quantity PBS (mL)
VE110GS	70-150	1	7
VE210GS	100-300	1	7
VE410GS	300-500	1	7
VE610GS	500-700	1	7
VE810GS	700-900	1	7
VE1010GS	900-1200	1	7
VE120GS	70-150	2	6
VE220GS	100-300	2	6
VE420GS	300-500	2	6
VE620GS	500-700	2	6
VE820GS	700-900	2	6
VE1020GS	900-1200	2	6

LC Bead (dyed) available size ranges

6.1 Differences between LC Bead and Bead Block

Bead Block is dyed blue using an FDA approved dye (used in contact lenses) to aid in the visualization of the microspheres in the delivery syringe (LC Bead are available as blue and in natural color). Bead Block is provided in a polycarbonate sterile syringe, LC Bead is provided in a sterile glass vial. The primary difference between LC Bead and Bead Block products, aside from the packaging relates to the degree of functionalisation of the macromer and the ratios of initiators used in the reaction which results in differences in the degree of crosslinking of the polymer in the microspheres.

This pre-market notification relates only to the addition of a size fraction for LC Bead in the range of 70-150µm which is a subgroup of the currently marketed LC Bead 100-300µm product and the 70-150µm size specification falls within that of the cleared 100-300 µm LC Bead size range. Please refer to Section 8: In-Vitro testing for further product characterization information. There is no change to the product supplied under the Bead Block trade name.

7 Summary of Non-clinical data

LC Bead and Bead Block have been tested in pre-clinical models for biocompatibility and safety in accordance with the FDA Guidance for Industry and staff; Class II Special Controls Guidance Document: Vascular and Neurovascular Embolization Devices.

7.1 Tests of Biocompatibility

Tests for biocompatibility were conducted in accordance with ISO 10993 parts 1, 3, 4, 6, 10 and 11 (listed in section 9), the products conform to the relevant requirements of these standards.

Biocompatibility Test	Pass/Fail
Genotoxicity: In Vitro Chromosomal Aberration Study in Mammalian Cells	Pass
Mouse Bone Marrow Micronucleus Study	Pass
In Vitro Hemolysis Study (Modified ASTM-Direct Contact Method)	Pass
ISO Muscle Implantation Study in the Rabbit	Pass
Cytotoxicity Study using the ISO Elution Method	Pass
ISO Sensitization Study in the Guinea Pig	Pass
ISO Acute Intracutaneous Reactivity Study in the Rabbit	Pass
Chronic Toxicity Study in the Rat following Subcutaneous Implantation (13 weeks)	Pass
Subchronic Intravenous Toxicity Study in the Rat (14 day, saline extract)	Pass
Genotoxicity: Bacterial Reverse Mutation Study	Pass
ISO Acute Systemic Toxicity Study in the Mouse (liquid/chemical)	Pass
ISO Surgical Muscle Implantation in the Rabbit (26 weeks)	Pass

7.2 Pre-clinical testing in a large animal model

Summary of the Evaluation of LC Bead (formerly Gelspheres) Embolic Agent in a Swine Embolization Model

The purpose of this study was to evaluate, characterize and compare the performance of LC Bead Embolic Agent (n=36) and Embosphere® microspheres (n=36) in a swine bilateral partial renal artery embolization model in order to assess the ability of these agents to occlude the vessel.

The primary outcomes for this study were assessment of:

(1) recanalization of the vessels, and,

(2) local and systemic foreign body tissue reactions.

The secondary outcomes were assessment of:

(1) ease of delivery of the embolic agent,

(2) the occurrence of blood vessel rupture

(3) non-target embolization/device migration.

LC Bead Embolic Agent and Embospheres microspheres performed in a substantially equivalent manner at 2, 7 and 28 days for all parameters except recanalization, where LC Bead appears to have an advantage of having a more durable embolization effect. The tissue reaction for both LC Bead and Embospheres was very mild and was essentially the same. Both embolic agents delivered easily, but Embospheres had six cases of catheter clogging out of 36 cases. There was

only one case of catheter clogging with LC Bead. There were no incidents of blood vessel rupture during the embolization procedures. There was one case of unexplained non-target embolization with Embospheres and none with LC Bead. Alternatively, there was one potential case of device migration with LC Bead and none with Embospheres.

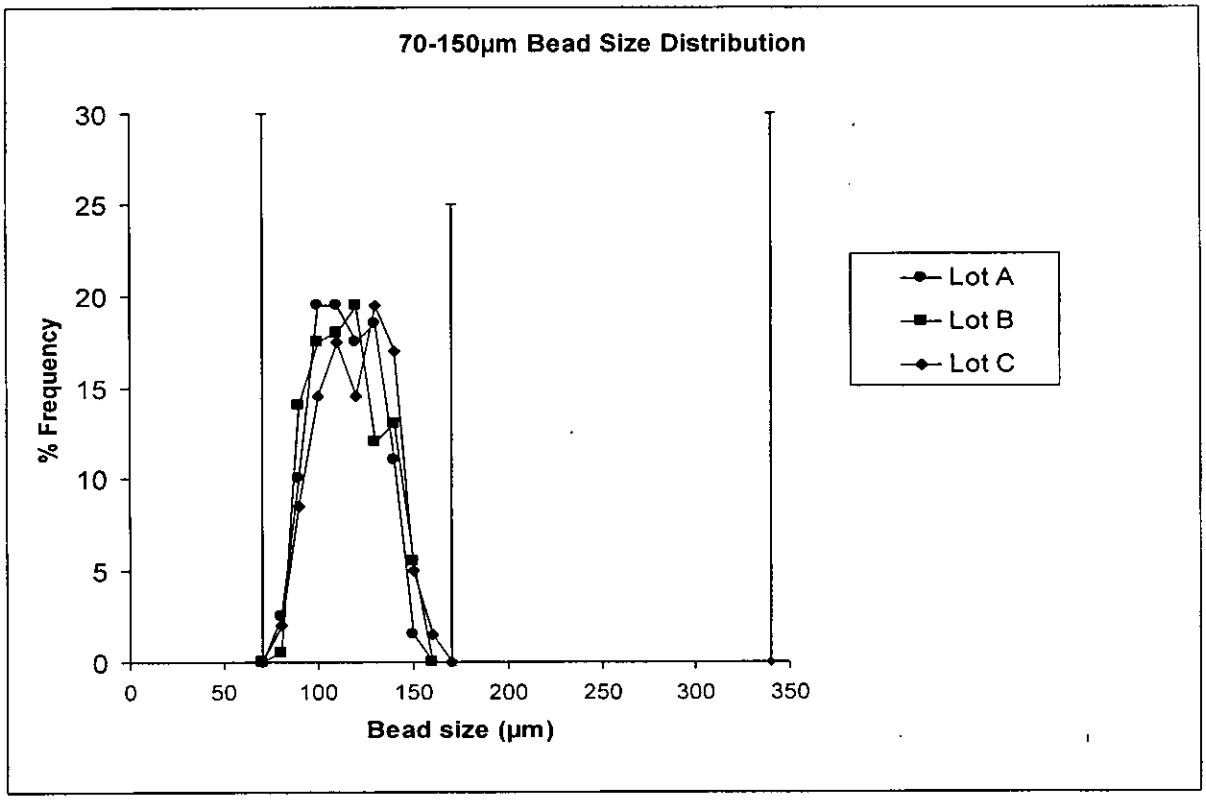
8 Summary of In-Vitro testing

Both LC Bead and Bead Block have been extensively tested and subject to product and process validation and verification testing. A summary of key characteristics for which test data has been provided in this 510K, are described in this section.

8.1 Size distribution

Data was provided in this pre market notification regarding the verification and validation of the new size range of LC Bead. The table and illustration below provide the results of these tests and demonstrate that all product met specification with respect to bead size.

Product	Sizing Specification	Fibres Specification
Current LC Bead 100-300µm	Pass	Pass
LC Bead 70-150µm	Pass	Pass



8.2 Compressibility

LC Bead has equivalent compressibility to other marketed embolic agents.

8.3 Catheter Delivery

Catheter delivery characteristics have been tested in accordance with a written protocol to assure performance with typical microcatheters. The table below provides a summary of the test results for the current marketed LC Bead product and the 70-150µm size fraction.

Catheter ID		Microcatheter Name	LC Bead/ size ranges (µm)				
(inches)	(µm)		70-150	100-300	300-500	500-700	700-900
0.024	610	5Fr. Angio Dynamics	✔	✔	✔	✔	✔
0.024	610	FasTracker® 325	✔	✔	✔	✔	✔
0.021	540	FasTracker® 18	✔	✔	✔	✔	
0.021	540	Cook 3.0 Fr	✔	✔	✔	✔	
0.016	420	Prowler® 14	✔	✔	✔		
0.022	570	2.4Fr Progreat™ Terumo	✔	✔	✔		
0.018	457	Spinnaker Elite1.8	✔	✔	✔		

✔	Catheter can be used for the effective delivery of the LC Bead product.

8.4 Other tests

Additional bead characterization data has been provided in this pre-market notification with respect to other attributes of the device. A summary of this additional test data is provided below.

Test	Pass/Fail
Residual starting materials *The residual starting materials present in the final packaged device.*	Pass
Residual solvents *The residual solvent levels present in the final packaged device.*	Pass
Product visual inspection for presence of fibres *The visual assessment of a sample of the final product to determine the level of fibres present.*	Pass
Product catheter deliverability Bead Aggregation/Clogging: *The incidence of any unintended bead aggregation in the syringe resulting in catheter blockage is assessed during catheter delivery testing.* Ease of Delivery: *The ease of delivery is assessed as part of catheter delivery testing and must be considered "not difficult" in order to pass this test.* Shape after embolic after injection: *The shape of the embolic agent is evaluated after catheter delivery using optical microscopy.* Bead Deliverability: *The ability to deliver the whole vial of beads mixed with contrast agent through a catheter as described in the Instructions for Use.* Levels of broken or bead fragments after catheter delivery: *The presence of broken is evaluated after catheter delivery using optical microscopy.*	Pass
Time to Suspension Studies *The time taken for the beads to form a stable homogeneous suspension when mixed with the recommended ratio of contrast agent and saline/water*	Pass
Bead aspiration from vial *The ease of removing the beads from the primary packaging using standard syringes and needles as described in the Instructions for Use.*	Pass
Bead sizing *The size of the beads after packaging and sterilisation.*	Pass
pH Testing *The pH of the final packing solution after sterilisation.*	Pass

9 Performance Standards

LC Bead/Bead Block Compressible Microspheres meet the following Performance Standards:

- Guidance For Industry; 2004: FDA Guidance for Neurological Embolization Products.
- ISO/EN 10993-1; 1997 Biological Evaluation of Medical Devices, Part I: Evaluation and Testing.
- ISO/EN 10993-3; 1993 Biological Evaluation of Medical Devices, Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity.
- ISO/EN 10993-4; 1993 Biological Evaluation of Medical Devices, Part 4: Selection of tests for interaction with blood.
- ISO/EN 10993-6; 1995 Biological Evaluation of Medical Devices, Part 6: Test for local effects after implantation.
- ISO/EN 10993-10; 1995 Biological Evaluation of Medical Devices, Part 10: Tests for Irritation and Sensitization.
- ISO/EN 10993-11; 1993 Biological Evaluation of Medical Devices, Part 11: Tests for Systemic Toxicity.
- ISO/EN 11607; 1997 – Packaging for terminally sterilized products.
- AAMI 17665-1; 2006 – Sterilization of Health Care Products Requirements for validation and routine control – Industrial moist heat sterilization 2nd edition.
- ANSI/AAMI/ISO 14937; 2009 – Sterilization of Health Care Products Characterization of a Sterilizing Agent and the Development, Validation and Routine Control of a Sterilization Process for Medical Devices.
- ISO 14971; 2007 – Medical Devices – Application of Risk Management

9.1 Conclusion

There are more similarities than differences between the predicate device and the LC Bead/Bead Block products. This Premarket Notification explains the minor revisions made to the manufacturing process to enable production of the additional smaller diameter SKU which is a subset of the currently cleared 100-300 LC Bead product. The primary packaging, indications for use, specifications and chemistry are unchanged from K033761/K042231/K083091. The predicate device and LC Bead/Bead Block products have the same intended use, warnings and contraindications. The predicate device and LC Bead/Bead Block products are identical other than the added size range, in design, and unchanged from the predicate device. When used in

accordance with the instructions for use, by qualified personnel, the LC Bead/Bead Block products are safe and effective, as indicated, for the intended use.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration
10903 New Hampshire Avenue
Document Mail Center - WO66-G609
Silver Spring, MD 20993-0002

APR 1 8 2010

Biocompatibles UK Ltd.
c/o Mr. John Greenbaum
President
Generic Devices Consulting, Inc.
20310 SW 48th Street
Ft. Lauderdale, FL 33332

Re: K094018
Trade/Device Name: LC Bead/Bead Block™ Compressible Microspheres
Regulation Number: 21 CFR 882.5950
Regulation Name: Neurovascular Embolization Device
Regulatory Class: Class II
Product Code: HCG
Dated: March 12, 2010
Received: March 17, 2010

Dear Mr. Greenbaum:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please go to http://www.fda.gov/AboutFDA/CentersOffices/CDRH/CDRHOffices/ucm115809.htm for the Center for Devices and Radiological Health's (CDRH's) Office of Compliance. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Malvina B. Eydelman, M.D.
Director
Division of Ophthalmic, Neurological,
and Ear, Nose and Throat Devices
Office of Device Evaluation
Center for Devices and
Radiological Health

Enclosure

510(k) Number(if known): K094018

Device Name:

LC Bead Microspheres

Bead Block™ Compressible Microspheres

Indications For Use:

"LC Bead Microspheres & Bead Block™ Compressible Microspheres is intended for embolization of hypervascular tumors and arteriovenous malformations."

Prescription Use_X_ **OR** **Over-The-Counter Use___**

(Per 21 CRF 801.109)

PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of Device Evaluation (ODE)

(Optional Format 1-2-96)

Quynh Hoang

(Division Sign-Off)

Division of Ophthalmic, Neurological and Ear, Nose and Throat Devices

510(k) Number K094018