

# Guidance for FDA Reviewers and Industry

## **Medical Devices Containing Materials Derived from Animal Sources (Except for In Vitro Diagnostic Devices)**

**Document Issued on: November 6, 1998**



**U.S. Department of Health and Human Services  
Food and Drug Administration  
Center for Devices and Radiological Health**

**CDRH BSE Working Group**

# **Preface**

## **Public Comment**

Until February 4, 1999, comments and suggestions regarding this document should be submitted to Docket No. 98D-0924, Dockets Management Branch, Division of Management Systems and Policy, Office of Human Resources and Management Services, Food and Drug Administration, 12420 Parklawn Drive (HFA-305), Room 1-23, Rockville, MD 20857. Such comments will be considered when determining whether to amend the current guidance.

After February 4, 1999, comments and suggestions may be submitted at any time for Agency consideration to: Kiki B. Hellman, Ph. D., Office of Science and Technology (HFZ-113), Center for Devices and Radiological Health, Food and Drug Administration, 9200 Corporate Blvd., Rockville, MD 20850. Comments may not be acted upon by the Agency until the document is next revised or updated. For questions regarding the use or interpretation of this guidance contact Kiki B. Hellman, Ph. D. at (301) 443-7158 or Karen F. Warburton, Office of Device Evaluation (HFZ-460)

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## Medical Devices Containing Materials Derived from Animal Sources (Except In Vitro Diagnostic Devices), Guidance for FDA Reviewers and Industry

### Introduction and Background

Bovine Spongiform Encephalopathy (BSE) is a degenerative disease which affects the central nervous system of cattle. It is similar to other transmissible spongiform encephalopathies (TSEs) such as scrapie in sheep and Creutzfeldt-Jakob Disease (CJD) in humans. At this point in time the incubation period of BSE appears to be from 2 to 8 years. There is currently no treatment, nor is there a validated test to detect the disease in a live animal. Diagnosis is determined by microscopic examination of brain tissue. The nature of the BSE agent is widely theorized to be a prion, an abnormally folded version of a normal cellular protein. The abnormal protein then recruits additional molecules of normal protein and facilitates their conversion to the abnormal form. The agent is extremely resistant to traditional forms of disinfection and sterilization. As new information on the diagnosis, treatment and nature of the agent becomes available, this guidance will be modified as appropriate.

Epidemiologic data suggest that the BSE epidemic in Great Britain which began in 1986 occurred through feeding cattle contaminated meat and bone meal as a protein source. The BSE agent may have been present for a long time, but changes in rendering procedures in the late 70's and early 80's may have enabled the active agent to survive in the animal feeds. The agent is thought to be from scrapie-infected sheep, but cattle with a previously unidentified TSE have not been ruled out. An association between cases of variant CJD in Great Britain and BSE seems likely, although causality has not been proved. To date, there have been no cases of BSE in the United States.

The possibility of introducing the BSE agent through a medical device requires special attention on the part of manufacturers with regard to the sourcing and processing of bovine-derived material. At present this can most easily be accomplished by assuring that the source cattle are free of BSE. In 1993 and more recently, on May 9, 1996, the Food and Drug Administration (FDA) issued letters to manufacturers to request that bovine-derived materials from cattle which have resided in or originated from countries where BSE has been diagnosed not be used in the manufacture of FDA-regulated products. (Attachments 1, 2 and 3)

Since 1989, the USDA has restricted the importation of live ruminants from Great Britain. Currently the USDA restricts the importation of live ruminants from countries where BSE is known to exist, and from those countries that present a significant risk of introducing BSE into the United States. Also restricted (by USDA) from import from these countries are other ruminant-derived products such as bone meal, meat and bone meal, blood meal, offal, glands, and gelatin for animal consumption. FDA recently prohibited protein derived from mammalian tissues to be used in ruminant feed for animals in the US (Federal Register June 5, 1997; 21 CFR Part 589 "Substances Prohibited From Use in Animal Food or Feed; Animal

Proteins Prohibited in Ruminant Feed").

To track medical devices which either contain or are exposed to animal-derived materials during manufacturing (e.g., human cells grown in media containing fetal calf serum), CDRH has developed the CDRH Biomaterials Database which contains an inventory of these devices, including type of material, animal species and country of origin, and target organ or tissue for each device. Originally proposed in response to the BSE issue, the Database was expanded to include all animal-derived products (including human) in order to respond to other animal material-based sourcing concerns that may arise in the future.

#### Purpose of Guidance

The purpose of this document is to provide recommendations for information to be included in submissions (IDE, PMA, 510(k)) for medical devices which either contain or are exposed to animal-derived materials during manufacturing. This will reduce the likelihood of the transmission of BSE through medical devices and will provide a profile of the animal-derived materials which can be used in risk analysis of the devices.

#### Scope of Guidance

This guidance is applicable to all medical devices, except in vitro diagnostic devices, which either contain or are exposed to animal-derived materials during manufacturing. All animal species (e.g., human, bovine, ovine, porcine, avian (e.g., chicken), fish, etc.) are included.

#### **Recommendations for Medical Devices Containing Materials Derived From BOVINE Sources**

1. All materials in a device which are derived from a bovine source should be identified. Examples are: bovine pericardium used in heart valves, bovine viscera used in gut sutures, bovine bone used in dental implants, and bovine collagen used in lacrimal plugs. These also include devices which are exposed to materials of bovine origin during manufacture (e.g., human cells grown in media containing fetal calf serum, tissue culture cells exposed to bovine trypsin.)
2. The bovine material should come from cattle which have not originated from or resided in a country where BSE has been diagnosed or which presents a significant risk of introducing BSE. This list of countries is maintained by the USDA and codified in 9 CFR 94.18. The countries currently identified include all countries of Europe.

##### Countries in which BSE exists:

Great Britain (including Northern Ireland and the Falklands)

Switzerland

France

Republic of Ireland  
Oman  
Portugal  
The Netherlands  
Belgium  
Luxembourg

Countries which present significant risk:

Albania  
Austria  
Bosnia-Herzegovina  
Bulgaria  
Croatia  
Czech Republic  
Denmark  
Federal Republic of Yugoslavia  
Finland  
Germany  
Greece  
Hungary  
Italy  
the former Yugoslav Republic of Macedonia  
Norway  
Poland  
Romania  
the Slovak Republic  
Slovenia  
Spain  
Sweden

3. Traceable records should be maintained by the device manufacturer for each lot of bovine material and each lot of FDA-regulated product. Records should indicate the country of origin and residence of the animals. The bovine tissue source (e.g. bone, heart valve, ligament/tendon) should also be indicated.
4. If the manufacturer certifies that the bovine-derived material is only available from a country where BSE is known to exist, then the manufacturer should provide evidence to indicate that the BSE agent is inactivated during the manufacturing process. A detailed description of the manufacturing process should be submitted. Evidence of inactivation may be derived from one or more of the following:
  - a. Validation study using an appropriate model (e.g., scrapie in mice.) If a validation study protocol and/or data are submitted the reviewer should

contact the Division BSE Focal Point (see below) for further guidance. Manufacturers are encouraged to consult with FDA during protocol development. Validation studies take at least 2 years to complete, are technically difficult, and may require review by experts in the TSE field. The TSE Advisory Committee will be consulted as appropriate.

- b. Other valid scientific evidence (e.g., scientific literature to support specific processing methods of specific tissues (e.g, hydroxyapatite obtained from bovine bone.))
5. The FDA has recently changed its position with regard to the use of **gelatin**. A guidance document has been issued regarding the use of gelatin in FDA-regulated products for human use (Attachment 4). The guidance pertinent to medical devices reads:

"Gelatin produced from bones and hides obtained from cattle residing in, or originating from, countries reporting BSE or from countries that do not meet the latest BSE-related standards of the Office International des Epizooties (OIE) should not be used either in injectable, ophthalmic, or implanted FDA regulated products, or in their manufacture."

The guidance also states:

"At this time there does not appear to be a basis for objection to the use of gelatin produced from bovine hides and bones in FDA products for human use if the gelatin is produced in the United States from US-derived raw materials or from cattle born, raised and slaughtered in other countries that have no reported BSE cases and that meet OIE BSE standards."

6. There are currently no restrictions on bovine milk and milk-derived products.

**Note--Future Considerations:** FDA is considering other changes in its policy concerning BSE and the safety of regulated products. Options to be considered in the future include evaluation of a country's compliance with BSE related standards of the Office International des Epizooties; and evaluating products with regard to the risk posed by the bovine tissue source and end use, in addition to the country of origin. For example, bovine neural tissue implanted in the central nervous system would pose a much greater risk than a few microliters of highly purified bovine pancreatic trypsin used in a manufacturing process to recover tissue culture cells which are further purified before use.

Experimental data with the mouse/scrapie model suggest that brain and spinal cord tissue from TSE-infected animals have high levels of infectivity; tissues such as lymph nodes and spleen are of medium infectivity; tissues such as bone marrow and liver may sometimes have low levels of infectivity. Experiments with TSE agents also indicate that the intracerebral

route of inoculation is the most efficient way of transmitting the disease, followed by parenteral inoculation; the oral route is the least efficient.

Another future option might be to encourage the use of closed herds for material sources. Animals of known lineage, husbandry and medical history should provide the safest sources. Should BSE be discovered in the United States, a closed herd would become a significantly more important source for bovine material. Because the incubation time for BSE is long (2-8 years) herds would have to be closed for at least 3 years for isolation to be meaningful.

Whenever FDA changes policy on BSE, this guidance document will be revised accordingly.

#### **Recommendations for Medical Devices Containing Materials Derived From Animal Sources OTHER Than Bovine**

All materials in a device derived from **any** animal source, including human, should be identified by tissue type and species of origin. Some examples of materials are: porcine heart valves, porcine collagen corneal shields, porcine blood vessels used in vascular grafts, porcine collagen used in wound dressings, and hyaluronic acid from rooster combs used in viscoelastic fluids. This also includes devices exposed to materials of animal origin during manufacture (e.g. porcine trypsin used in artificial skin.)

1. Country of origin/residence should be identified for all materials.
2. For products derived from human tissue, refer to 21 CFR 1270, Human Tissue Intended for Transplantation, for additional requirements.

#### **CDRH Biomaterials Database**

Reviewers will evaluate submissions to identify products which contain or are exposed to animal-derived materials. Information on these products will be entered into the CDRH Biomaterials Database (Attachment 5).

The acknowledgement letter issued to manufacturers upon receipt of the IDE, PMA or 510(k) submission will prompt them to notify the reviewing Division if the device contains an animal or human derived material and such information was not provided in the original submission.

#### **BSE Working Group:**

Chair: Kiki Hellman (OST)

ODE Division Focal Points:

DGRD: David Berkowitz

DCLD: Claudia Gaffey/Gus Gonzalez  
DCRND: Lisa Kennell  
DOD: Karen Warburton  
DRAERD: Raju Kammula  
DDIGD: Pandu Soprey

**Database Contacts:**

Stan Brown (OST)  
Ken Krell (OMS)

**Attachments:**

1. FR notice (August 29, 1994) Bovine Derived Materials; Agency Letters to Manufacturers of FDA-Regulated Products
2. May 9, 1996 letter to Manufacturers of FDA-Regulated Drug/Biologic/Device Products
3. Background Information and Chronology of U.S. BSE-Related Actions
4. FDA Guidance, "The Sourcing and Processing of Gelatin to Reduce the Potential Risk Posed by Bovine Spongiform Encephalopathy (BSE) in FDA-Regulated Products for Human Use" (September 1997)
5. Database Data Entry Form



[Federal Register: August 29, 1994]

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

**Bovine-Derived Materials; Agency Letters to Manufacturers of FDA-Regulated Products**

AGENCY: Food and Drug Administration, HHS.

ACTION: Notice.

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SUMMARY: The Food and Drug Administration (FDA) is publishing the texts of four letters it recently issued to manufacturers of FDA-regulated products requesting that bovine-derived materials from certain cattle not be used in the manufacture of FDA-regulated products intended for humans or animals. FDA believes that bovine spongiform encephalopathy (BSE), a neurological disease of bovine animals, is a concern in the manufacture of FDA-regulated products. FDA believes that precautionary measures will reduce potential risk of exposure to, or transmission of, the agents that cause BSE in cattle. FDA is publishing the texts of the four letters at the end of this document in addition to mailing them directly to manufacturers.

FOR FURTHER INFORMATION CONTACT:

For dietary supplements and cosmetics: Elisa L. Elliot, Center for Food Safety and Applied Nutrition (HFS-22), Food and Drug Administration, 200 C St. SW., Washington, DC 20204, 202-205-5140.

For medical devices: Kiki B. Hellman, Center for Devices and Radiological Health (HFZ-113), Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857, 301-443-7158.

For human drugs: Gayle R. Dolechek, Center for Drug Evaluation and Research (HFD-335), Food and Drug Administration, 7520 Standish Pl., Rockville, MD 20855, 301-594-0104.

For biological products: Timothy W. Beth, Center for Biologics Evaluation and Research (HFM-635), Food and Drug Administration, 1401 Rockville Pike, Rockville, MD 20852-1448, 301-594-3074.

For veterinary drugs: William C. Keller, Center for Veterinary Medicine (HFV-210), Food and Drug Administration, 7500 Standish Pl., Rockville, MD 20855, 301-594-1722.

For animal feeds: John P. Honstead, Center for Veterinary Medicine (HFV-222), Food and Drug Administration, 7500 Standish Pl., Rockville, MD 20855, 301-594-1728.

For information on countries with BSE: Harvey Kryder, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Federal Bldg., rm. 757, 6506 Belcrest Rd., Hyattsville, MD 20782, 301-436-7885.

SUPPLEMENTARY INFORMATION: FDA has recently issued four letters requesting that bovine-derived materials from cattle that have resided in, or originated from, countries designated by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), as countries where BSE exists, not be used in the manufacture of FDA-regulated products intended for humans or animals. A letter dated

November 9, 1992, was issued to manufacturers of dietary supplements. A letter dated December 17, 1993, was issued to manufacturers of human drugs, biologics, and medical devices. (With respect to the December 17 letter, the agency has subsequently clarified that FDA does not object to the use of bovine-derived materials from BSE-countries in the manufacture of pharmaceutical grade gelatin at this time.) A letter dated August 17, 1994, was issued to manufacturers of FDA-regulated products for animals. A letter dated August 17, 1994, was issued to manufacturers and importers of dietary supplements and cosmetics.

BSE is a neurological disease of bovine animals. USDA has regulations that prohibit and restrict the importation of certain animal products and animal byproducts from ruminants that have been in countries where BSE exists. These countries are designated by USDA and listed in 9 CFR 94.18.

The BSE agent is extremely resistant to traditional forms of processing and sterilization. The disease was first identified in 1986. Since that time, over 100,000 cattle in Great Britain have either died or been destroyed as a result of BSE infection. At the present time, BSE is not known to exist in the United States. The disease is not known to be contagious by direct transmission.

BSE is a neurological disease classified as a transmissible spongiform encephalopathy (TSE), and is similar to other TSE's such as scrapie in sheep and Creutzfeldt-Jakob disease (CJD) in humans. Its continued spread within countries where BSE exists appears to be through the use of feed containing protein and other products from ruminants infected with BSE. In the United Kingdom, scrapie in sheep has been epidemiologically associated with the occurrence of BSE in cattle. Scrapie in sheep is known to have existed in Britain, Ireland, France, and Germany for over 200 years and has been observed in the United States and Canada for about 50 years. Because FDA cannot positively rule out a direct association between scrapie and BSE, FDA is proposing elsewhere in this issue of the Federal Register to prohibit the use in ruminant feed of specified offal from adult sheep and goats.

CJD is a rare neurological disease of humans that has similarities to BSE in cattle. The cause of CJD is unknown except in a few cases of specific genetic mutations and iatrogenic CJD in the case of CJD-contaminated growth hormone injections, dura mater grafts, and corneal transplants. Even though there is no direct evidence supporting an association between BSE and human disease, FDA believes that it is prudent to reduce any potential risk of human exposure to the BSE agent.

The purpose in issuing these four letters is to request that bovine-derived materials from cattle that have resided in or originated from USDA-designated BSE countries not be used in the manufacture of FDA-regulated products intended for humans or animals. Meat (i.e., skeletal muscle) is not covered by these letters. For guidance on importation of meat and other USDA-regulated products, refer to Title 9 of the Code of Federal Regulations.

The text of the November 9, 1992, letter to manufacturers of dietary supplements follows:

November 9, 1992

Dear Manufacturer of Dietary Supplements:

In a series of recent meetings, representatives of the dietary supplement industry have suggested that if FDA has concerns involving dietary supplement products, it should communicate its concerns directly to the industry. We agree that this is a reasonable and appropriate suggestion. Therefore, I wish to bring a matter of some importance to FDA to your attention. I would like to share with you FDA's concerns regarding the marketing of certain nutritional supplements. We have become aware that some supplements contain brain, nervous tissue, or glandular materials from a variety of animal species, including bovine (oxen, beef) and ovine (sheep) species. We are concerned that some amount of these materials may

have come from countries experiencing Bovine Spongiform Encephalopathy (BSE) in the case of bovine tissues, or scrapie in the case of ovine tissues.

As you may know, BSE is an infectious neurologic disorder of cattle, and is prevalent in certain parts of the world (''BSE countries''). Scrapie is a spongiform encephalopathy of sheep, and is a disease that is endemic in many parts of the world, including the United States. It is believed that the rapid spread of BSE among animals in Great Britain was caused by inadequately rendered, scrapie agent-containing material being fed to cattle. Thus, it is suggested that BSE is the clinical manifestation of scrapie in cattle. It is further suggested that cattle became infected by the orogastric route. Both scrapie and BSE are classified as transmissible spongiform encephalopathies. The causal agent is unknown, but suspected to be an agent known variously as ''prion,'' ''virino,'' ''unconventional virus,'' or ''slow virus.'' That these agents can infect across species, and infect primates, has been demonstrated repeatedly in laboratory studies.

Although cases are rare, spongiform encephalopathies can affect humans, most notably, Creutzfeldt-Jakob Disease (CJD). CJD is a rare disease, its incidence being about 1 case per million population. It is 100% fatal. Human-to-human transmission by iatrogenic means (e.g., contaminated neurosurgical instruments, corneal and dura mater implants, human growth hormone injections) has been documented. The possibility of transmission of animal spongiform encephalopathy agents to humans from consumption of animal brains from a variety of species, such as squirrel, goat, sheep, and hogs, and from consumption of sheep's eyeballs has been examined in the past. Although proof of such dietary transmission is lacking, some suspicions remain. The rarity of the disease, coupled with what is believed to be a long onset time (median - 13 years), make more precise epidemiological studies extremely difficult. Additionally, there may be a genetic or other susceptibility in some individuals.

FDA has recently been involved in investigating a consumer complaint involving a confirmed case of CJD. It is standard procedure for FDA to follow-up on all consumer complaints involving death or serious injury. In the course of this investigation, FDA learned that the woman had taken a bovine tissue-containing dietary supplement. Although, at the present there is no basis to conclude that this supplement played any role in causing this disease, FDA and NIH have decided that it is prudent to further investigate this matter. Therefore, both agencies have begun to conduct cooperative studies to determine whether nutritional supplements containing brain, nervous tissue or glandular materials from bovine and ovine species might be linked to human spongiform encephalopathies.

In 1991, the United States Department of Agriculture published a rule (9 CFR 95.4) which prohibits imports of various tissues and organs from ruminants in countries where BSE exists. Similar prohibitions have been in place for scrapie for many years. The concern addressed by the rules was that BSE - or scrapie-containing materials may find their way into cattle or sheep in the U.S. Nevertheless, FDA feels that the principle embodied in the USDA rule is an appropriate standard for tissues, organs, glands, and processed extracts from these articles insofar as they may be used for human food, including in supplement form.

FDA is requesting that you investigate the source of your neural and glandular tissue(s) or tissue extracts of bovine or ovine species to determine if they are being produced in known BSE countries or from flocks in which scrapie may be present. We would recommend that you reformulate your products using neural or glandular tissues that you are assured are BSE or scrapie free. We suggest within the next two months, that you gather information and determine the source of bovine or ovine materials used in your product(s). If you use bovine-derived materials in your product(s),

we suggest that you develop a plan to assure, with a high degree of certainty, that there is no possibility that materials of bovine origin are being supplied by BSE countries, either directly or indirectly. If you use ovine materials in your product(s), we suggest that you also develop a similar plan for assuring that these tissues are from scrapie-free animals. We fully recognize that there is no proven link between BSE or scrapie, and human disease, but given the devastating consequences of human spongiform encephalopathies such as CJD, we believe that our request is a prudent step at this time.

FDA requests that you communicate your plan(s) to us once you have developed them. We recognize that the steps you take to secure the assurances you need from exporting countries may be difficult, but we are certain you will agree with us that they are desirable.

If you need any additional information or guidance, please contact Dr. Douglas L. Archer, Deputy director, Center for Food Safety and Applied Nutrition at 202-205-4057. We appreciate your cooperation and attention to this matter.

Sincerely,

Fred R. Shank, Ph.D.

Director

Center for Food Safety and Applied Nutrition

The text of the December 17, 1993, letter to manufacturers of drugs, biological drugs, medical devices, and biological device products follows:

December 17, 1993

TO: Manufacturers of FDA-regulated Products

The Food and Drug Administration (FDA, the Agency) is issuing this letter to request that bovine-derived materials from cattle which have resided in or originated from countries where Bovine Spongiform Encephalopathy (BSE) has been diagnosed not be used in the manufacture of FDA-regulated products intended for administration to humans. We are advising you of our current recommendations pertaining to the use of such bovine-derived products.

FDA is providing the following information to explain why the Agency thinks that an animal disease (such as BSE) may potentially be a concern in the manufacture of FDA-regulated products intended for administration to humans. BSE has been reported for more than 109,000 cattle in the United Kingdom [Fall, 1993 quarterly report of the Ministry of Agriculture, Fisheries, and Food (MAFF)], and to a much lesser extent in other European countries. This neurological disease is a transmissible spongiform encephalopathy (TSE), and is similar to other TSEs such as scrapie in sheep and Creutzfeldt-Jakob Disease (CJD) in humans. The spongiform encephalopathies are uniformly fatal, and no rapid diagnostic test for infection in living animals (or humans) is currently available. Iatrogenic transmissions of CJD from both pituitary-derived human growth hormone (somatotropin) and dura mater\1\ have been reported. Research projects into the exact nature of both the BSE agent and other spongiform encephalopathy agents, host range, patterns of pathogenicity, and development of rapid antemortem diagnostic tests are ongoing. Available scientific information indicates that these agents are extremely resistant to inactivation by normal disinfection or sterilization procedures. The list of countries where BSE is known to exist (BSE-countries) is maintained by the United States Department of Agriculture (USDA). Countries listed in the Federal Register on December 6, 1991 (56 FR 63865 through 63870) include France, Great Britain (includes the Falkland Islands), Northern Ireland, the Republic of Ireland, Oman, and Switzerland.

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\\1\Brown P, Preece MA, Will RG. ``Friendly fire in medicine:

hormones, homografts, and Creutzfeldt-Jakob disease''. Lancet 1992;340:24-27.

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While transmission of the causative agent of BSE to humans has not been reported to date, FDA considers the recommendations below to be prudent at this time to further reduce any potential risk of exposure or transmission of a BSE-agent to humans by FDA-regulated products.

The Agency notes that regulated products intended for administration to humans and manufactured with bovine-derived materials derived from cattle that have at any time been in BSE-countries may be adulterated under Section 501(a)(2)(B) of the Federal Food, Drug, and Cosmetic Act (the Act), for drugs and biological drug products; or Section 501(h) of the Act, for medical devices and biological device products. The Agency is considering rulemaking to restrict the use of bovine-derived materials from BSE-countries. At this time, FDA recommends that bovine-derived materials from BSE-countries not be used in the manufacture of FDA-regulated products.

The Agency is providing the following suggestions to prevent the use of bovine-derived materials from cattle which have resided in or originated from BSE-countries. FDA recommends that manufacturers:

- a. identify bovine-derived materials used in the regulated product and identify all countries where the animals used for the material have lived. This information may be provided to the regulated-product manufacturer by the supplier of the bovine product. The supplier may also provide the manufacturer with appropriate veterinary regulatory inspection certification of slaughter, as required by the country of origin of live animals.
- b. maintain traceable records for each lot of bovine material and each lot of FDA-regulated product using these materials. These records should be part of the batch records, and available for FDA inspection.
- c. document the country of origin of the live animal source of any bovine-derived materials used in the manufacture of the regulated product. Documentation should be maintained for any new or in-process lots of licensed, cleared, or approved products; products pending clearance or approval; and investigational products intended to be administered to humans. Such documentation should be a part of the traceable records maintained in conjunction with batch production records, and such information should be available for review during FDA inspections.
- d. maintain copies of the records identified above for FDA-regulated products that are manufactured with bovine-derived materials at foreign sites, or by the foreign manufacturers. The U.S. firms responsible for marketing these products should be responsible for these records. Manufacturers of products subject to licensure should maintain records at the site of manufacture.

The Agency recommends that the information identified above be obtained for all currently approved, cleared, or licensed products, pending or approvable products, and investigational products.

Some manufacturers of FDA-regulated products may have already provided some of this information in applications to the USDA for permits to import certain animal products into the United States. In some instances, copies of these applications and permits may contain some of the information that the FDA is requesting. FDA suggests that this information be documented, recorded, and maintained for all bovine-derived products currently manufactured or marketed in the U.S. This information should be available for FDA inspection.

If you have any questions regarding the above items please contact the appropriate center as follows:

Center for Devices and Radiological Health: 301-594-4692 ext.

Center for Drug Evaluation and Research: 301-594-0054  
Center for Biologics Evaluation and Research--contact the  
Application Division in the CBER Office responsible for the  
regulation of your product. These Offices are:  
Office of Vaccines Research and Review 301-594-2090  
Office of Therapeutics Research and Review 301-594-5109  
Office of Blood Research and Review 301-594-2012  
Regulated-product manufacturers are referred to the USDA for  
current information and countries on the "BSE-list". Additional  
information and regulations concerning bovine spongiform  
encephalopathy (BSE) and affected animals may be obtained from the  
open veterinary literature and the United States Department of  
Agriculture (see 9 CFR 94.18).

Sincerely yours,

Jane E. Henney, M.D.

Deputy Commissioner for Operations

The text of the August 17, 1994, letter to manufacturers of FDA-  
regulated products for animals follows:

August 17, 1994

To: Manufacturers of FDA-regulated products for animals

The Food and Drug Administration is issuing this letter to  
request that bovine-derived materials from cattle which have resided  
in, or originated from, countries designated as bovine spongiform  
encephalopathy (BSE) countries by United States Department of  
Agriculture (USDA), Animal and Plant Health Inspection Service, not  
be used in the manufacture of FDA-regulated products (drugs and  
feed) intended for animals. FDA believes that this action is  
necessary to prevent the occurrence of BSE in U.S. cattle. Meat  
(i.e., skeletal muscle) is not covered by this letter. For guidance  
on importation of meat and other USDA-regulated products, refer to  
Title 9 of the Code of Federal Regulations.

FDA is providing the following information to explain why the  
Agency thinks that BSE may potentially be a concern in the  
manufacture of FDA-regulated products intended for administration to  
animals. BSE has been identified in more than 100,000 cattle in the  
United Kingdom and to a much lesser extent in other European  
countries. BSE has not been diagnosed in the U.S. This neurological  
disease is a transmissible spongiform encephalopathy (TSE), and is  
similar to other TSE's such as scrapie in sheep and Creutzfeldt-  
Jakob Disease (CJD) in humans. The spongiform encephalopathies are  
uniformly fatal and no rapid diagnostic test for infection in living  
animals is currently available. A range of research projects into  
the exact nature of both the BSE agent and other TSE agents, host  
range, patterns of pathogenicity, and development of rapid ante  
mortem diagnostic tests is ongoing. Available scientific information  
indicates that these agents are extremely resistant to inactivation  
by normal disinfection or sterilization procedures. The list of  
countries where BSE is known to exist is maintained by the USDA and  
codified in Title 9, Code of Federal Regulations, Part 94.18.

The Agency notes that products intended for animals and  
manufactured with bovine-origin materials derived from cattle that  
have, at any time, been in BSE countries may be adulterated under  
Section 501(a)(2)(B) of the Federal Food, Drug, and Cosmetic Act.  
The Agency is considering rulemaking to restrict the use of bovine-  
derived materials from BSE countries in the manufacture of FDA-  
regulated products for animals. At this time, we request that  
bovine-derived materials from BSE countries not be used in the  
manufacture of FDA-regulated products intended for animals.

FDA considers the recommendations below to be prudent at this  
time to further reduce any potential risk of exposure to, or  
transmission of, a BSE agent to animals by FDA-regulated products.

We recommend that manufacturers:

- a. Identify bovine-origin materials used in regulated products  
for animals and identify all countries where the cattle used for the

material have lived. This information may be provided to the regulated product manufacturer by the supplier of the bovine material. The supplier may also provide the manufacturer with appropriate veterinary regulatory inspection certification of slaughter if already required by USDA for import from BSE countries which verify the country of origin.

b. Maintain traceable records for each lot of bovine-derived material and each lot of FDA-regulated products intended for animals that are manufactured using these materials. These records should be part of the batch records and available for FDA inspection.

c. Document the country of origin of the live animals for bovine-origin materials used in the manufacture of any new or in-process lots of FDA-regulated products intended for animals. Such documentation should be a part of the traceable records maintained in conjunction with batch production records and such information should be available for FDA inspection.

d. Maintain copies of the appropriate records identified above for FDA-regulated products intended for animals that are manufactured with bovine-derived materials at foreign sites, or by the foreign manufacturers. The U.S. firms responsible for marketing these animal products should be responsible for these records. Registered product manufacturers should maintain records at the site of manufacture.

The Agency recommends that the information identified above be obtained and maintained for all FDA-regulated products intended for animals.

Some manufacturers of FDA-regulated products intended for animals may have already provided some of this information in applications to the USDA for permits to import certain bovine materials into the U.S. In some instances, copies of these applications and permits may contain some of the information requested. We request that this information be documented, recorded, and maintained for all bovine-origin materials for use in FDA-regulated products intended for animals currently manufactured or marketed in the U.S. This information should be available for FDA inspection.

If you have any questions regarding the above items, please contact the Center for Veterinary Medicine:

For Veterinary Drugs: Dr. William Keller, Director, Division of Surveillance, HFV-210, 7500 Standish Place, Rockville, Maryland 20855, 301-594-1722

For Animal Feeds: Dr. John Honstead, Division of Animal Feeds, HFV-222, 7500 Standish Place, Rockville, Maryland 20855, 301-594-1728

Regulated product manufacturers are referred to the USDA for current information and countries on its list of countries with BSE in native animals. Additional information and regulations concerning BSE and affected animals may be obtained from the USDA, Animal and Plant Health Inspection Service (301-436-7830).

Sincerely yours,

Linda A. Suydam

Interim Deputy Commissioner for Operations

The text of the August 17, 1994, letter to manufacturers and importers of dietary supplements and cosmetics follows:

August 17, 1994

To Manufacturers and Importers of Dietary Supplements:

To Manufacturers and Importers of Cosmetics:

The Food and Drug Administration (FDA) is recommending that firms that manufacture or import dietary supplements and cosmetics containing specific bovine tissues (see Appendix A) ensure that such tissues do not come from cattle born, raised, or slaughtered in countries where bovine spongiform encephalopathy (BSE) exists (BSE-countries). Extracts of these tissues and ingredients derived from these tissues are also of concern. The recommended actions are

precautionary measures to reduce potential risk of human exposure to, or transmission of, the agent which causes BSE in cattle.

At this time, FDA is not extending the recommendation in this letter to dairy products or gelatin, because available evidence does not suggest transmission via these foods. Furthermore, meat (i.e., skeletal muscle) is not covered by this letter. For guidance on importation of meat and other products regulated by the United States Department of Agriculture (USDA), refer to Title 9 of the Code of Federal Regulations.

The Agency is providing the following information to explain why it believes that BSE may potentially be a concern with certain dietary supplements and cosmetic products. BSE has been identified in more than 100,000 cattle in the United Kingdom and, to a much lesser extent, in several other countries. BSE has not been diagnosed in the United States. This neurological disease is a transmissible spongiform encephalopathy (TSE) and is similar to other TSEs such as scrapie in sheep and Creutzfeldt-Jakob Disease (CJD) in humans. The spongiform encephalopathies are uniformly fatal and no rapid diagnostic test for infection in living animals or humans is presently available. Current scientific information indicates that the causative agent is extremely resistant to inactivation by normal disinfection or sterilization procedures. A range of research projects into the exact nature of both the BSE agent and other TSE agents, host range, patterns of pathogenicity, and development of rapid ante mortem diagnostic tests is ongoing.

Since 1991, USDA has prohibited the importation into the U.S. of certain tissues and organs from ruminants from countries where BSE exists (BSE-countries; see 9 CFR 94.18). USDA's regulations are intended to protect livestock in the United States from contracting TSEs and address known or strongly suspected modes of transmission. For the up-to-date listing of BSE-countries please contact USDA, Animal and Plant Health Inspection Service (APHIS) at (301) 436-7830.

The USDA regulations permit, under certain conditions, the importation of some cosmetic ingredients (i.e., collagen, collagen products, amniotic liquids or extracts, placental liquids or extracts, serum albumin, and serocolostrum) derived from ruminants from BSE-countries; see 9 CFR 95.4.

The USDA regulations do not apply to imports of:

- \* cosmetic products that are packaged and ready for sale;
- \* bovine-derived materials intended for human consumption as either finished dietary supplement products or for use as ingredients in dietary supplements; or
- \* human food (except meat, i.e., skeletal muscle).

While documented transmission of the causative agents of BSE or scrapie to humans has not been reported to date, the FDA wrote to manufacturers of dietary supplements in November 1992, alerting them to the developing concern about TSEs in animals and CJD in man. That letter recommended that manufacturers voluntarily investigate the geographic source(s) of any bovine or ovine material used in their products (generally neural or glandular tissue or tissue extracts). The Agency also suggested that each manufacturer develop a plan "to assure, with a high degree of certainty," that such materials are not from BSE-countries, as identified by USDA's APHIS, or from scrapie-infected sheep flocks, either foreign or domestic.

FDA now considers further protective steps to be reasonable and is restating and expanding its recommendation to manufacturers and importers of dietary supplements and their ingredients, to develop plans for ensuring, with a high degree of certainty, that specific bovine-derived materials (see Appendix A) from BSE-countries are not being used. The Agency is also recommending that manufacturers and importers of cosmetic products and their ingredients develop the same type of plans. FDA is not, at this time, recommending restrictions on the use of ovine-derived materials in the



manufacture of dietary supplement and cosmetic products and ingredients, as the epidemiological evidence now appears convincing that scrapie is not related to TSEs in humans.

FDA believes it is prudent to expand its recommendation to cosmetics and cosmetic ingredients because extracts of listed tissues, e.g. sphingolipids isolated from brain tissue and extracts of bovine placenta, are used in cosmetics. Additionally, FDA is unaware of data demonstrating that processing techniques used in the manufacture of cosmetics will inactivate TSE agents. Further, little is known about the potential human risk of transmission from topical application of cosmetics containing TSE agents to intact, broken or abraded skin.

To assist manufacturers and importers whose products are within the scope of this recommendation in developing their plans, the following guidance is provided:

a. To ensure that bovine-derived materials (listed in Appendix A) used in the product(s) are from non BSE-countries, identify all countries where the animals used were born, raised or slaughtered. The supplier of the bovine-derived materials should provide the necessary records.

b. Maintain traceable records for each lot of bovine-derived material and records of products containing the materials.

c. Maintain records for those products manufactured at foreign sites or by foreign manufacturers which contain bovine-derived materials.

The Agency recommends that manufacturers and importers of dietary supplements and cosmetic products and ingredients used in the manufacture of these products develop their plans within the next two months and notify the Agency, in writing, that their plans have been developed. The designated contact is Dr. Elisa Elliot, Science Policy Analyst, Executive Operations Staff, HFS-22, Center for Food Safety and Applied Nutrition, FDA, 200 C Street, S.W., Washington, DC, 20204 or FAX (202) 205-5025. FDA recommends that the plans be implemented as soon after development as possible, and be available for review by the Agency during inspections.

The Agency is continuing to examine all available information about TSEs and will provide additional guidance as necessary. If you need more information please contact Dr. Elliot by telephone at (202) 205-5140.

We appreciate your attention to and cooperation in this matter.

Sincerely,

Linda A. Suydam

Interim Deputy Commissioner for Operations

Attachment

#### Appendix A

##### List of Tissues With Suspected Infectivity

###### Category I (High infectivity)

<bullet> Brain

<bullet> Spinal cord

###### Category II (Medium infectivity)

<bullet> Ileum

<bullet> Lymph nodes

<bullet> Proximal colon

<bullet> Spleen

<bullet> Tonsil

<bullet> Dura mater

<bullet> Pineal gland

<bullet> Placenta

<bullet> Cerebrospinal fluid

<bullet> Pituitary gland

<bullet> Adrenal gland

Category III (Low infectivity)

- <bullet> Distal colon
- <bullet> Nasal mucosa
- <bullet> Sciatic nerve
- <bullet> Bone marrow
- <bullet> Liver
- <bullet> Lung
- <bullet> Pancreas
- <bullet> Thymus gland

List taken from "Report of a WHO Consultation on Public Health Issues Related to Animal and Human Spongiform Encephalopathies," World Health Organization, Office of International Epizootics, Geneva, Switzerland, November 12-14, 1991.

Dated: August 19, 1994.

Linda A. Suydam,

Interim Deputy Commissioner for Operations.

[FR Doc. 94-21279 Filed 8-26-94; 8:45 am]

BILLING CODE 4160-01-F



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration  
Rockville, MD 20857

May 9, 1996

**TO MANUFACTURERS OF FDA-REGULATED DRUG/BIOLOGIC/DEVICE PRODUCTS:**

As the media have widely reported, the British government announced on March 20, 1996, that new information had been gathered about bovine spongiform encephalopathy (BSE) in cattle that suggests a possible relationship between BSE and ten cases of a newly identified form of Creutzfeldt-Jakob disease (CJD), a similar fatal transmissible spongiform encephalopathy (TSE), in humans. To serve our mutual interest in protecting public health, the Food and Drug Administration (FDA) believes it is prudent to reiterate concerns we have previously expressed on this issue.

We strongly recommend you take whatever steps are necessary to assure yourselves and the public that, in the manufacture of FDA-regulated products intended for administration to humans, you are not using materials that have come from cattle born, raised, or slaughtered in countries where BSE is known to exist. FDA believes that immediate and concrete steps must be taken by manufacturers to reduce the potential risk of human exposure to, or transmission of, the infectious agent which causes BSE in cattle.

BSE is an infectious neurologic disorder of cattle and is prevalent in certain parts of the world. BSE has never been diagnosed in cattle in the United States. It is believed that the rapid spread of BSE in cattle in some countries, particularly Great Britain, was caused by the feeding of certain infected cattle and sheep tissues to cattle. While transmission of the causative agent of BSE to humans has not been definitively documented to date, inter-species transfer has been demonstrated (e.g., mice can be infected by exposure to infected bovine tissues). Recent developments in Great Britain raise serious questions regarding potential hazards of the use of animal tissues containing the causative agent of BSE.

The list of countries where BSE is known to exist is maintained by the U.S. Department of Agriculture (USDA) and codified in Title 9, Code of Federal Regulations, Part 94.18. A current list of these countries follows:

**USDA LIST OF COUNTRIES WHERE BSE EXISTS**  
(Current as of May 1996)

Great Britain (including Northern Ireland and the Falklands)  
Switzerland  
France  
Republic of Ireland  
Oman  
Portugal

Page 2 - BSE

A range of research projects into the exact nature of both the BSE agent and other TSE agents is ongoing. Available scientific information indicates that these agents are extremely resistant to inactivation by normal disinfection or sterilization procedures.

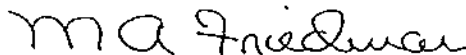
At a future date, we will contact you with guidance on how best to provide assurance that your products do not contain potentially BSE-infected materials.

If you need more information, please contact the following:

Yuan Yuan Chiu, Ph.D., 301 443-3510 (drug products)  
Kiki Hellman, Ph.D., 301 443-7158 (medical devices)  
Paul Richman, Ph.D., 301 827-3070 (biologics).

Thank you for your attention to and cooperation in this matter.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "MA Friedman".

Michael A. Friedman, M.D.  
Deputy Commissioner for Operations

## BACKGROUND INFORMATION AND CHRONOLOGY OF U.S. BSE-RELATED ACTIONS

- November 1986 - BSE first recognized as new cattle disease by researchers at Central Veterinary Laboratory of British MAFF, Weybridge, England
- December 12, 1990 - First meeting of FDA BSE Task Force; initial discussions of product inventories and guidance letters to regulated industry on products of bovine origin
- May 3, 1991 - FDA/CBER Letter to Biologics Manufacturers requesting information on sources of bovine- or ovine-derived products
- August 13, 1992 - FDA BSE Working Group established in Office of Commissioner to provide coordination across FDA Centers on emerging BSE-related issues
- September 1, 1992 - FDA Import Bulletin alerting field units to imports from BSE countries of animal by-products and regulated products with animal by-product ingredients
- November 9, 1992 - FDA/CFSAN Letter to Manufacturers of Dietary Supplements asking to ensure that bovine- and ovine-derived materials do not come from countries reporting BSE
- December 17, 1993 - FDA Letter to Manufacturers of FDA-Regulated Products (human drugs, biologics, and medical devices) requesting that bovine-derived materials from cattle which have resided in or originated from countries where BSE has been diagnosed not be used in manufacture of FDA-regulated products intended for administration to humans
- July 1, 1994 - After review of processing and manufacturing procedures for pharmaceutical gelatin, FDA letter to legal counsel of gelatin industry stating it does not object to use of bovine-derived materials from BSE countries in manufacture of pharmaceutical grade gelatin; considers it prudent, however, to obtain such materials from non-BSE countries whenever practical, and to maintain records of bovine material sources
- August 17, 1994 - FDA Letter to Manufacturers of FDA-Regulated Products for Animals; FDA Letter to Manufacturers and Importers of Dietary Supplements and Cosmetics recommending that firms manufacturing or importing dietary supplements and cosmetics containing specific bovine tissues ensure that such tissues do not come from cattle born, raised, or slaughtered in countries where BSE exists. Extracts of these tissues and ingredients derived from these tissues are also of concern. FDA is not extending the recommendations to dairy products or gelatin, at this time, because available evidence does not suggest the transmission via these foods
- August 29, 1994 - FR Notice: FDA proposal to ban use of offal from adult sheep and goats in feed for ruminants and Letters (4) to Manufacturers requesting that bovine-derived materials from cattle that have resided in, or originated from, countries designated by the USDA,

APHIS as countries where BSE exists not be used in FDA-regulated products intended for humans or animals

- October 19, 1995 - FDA Import Alert - detention, without examination, of bulk shipments of high-risk bovine tissues, and tissue-derived ingredients from the United Kingdom, France, Ireland, Oman, Switzerland, and Portugal
- March 20, 1996 - British government announcement of 10 cases in Great Britain of previously unrecognized form of Creutzfeld-Jakob Disease (CJD) and possible relationship with BSE. SEAC postulates link between cases of variant CJD (vCJD) and exposure to BSE-infected beef, most likely before 1989
- March 29, 1996 - USDA and PHS press release supporting voluntary industry efforts to keep U.S. free of BSE; FDA/CVM will expedite regulations prohibiting ruminant protein in ruminant feeds
- March 29, 1996 - FDA reinstitutes meetings of FDA BSE Working Group
- May 9, 1996 - FDA letters (4) to manufacturers of FDA-regulated products to alert them to new information from U.K. and to reiterate earlier recommendations
- May 10, 1996 - HHS Fact Sheet - actions to prevent BSE in U.S. cattle and to minimize any potential risk to humans from BSE exposure
- May 14, 1996 - FDA Advanced Notice of Proposed Rulemaking soliciting comments on use of protein derived from ruminants in ruminant feed
- May 21, 1996 - FDA letter to legal counsel of gelatin industry reiterating earlier statement that FDA does not object to FDA-regulated products containing pharmaceutical grade gelatin made from cattle from BSE countries and that FDA was not extending the recommendations concerning material from BSE countries to dairy products and gelatin
- June 9, 1996 - FDA recharter CJD Advisory Committee as the TSE Advisory Committee
- January 3, 1997 - FDA/CVM publishes proposed rule on feed ban
- January 29, 1997 - FDA Update on proposed feed ban rule to U.S. House of Representatives Committee on Government Reform and Oversight
- April 23-24, 1997 - First meeting of TSE Advisory Committee to assess safety of imported and domestic gelatin and gelatin by-products used in FDA-regulated products with regard to risk posed by BSE

- April 15, 1997 - FDA/CVM publishes draft rule on mammalian to ruminant feed ban for comment
- June 5, 1997 - FDA/CVM publishes final rule - "Substances Prohibited from Use in Animal Food or Feed: Animal Proteins Prohibited in Ruminant Feed"
- October 6-7, 1997 - Second meeting of TSE Advisory Committee to: 1) assess safety of processed human dura mater as an implant for surgical use with regard to the risk of CJD transmission, considering its purported clinical benefits, and the adequacy of alternative products; and 2) consider appropriate actions for FDA on TSE-implicated "secondary" products - products in which, before it was withdrawn, a TSE-implicated plasma derivative was added as an excipient or used as a reagent in manufacturing process
- October 7, 1997 - FDA publishes Guidance for Industry, "The Sourcing and Processing of Gelatin to Reduce the Potential Risk Posed by BSE in FDA-Regulated Products for Human Use"
- April 15-16, 1998 - Third meeting of TSE Advisory Committee to: 1) assess the safety of both imported and domestic tallow and tallow derivatives with regard to the risk posed by TSEs (specifically, BSE); 2) assess whether healthy cattle from BSE countries or BSE-status unknown countries are a safe source of bones to produce gelatin intended for oral consumption or topical application by humans if, as previously recommended, the cattle are from BSE-free herds and the heads, spines, and spinal cords are removed, and whether such cattle are a safe source of hides to produce gelatin intended for the same purposes if, as previously recommended, the cattle are from BSE-free herds and contamination of the hides with CNS tissue and eyes is avoided; and 3) to provide comments on FDA's proposed course of action on the human dura mater issue, including FDA's considerations for a letter to dura manufacturers to be published in the Federal Register.
- June 8-9, 1998 - The Joint Institute for Food Safety and Applied Nutrition (JIFSAN), a partnership between the FDA and the University of Maryland, sponsors the "Workshop on TSE Risks in Relation to Source Materials, Processing, and End-Product Use." Workshop outcomes include a Draft Document of Critical Elements for material sourcing, material processing, and end use of product, the first step in developing a framework of practical guiding principles related to these topics.

U.S. Food and Drug Administration

# Guidance for Industry

## The Sourcing and Processing of Gelatin to Reduce the Potential Risk Posed by Bovine Spongiform Encephalopathy (BSE) in FDA-Regulated Products for Human Use

Comments and suggestions regarding this document should be submitted by December 22, 1997, to Docket No. 97D-0411, Dockets Management Branch (HFA-305), Food and Drug Administration, 12420 Parklawn Dr., Rm. 1-23, Rockville, MD 20857.

U.S. Department of Health and Human Services

Food and Drug Administration

September 1997

**Introduction** - FDA has adopted Good Guidance Practices (GGPs), which set forth the agency's policies and procedures for the development, issuance, and use of guidance documents (62 FR 8961, February 27, 1997). This guidance is issued as Level 1 guidance consistent with GGPs. The agency is soliciting public comment but is implementing this guidance immediately because of public health concerns related to the use of gelatin. This guidance document represents the agency's current thinking on reducing the potential risk of transmission of BSE related to the use of gelatin in FDA-regulated products for human use. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public. An alternative approach may be used if such approach satisfies the requirements of the applicable statutes, regulations, or both.

**Purpose** - This guidance document addresses the safety of gelatin as it relates to the potential risk posed by BSE in FDA-regulated products for human use. It is intended to provide guidance to industry concerning the sourcing and processing of gelatin used in FDA-regulated products. In developing this proposed guidance, FDA considered various information, including the conclusions of the Transmissible Spongiform Encephalopathies (TSEs) Advisory Committee in a meeting on April 23-24, 1997. The committee reviewed data on the sourcing and processing of materials used to make gelatin as well as data from an experimental study on the effect of gelatin processing on the infectivity of a spongiform agent.

**Background** - Over the last several years, FDA has provided guidance to manufacturers



and importers of FDA-regulated products regarding products containing or exposed to bovine-derived materials from countries reporting cases of BSE. The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) identified these BSE countries beginning in December 1991 (9 CFR 94.18; see also recent USDA interim rule designating the Netherlands a BSE country: 62FR18623 on April 15, 1997). As a way to prevent the introduction of BSE infection in U.S. cattle, USDA has prohibited, since 1989, the importation of livestock from BSE countries, and has also banned, since 1991, bovine-derived products from BSE countries which are intended for animal use. USDA has conducted extensive monitoring and has diagnosed no cases of BSE in U.S. cattle to date.

The British BSE epidemic is thought to have resulted from the practice of adding rendered animal tissue to cattle feed. Early on, some evidence suggested the potential for cross-species transmission of TSEs (rare, fatal neurological diseases such as scrapie in sheep and Creutzfeldt-Jakob disease in humans). Although it was not known whether BSE could be transmitted from contaminated cattle to humans, FDA believed it prudent to alert manufacturers to this potential risk. Since 1992, FDA has sent a number of letters to manufacturers of FDA-regulated products providing guidance on the use of bovine materials from BSE countries (see Appendix A for a chronology of FDA's guidance to the industry).

Guidance on Gelatin - In 1994, representatives of the gelatin industry presented preliminary data to FDA staff concerning an experimental study of the infectivity of TSE-infected tissue that had undergone one of two processes (lime or acid) used to make gelatin. Based on these data, FDA decided not to include gelatin as part of its recommendations concerning other bovine ingredients in FDA-regulated products. A notice in the *Federal Register* of August 29, 1994, summarized FDA's recommendations to reduce any potential BSE risk and clarified that FDA's recommendations at that time did not extend to gelatin for human use produced from bovine materials from BSE countries.

Recent Review of Gelatin Guidance - In 1996, FDA decided to review its previous guidance on the use of gelatin because of new information suggesting that BSE may be transmissible to humans and because of updated data from the study on the effect of gelatin processing on infectivity.

During the April 1997 meeting of the TSE advisory committee, information on industry practices and the results of the research study were presented. The study involved mouse brain tissue that had been infected with scrapie (as a BSE model).<sup>1</sup> The tissue was treated with lime or with acid according to gelatin manufacturing conditions. Neither the acid nor the lime treatment completely inactivated the infectious agent. A second infectivity study is due to be completed in late 1997 or early 1998.

The advisory committee members stated opinions on questions raised by FDA and were polled on their answers to the final question, "Does current scientific evidence justify continuing to exempt gelatin from restrictions recommended by FDA for other bovine-derived materials from BSE countries?" Ten of the 14 members responded "no" or a "qualified no" to this question (see Appendix B for a summary of the advisory committee meeting).

Recommendations - FDA has been reviewing the currently available scientific information, including information provided on behalf of the Gelatin Manufacturers of Europe and the Gelatin Manufacturers Institute of America. FDA also considered the advisory committee's recommendations and other available information. Based on this review, FDA proposes the following recommendations concerning the acceptability of gelatin for use in FDA-regulated products intended for human use:

1. In order to ensure that all parties in the distribution chain take appropriate responsibility,

importers, manufacturers, and suppliers should determine the tissue, species, and country source of all materials to be used in processing gelatin for human use.

2. Bones and hides from cattle that shows signs of neurological disease, from any source country, should not be used as raw material for the manufacture of gelatin.

3. Gelatin produced from bones and hides obtained from cattle residing in, or originating from, countries reporting BSE or from countries that do not meet the latest BSE-related standards of the Office International des Epizooties (OIE)<sup>2</sup> (see Appendix C) should not be used either in injectable, ophthalmic, or implanted FDA-regulated products, or in their manufacture.

4. At this time, there does not appear to be a basis for objection to the use of gelatin in FDA-regulated products for oral consumption and cosmetic use by humans when the gelatin is produced from bones obtained from cattle residing in, or originating from, BSE countries, if the cattle come from BSE-free herds and if the slaughterhouse removes the heads, spines, and spinal cords directly after slaughter. Nor does there appear to be a basis for objection to gelatin for oral consumption and cosmetic use which is produced from bones from countries which have not reported BSE but which fail to meet OIE standards if the slaughterhouse removes the heads, spine, and spinal cords after slaughter. Gelatin processors should ensure that slaughterhouses that supply bovine bones for gelatin production remove heads, spines, and spinal cords as the first procedure following slaughter.

5. At this time, there does not appear to be a basis for objection to the use of gelatin produced from bovine hides, from any source country, in FDA-regulated products for oral consumption and cosmetic use by humans use if processors ensure that the bovine hides have not been contaminated with brain, spinal cord, or ocular tissues of cattle residing in, or originating from, BSE countries and if they exclude hides from cattle that have signs of neurological disease (see #2).

6. At this time, there does not appear to be a basis for objection to the use of gelatin produced from bovine hides and bones in FDA-regulated products for human use if the gelatin is produced from U.S.-derived raw materials or from cattle born, raised, and slaughtered in other countries that have no reported BSE cases and that meet OIE BSE standards.

7. At this time, there does not appear to be a basis for objection to the use of gelatin produced from porcine skins, from any source country, in FDA-regulated products for human use. Processors should ensure that gelatin made from porcine skins is not cross-contaminated with bovine materials originating from BSE countries or from countries that do not meet OIE standards.

#### APPENDIX A CHRONOLOGY OF FDA'S BSE-RELATED GUIDANCE/REGULATION

- In November 1992, FDA wrote to manufacturers of dietary supplements, alerting them to the developing concern about transmissible spongiform encephalopathies (TSEs) in animals and Creutzfeldt-Jakob Disease in humans. In that letter, the agency recommended that manufacturers investigate the geographic source(s) of any bovine or ovine material (generally neural or glandular) used in their products. FDA also suggested that each manufacturer develop a plan "to assure, with a high degree of certainty," that such materials are not from BSE-countries, as identified by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, or from scrapie-infected sheep flocks, either foreign or domestic (9 CFR 94.18) .

- In a December 17, 1993, letter to manufacturers of drugs, biologics, and medical devices, FDA recommended against the use of bovine-derived materials from cattle which have resided in, or originated from, BSE countries (59 FR 44592). FDA recommended that manufacturers: a) identify bovine-derived materials in the product and identify all countries where the animals used to produce the material have lived; b) maintain traceable records for each lot of bovine material and for each lot of FDA-regulated product using these materials; c) document the country of origin of the live animal source of any bovine-derived materials used in the manufacture of the regulated product; and d) maintain copies of the record identified above for FDA-regulated products manufactured using bovine-derived materials at foreign sites or by the foreign manufacturers.
- On July 1, 1994, Ms. Linda Suydam, then Interim Deputy Commissioner for Operations, sent letters to counsel representing the Gelatin Manufacturers Association (GMA) and the Gelatin Manufacturers of America (GMIA) which stated that, after reviewing available scientific information, "FDA does not object to the use of bovine-derived materials from BSE-countries in the manufacture of pharmaceutical grade gelatin at this time." The agency also stated that, "We continue to consider it prudent, however, to obtain such materials from non BSE-countries whenever practical, and to maintain records as to the sources of the bovine materials used to manufacture pharmaceutical grade gelatin."
- FDA published a notice in the *Federal Register* of August 29, 1994, entitled, "Bovine-Derived Materials; Agency Letters to Manufacturers of FDA-regulated Products" (59 FR 44592). The notice published letters to Manufacturers of Dietary Supplements (November 9, 1992), Manufacturers of FDA-Regulated Products (December 17, 1993), Manufacturers of FDA-regulated Products for Animals (August 17, 1994), and to Manufacturers and Importers of Dietary Supplements and of Cosmetics (August 17, 1994). The letter to manufacturers and importers of dietary supplements and cosmetics stated, "The FDA is recommending that firms that manufacture or import dietary supplements and cosmetics containing specific bovine tissues...ensure that such tissues do not come from cattle born, raised, or slaughtered in countries where bovine spongiform encephalopathy (BSE) exists (BSE-countries)." The Agency also stated, "At this time, FDA is not extending the recommendation in this letter to dairy products and gelatin, because available evidence does not suggest transmission via these foods."
- In October 19, 1995, FDA issued Import Alert 17-04 (replacing the 1992 Import Bulletin and revising an alert issued July 18, 1995) calling for the detention, without examination, of bulk shipments of high-risk bovine tissues and tissue-derived ingredients from the United Kingdom, France, Ireland, Oman, Switzerland, and Portugal.
- In March 1996, the British government announced that new information from the Spongiform Encephalopathy Advisory Committee (SEAC) suggested a possible relationship between BSE and 10 cases of a newly identified form of CJD.<sup>4</sup> On May 9, 1996, FDA sent letters to inform the industry of the announcement by the British government and to reiterate the Agency's concerns on this issue. In these letters, FDA strongly reiterated its recommendations that firms that manufacture or import FDA-regulated products take whatever steps necessary to assure themselves and the public that bovine-derived ingredients do not come from cattle, born, raised, or slaughtered in countries that have reported BSE.
- In May 21, 1996, letters to counsel to the GMA and GMIA, Dr. Michael A. Friedman, Deputy Commissioner for Operations stated that, "Although we continue to review

scientific information on animal and human transmissible spongiform encephalopathies related to FDA-regulated products, we have no new knowledge, at this time, to cause us to change our position on gelatin as stated in those letters." However, FDA staff began review of final data from the mouse study whose preliminary data FDA had reviewed in deciding that gelatin from BSE countries was acceptable in FDA-regulated products.

- On June 5, 1997, FDA published in the *Federal Register* a document entitled, "Substances Prohibited From Use in Animal Food or Feed; Animal Proteins Prohibited in Ruminant Feed; Final Rule (62 FR 30936). This final rule excludes domestic gelatin from the definition of animal proteins prohibited in ruminant feed. In fact, U.S. manufacturers do not add gelatin—a poor source of protein—as a protein supplement to animal feed. (Imported gelatin and other bovine-derived products from BSE countries intended for animal use are banned by USDA/APHIS).

#### APPENDIX B SUMMARY OF TSE ADVISORY COMMITTEE MEETING

On April 23-24, 1997, FDA held a public meeting of the Transmissible Spongiform Encephalopathies Advisory Committee to help FDA assess the safety of imported and domestic gelatin and gelatin by-products in FDA-regulated products with regard to the risk posed by bovine spongiform encephalopathy (BSE). Following presentations on gelatin sourcing and processing, risk assessment, process validation, and BSE's infectivity, panel members were asked the following:

1. Which, if any, specific gelatin-processing procedure is preferred or essential to assure optimal inactivation of any contaminating TSE agent?

The committee agreed with the FDA that the alkali treatment step in gelatin production was a key step in the inactivation of BSE infectious agent. It stated that steps such as heat, alkaline treatment, and filtration could be effective in reducing the level of contaminating TSE agents; however, scientific evidence is insufficient at this time to demonstrate that these treatments would effectively remove the BSE infectious agent if present in the source material.

2. What criteria should be considered in designing gelatin process validation studies and analyzing the results of such studies?

The committee agreed with FDA that there is a need for well-designed process validation protocols to verify that a specific manufacturing process would inactivate BSE's infectious agent. It recommended that FDA use the help of outside experts to review industry submissions. The committee also offered to provide input. The committee stated the need for assurance that manufacturers would follow the specified manufacturing processes.

3. If gelatin and gelatin by-products are no longer to be exempted from FDA BSE restrictions, what level of restriction is sufficient to reduce risk appropriately?

The committee expressed some concern over the current list of USDA-designated BSE countries because ineffective BSE surveillance by some countries may fail to detect BSE cases. It indicated the need for developing criteria for BSE designation/classification. USDA is addressing the issue of effective surveillance and revising its current list. However, it may be some time before this is completed. The committee stated that sourcing for gelatin should be as safe as possible and that countries which had no reported cases, but had an established BSE risk, or lacked an appropriate surveillance system would be of concern.

The committee stated that criteria for gelatin should be established relative to the risk posed by the use of that gelatin. The risk would differ for oral consumption, parenteral, and cosmetic uses. Other factors, such as processing and the type of material processed (bovine/porcine, bones/hides), should be considered in this risk assessment.

4. Does current scientific evidence justify continuing to exempt gelatin from restrictions recommended by FDA for other bovine-derived materials from BSE countries (i.e., that these materials NOT come from BSE countries)?

Ten members said NO or a qualified no; three said YES or a qualified yes; one abstained.

APPENDIX C  
*International Animal Health Code*  
*Special Edition 1997*  
Chapter 3.2.13.

Bovine Spongiform Encephalopathy  
(BSE)

Article 3.2.13.1.

Bovine spongiform encephalopathy (BSE) is a progressive nervous disease of adult cattle. BSE has a long *incubation period* measured in years, and arose from feeding contaminated ruminant protein.

The BSE status of a country can only be determined by continuous surveillance and monitoring. The minimum requirements for effective surveillance are:

- 1) compulsory notification and clinical investigation of suspect cases;
  - 2) a risk assessment identifying the potential hazards for BSE occurrence:
    - a) risk arising by:
      - i) importation of animals or *embryos/ova* which are potentially infected with a transmissible spongiform encephalopathy (TSE);
      - ii) importation and feeding of potentially contaminated animal feedstuff to cattle;
    - b) indigenous risks:
      - i) consumption, by cattle, of contaminated, animal-derived proteins arising from transmissible spongiform encephalopathy-infected animals and rendering processes which do not inactivate the agent;
      - ii) potential vertical transmission of BSE from cows originating from infected countries;
  - 3) a continuous BSE surveillance and monitoring system with emphasis on risks identified in point 2) above; and
  - 4) examination in an approved laboratory of brain material from cattle older than 20 months displaying signs of progressive neurologic disease in accordance with the diagnostic techniques set out in the *Manual*. A sufficient number of investigations as indicated in Table I of the Guidelines for Continuous Surveillance and Monitoring of BSE (Appendix VIII of document 65 SG/12/CS.) should be carried out annually;
- in countries where progressive neurologic disease incidence is low, surveillance

should be targeted at cattle older than four years of age displaying other progressive disease conditions;

5) records of the number and results of investigations should be maintained for at least seven years.

Each confirmed case should be reported as a separate *outbreak*.

Article 3.2.13.2.

Countries may be considered free of BSE if:

1) they have implemented a risk management strategy to address any risk, as identified in Article 3.2.13.1. point 2); and

2) The feeding of *meat-and-bone meal* to cattle derived from ruminants originating from animal TSE infected countries, or countries which do not have an effective and continuous surveillance and monitoring system as described in Article 3.2.13.1 points 3) and 4), has been banned and is effectively enforced;

AND

3) a) there has been no clinical case of BSE, the disease is notifiable, and an effective and continuous surveillance and monitoring system is practised, as described in Article 3.2.13.1. point 3) and 4); or

b) all cases of BSE have been clearly demonstrated to originate directly from importation of live cattle originating from BSE infected countries, provided that the disease is made notifiable and suspect animals are slaughtered, investigated and, if disease is confirmed, completely destroyed and an effective and continuous surveillance and monitoring system is practised, as described in Article 3.2.13.1. points 3) and 4); or

c) BSE has been eradicated (under study).

Article 3.2.13.3.

*Veterinary Administrations* can authorise without restriction the import or transit through their territory, directly or indirectly, of milk, milk products, tallow, hides and skins originating from healthy animals from countries where BSE has been reported. There is also no scientific evidence of a risk associated with the trade in semen from healthy animals. By-products, such as gelatin and collagen, are considered to be safe if produced by processes (under study) which inactivate any residual BSE infectivity.

Article 3.2.13.4.

When importing from countries with low incidence of BSE, *Veterinary Administrations* should require:

for cattle

the presentation of an *international animal health certificate* attesting that:

- 1) the disease is compulsorily notifiable;
- 2) affected cattle are slaughtered and completely destroyed;
- 3) suspect heifers or cows close to calving are isolated;
- 4) an effective and continuous surveillance and monitoring system is practised in accordance with Article 3.2.13.1.;
- 5) the feeding of *meat-and-bone meal* derived from ruminants to ruminants has been banned and effectively enforced;
- 6) cattle selected for export:
  - a) are identified by a permanent mark enabling them to be traced back to the dam and herd of origin;
  - b) are not the calves of BSE suspect or confirmed females.

Article 3.2.13.5.

When importing from countries with a high incidence of BSE, *Veterinary Administrations* should require:

for cattle

the presentation of an *international animal health certificate* attesting, in addition to the requirements set forth in Article 3.2.13.4. that animals for export:

- 1) either were born after the date on which an effective ban on the use of ruminant *meat-and-bone meal* in feed for ruminants has been effectively enforced; or

2) were born, raised and had remained in a herd in which no case of BSE had ever been confirmed, and which contains only cattle born on the farm or coming from a herd of equal status; and

3) have never been fed ruminant meat-and-bone meal.

#### Article 3.2.13.6.

When importing from countries with a low incidence of BSE, *Veterinary Administrations* should require:

for fresh meat (bone-in or deboned) and meat products from cattle

—

the presentation of an *international sanitary certificate* attesting that:

1) the disease is compulsorily notifiable;

2) affected cattle are slaughtered and completely destroyed;

3) *ante mortem* inspection is carried out on all bovines;

4) an effective and continuous surveillance and monitoring system is practised in accordance with Article 3.2.13.1.;

5) the meat products do not contain brain, eyes, spinal cord or distal ileum from cattle over six months of age which were born before the date on which the feed ban referred to in paragraph 5) of Article 3.2.13.4. was effectively enforced.

#### Article 3.2.13.7.

When importing from countries with high incidence of BSE, *Veterinary Administration* should require:



for fresh bone-in meat from cattle

—

the presentation of an *international sanitary certificate* attesting, in addition to the requirements set forth in Article 3.2.13.6., that:

1) the tissues listed in Article 3.2.13.12. are removed from all cattle at slaughter and destroyed;

2) the cattle from which the *meat* originates:

a) were born after the date on which a ban on the use of ruminant *meat-and-bone meal* in feed for ruminants has been effectively enforced; or

b) were born and had only been kept in herds in which no case of BSE had been recorded; and

c) have never been fed ruminant meat-and-bone meal.

Article 3.2.13.8.

When importing from countries with a high incidence of BSE, *Veterinary Administrations* should require:

for fresh deboned meat and meat products from cattle

—

the presentation of an *international sanitary certificate* attesting that the conditions in Article 3.2.13.7. apply or alternatively that:

1) the disease is compulsorily notifiable;

2) affected cattle are slaughtered and completely destroyed;

3) *ante mortem* inspection is carried out on all bovines;

- 4) an effective and continuous surveillance and monitoring system is practised in accordance with Article 3.2.13.1.;
- 5) the tissues listed in Article 3.2.13.12. are removed from all cattle at slaughter and destroyed;
- 6) nervous and lymphatic tissues exposed during the cutting process have been removed and destroyed.

Article 3.2.13.9.

When importing from countries with a low incidence of BSE, *Veterinary Administrations* should require:

for bovine *embryos/ova*

the presentation of an *international animal health certificate* attesting that:

- 1) the disease is compulsorily notifiable;
- 2) affected cattle are slaughtered and completely destroyed;
- 3) suspect heifers or cows close to calving are isolated;
- 4) an effective and continuous surveillance and monitoring system is practised in accordance with Article 3.2.13.1.;
- 5) the feeding of *meat-and-bone meal* derived from ruminants to ruminants has been banned and effectively enforced;
- 6) embryos/ova for export are derived from females which:

- a) are not affected with BSE;
- b) are not the daughters of BSE affected females; and
- c) were not suspected of being so affected at the time of embryo collection.

Article 3.2.13.10.

When importing from countries with a high incidence of BSE, *Veterinary Administrations* should require:

for bovine *embryos/ova*

the presentation of an *international animal health certificate* attesting that embryos/ova for export are derived from females which comply with the conditions in Article 3.2.13.5. and paragraph 6) of Article 3.2.13.9.

Article 3.2.13.11.

*Meat-and-bone meal* containing any ruminant protein which originates from countries with a high incidence of BSE, should not be traded between countries.

Meat-and-bone meal containing any ruminant protein which originates from countries with a low incidence of BSE, should not be traded between countries for use in ruminant feed. For other uses, it should have been processed in plants which are approved and regularly controlled by the *Veterinary Administration* following validation that each plant can achieve the processing parameters described in Appendix 4.3.3.1.

Article 3.2.13.12.

Bovine brains, eyes, spinal cord, tonsils, thymus, spleen and distal ileum (tissues under study) and protein products derived from them from cattle over six months of age originating from countries with a high incidence of BSE should not be traded between countries.

Bovine brains, eyes, spinal cord and distal ileum (tissues under study) and protein products derived from them from cattle over six months of age which originate from countries with a low incidence of BSE and were born before the date on which the feed ban referred to in point 5) of Article 3.2.13.4. was effectively enforced, should not be traded between countries, unless they comply with the provisions of Article 3.2.13.11.

Article 3.2.13.13.

Careful selection of source materials is the best way to ensure maximum safety of ingredients or reagents of bovine origin used in the manufacture of medicinal products.

Countries wishing to import bovine materials for such purposes should therefore consider the following factors:

- 1) the BSE status of the country and herd(s) where the animals have been kept, as determined under the provisions of Article 3.2.13.1. and Article 3.2.13.2.;
- 2) the age of the donor animals;
- 3) the tissues required and whether or not they will be pooled samples or derived from a single animal.

Additional factors may be considered in assessing the risk from BSE, i.e.:

- 1) precautions to avoid contamination during collection of tissues;
- 2) the process to which the material will be subjected during manufacture;
- 3) the amount of material to be administered;
- 4) the route of administration.

<sup>1</sup>Shrieber, R. 1997. Presentation to the FDA Transmissible Spongiform Encephalopathy Advisory Committee, April 23, 1997. Transcript is available in hard copy or on disk from Freedom of Information, HFI-35, Food and Drug Administration, Rockville, MD 20857.

<sup>2</sup>Office International des Epizooties. 1997. *International Animal Health Code*, Special Edition, Chapter 3.2.13. pp. 267-274, Paris.

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**FDA HOME PAGE**  
**September 1997**

## FDA ANIMAL PRODUCTS DATABASE

For each animal derived product device, fill out one DEVICE IDENTIFICATION form.

For each animal product or component in the device, fill out one MATERIAL INFORMATION form

### DEVICE IDENTIFICATION INFORMATION

Manufacturer name: _____	
Submission number: _____	ODE division: _____
Generic Device Name: _____	
Model Identifier or trade name: _____	
Implantation or Tissue contact Duration: _____	
<input type="checkbox"/> less than 24 hours <input type="checkbox"/> 24 hours to 30 days <input type="checkbox"/> greater than 30 days	

FROM THE LISTS BELOW, circle the most appropriate:

1. generic organ system with which the device makes contact
2. tissue with which the device makes contact
- 3 & 4. form of packaging and sterilization used.

#### ORGAN SYSTEM

cardiovascular  
 dental  
 ear  
 endocrine  
 gastrointestinal  
 musculoskeletal  
 neuroklogical  
 ophthalmic  
 pulmonary  
 reproductive  
 soft tissue  
 urogenital  
 other:

#### TISSUE CONTACT

bladder  
 blood  
 bone  
 brain/CNS  
 breast  
 gastric  
 gingival  
 heart  
 joint  
 kidney  
 liver  
 lung  
 muscle  
 ocular  
 oral mucosa  
 pulmonary  
 rectum  
 reproductive, female  
 reproductive, male  
 skin  
 subcutaneous  
 synovial  
 teeth  
 vascular  
 other:

#### PACKAGING & STERILIZATION

bubble wrap  
 double blister pack  
 foam bubble  
 inert gas pack  
 single blister pack  
 none  
 other:

chlorine dioxide  
 dry heat  
 electron-beam  
 ethylene oxide (ETO)  
 filtration  
 gamma radiation, in air  
 gamma radiation, inert gas  
 hydrogen peroxide  
 solution sterilized  
 steam  
 not sterile  
 other:

# MATERIAL AND ANIMAL PRODUCT INFORMATION

Using the tables below, indicate the animal product, species, country of origin, and other indicated information

one form for each product or component in the device

## TISSUES, CELLS, & BIOMOLECULES (select one)

TISSUES:	BIOMOLECULES:
blood vessel	agar
bone	albumin
cartilage	alginate
coral	BMP
cornea	cellulose
dura mater	chitosan/chitan
fascia lata	chondroitin sulfate
fibrous sheath	collagen
heart valve	elastin
joint	fibrin
ligament/tendon	fibrinogen
pericardium	fibronectin
umbilical cord	gelatin
umbilical vein	growth hormones
viscera	heparin
other _____	hyaluronic acid
	hydroxypropylmethylcellulose
	insulin
	molluscan glue
	PHB
	pituitary extract
	phospholipid
	polyaminoacid
	protein extract
	RGD protein
	saline
	serum
	silk
	triglycerides, soy bean oil
	trypsin
	other _____

CELLS:
adipocyte
bone marrow
chondrocyte
endothelial
epithelial
fibroblast
hepatocyte
islet
keratinocyte
osteoblast
renal tubular prog.
smooth muscle
other _____

## SPECIES

bacterial
bat
bovine (cow)
caprine (goat)
chicken
coral, scleractinia
equine (horse)
feline (cat)
fish
fungus/synthetic
hamster
human, allograft
human, self
insect
kangaroo
lapine (rabbit)
mollusk
monkey
murine (mouse)
ovine (sheep)
plants
porcine (pig)
rat
shark
snake

## COUNTRY OF ORIGIN?

name: \_\_\_\_\_

is the material bioresorbable?

( ) yes ( ) no

STARTING FORM: was the biological product? (circle one)

purified  
recombinant  
synthetic

FORMING & PROCESSING were any of these processes utilized during fabrication of the component? (circle all that apply)

cell/tissue culture  
mandrel grown  
cryopreserved  
cell seeded  
TDMAC  
other \_\_\_\_\_

cross-linked  
enzyme treatment  
fixation, chemical  
viral inactivation  
demineralize  
hydrothermal conversion