August 31, 2018

Baxter Healthcare Corporation
Caitlin Ziebell
Regulatory Affairs Senior Associate
32650 N. Wilson Road
Round Lake, Illinois 60073

Re: K181225
Trade/Device Name: ALTAPORE
Regulation Number: 21 CFR 888.3045
Regulation Name: Resorbable calcium salt bone void filler device
Regulatory Class: Class II
Product Code: MQV
Dated: July 26, 2018
Received: July 31, 2018

Dear Ms. Ziebell:

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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. 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) for

devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 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 comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Sarah B. Nelson -S

For: Mark N. Melkerson
Director
Division of Orthopedic Devices
Office of Device Evaluation
Center for Devices and
Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K181225

Device Name
ALTAPORE

Indications for Use *(Describe)*
ALTAPORE is an implant intended to fill bony voids or gaps of the skeletal system (i.e., extremities, pelvis and posterolateral spine). ALTAPORE may be used with autograft as a bone graft extender or bone marrow aspirate in extremities, and pelvis. ALTAPORE must be used in combination with autograft as a bone graft extender or autogenous bone marrow aspirate in posterolateral spinal fusion procedures. These osseous defects are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. ALTAPORE resorbs and is replaced with bone during the healing process.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

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Section 5. 510(k) Summary

August 30, 2018

OWNER:

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CONTACT PERSON:

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IDENTIFICATION OF THE DEVICE:

Common Name: Bone Void Filler
Trade/Device Name: ALTAPORE
Classification Panel: 87 Orthopedic
Regulation Number: 21 CFR 888.3045
Regulation Name: Resorbable Calcium Salt Bone Void Filler Device
Regulatory Class: Class II
Product Code: MQV

Table 1. Model Numbers for ALTAPORE

Model Number	Name
1504319	ALTAPORE, 1.5 ml
1504320	ALTAPORE, 2.5 ml
1504321	ALTAPORE, 5 ml
1504322	ALTAPORE, 10 ml
1504323	ALTAPORE, 20 ml

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PREDICATE DEVICES:

ALTAPORE is substantially equivalent to the following predicate devices (Table 2):

Table 2. Predicate Devices

Device	Company	Predicate 510(k)	Clearance Date
MASTERGRAFT® Putty (Primary predicate)	Medtronic Sofamor Danek USA, Inc.	K140375	April 18, 2014
ULTRAFUSE[a] (Secondary predicate)	Baxter Healthcare Corporation	K130531	April 8, 2014

[a] Device name changed to ALTAPORE during FDA review of K130531.

The proposed device is substantially equivalent to the predicate devices, MASTERGRAFT® Putty and ALTAPORE. The primary predicate, MASTERGRAFT® Putty, supports spinal use with the proposed product. The proposed and secondary predicate devices have identical chemical composition, physical structure, packaging, sterilization, and manufacturing process.

DESCRIPTION OF THE DEVICE:

ALTAPORE is a bioactive and osteoconductive silicate-substituted calcium phosphate bone void filler. The interconnected and open porous structure of the silicate-substituted calcium phosphate phase of ALTAPORE is similar to human cancellous bone and is intended to support bone growth with macro and micro- porosity. ALTAPORE is composed solely of elements that exist naturally in normal bone (Ca, P, O**,** H, Si).

ALTAPORE is supplied in a sterile applicator and contains ALTAPORE microgranules, sized 1-2 mm, 80-85% total porosity, suspended in an absorbable aqueous gel carrier. ALTAPORE does not set in-situ following implantation. ALTAPORE is available in 1.5 ml, 2.5 ml, 5 ml, 10 ml, and 20 ml configurations.

ALTAPORE is designed for use as a standalone bone graft substitute or as an autograft extender. While not necessary, the product can be mixed with Bone Marrow Aspirate (BMA) or autologous bone at the discretion of the surgeon.

ALTAPORE is bioactive based on *in vitro* studies that show it forms a surface apatite-layer when submerged in simulated body fluid that contains the same ion concentrations

as human blood plasma. This apatite layer provides scaffolding onto which the patient's new bone will grow, allowing complete repair of the defect.

ALTAPORE is osteoconductive based on *in vivo* animal studies that show it achieves bone healing in a critical defect model as confirmed with radiographic, histolopathological, histomorphometric, and mechanical analyses. ALTAPORE undergoes cell-mediated remodeling and is replaced by natural bone.

INDICATIONS FOR USE

ALTAPORE is an implant intended to fill bony voids or gaps of the skeletal system (i.e., extremities, pelvis and posterolateral spine). ALTAPORE may be used with autograft as a bone graft extender or bone marrow aspirate in extremeties, and pelvis. ALTAPORE must be used in combination with autograft as a bone graft extender or autogenous bone marrow aspirate in posterolateral spinal fusion procedures. These osseous defects are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. ALTAPORE resorbs and is replaced with bone during the healing process.

The Indications for Use statement for the ALTAPORE device is not identical to the predicate devices; however, the differences do not alter the intended therapeutic use of the device nor do they affect the safety and effectiveness of the device relative to the predicate devices. Both the proposed and predicate devices have the same intended use for the treatment of filling bony voids or gaps of the skeletal system.

TECHNOLOGICAL CHARACTERISTICS AND SUBSTANTIAL EQUIVALENCE

ALTAPORE is substantially equivalent to the predicate devices previously cleared under 510(k) premarket notifications, K130531 and K140375. The function and intended use of the proposed device are equivalent to the predicate devices. Table 3 provides a comparison of the technological characteristics of the proposed and predicate devices.

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Table 3. Technological Characteristics

Features	**Secondary Predicate Device (K130531):** **ALTAPORE**	**Primary Predicate Device (K140375):** **MASTERGRAFT® Putty**	**Proposed Device:** **ALTAPORE**
Composition	Calcium Phosphate Salt: Silicate-substituted calcium phosphate composed solely of elements that exist naturally in normal bone (Ca, P, O, H, Si).	Calcium Phosphate Salt: Purified collagen of bovine origin and biphasic calcium phosphate ceramic. Type **I** bovine collagen. **15** percent hydroxyapatite and **85** percent β-tricalcium phosphate formulation.	Identical to secondary predicate.
Physical Structure	Granules with a porosity similar to cancellous bone.	Granules with a natural, interconnected, porous structure which mimics the natural structure of bone.	Identical to primary and secondary predicate.
Nominal (Total) Porosity	82.5 ± 2.5%	80% (interconnected porosity)	Identical to primary and secondary predicate. The nominal total porosity of the primary predicate falls within the range of the proposed device
Strut Porosity	31-47%	Information not publicly available.	Identical to secondary predicate.
Sterility	Irradiation	Irradiation	Identical to primary and secondary predicate.

DISCUSSION OF NONCLINICAL TESTS

Baxter Healthcare Corporation conducts risk analyses and design verification tests based on the result of these analyses. All test results met the acceptance criteria, and support that the proposed devices are appropriately designed for their intended use.

Performance Testing- Bench

The proposed device and secondary predicate device have identical chemical composition, physical structure, packaging, sterilization, and manufacturing process. As such, no additional bench testing was conducted. All previous verification and validation testing performed for the secondary predicate device, cleared under K130531, is still applicable to the proposed product.

The following *in vitro* studies were previously conducted as part of the secondary predicate submission (K130531) to evaluate the performance characteristics of ALTAPORE:

- Dissolution properties

Testing of dissolution was performed in accordance with ISO 10993-14: Biological evaluation of medical devices – Part 14: Identification and quantification of degradation products from ceramics.

- Bioactive properties

An *In Vitro* Bioactivity Study was conducted to evaluate the amount of hydroxycarbonate apatite (HCA) formation on granular ceramic bone graft after submersion in simulated body fluid at a specific temperature at a range of different time periods.

Performance Testing- Animal

A preclinical animal study was conducted to evaluate the following performance characteristics of ALTAPORE for use in the posterolateral spine:

- Efficacy for use in posterolateral fusion (with and without bone marrow aspirate (BMA), with and without autogenous iliac crest bone graft (ICBG)

In the animal study conducted, 182 New Zealand White Rabbits underwent uninstrumented posterolateral fusion of the spine at L5-L6, according to the model

validated by Boden et al. There were six treatment groups: ALTAPORE alone, with bone marrow aspirate, and with autologous bone; MASTERGRAFT® Putty alone, with bone marrow aspirate, and with autologous bone; and a control group treated with autologous bone. There were no test article related complications or premature deaths in this study, at the 4, 8, and 12 week follow-up.

The performance of ALTAPORE was evaluated by mechanical, radiographic, and histological examination of the treated segments of the spine. These studies demonstrated that similar performance in normal bone healing response leading to spinal fusion was only observed with the BMA and Autograft mixed groups.

A preclinical animal study was previously carried out to assess the following performance characteristics of ALTAPORE in extremities and was demonstrated previously as part of the secondary predicate submission (K130531):

- Safety for use in extremities (with and without bone marrow aspirate (BMA), with and without autogenous iliac crest bone graft (ICBG))
- Efficacy for use in extremities (with and without bone marrow aspirate (BMA), with and without autogenous iliac crest bone graft (ICBG))

In the animal study conducted, four defects (two defects per femur) were created in each of 39 sheep to create 156 defects total for assessment, according to the ovine critical size defect model. There were four treatment groups: ALTAPORE alone, with bone marrow aspirate, and with autologous bone; predicate device, Actifuse ABX; and a control group treated with un-implanted cancellous bone for mechanical testing only. There were no test article related complications. There were three premature deaths in this study, which occurred shortly after implantation. The causes of death were not related to the impantation of the test or control materials.

Safety for use in extremeties of ALTAPORE was evaluated with subsequent assessment by decalcified histopathology, manual palpitation, macroscopic assessment, and plain radiography of the treated defects. Efficacy for use in extremeties was evaluated with subsequent assessment by non-histomorphometry, biomechanical testing of explants, and plain radiographs of the treated defects. These studies demonstrated normal bone healing response in extremeties which was equivalent to the predicate device.

Biocompatibility

All materials in the proposed device have been used in the secondary predicate device, ALTAPORE, with the same intended use and with the same type and duration of contact. ALTAPORE has been previously cleared under 510(k) submission, K130531.

Biocompatibility assessments were conducted based on ISO-10993-1 and FDA guidance *Use of International Standard ISO-10993-1,* "*Biological Evaluation of Medical Devices Part 1: Evaluation and Testing within a Risk Management Process*," as recommended in the FDA guidance document, *Guidance for Industry and FDA Staff- Class II Special Controls Guidance Document: Resorbable Calcium Salt Bone Void Filler Device*. The battery of testing included the following tests:

- Cytotoxicity
- Sensitization
- Irritation
- System Toxicity
- Genotoxicity, Carcinogenicity, and Reproductive Toxicity
- Implantation

CONCLUSION

The non-clinical data demonstrate that the subject device is substantially equivalent and performs comparably to the predicate devices that are currently marketed for the same intended use.