July 11, 2023

Bonalive Biomaterials, Ltd.
% Elisa Maldonado-Holmertz
RA/QA Consultant
Obelix Consulting, LLC
806 Jefferson St
Bastrop, Texas 78602

Re: K231528
Trade/Device Name: Bonalive Orthopedics granules
Regulation Number: 21 CFR 888.3045
Regulation Name: Resorbable Calcium Salt Bone Void Filler Device
Regulatory Class: Class II
Product Code: MQV
Dated: May 24, 2023
Received: May 26, 2023

Dear Ms. Maldonado-Holmertz:

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/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); 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 https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). 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 (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Jesse Muir -S

Jesse Muir, Ph.D.
Assistant Director
DHT6C: Division of Restorative, Repair
and Trauma Devices
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality
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: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K231528

Device Name

Bonalive® Orthopedics granules

Indications for Use *(Describe)*

Bonalive® Orthopedics granules is an implant intended to fill bony voids or gaps of the skeletal system (i.e., extremities and pelvis). These osseous defects may be the result of benign bone cysts and tumors (in adults and pediatric patients ≥ 6 years old), are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. Bonalive® Orthopedics granules 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.

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K231528 510(k) Summary

1. Submission Sponsor

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2. Submission Correspondent

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3. Date Prepared

24 May 2023

4. Device Identification

Type of 510(k) Submission:	Traditional
Trade or Proprietary Name:	Bonalive Orthopedic granules
Common or Usual Name:	Filler, Bone Void, Calcium Compound
Regulation Description:	Resorbable calcium salt bone void filler device
Regulation Classification:	888.3045
Product Code:	MQV
Class of Device:	Class II
Review Panel:	Orthopedic
Reason for Submission:	Labeling Change
Prior Related Submissions:	K191274
Multiple Devices:	None

5. Legally Marketed Predicate Device(s)

Predicate: K191274 Bonalive® granules by Bonalive Biomaterials, Ltd.
Reference: K113871 Pro-Dense Bone Graft Substitute by Wright Medical Technology, Inc.

6. Device Description

Bonalive® Orthopedics granules is composed of osteostimulative calcium-phosphorous-sodium-silicate (glass S53P4) granules (size 0.5-0.8 mm or 1.0-2.0 mm) and is a sterile medical device. This synthetic, osteoconductive material is comprised of SiO2, Na2O, CaO and P_2O_5. Bioactive glass is characterized by its ability to attach firmly to living tissue. Other properties include its ability to facilitate bone tissue growth, bond chemically with surrounding bone, and promote new bone formation in the implanted area.

In aqueous solution (e.g. body fluids), bioactive glass works by leaching out ions and developing a silica-gel layer which acts as a template for a calcium phosphate (CaP) precipitation. The CaP crystallizes to hydroxyapatite, which resembles the mineral phase of natural bone in its chemical composition and structure, thus enabling bonding of the bioactive glass to the surrounding bone.

The Bonalive® Orthopedics granules resorb and are replaced with bone slowly over a period of years. The bioactive glass in the Bonalive® Orthopedics granules is radiodense thus enabling postoperative radiologic evaluation.

Best results are obtained by ensuring close contact of the device with surrounding bone tissue and by carefully following the Instructions for Use.

Bonalive® Orthopedics granules is sterilized by irradiation and is available in different granule and unit sizes.

7. Indication for Use Statement

Bonalive® Orthopedics granules is an implant intended to fill bony voids or gaps of the skeletal system (i.e., extremities and pelvis). These osseous defects may be the result of benign bone cysts and tumors (in adults and pediatric patients ≥ 6 years old), are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. Bonalive® Orthopedics granules resorbs and is replaced with bone during the healing process.

RX Only

8. Substantial Equivalence Discussion

The following table compares the subject device to the predicate and reference devices with respect to intended use, technological characteristics and principles of operation, providing more detailed information regarding the basis for the determination of substantial equivalence.

Comparison of Characteristics

Manufacturer	**Subject Device** Bonalive Biomaterials, Ltd	**Predicate Device** Bonalive Biomaterials, Ltd	**Reference Device** Wright Medical Technology	**Significant Differences**

Trade Name	Bonalive® Orthopedics granules	Bonalive® granules	Pro-Dense Bone Graft Substitute	
510(k) Number		K191274	K113871	
Product Code	MQV	MQV	MQV	None
Regulation Number	888.3045	888.3045	888.3045	None
Regulation Name	Resorbable calcium salt bone void filler device	Resorbable calcium salt bone void filler device	Resorbable calcium salt bone void filler device	None
Indications for Use	Bonalive® Orthopedics granules is an implant intended to fill bony voids or gaps of the skeletal system (i.e., extremities and pelvis). These osseous defects may be the result of benign bone cysts and tumors (in adults and pediatric patients ≥ 6 years old), are surgically created or the result of traumatic injury to the bone and are not intrinsic to the stability of the bony structure. Bonalive® Orthopedics granules resorbs and is replaced with bone during the healing process.	Bonalive® granules is indicated only for bony voids or gaps that are not intrinsic to the stability of the bony structure. Bonalive® granules is indicated to be gently packed into bony voids or gaps of the skeletal system (i.e. the extremities and pelvis). These defects may be the result of surgically created osseous defects or osseous defects created from traumatic injury to the. The product contains a bone void filler that resorbs and is replaced with bone during the healing process. When used in the extremities and pelvis, Bonalive® granules is intended to be used alone.	PRO-DENSE® resultant paste is intended for use as a bone graft substitute to be injected or digitally packed into open bone voids/gaps that are not intrinsic to the stability of bony structure of the skeletal system (i.e., the extremities and pelvis) to cure *in situ*. These open bone voids may be the result of benign bone cysts and tumors (in adults and pediatric patients ≥ 6 years old), surgically created osseous defects or osseous	Labeling Change from K191274 Same as K113871: "may be the result of benign bone cysts and tumors (in adults and pediatric patients ≥ 6 years old)"

Manufacturer	**Subject Device** Bonalive Biomaterials, Ltd	**Predicate Device** Bonalive Biomaterials, Ltd	**Reference Device** Wright Medical Technology	**Significant Differences**
Trade Name	Bonalive® Orthopedics granules	Bonalive® granules	Pro-Dense Bone Graft Substitute	
			defects created from traumatic injury to the bone. The paste provides a bone graft substitute that resorbs and is replaced with bone during the healing process. The PRO-DENSE® paste cured *in situ* provides an open void/gap filler that can augment provisional hardware (e.g. K Wires) to help support bone fragments during the surgical procedure. The cured paste acts only as a temporary support media and is not intended to provide	

Manufacturer	**Subject Device** Bonalive Biomaterials, Ltd	**Predicate Device** Bonalive Biomaterials, Ltd	**Reference Device** Wright Medical Technology	**Significant Differences**
Trade Name	Bonalive® Orthopedics granules	Bonalive® granules	Pro-Dense Bone Graft Substitute	
			structural support during the healing process. PRO-DENSE® is provided sterile for single use only.	
Rx or OTC	Rx	Rx	Rx	None
Physical Form	Amorphous, non-porous random-shaped particles	Amorphous, non-porous random-shaped particles	Resultant paste	None - Predicate
Color	Brown	Brown	White	None – Predicate
Materials Composition	SiO_2, Na_2O, CaO and P_2O_5	SiO2, Na2O, CaO and P2O5	CaSO4, CaPO4	None – Predicate
Product Sizes	Granule sizes: 0.5-0.8 mm 1.0-2.0 mm Product volumes: 1 cc 2.5 cc 5 cc 10 cc	Granule sizes: 0.5-0.8 mm 1.0-2.0 mm Product volumes: 1 cc 2.5 cc 5 cc 10 cc	Product volumes: 4, 10, 20 cc	None - Predicate
Biocompatibility	Biocompatible ISO 10993	Biocompatible ISO 10993	Biocompatible ISO 10993	None
Sterilization	Gamma Sterile, SAL 10^{-6}	Gamma Sterile, SAL 10-6	Ethylene oxide	None - Predicate
Pyrogenicity	Non-pyrogenic	Non-pyrogenic	Non-pyrogenic	None
Single Use/ Reuse	Single use only	Single use only	Single use only	None

Manufacturer	**Subject Device** Bonalive Biomaterials, Ltd	**Predicate Device** Bonalive Biomaterials, Ltd	**Reference Device** Wright Medical Technology	**Significant Differences**
Trade Name	Bonalive® Orthopedics granules	Bonalive® granules	Pro-Dense Bone Graft Substitute	
Mode of action	Works by leaching out ions that react with the body fluids transforming the glass surface chemically into one that by its chemical composition and structure resembles the mineral phase found in natural bone.	Works by leaching out ions that react with the body fluids transforming the glass surface chemically into one that by its chemical composition and structure resembles the mineral phase found in natural bone.	Angiogenesis . Reso–ption of the PRO-DENSE™ scaffold releases bound proteins. Active proteins recruit cells to the implant surface.	None - Predicate
Properties	Synthetic Osteoconductive	Synthetic Osteoconductive	Synthetic Osteoconductive	None
MR Safety	MR Safe	MR Safe	MR Safe	None

9. Non-Clinical Performance Data

The following testing was performed on the predicate K191274 Bonalive® granules. No changes have been made to the subject device Bonalive® Orthopedics granules materials, manufacturing, or sterilization processes.

- Apatite
- Composition - Heavy Metals
- Crystallinity
- Particle Size Distribution
- Surface Area
- Manufacturing & Specifications Validation

10. Biocompatibility

Biocompatibility testing was conducted in accordance with ISO-10993-1, "Biological evaluation of medical device – Part 1: Evaluation and testing within a risk management process". The following biocompatibility studies were successfully performed on the predicate K191274 Bonalive® granules. No changes have been made to the subject device Bonalive® Orthopedics granules materials, manufacturing, or sterilization processes.

- Cytotoxicity
- Sensitization
- Systemic toxicity
- Genotoxicity
- Muscle Implantation
- Pyrogen

11. Sterility and Shelf Life

The following testing was performed on the predicate K191274 Bonalive® granules. No changes have been made to the subject device Bonalive® Orthopedics granules materials, manufacturing, or sterilization processes.

- EN ISO 11137 – Radiation Sterilization Validation
- ISO 11607 - Packaging for terminally sterilized medical devices

12. Clinical Performance Data

There was no clinical testing required to support the medical device as the indications for use is equivalent to the predicate device.

13. Statement of Substantial Equivalence

Bonalive® Orthopedics granules is substantially equivalent to the predicate device as it has the same design, materials, mode of action, manufacturing and sterilization processes, and technological characteristics as the previously cleared predicate device, and the subject device does not raise new questions regarding its safety and effectiveness as compared to the predicate device.