

FiberFlo®

Pleated Cartridge Filters

Validation Guide



CONTENTS

| | |
|---|----|
| INTRODUCTION | 4 |
| LIQUID FLOW RATES | 6 |
| Product Claim | 6 |
| Test Methods | 6 |
| AIR FLOW RATES | 8 |
| Product Claim | 8 |
| Test Methods | 8 |
| CHEMICAL COMPATIBILITY | 10 |
| Product Claim | 10 |
| Test Methods | 10 |
| STERILIZATION BY AUTOCLAVE | 12 |
| Product Claim | 12 |
| Test Methods | 12 |
| STERILIZATION BY IN-LINE STEAM | 13 |
| Product Claim | 13 |
| Test Methods | 13 |
| BIOSAFETY | 14 |
| Product Claim | 14 |
| Test Methods | 14 |
| CYTOTOXICITY | 15 |
| Product Claim | 15 |
| Test Methods | 15 |
| VALIDATION LETTERS | 16 |

INTRODUCTION

The FiberFlo® pleated cartridge is a pleated, all polypropylene depth filter. Manufactured using a unique process by which all of the polypropylene components (end caps, inner core, outer cage, and filter media) are melted together to make an integral cartridge, FiberFlo® pleated cartridges use no adhesives. The absence of adhesives results in lower extractable and simplified chemical compatibility assessment.

Polypropylene® is an inert, highly stable material with extremely broad chemical compatibility and resistance to high temperature. The inertness of the FiberFlo® pleated cartridge makes it a low-cost alternative to more expensive fluropolymers. In addition, FiberFlo® pleated cartridges can be used for filtration of both aqueous and non-aqueous solutions.

FiberFlo® pleated cartridges range in nominal pore size ratings from 0.2 to 60 microns. The various pore sizes incorporate serial layers of graded filter media to give large throughputs and long life. The filter media is a melt-blown polypropylene with contact points melted together. The result is a controlled pore rating throughout the service life of the filter.

FiberFlo® pleated cartridges have been specially engineered to match dimensions and seal requirements of almost all currently available filter cartridge housings. FiberFlo® pleated cartridges are offered in lengths of 10, 20, 30, and 40 inches and in many end cap configurations.

This validation guide has been prepared to help you assess the filtration characteristics of the FiberFlo® pleated cartridge line and relate those characteristics to your individual filtration needs. We invite you to review this guide and the data compiled within it. Should you wish to discuss any aspect of our procedures or test results, please contact Fibercor® at 1-800-328-3324.

| | |
|----------------------------|---------------|
| End Caps: | Polypropylene |
| Outer Filter Support Tube: | Polypropylene |
| Core: | Polypropylene |
| Upstream Filter Support: | Polypropylene |
| Downstream Filter Support: | Polypropylene |
| Seal Material: | Polypropylene |
| Filter Media: | Polypropylene |

FiberFlo® pleated cartridges contain a polypropylene medium made by a melt-blown process. The process produces extremely fine continuous filaments which can be packed into uncommonly dense structures having very small passages. This results in much finer pore ratings than have been previously obtainable with depth filter cartridges. The degree of particle separation provided by the FiberFlo® pleated cartridge was previously available only with more expensive membrane filters.

In the lower pore size ratings, FiberFlo® pleated cartridges are composed of several graded serial layers. This means that larger contaminants are removed by the upstream layers, leaving the final downstream layer(s) free to remove the final size particles appropriate to the cartridge's rating. This gives the cartridge filter a very long life and throughput at all ratings.

The fine, continuous filament filtration media used in the FiberFlo® pleated cartridge makes it unlike classical membrane filter cartridges. FiberFlo® pleated cartridges are nominally rated, which means that the majority of particles below the nominal rating will be permitted to pass through the filter media. Without extra particle loading, FiberFlo® pleated cartridge can give extended services at their rating.

FiberFlo® pleated cartridges are also unlike string wound filters which have extremely low surface areas and are subject to media compression under dynamic conditions. Both of these deficiencies lead to short filter life and more frequent replacement. FiberFlo® pleated cartridges have large surface areas and a non-compressible media which results in lower overall filtration costs. Additionally, FiberFlo® pleated cartridges allow for more efficient filtration than is usually associated with string wound filters.

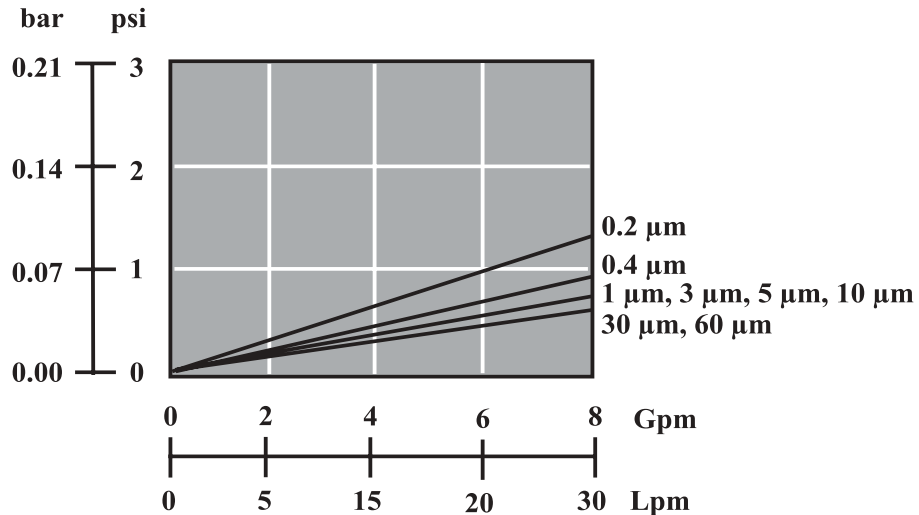
LIQUID FLOW RATES

Product Claim

Flow rates are for solutions with a viscosity of 1 centipoise. For solutions with higher viscosities, divide the flow rate by the viscosity in centipoise.

Diagram 1: Typical Water Flow Rates

(10-inch Nominal Length)



Test Method

Purpose:

To determine the correlation between flow rate differential pressure for cartridges installed in specified housing.

Materials:

1. Prefiltered (0.2 µm) water, with ability to vary flow rate
2. Prefiltered (0.2 µm) isopropyl alcohol for prewetting cartridge media
3. Cartridge filter
4. Filter housing, in-line sanitary style, accepting -222 O-ring outlet cartridge
5. Pressure gauges upstream and downstream of filter, calibrated
6. Flow meter, calibrated

Method:

1. Prewet cartridge slowly with alcohol (isopropyl alcohol recommended).
2. Start water flow slowly, venting all air in housing through housing vent. Make certain housing is fully vented.
3. At various flow rates, record differential pressure across filter and housing. At the end of the test, repeat initial flow rate to check consistency (no wetting problems or plugging of the filter).

Data Report:

1. Plot differential pressure vs. flow rate, recording cartridge rating, product number, and type of housing use.

Table 1: Table 1: Typical Measurements - Water Flow Rates

| Nominal Rating (µm) | Product Number | Lot Number | Differential Pressure at 10 Gpm (37.9 Lpm) | |
|---------------------|----------------|------------|--|-------|
| | | | psi | bar |
| 0.2 | FP-02-10-A | 6170 | 1.53 | 0.105 |
| 0.2 | FP-02-10-A | 6226 | 1.50 | 0.103 |
| 0.2 | FP-02-10-A | 6170-1 | 1.17 | 0.080 |
| 0.4 | FP-04-10-A | 6140 | 0.93 | 0.064 |
| 0.4 | FP-04-10-A | 6248-1 | 0.80 | 0.055 |
| 0.4 | FP-04-10-A | 6322 | 0.90 | 0.062 |
| 1 | FP-1-10-A | 6365 | 0.33 | 0.048 |
| 1 | FP-1-10-A | 6117-1 | 0.37 | 0.032 |
| 1 | FP-1-10-A | 6117 | 0.68 | 0.027 |
| 3 | FP-3-10-A | 6174 | 0.33 | 0.022 |
| 3 | FP-3-10-A | 5911 | 0.37 | 0.025 |
| 3 | FP-3-10-A | 5994 | 0.68 | 0.046 |
| 5 | FP-5-10-A | 6278 | 0.48 | 0.012 |
| 5 | FP-5-10-A | 542506 | 0.32 | 0.022 |
| 5 | FP-5-10-A | 5758014 | 0.42 | 0.028 |
| 10 | FP-10-10-A | 50951 | 0.40 | 0.027 |
| 10 | FP-10-10-A | 50951 | 0.50 | 0.034 |
| 10 | FP-10-10-A | 50951 | 0.45 | 0.031 |
| 30 | FP-30-10-A | 5032-1 | 0.20 | 0.013 |
| 30 | FP-30-10-A | 5032-1 | 0.30 | 0.020 |
| 30 | FP-30-10-A | 5032-1 | 0.30 | 0.020 |
| 60 | FP-60-10-A | 512001 | 0.19 | 0.013 |
| 60 | FP-60-10-A | 512001 | 0.15 | 0.010 |
| 60 | FP-60-10-A | 512001 | 0.21 | 0.014 |

Test Cartridges were installed in an in-line sanitary style stainless steel housing which accepts cartridges with -222 O-ring outlet.

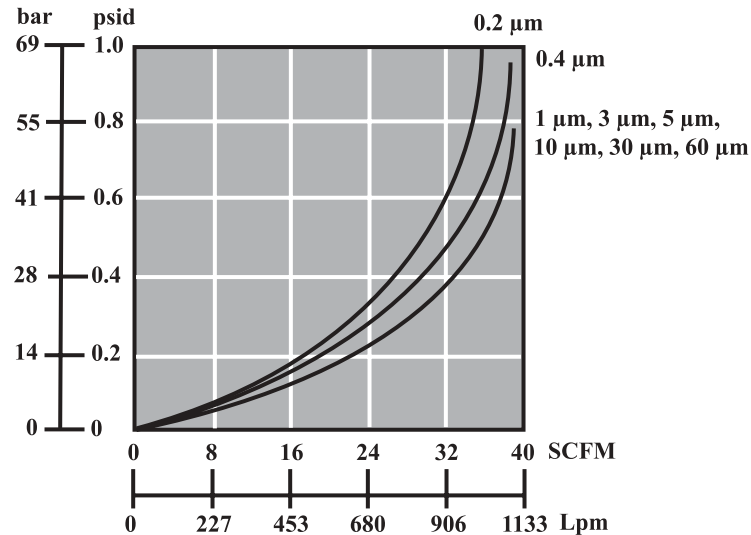
AIR FLOW RATES

Product Claim

Air flow rates for FiberFlo® pleated cartridges are charted in Diagram 2 below:

Diagram 2: Typical Air Flow Rates

(10-inch Nominal Length)



Test Method

Purpose:

To determine the relationship between air flow rate and differential pressure for filter cartridges installed in specified housings.

Materials:

1. Source of dry prefiltered (0.2 µm) air, 0-100 psi (7 bar)
2. Pressure regulator 0-100 psi (7 bar) or valve upstream of test filter
3. Pressure gauges, one upstream and one downstream of filter, calibrated
4. Flow meter downstream of filter, at atmospheric pressure, calibrated
5. Test filter
6. Filter housing, in-line sanitary style, accepting -222 O-ring outlet cartridge

Method:

At various rates (over entire accurate range of flow meter and/or pressure gauge) record differential pressure across filter and housing. At end of test, repeat initial flow rate to check for consistency (no plugging of filter from particles in the air).

Table 2: Typical Measurements - Air Flow Rates

| Nominal Rating (μm) | Product Number | Lot Number | Differential Pressure at 51.8 SCFM (1466 Lpm) | |
|-------------------------------------|----------------|------------|--|-------|
| | | | psi | bar |
| 0.2 | FP-02-10-A | XP1676 | 1.25 | 0.086 |
| 0.2 | FP-02-10-A | XP1676 | 1.15 | 0.079 |
| 0.2 | FP-02-10-A | XP1676 | 1.35 | 0.093 |
| 0.4 | FP-04-10-A | XP1654 | 0.64 | 0.044 |
| 0.4 | FP-04-10-A | XP1654 | 0.64 | 0.044 |
| 0.4 | FP-04-10-A | XP1654 | 0.64 | 0.044 |
| 1 | FP-1-10-A | 3685 | 0.80 | 0.550 |
| 1 | FP-1-10-A | 3685 | 0.60 | 0.410 |
| 1 | FP-1-10-A | 3685 | 0.60 | 0.410 |
| 3 | FP-3-10-A | 3694 | 0.40 | 0.027 |
| 3 | FP-3-10-A | 3694 | 0.45 | 0.031 |
| 3 | FP-3-10-A | 3694 | 0.40 | 0.027 |
| 5 | FP-5-15-A | 0202 | 0.42 | 0.028 |
| 5 | FP-5-15-A | 0202 | 0.31 | 0.021 |
| 5 | FP-5-15-A | 0202 | 0.42 | 0.028 |
| 10 | FP-10-10-A | 3653 | 0.21 | 0.014 |
| 10 | FP-10-10-A | 3653 | 0.21 | 0.014 |
| 10 | FP-10-10-A | 3653 | 0.31 | 0.021 |
| 30 | FP-30-10-A | 3717 | 0.30 | 0.020 |
| 30 | FP-30-10-A | 3717 | 0.30 | 0.020 |
| 30 | FP-30-10-A | 3717 | 0.31 | 0.021 |
| 60 | FP-60-10-A | 3732 | 0.15 | 0.010 |
| 60 | FP-60-10-A | 3732 | 0.15 | 0.010 |
| 60 | FP-60-10-A | 3732 | 0.16 | 0.011 |

CHEMICAL COMPATIBILITY

Product Claim

The FiberFlo® pleated cartridge is constructed entirely of polypropylene, which is resistant to a wide range of chemical solutions. Special compatibility consideration is given to solutions frequently filtered through these cartridges.

Test Method

Purpose:

To determine the compatibility of filter elements with solvents, acids, and bases.

Methods:

1. Determine and record the following data for the filter element as appropriate for the type of element and application:
 - a. Dimensions
 - b. Flow rate
 - c. Appearance
2. Completely immerse the filter element in the test fluid at 25°C for 48 hours.

Note: If anticipated filter usage conditions differ from these parameters, adjust test conditions appropriately to verify compatibility in that application.
3. After immersion under test conditions, determine and record the data listed in step 1, above. Note the significant discrepancies.

The materials used in the manufacture of filtration products are carefully chosen for their resistance to a wide range of chemical solutions. The compatibility between the fluid to be filtered and filter elements is essential.

The chemical compatibility data listed on the following page is a compilation of component manufacturer's data and selected testing by Fibercor® with indicative chemicals. The data is intended to provide expected results when the materials are exposed to the chemical under static conditions for 48 hours at 25°C.

This chart is intended only as a guide. Users should verify chemical compatibility based upon experimentation with specific filters under actual use conditions; chemical compatibility is affected by many variables, including temperature, concentration, and length of exposure.

Table 3: Typical Measurements - Chemical Compatibility

| | | | | | |
|------------------------------|----|--------------------------------|----|----------------------------|----|
| Acids | | Potassium Hydroxide, 3N | R | Trichloroethylene | NR |
| Acetic Acid, Glacial | R | Sodium Hydroxide, 3N | R | Ketones | |
| Acetic Acid, 90% | R | Sodium hydroxide, 6N | R | Acetone | R |
| Acetic Acid, 30% | R | Esters | | Cyclohexanone | R |
| Acetic Acid, 10% | R | Amyl Acetate | R | Methyl Ethyl Ketone | R |
| Hydrochloric Acid, Conc. | R | Butyl Acetate | LR | Methyl Isobutyl Ketone | R |
| Hydrochloric Acid, 6N | R | Cellosolve Acetate | R | Oils | |
| Nitric Acid, conc. | R | Ethyl Acetate | LR | Cottonseed Oil | R |
| Nitric Acid, 6N | R | Isopropyl Acetate | R | Lubrication Oil MIL-L-7808 | R |
| Sulfuric Acid, Conc. | R | Methyl Acetate | R | Peanut Oil | R |
| Sulfuric Acid, 6N | R | Ethers | | Sesame Oil | R |
| Phosphoric Acid | R | Ethyl Ether | LR | White Petrolatum | R |
| Chromic Acid, conc. | R | Isopropyl | R | Photoresists | |
| Hydrofluoric Acid, 6N | R | Dioxane | R | Positive | R |
| Alcohols | | Tetrahydrofuran | NR | Negative | R |
| Amyl Alcohol | R | Glycols | | Miscellaneous | |
| Benzyl Alcohol, 100% | R | Ethylene Glycol | R | Acetonitrile | LR |
| Benzes Alcohol, 3% | R | Glycerin | R | Aniline | LR |
| Butanol | R | Propylene Glycol | R | Dimethyl Formamide | R |
| Ethanol | R | Nickel Sulfate Solution | R | Dimethyl Sulf oxide | R |
| Isopropanol | R | Halogenated Hydrocarbon | | Formaldehyde, 37% | LR |
| Methanol | R | Carbon Tetrachloride | LR | Formaldehyde, 4% | R |
| Aromatic Hydrocarbons | | Chloroform | NR | Gasoline | N |
| Benzene | NR | Chlorothene® NU | NR | Hexane, Dry | N |
| Toluene | NR | Dowclene WA | LR | JP-4 | R |
| Xylene | NR | Freon® TF | LR | Kerosene | R |
| Bases | | Freon TMC | LR | Phenol, Liquefied | LR |
| Ammonium Hydroxide, 3N | R | Genosolv® D | - | Skydrol 500 | - |
| Ammonium Hydroxide, 6n | R | Methylene Chloride | LR | Turpentine | LR |
| Ammonium Hydroxide, 3N | R | Perchloroethylene | NR | Water | R |

This data is presented as a customer service. Accuracy cannot be guaranteed. Variables in customer use such as concentrations, purity, temperature, pressure, time, and various chemical combinations prevent complete accuracy.

Data Interpretation:

Chemical compatibility observations are divided into three categories as follows:

R = Resistant: no change was observed in performance, physical properties, or dimensions of the cartridge filter following 48 hours exposure to the test fluid at 25°C.

LR = Limited Resistance: minor changes in physical properties or dimensions of the cartridge filter were observed. However, filter performance was not altered. Filter may be suitable for short-term use.

NR = Not Resistant: the cartridge was found to be unstable. In most cases, extensive shrinking or swelling occurs. Filter may gradually weaken or partially dissolve after extended exposure.

- = Insufficient Data

STERILIZATION BY AUTOCLAVE

Product Claim

FiberFlo® pleated cartridges are documented to withstand multiple cycles of sterilization by autoclaving at 121°C at 15 psi for (1 bar) 20 min.

Note: Configurations utilizing stainless steel adapter inserts (ss) should be used when autoclaving FiberFlo® cartridges.

Test Method

Materials:

1. Filter assembly
2. Non-fiber-releasing autoclave wrap and tape

Procedure: Heat Penetration/Heat Distribution

1. Open the inlet and outlet ports, and any vents on the assembly. Cover the opening with a suitable non-fiber-releasing wrap which allows steam penetration, and secure the wrapping with autoclave tape.
2. Run a standard sterilization cycle with slow exhaust (fast exhaust and vacuum are not recommended). Temperature set-point should be 12-125°C. Cycle time should be 20 min.

Procedure: Cycle Challenge

The sterilization cycle of a filter can be challenged with either a bacterial suspension or spore strips.

Table 4: Typical Measurements - Autoclavability

| Nominal Rating (µm) | Product Number | Lot Number | Number of Cycles | Number Tested | Number Failed |
|---------------------|----------------|------------|------------------|---------------|---------------|
| 0.2 | FP-02-10-A | 3787-2 | 5 | 3 | 0 |
| 0.2 | FP-02-10-A | 3787-2 | 5 | 3 | 0 |
| 0.4 | FP-04-10-A | 3724 | 5 | 3 | 0 |
| 0.4 | FP-04-10-A | 3724 | 5 | 3 | 0 |

Failure determined by reverse bubble point and flow rate.

STERILIZATION BY IN-LINE STEAM

STERILIZATION
BY IN-LINE
STEAM

Product Claim

FiberFlo® pleated cartridges are documented to withstand multiple cycles of in-line steam sterilization lasting one hour at 134°C.

Note: Configurations utilizing stainless steel adapter inserts (SS) should be used when autoclaving FiberFlo® pleated cartridges.

Test Method

Materials:

1. Filter assembly
2. Regulated clean saturated steam
3. Regulated sterile compressed gas
4. Two pressure gauges, 0-30 psig (0-2.1 bar) calibrated
5. Sanitary valves as needed

Procedure:

1. Load cartridge into housing. Connect filter assembly to source of clean saturated steam. Place thermocouple probes throughout the assembly to monitor heat penetration, heat distribution, and determine the cold spot in the assembly.
2. Close valves for fluid in, fluid out, and gas in.
3. Open valves for vent and drain.
4. Turn on regulated steam. (Note: It may be necessary to add a drain to the steam valve to remove condensate developed as the piping reaches temperature). Steam pressure should be increased slowly if the filter assembly is wet, to prevent shocking the assembly and developing excess condensate.
5. Close the vent valve when continuous steam flow is evident.
6. Increase steam until downstream gauge reads 31 psig, 134°C and hold for one hour. Differential pressure between upstream and downstream gauges should be 1-3 psig (.2 bar).
7. Close steam valve and open compressed gas valve regulated to 10 psig (1.47 bar). Compressed gas should flow for 15 mm., or until assembly is cool.
8. Close drain and gas valves. Open vent to release pressure in the assembly.
9. Allow assembly to cool to ambient temperature.

Table 5: Typical Measurements - In-Line Steam Sterilization

| Nominal Rating (µm) | Product Number | Lot Number | Number of Cycles | Number Tested | Number Failed |
|---------------------|----------------|------------|------------------|---------------|---------------|
| 0.2 | FP-02-10-A | 3787-2 | 10 | 3 | 0 |
| 0.2 | FP-02-10-A | 3787-2 | 10 | 3 | 0 |
| 0.4 | FP-04-10-A | 3724 | 7 | 3 | 0 |
| 0.4 | FP-04-10-A | 3724 | 7 | 3 | 0 |

BIOSAFETY

Product Claim

FiberFlo® pleated cartridge materials have been evaluated and documented for biosafety in accordance with USP Class V1 121° Plastics Tests to ensure safety of materials.

Test Method

Cartridge materials were tested in accordance with United States Pharmacopoeia guidelines.

CYTOTOXICITY

CYTOTOXICITY

Product Claim

Extracts of FiberFlo® pleated cartridge are non-toxic to L-929 mouse fibroblast cells.

Test Method

Pleated cartridge materials of construction were tested in accordance with United States Pharmacopoeia.

2261 Tracy Road - Northwood, Ohio 43619-1397 - Phone 419/666-9455

LAB NO. 90T-17303-00
P.O. NO. PP0086156
LOT NO. 52/R#64

Page 1 of 2

ACUTE SYSTEMIC TOXICITY - T12
(CURRENT USP)

Test Article: Polypure Polypropylene Media

Extracting Conditions:

A 120 sq. cm portion was covered with 20 ml of vehicle(s) and extracted at 121 degrees C for 1 hour(s). Control solutions (extracts without test article) were prepared in a similar manner.

Condition of Extracts:

Clear.

Procedure: Healthy, young albino mice ranging in body weight from 17 to 23 grams were used as test animals. The animals, identified by fur marking, were group housed in stock cages and offered food and water ad libitum.

Two groups, each consisting of five mice, were used for each extract. One group was injected with the extract of the test article, while the other group was injected with the control solution. After injection, the animals were observed immediately and at 4, 24, 48 and 72 hours. The initial and final body weights were recorded as well as mortalities and/or reactions. If, during the observation period, none of the animals treated with the test article extract showed a significantly greater reaction than the animals treated with the control solution, then the test article met the requirements of the test.

Imx Completed 11-13-90 Tech. KSH/TMM
LMR/CAP/LLT

Approved Laura L. Jasse

Jm

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TU012-500

Form No. 1P-12 (2-82)

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LAB NO. 90T-17303-00
P.O. NO. PP0086156
LOT NO. 52/R#64

Page 2 of 2

ACUTE SYSTEMIC TOXICITY - T12
(CURRENT USP)

Test Article: Polypure Polypropylene Media

Results:

| Extract, Route and Dose | Mortality and Body Weight Data | | | | | | | |
|---|--------------------------------|------------|----|---------------|---------------|------------|----|---------------|
| | TEST ARTICLE | | | | CONTROL | | | |
| | Animal Number | Weight (g) | | #Dead/#Tested | Animal Number | Weight (g) | | #Dead/#Tested |
| | Day 0 | Day 3 | | | Day 0 | Day 3 | | |
| Sodium Chloride Injection (SC) (I.V.; 50 ml/Kg) | 1 | 17 | 22 | 0/5 | 1 | 20 | 24 | 0/5 |
| | 2 | 22 | 24 | | 2 | 17 | 20 | |
| | 3 | 21 | 25 | | 3 | 17 | 21 | |
| | 4 | 20 | 22 | | 4 | 21 | 24 | |
| | 5 | 17 | 21 | | 5 | 17 | 20 | |
| Alcohol in Sodium Chloride Injection (1:20) (AS) (I.V.; 50 ml/Kg) | 1 | 17 | 21 | 0/5 | 1 | 19 | 22 | 0/5 |
| | 2 | 18 | 22 | | 2 | 19 | 22 | |
| | 3 | 20 | 20 | | 3 | 20 | 24 | |
| | 4 | 17 | 20 | | 4 | 17 | 20 | |
| | 5 | 17 | 21 | | 5 | 19 | 23 | |
| Polyethylene Glycol 400 (PEG) (I.P.; 10 g/Kg) | 1 | 20 | 22 | 0/5 | 1 | 18 | 21 | 0/5 |
| | 2 | 18 | 22 | | 2 | 18 | 20 | |
| | 3 | 17 | 20 | | 3 | 20 | 23 | |
| | 4 | 18 | 20 | | 4 | 19 | 23 | |
| | 5 | 17 | 20 | | 5 | 17 | 20 | |
| Cottonseed Oil (CSO) (I.P.; 50 ml/Kg) | 1 | 21 | 23 | 0/5 | 1 | 19 | 21 | 0/5 |
| | 2 | 17 | 21 | | 2 | 18 | 21 | |
| | 3 | 17 | 20 | | 3 | 17 | 19 | |
| | 4 | 17 | 21 | | 4 | 19 | 22 | |
| | 5 | 20 | 21 | | 5 | 19 | 21 | |

Test Article: Passes

Date Prepared: 11-8-90 Date Injected: 11-8-90 Date Terminated: 11-11-90

Comments:

lms Completed --- Tech. --- Approved (See page 1)

Jm

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Form No. IP-12 (2-82)



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LAB NO. 90T-17303-00
P.O. NO. PP0086156
LOT NO. 52/R#64

CERTIFICATE OF COMPLIANCE
USP BIOLOGICAL TESTS

CLASSIFICATION VI

Test Article: **Polypure Polypropylene Media**

ACUTE SYSTEMIC TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test article injected into mice did not produce a significantly greater systemic reaction than the blank extractant.

INTRACUTANEOUS TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test article injected intracutaneously in rabbits did not produce a significantly greater tissue reaction than the blank extractant.

IMPLANTATION TEST (USP): The macroscopic reaction of the test article implanted 5 days was not significant as compared to the USP negative control plastic.

The sample of test article extracted at a ratio of 120 cm sq/20 ml and at a temperature of 121 degrees C for 1 hour met the requirements of a USP Class VI Plastic.

dm1 Completed *11-16-90*
Jmw

Approved *Laura L. Jasse*

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Form No. IP 12 12-82

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LAB NO. 90T-17303-00
P.O. NO. PP0086156
LOT NO. 52/R#64

Page 1 of 2

INTRACUTANEOUS TOXICITY - T13
(CURRENT USP)

Test Article: Polypure Polypropylene Media

Extracting Conditions:

A 120 sq. cm portion was covered with 20 ml of vehicle(s) and extracted at 121 degrees C for 1 hour(s). Control solutions (extracts without test article) were prepared in a similar manner.

Condition of Extracts:

Clear.

Procedure: Two healthy New Zealand White rabbits free of significant dermal blemishes were used as test animals for each extract or pair of extracts. Animals were housed individually, fed daily, and allowed water ad libitum. Prior to injection, the hair was closely clipped from the back and flanks of each rabbit. Exactly 0.2 ml of the test article extract was injected intracutaneously into five separate sites on the right side of the back of each animal while 0.2 ml of the control solution was injected into five separate sites on the left side. Injection sites were examined 24, 48 and 72 hours after injection for erythema and edema. The average tissue reaction to the extract of the test article was compared with the control. The requirements of the test were met if no significant differences were noted.

1ms Completed 11-13-90

Tech. KSH/TMM
KDC/CAP/LLT Approved

Laura L. Jasse

TU013-800

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Form No. IP-12 (2-82)

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LAB NO. 90T-17303-00
 P.O. NO. PP0086156
 LOT NO. 52/R#64

Page 2 of 2

INTRACUTANEOUS TOXICITY - T13
 (CURRENT USP)

Test Article: Polypure Polypropylene Media

Results:

| Extract | Rabbit No. | | 24 HR. | | 48 HR. | | 72 HR. | | KEY |
|--------------------------------------|------------|---------|--------|----|--------|----|--------|----|---|
| | | | ER | ED | ER | ED | ER | ED | |
| Sodium Chloride (SC) | 55849 | Test | 0 | 0 | 0 | 0 | 0 | 0 | ER=ERYTHEMA 0=None 1=Barely Perceptible 2=Well Defined 3=Moderate 4=Severe ED=EDEMA 0=None 1=Barely Perceptible 2=Well Defined 3=Raised 1 mm 4=Raised > 1 mm |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 55851 | Test | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| Alcohol In Sodium Chloride 1:20 (AS) | 55849 | Test | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 55851 | Test | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| Polyethylene Glycol 400 (PEG) | 55855 | Test | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 55853 | Test | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Control | 0 | 0 | 0 | 0 | 0 | 0 | |
| Cottonseed Oil (CSO) | 55855 | Test | 1 | 1 | 1 | 1 | 1 | 1 | |
| | | Control | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 55853 | Test | 1 | 1 | 1 | 2 | 1 | 2 | |
| | | Control | 1 | 1 | 1 | 2 | 1 | 2 | |

RATING (Test-Control)
 0-0.5 Acceptable
 0.6-1.0 Slight
 > 1.0 Significant

| Mean Test - Mean Control = | Difference | Passes | Fails |
|----------------------------|------------|--------|-------|
| SC = 0.0 - 0.0 | 0.0 | X | |
| AS = 0.0 - 0.0 | 0.0 | X | |
| PEG = 0.0 - 0.0 | 0.0 | X | |
| CSO = 1.2 - 1.2 | 0.0 | X | |

Date Prepared: 11-8-90 Date Injected: 11-8-90 Date Terminated: 11-11-90

Comments:

ImS Completed ___ Tech. ___ Approved (See page 1)

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Form No. 1P-12 (2-82)

NANSA[®] NORTH AMERICAN SCIENCE ASSOCIATES, INCORPORATED

2261 Tracy Road - Northwood, Ohio 43619-1397 - Phone 419/666-9455

LAB NO. 90T-17303-00
 P.O.NO. PP0086156
 LOT NO. 52/R#64

CYTOTOXICITY - MEM ELUTION - MT023

Test Article: **Polypure Polypropylene Media**

Test Article Size Used: 120 sq. cm (0.5 gram)

Procedure: A monolayer of L-929 mouse fibroblast cells was grown to confluency and exposed to an extract of the test article prepared by placing the test article in 20 ml of Minimum Essential Medium (Eagle) and bovine serum (5%) and extracting at 37 degrees C for 24 hours. An MEM aliquot was used as a negative control. After exposure to the extract, the cells were examined microscopically for cytotoxic effect (CTE). Presence (+) or absence (-) of a confluent monolayer, intracellular granulation, cellular swelling and crenation and the percentage of cellular lysis were recorded.

CTE was scored as either Nontoxic(N), Intermediate(I) or Toxic(T).

N = Indicates a negative or nontoxic response.

I = Indicates an intermediate response, a subjective assessment of the extent of cellular response.

T = Indicates a positive or toxic response consisting of greater than 50% cell death.

| Results: | Confluent Monolayer | Intracellular Granulation | Swelling | Crenation | % Lysis | CTE Score |
|------------------|---------------------|---------------------------|----------|-----------|---------|-----------|
| <u>24 HOURS</u> | | | | | | |
| Test Extract | (+) | (-) | (-) | (-) | 0 | N |
| Negative Control | (+) | (-) | (-) | (-) | 0 | N |
| <u>48 HOURS</u> | | | | | | |
| Test Extract | (+) | (-) | (-) | (-) | 0 | N |
| Negative Control | (+) | (-) | (-) | (-) | 0 | N |
| <u>72 HOURS</u> | | | | | | |
| Test Extract | (+) | (-) | (-) | (-) | 0 | N |
| Negative Control | (+) | (-) | (-) | (-) | 0 | N |

Positive control, SCG-3, was toxic at a dilution of 1:16 at 24 hours.

Conclusion: Nontoxic

Comments:

Date Prepared:11-5-90 Date Terminated:11-9-90

mt Completed 11-12-90
 pof

Tech. KSH/AE/LMY/MMC Approved

Margaret Cassano
 MT023-100

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Form No. IP 12 (2-82)

NAAMSA[®] NORTH AMERICAN SCIENCE ASSOCIATES, INCORPORATED

2261 Tracy Road - Northwood, Ohio 43619-1397 - Phone 419/666-9455

LAB NO. 90T-17303-00
 P.O. NO. PP0086156
 LOT NO. 52/R#64

IMPLANTATION TEST (T14) (CURRENT USP)

Test Article: **Polypure Polypropylene Media**

Preparation: The test article was cut and trimmed to 1 x 10 mm. Date Prepared: 11-7-90.
 Sterilized by steam. Date Sterilized: 11-7-90.

Procedure: Two healthy (minimum), adult New Zealand White rabbits weighing at least 2.5 kg were used as test animals. The back of each animal was clipped of fur on both sides of the spinal column. Loose hair was removed by alcohol wipe after clipping and the paravertebral muscles were anesthetized. Four strips (minimum) of sterile test article were introduced into the right paravertebral muscle of each rabbit; two strips (minimum) of USP control plastic were implanted in the left paravertebral muscle of each rabbit on 11-7-90.

The animals were euthanized 5 days after implantation and the entire paravertebral muscle on each side of the vertebrae removed on 11-12-90. Cross sections of the muscles were made to locate the implants. The tissue surrounding the implant was examined macroscopically.

Results of Macroscopic Examination:

| Rabbit# | Article | Test | Control |
|-----------------|---------|------------|------------|
| 55652 2.8 kg | 1 | <u>0</u> | <u>0</u> |
| | 2 | <u>0</u> | <u>0</u> |
| | 3 | <u>0</u> | |
| | 4 | <u>0</u> | |
| 55617 2.9 kg | 1 | <u>0</u> | <u>0</u> |
| | 2 | <u>0</u> | <u>0</u> |
| | 3 | <u>0</u> | |
| | 4 | <u>0</u> | |
| Average: | | <u>0.0</u> | <u>0.0</u> |

| Score | Scoring Key Capsule Formation |
|-------|----------------------------------|
| 0 | None Noted |
| 1 | Up to 0.5 mm |
| 2 | 0.6 to 1.0 mm |
| 3 | 1.1 to 2.0 mm |
| 4 | > 2.0 mm |

Reaction Index
 Average (test) - Average (control) = 0.0

| | |
|---------|-----------------|
| 0-0.5 | Not significant |
| 0.6-1.0 | Trace |
| 1.1-2.0 | Slight |
| 2.1-3.0 | Moderate |
| > 3.0 | Marked |

Macroscopic: The reaction was not significant as compared to the negative control implant material.

Comments:

Imgs Completed 11-14-90

Tech. DPB/LLT

Approved Laura A. Jasse

Jm

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TU014-805

Form No. IP-12 (2-82)

NANSA[®] NORTH AMERICAN
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INCORPORATED

2261 Tracy Road • Northwood, Ohio 43619-1397

Phone 419/666-9455

Lab. No. 85T-06655-00
Lot No. 6530
P. O. No. 49325
EA91M1M-S

Material: Polypropylene Structural Components

CERTIFICATE OF COMPLIANCE
USP BIOLOGICAL TESTS

CLASSIFICATION VI

ACUTE SYSTEMIC TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test material injected into mice did not produce a significantly greater systemic reaction than the blank solution.

INTRACUTANEOUS TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test material injected intracutaneously in rabbits did not produce a significantly greater tissue reaction than the blank solution.

IMPLANTATION TEST (USP): Implanted 3 days. The macroscopic reaction of the test material was not significant as compared to the negative control material.

The sample of test material met the requirements of a USP Class VI Plastic (121°C, 1 hour).

Dam
Emie

Completed

7-19-85

Tech.

Approved by

Paul J. Nyman

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Form No JP-12 (2-82)

Lab. No. 85T-06655-00

Lot No. 6530

P.O. No. 49325
EA91M1M-S

ACUTE SYSTEMIC TOXICITY — T12 (CURRENT U.S.P.)

Material(s): **Polypropylene Structural Components**

Extracting Conditions: 121° C, 1 hour. 70° C, 24 hours. 50° C, 72 hours. 37° C, 24 hours.

Procedure: _____ cm² (or) 4.0 g added to 20 ml extract(s). Condition of extract(s): PEG test cloudy upon dilution; Others clear

Healthy, young white mice ranging in body weight from 17 to 23 grams were used as test animals. The animals were housed in stock cages and offered food and water *ad libitum*.

Two groups, each consisting of five mice, were used for each extract. One group was injected with the extract of the Test Material, while the other group was injected with the Blank. After injection, the animals were observed immediately and at 4, 24, 48 and 72 hours. Initial and final body weights were recorded as well as mortalities and/or reactions. If, during the observation period, none of the animals treated with the extract of the Test Material show a significantly greater reaction than the animals treated with the Blank, the material meets the requirements of the test.

Results:

| Extract, Dose and Route | Mortality and Body Weight Data | | | | | | | | |
|--|--------------------------------|---------------|-------|-----|-----------------|---------------|--------------|-----|-----------------|
| | Animal Number | TEST MATERIAL | | | # Dead # Tested | Animal Number | BLANK | | # Dead # Tested |
| | | Weight (gms) | | | | | Weight (gms) | | |
| | | Day 0 | Day 3 | | | Day 0 | Day 3 | | |
| Sodium Chloride Injection (I.V.; 50 ml/Kg) | 1 | 19 | 22 | 0/5 | 1 | 17 | 20 | 0/5 | |
| | 2 | 18 | 21 | | 2 | 18 | 20 | | |
| | 3 | 18 | 20 | | 3 | 18 | 22 | | |
| | 4 | 20 | 22 | | 4 | 18 | 22 | | |
| | 5 | 20 | 21 | | 5 | 17 | 18 | | |
| Ethanol in Sodium Chloride Injection (1.20) (I.V.; 50 ml/Kg) | 1 | 21 | 23 | 0/5 | 1 | 17 | 21 | 0/5 | |
| | 2 | 19 | 22 | | 2 | 18 | 23 | | |
| | 3 | 18 | 20 | | 3 | 18 | 21 | | |
| | 4 | 19 | 21 | | 4 | 17 | 21 | | |
| | 5 | 19 | 19 | | 5 | 17 | 23 | | |
| Polyethylene Glycol 400 (I.P.; 10 g/Kg) | 1 | 18 | 21 | 0/5 | 1 | 18 | 22 | 0/5 | |
| | 2 | 19 | 21 | | 2 | 17 | 21 | | |
| | 3 | 18 | 22 | | 3 | 21 | 24 | | |
| | 4 | 18 | 21 | | 4 | 19 | 21 | | |
| | 5 | 19 | 22 | | 5 | 18 | 21 | | |
| Cottonseed Oil (I.P.; 50 ml/Kg) | 1 | 18 | 21 | 0/5 | 1 | 20 | 24 | 0/5 | |
| | 2 | 17 | 19 | | 2 | 20 | 24 | | |
| | 3 | 17 | 21 | | 3 | 17 | 21 | | |
| | 4 | 18 | 21 | | 4 | 18 | 22 | | |
| | 5 | 19 | 21 | | 5 | 19 | 21 | | |

Comments:

Test Material: Passes Does Not Pass Test

Prepared: 7-3-85

Injected: 7-4-85

Terminated: 7-7-85

am
pam

Completed 7/8/85 Tech. IJH/GEO/TLF

Approved by Ann M. Creely

TU012-500

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Form No. IP-6 (Rev. 11/81)

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Lab. No. 85T-06655-00
 Lot No. 6530
 P.O. No. 49325
 EA91M1M-S

INTRACUTANEOUS TOXICITY — T13 (CURRENT U.S.P.)

Material(s) **Polypropylene Structural Components**

Extracting Conditions X 121°C. 1 hr 70°C. 24 hrs 50°C. 72 hrs 37°C. 24 hrs
 cm² (or) 4.0 g added to 20 ml extract(s) Condition of extract(s) Clear

Procedure

Two healthy, previously unused New Zealand White rabbits were used as test animals for each extract. Animals were housed individually and allowed food and water *ad libitum*. Prior to injection, the hair was closely clipped from the back and flanks of each rabbit. Exactly 0.2 ml of the extract of the Test Material was injected intracutaneously into ten separate sites on the right side of the back of each animal while 0.2 ml of the extracting medium (Blank) was injected into five separate sites on the left side. Injection sites were examined 24, 48 and 72 hours after injection for erythema and edema. The average tissue reaction to the extract of the Test Material was compared with the Blank. The requirements of the test were met if no significant differences were noted.

Results

| Extract | | Rabbit No | 24 HR | | 48 HR | | 72 HR | |
|--------------------------------------|-------|-----------|-------|----|-------|----|-------|----|
| | | | ER | ED | ER | ED | ER | ED |
| Sodium Chloride (SC) | Test | 19015 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blank | | 0 | 0 | 0 | 0 | 0 | 0 |
| | Test | 19018 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Blank | | 1 | 0 | 0 | 0 | 0 | 0 |
| Alcohol in Sodium Chloride 1:20 (AS) | Test | 19021 | 2 | 0 | 1 | 0 | 1 | 0 |
| | Blank | | 1 | 0 | 0 | 0 | 0 | 0 |
| | Test | 19024 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blank | | 0 | 0 | 0 | 0 | 0 | 0 |
| Polyethylene Glycol 400 (PEG) | Test | 18996 | 2 | 1 | 1 | 1 | 1 | 0 |
| | Blank | | 0 | 0 | 0 | 0 | 0 | 0 |
| | Test | 18997 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Blank | | 1 | 0 | 0 | 0 | 0 | 0 |
| Cottonseed Oil (CSO) | Test | 18999 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Blank | | 2 | 2 | 1 | 2 | 2 | 2 |
| | Test | 19000 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Blank | | 2 | 2 | 1 | 2 | 2 | 2 |

Key

ER Erythema ED Edema
 0 None 0 None
 1 Barely Perceptible 1 Barely Perceptible
 2 Well Defined 2 Well Defined
 3 Moderate 3 Raised 1 mm
 4 Severe 4 Raised >1 mm

| \bar{X} Test - \bar{X} Blank | Δ | Pass | Fail |
|----------------------------------|----------|------|------|
| SC 0.1 - 0.1 | 0.0 | X | |
| AS 0.3 - 0.1 | 0.2 | X | |
| PEG 0.6 - 0.1 | 0.5 | X | |
| CSO 2.0 - 1.8 | 0.2 | X | |

Prepared 7-3-85

Injected 7-3-85

Terminated 7-6-85

Completed 7-8-85 Tech IJH/SGW/TLF JMR Approved by [Signature] TU013-800
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Lab. No. 85T-06655-00

Lot No. 6530

P.O. No. 49325
EA91M1M-S

IMPLANTATION TEST T-14
(Current U.S.P.)

Materials(s): **Polypropylene Structural Components**

Procedure:

Two healthy (minimum) adult New Zealand White rabbits weighing not less than 2.5 Kg were used as test animals. The rabbits were housed individually and allowed food and water *ad libitum*. Prior to the implantation, the back of each animal was clipped on both sides of the spinal column. All loose hair was removed after clipping and prior to implantation to prevent entry into the implantation site.

Four strips (minimum) of sterilized (**steam**) test material, approx 1 mm wide and 10 mm long were introduced into the right paravertebral muscle of each rabbit. Two strips of U.S.P. negative control plastic were implanted in the left paravertebral muscle of each rabbit.

The animals were humanely killed 3 days after implantation and the entire paravertebral muscle on each side of the spinal cord removed. Cross sections of the muscles were made to locate the implants. The tissue surrounding the center portion of each implant was examined macroscopically X ; and/or microscopically N/A.

Tissues to be examined microscopically were preserved in 10% Neutral Buffered Formalin, sectioned and stained with Hematoxylin and Eosin.

Results of Macroscopic Examination

| Scoring | | | |
|--------------------|--------|------|---------|
| Rabbit | Sample | Test | Control |
| 19046 2.5 Kg | 1 | 1 | 1 |
| | 2 | 1 | 1 |
| | 3 | 1 | |
| | 4 | 1 | |
| | 5 | | |
| 18781 2.5 Kg | 1 | 1 | 1 |
| | 2 | 1 | 1 |
| | 3 | 1 | |
| | 4 | 1 | |
| | 5 | | |
| Mean (\bar{x}) | | 1.0 | 1.0 |

Scoring Key

| Score | Capsule Formation |
|-------|-------------------|
| 0 | None Noted |
| 1 | Up to 0.5 mm |
| 2 | 0.6 to 1.0 mm |
| 3 | 1.1 to 2.0 mm |
| 4 | > 2.0 mm |

Reaction Index
 \bar{x} (Test) - \bar{x} (Control)

| | |
|-----------|-----------------|
| 0 - 0.5 | Not Significant |
| 0.6 - 1.0 | Trace |
| 1.1 - 2.0 | Slight |
| 2.1 - 3.0 | Moderate |
| > 3.1 | Marked |

Macroscopic: The reaction was not significant
as compared to the negative control implant material.

Microscopic: The reaction was N/A
as compared to the negative control implant material (see attached report).

Comments:

Prepared: 7/11/85
Implanted: 7/15/85
Sacrificed: 7/18/85

CEA Completed 7-18-85 Tech JMR/MKB Approved by Orlando M. Crejtu TU014-803

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2261 Tracy Road • Northwood, Ohio 43619-1397
Phone 419/666-9455

Lab. No. 85T-06653-00
Lot No. 6530
P. O. No. 49325
EA91M1M-S

Material(s): Polypropylene Support Material

CERTIFICATE OF COMPLIANCE
USP BIOLOGICAL TESTS

CLASSIFICATION VI

AGUTE SYSTEMIC TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test material injected into mice did not produce a significantly greater systemic reaction than the blank solution.

INTRACUTANEOUS TOXICITY (USP): The saline, alcohol in saline, polyethylene glycol 400 and cottonseed oil extracts of the test material injected intracutaneously in rabbits did not produce a significantly greater tissue reaction than the blank solution.

IMPLANTATION TEST (USP): Implanted 4 days. The macroscopic reaction of the test material was not significant as compared to the negative control material.

The sample of test material met the requirements of a USP Class VI Plastic (121° C, 1 hour).

CE
pan Completed 2-17-85 Tech. Approved by Paul J. Lynn

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Form No. 1P-12 (2-82)

Lab. No. 85T-06655-00
Lot No. 6530
P. O. No. 49325
EA91M1M-5

CYTOTOXICITY — MEM ELUTION — MT023

Material(s): Polypropylene Structural Components

Sample Size Used: sq. cm. 4.0 g other

Procedure: A monolayer of L-929 Mouse Fibroblast cells was grown to confluency and exposed to an extract of the test sample prepared by placing the sample material in 20 ml of Minimum Essential Medium (Eagle) and bovine serum (5%) and extracting at 37 degrees C for 24 hours. An MEM aliquot was used as a negative control. After exposure to the extract, the cells were examined microscopically for cytotoxic effect (CTE). Presence (+) or absence (-) of a confluent monolayer, intracellular granulation, cellular swelling and crenation and the percentage of cellular lysis were recorded.

CTE was scored as either Non-Toxic (N), Intermediate (I) or Toxic (T).

N = Indicates a negative or non-toxic response.

I = Indicates an intermediate response, a subjective assessment of the extent of cellular response.

T = Indicates a positive or toxic response consisting of greater than 50% cell death.

Results:

| | Confluent Monolayer | Intracellular Granulation | Swelling | Crenation | % Lysis | CTE Score |
|-----------------|---------------------|---------------------------|----------|-----------|---------|-----------|
| 24 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |
| 48 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |
| 72 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |

Positive control, T- 6500 was toxic at a titer of 1:2 at 24 hours.

Conclusion: Test Score Non-Toxic Intermediate Toxic

Comments:

Completed 7/5/85 Tech. IJH/BH Approved by [Signature] MT023-100
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Lab. No. 85T-06653-00

Lot No. 6530

P.O. No. 49325
EA91M1M-S

INTRACUTANEOUS TOXICITY — T13 (CURRENT U.S.P.)

Material(s): **Polypropylene Support Material**

Extracting Conditions: X 121°C. 1 hr 70°C. 24 hrs 50°C. 72 hrs 37°C. 24 hrs

 cm² (or) 4.0 g added to 20 ml extract(s) Condition of extract(s) Clear

Procedure:

Two healthy, previously unused New Zealand White rabbits were used as test animals for each extract. Animals were housed individually and allowed food and water *ad libitum*. Prior to injection, the hair was closely clipped from the back and flanks of each rabbit. Exactly 0.2 ml. of the extract of the Test Material was injected intracutaneously into ten separate sites on the right side of the back of each animal while 0.2 ml. of the extracting medium (Blank) was injected into five separate sites on the left side. Injection sites were examined 24, 48 and 72 hours after injection for erythema and edema. The average tissue reaction to the extract of the Test Material was compared with the Blank. The requirements of the test were met if no significant differences were noted.

Results

| Extract | Rabbit No. | 24 HR | | 48 HR | | 72 HR | |
|--------------------------------------|------------|-------|----|-------|----|-------|----|
| | | ER | ED | ER | ED | ER | ED |
| Sodium Chloride (SC) | Test | 1 | 0 | 0 | 0 | 0 | 0 |
| | Blank | 18758 | 1 | 0 | 0 | 0 | 0 |
| | Test | 18741 | 1 | 0 | 0 | 0 | 0 |
| | Blank | 18741 | 0 | 0 | 0 | 0 | 0 |
| Alcohol in Sodium Chloride 1:20 (AS) | Test | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blank | 18780 | 0 | 0 | 0 | 0 | 0 |
| | Test | 19025 | 1 | 0 | 0 | 0 | 0 |
| | Blank | 19025 | 0 | 0 | 0 | 0 | 0 |
| Polyethylene Glycol 400 (PEG) | Test | 1 | 1 | 0 | 0 | 0 | 0 |
| | Blank | 19002 | 1 | 1 | 0 | 0 | 0 |
| | Test | 19005 | 1 | 1 | 0 | 0 | 0 |
| | Blank | 19005 | 0 | 0 | 0 | 0 | 0 |
| Cottonseed Oil (CSO) | Test | 3 | 3 | 3 | 3 | 3 | 3 |
| | Blank | 19007 | 2 | 2 | 2 | 2 | 2 |
| | Test | 19011 | 2 | 2 | 2 | 2 | 2 |
| | Blank | 19011 | 2 | 2 | 1 | 2 | 2 |

Key

ER : Erythema

ED = Edema

0 = None

0 = None

1 = Barely Perceptible

1 = Barely Perceptible

2 = Well Defined

2 = Well Defined

3 = Moderate

3 = Raised 1 mm

4 = Severe

4 = Raised >1 mm

| \bar{X} Test - \bar{X} Blank : | Δ | Pass | Fail |
|------------------------------------|----------|------|------|
| SC 0.2 - 0.1 | 0.1 | X | |
| AS 0.1 - 0.0 | 0.1 | X | |
| PEG 0.3 - 0.2 | 0.1 | X | |
| CSO 2.5 - 1.9 | 0.6 | X* | |

Prepared: 7-3-85

Injected: 7-3-85

Terminated: 7-6-85

* The CSO was considered a slight irritant.

Completed 7-8-85

Tech. IJH/SGW/TLF Approved by JMR

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TU013-800

Form No. IP-8 (5/84)

Lab. No. 85T-06653-00

Lot No. 6530

P.O. No. 49325
EA91M1M-S

ACUTE SYSTEMIC TOXICITY — T12
(CURRENT U.S.P.)

Material(s): **Polypropylene Support Material**

Extracting Conditions: X 121° C, 1 hour. 70° C, 24 hours. 50° C, 72 hours. 37° C, 24 hours.

Procedure: cm² (or) 4.0 g added to 20 ml extract(s). Condition of extract(s): CSO test cloudy;
Others clear

Healthy, young white mice ranging in body weight from 17 to 23 grams were used as test animals. The animals were housed in stock cages and offered food and water *ad libitum*.

Two groups, each consisting of five mice, were used for each extract. One group was injected with the extract of the Test Material, while the other group was injected with the Blank. After injection, the animals were observed immediately and at 4, 24, 48 and 72 hours. Initial and final body weights were recorded as well as mortalities and/or reactions. If, during the observation period, none of the animals treated with the extract of the Test Material show a significantly greater reaction than the animals treated with the Blank, the material meets the requirements of the test.

Results:

| Extract, Dose and Route | Mortality and Body Weight Data | | | | | | | | |
|---|--------------------------------|-----------------------|-----------------------|-----------------------|--------------------|---------------|-----------------------|-----------------------|--------------------|
| | Animal Number | TEST MATERIAL | | | # Dead # Tested | Animal Number | BLANK | | # Dead # Tested |
| | | Weight (gms) Day 0 | Weight (gms) Day 3 | Weight (gms) Day 3 | | | Weight (gms) Day 0 | Weight (gms) Day 3 | |
| Sodium Chloride Injection (I.V., 50 ml/Kg) | 1 | 18 | 23 | 0/5 | 1 | 17 | 20 | 0/5 | |
| | 2 | 18 | 23 | | 2 | 18 | 20 | | |
| | 3 | 19 | 23 | | 3 | 18 | 22 | | |
| | 4 | 17 | 20 | | 4 | 18 | 22 | | |
| | 5 | 17 | 20 | | 5 | 17 | 18 | | |
| Ethanol in Sodium Chloride Injection (1:20) (I.V., 50 ml/Kg) | 1 | 20 | 23 | 0/5 | 1 | 17 | 21 | 0/5 | |
| | 2 | 19 | 22 | | 2 | 18 | 23 | | |
| | 3 | 19 | 25 | | 3 | 18 | 21 | | |
| | 4 | 20 | 24 | | 4 | 17 | 21 | | |
| | 5 | 17 | 22 | | 5 | 17 | 23 | | |
| Polyethylene Glycol 400 (I.P., 10 g/Kg) | 1 | 17 | 23 | 0/5 | 1 | 18 | 22 | 0/5 | |
| | 2 | 18 | 21 | | 2 | 17 | 21 | | |
| | 3 | 18 | 22 | | 3 | 21 | 24 | | |
| | 4 | 17 | 21 | | 4 | 19 | 21 | | |
| | 5 | 17 | 19 | | 5 | 18 | 21 | | |
| Cottonseed Oil (I.P., 50 ml/Kg) | 1 | 20 | 22 | 0/5 | 1 | 20 | 24 | 0/5 | |
| | 2 | 19 | 24 | | 2 | 20 | 24 | | |
| | 3 | 20 | 23 | | 3 | 17 | 21 | | |
| | 4 | 19 | 23 | | 4 | 18 | 22 | | |
| | 5 | 18 | 23 | | 5 | 19 | 21 | | |

Comments:

Test Material: X Passes Does Not Pass Test

Prepared: 7-3-85

Injected: 7-4-85

Terminated: 7-7-85

Completed 7/8/85 Tech. IJH/GEO/TLF Approved by [Signature] TU012-500

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Form No. 1P-6 (Rev. 11/81)

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2261 Tracy Road • Northwood, Ohio 43619-1397 • Phone 419/666-9455

Lab. No. 85T-06653-00
 Lot No. 6530
 P. O. No. 49325
 EA91M1M-S

CYTOTOXICITY — MEM ELUTION — MT023

Material(s): **Polypropylene Support Material**

Sample Size Used: 60 sq. cm. g other

Procedure: A monolayer of L-929 Mouse Fibroblast cells was grown to confluency and exposed to an extract of the test sample prepared by placing the sample material in 20 ml of Minimum Essential Medium (Eagle) and bovine serum (5%) and extracting at 37 degrees C for 24 hours. An MEM aliquot was used as a negative control. After exposure to the extract, the cells were examined microscopically for cytotoxic effect (CTE). Presence (+) or absence (-) of a confluent monolayer, intracellular granulation, cellular swelling and crenation and the percentage of cellular lysis were recorded.

CTE was scored as either Non-Toxic (N), Intermediate (I) or Toxic (T).

N = Indicates a negative or non-toxic response.

I = Indicates an intermediate response, a subjective assessment of the extent of cellular response.

T = Indicates a positive or toxic response consisting of greater than 50% cell death.

Results:

| | Confluent Monolayer | Intracellular Granulation | Swelling | Crenation | % Lysis | CTE Score |
|-----------------|---------------------|---------------------------|----------|-----------|---------|-----------|
| 24 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |
| 48 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |
| 72 HOURS | | | | | | |
| Sample Extract | (+) | (-) | (-) | (-) | 0 | N |
| (-) Control | (+) | (-) | (-) | (-) | 0 | N |

Positive control, T-6500 was toxic at a titer of 1:2 at 24 hours.

Conclusion: Test Score Non-Toxic Intermediate Toxic

Comments:

pam Completed 7/19/85

Tech. IJH/BH

Approved by [Signature]

MT023-100

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Form No. IP-12 (10/83)

Lab. No. 85T-06653-00

Lot No. 6530

P.O. No. 49325
EA91M1M-S

IMPLANTATION TEST T-14
(Current U.S.P.)

Materials(s) **Polypropylene Support Material**

Procedure

Two healthy (minimum), adult New Zealand White rabbits weighing not less than 2.5 Kg. were used as test animals. The rabbits were housed individually and allowed food and water *ad libitum*. Prior to the implantation, the back of each animal was clipped on both sides of the spinal column. All loose hair was removed after clipping and prior to implantation to prevent entry into the implantation site.

Four strips (minimum) of sterilized (**steam**) test material, approx 1 mm wide and 10 mm long were introduced into the right paravertebral muscle of each rabbit. Two strips of U.S.P. negative control plastic were implanted in the left paravertebral muscle of each rabbit.

The animals were humanely killed 4 days after implantation and the entire paravertebral muscle on each side of the spinal cord removed. Cross sections of the muscles were made to locate the implants. The tissue surrounding the center portion of each implant was examined macroscopically X and/or microscopically N/A.

Tissues to be examined microscopically were preserved in 10% Neutral Buffered Formalin, sectioned and stained with Hematoxylin and Eosin.

Results of Macroscopic Examination

| Scoring | | | |
|--------------------|--------|------|---------|
| Rabbit | Sample | Test | Control |
| 18844 2.5Kg | 1 | 1 | 1 |
| | 2 | 1 | 1 |
| | 3 | 1 | |
| | 4 | 1 | |
| | 5 | | |
| 18886 2.5Kg | 1 | 1 | 1 |
| | 2 | 1 | 1 |
| | 3 | 1 | |
| | 4 | 1 | |
| | 5 | | |
| Mean (\bar{x}) | | 1.0 | 1.0 |

| Scoring Key | |
|-------------|-------------------|
| Score | Capsule Formation |
| 0 | None Noted |
| 1 | Up to 0.5 mm |
| 2 | 0.6 to 1.0 mm |
| 3 | 1.1 to 2.0 mm |
| 4 | > 2.0 mm |

| Reaction Index \bar{x} (Test) - \bar{x} (Control) | |
|--|-----------------|
| 0 - 0.5 | Not Significant |
| 0.6 - 1.0 | Trace |
| 1.1 - 2.0 | Slight |
| 2.1 - 3.0 | Moderate |
| > 3.1 | Marked |

Macroscopic: The reaction was not significant
as compared to the negative control implant material.

Microscopic: The reaction was N/A
as compared to the negative control implant material (see attached report).

Comments

Prepared: 7/5/85
Implanted: 7/11/85
Sacrificed: 7/15/85

SSM

Completed 7-16-85 Tech MKB Approved by Sandra Sarnowski Smith TU014-803

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