

GAMMAPLEX- human immunoglobulin g solution

Bio Products Laboratory Limited

HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use GAMMAPLEX® 10% safely and effectively. See full prescribing information for GAMMAPLEX 10%.

GAMMAPLEX 10% Immune Globulin Intravenous [Human], 10% Liquid
Initial U.S. Approval: 2017

WARNING: THROMBOSIS, RENAL DYSFUNCTION and ACUTE RENAL FAILURE

See full prescribing information for complete boxed warning.

- **Thrombosis may occur with immune globulin products, including GAMMAPLEX 10%. Risk factors may include: advanced age, prolonged immobilization, hypercoagulable conditions, history of venous or arterial thrombosis, use of estrogens, indwelling vascular catheters, hyperviscosity and cardiovascular risk factors (5.2)**
- **Renal dysfunction, acute renal failure, osmotic nephrosis, and death¹ may occur in predisposed patients with immune globulin intravenous (IGIV) products, including GAMMAPLEX 10%**
- **Renal dysfunction and acute renal failure occur more commonly with IGIV products containing sucrose. GAMMAPLEX 10% does not contain sucrose (5.1)**
- **For patients at risk of thrombosis, renal dysfunction or acute renal failure, administer GAMMAPLEX 10% at the minimum dose and infusion rate practicable. Ensure adequate hydration in patients before administration. Monitor for signs and symptoms of thrombosis and assess blood viscosity in patients at risk for hyperviscosity (2.3, 5.2)**

----- **INDICATIONS AND USAGE** -----

GAMMAPLEX 10% is an Immune Globulin Intravenous (Human) 10% Liquid indicated for the treatment of:

- primary humoral immunodeficiency (PI) in adults and pediatric patients 2 years of age and older (1.1)
- chronic immune thrombocytopenic purpura (ITP) in adults (1.2)

----- **DOSAGE AND ADMINISTRATION** -----

For Intravenous Use Only

Indication	Dose	Initial infusion rate	Maintenance infusion rate (if tolerated)
PI	300-800 mg/kg (3-8 mL/kg) every 3-4 weeks	0.5 mg/kg/min (0.005 mL/kg/min) for 15 minutes	Increase gradually every 15 minutes to 8 mg/kg/min (0.08 mL/kg/min)
ITP	1 g/kg (10 mL/kg) for 2 consecutive days	0.5 mg/kg/min (0.005 mL/kg/min) for 15 minutes	Increase gradually every 15 minutes to 8 mg/kg/min (0.08 mL/kg/min)

- Ensure that patients with pre-existing renal insufficiency are not volume depleted; discontinue GAMMAPLEX 10% if renal function deteriorates (2.3, 5.1)
- For patients at risk of renal dysfunction, thrombotic events or volume overload, administer GAMMAPLEX 10% at the minimum infusion rate practicable (2.3, 5.1, 5.2, 5.8)

----- **DOSAGE FORMS AND STRENGTHS** -----

GAMMAPLEX 10% is a liquid solution containing 10% IgG (100 mg/mL). (3)

----- **CONTRAINDICATIONS** -----

- History of anaphylactic or severe systemic reactions to human immunoglobulin (4)
- IgA-deficient patients with antibodies against IgA and a history of hypersensitivity (4)

----- **WARNINGS AND PRECAUTIONS** -----

- IgA-deficient patients with antibodies to IgA are at greater risk of developing severe hypersensitivity and

- anaphylactic reactions (5.3)
- Hyperproteinemia, increased serum viscosity, and hyponatremia may occur in patients receiving IGIV therapy (5.4)
- Aseptic meningitis syndrome may occur, especially with high doses or rapid infusion (5.5)
- Hemolysis, either intravascular or due to enhanced red blood cell sequestration, can develop subsequent to GAMMAPLEX 10% treatments. Risk factors include high doses and non-O blood group. Closely monitor patients for hemolysis and hemolytic anemia (5.6)
- Monitor patients for pulmonary adverse reactions (transfusion-related acute lung injury [TRALI]) (5.7)
- Volume overload can occur. Monitor for signs and symptoms (5.8)
- Consider risks and benefits before prescribing the high dose regimen for chronic ITP in patients at risk of thrombosis, hemolysis, acute kidney injury, or volume overload (5)
- GAMMAPLEX 10% is made from human plasma and may contain infectious agents, e.g. viruses and, theoretically, the Creutzfeldt-Jakob disease agent (5.9)
- Passive transfer of antibodies may confound serologic testing (5.10)

ADVERSE REACTIONS

- **PI** - The most common adverse reactions reported in $\geq 5\%$ of clinical trial subjects were headache, migraine and pyrexia (6)
- **Chronic ITP** - The safety of GAMMAPLEX 10% has not been established in patients with ITP. However, the safety of GAMMAPLEX 5% has been studied in subjects with ITP, and it is anticipated that the safety profile for both formulations are comparable for ITP patients. Hence adverse reaction information is presented for GAMMAPLEX 5% where relevant. The most common adverse reactions reported with GAMMAPLEX 5% in $\geq 5\%$ of clinical trial subjects with ITP were headache, vomiting, pyrexia, nausea, arthralgia and dehydration (6)

To report SUSPECTED ADVERSE REACTIONS, contact BPL Inc. (1-844-427-5872) or MedInfo@BPL-US.com, FDA (1-800-FDA-1088) or www.fda.gov/medwatch

DRUG INTERACTIONS

- Passive transfer of antibodies may transiently interfere with the immune response to live virus vaccines, e.g. measles, mumps, and rubella (7)
- Therapy with GAMMAPLEX 10% may confound serological testing (7)

USE IN SPECIFIC POPULATIONS

- Pediatrics: In pediatric patients 2 years of age and older, the pharmacokinetics, dosage and safety are similar to those in adults (8.4)
- Geriatrics: In patients over the age of 65 years or in any patient at risk of developing renal insufficiency, do not exceed the recommended dose and infuse GAMMAPLEX 10% at the minimum rate practicable (8.5)

See 17 for PATIENT COUNSELING INFORMATION.

Revised: 11/2021

FULL PRESCRIBING INFORMATION: CONTENTS*

WARNING: THROMBOSIS, RENAL DYSFUNCTION and ACUTE RENAL FAILURE

1 INDICATIONS AND USAGE

- 1.1 Primary Humoral Immunodeficiency (PI)
- 1.2 Chronic Immune Thrombocytopenic Purpura (ITP)

2 DOSAGE AND ADMINISTRATION

- 2.1 Dosage
- 2.2 Preparation and Handling
- 2.3 Administration

3 DOSAGE FORMS AND STRENGTHS

4 CONTRAINDICATIONS

5 WARNINGS AND PRECAUTIONS

- 5.1 Renal Dysfunction/Failure
- 5.2 Thrombotic Events
- 5.3 Hypersensitivity
- 5.4 Hyperproteinemia, Increased Serum Viscosity, and Hyponatremia
- 5.5 Aseptic Meningitis Syndrome (AMS)
- 5.6 Hemolysis
- 5.7 Transfusion-related Acute Lung Injury (TRALI)
- 5.8 Volume Overload
- 5.9 Transmissible Infectious Agents
- 5.10 Laboratory Tests

6 ADVERSE REACTIONS

- 6.1 Clinical Trials Experience
- 6.2 Postmarketing Experience

7 DRUG INTERACTIONS

8 USE IN SPECIFIC POPULATIONS

- 8.1 Pregnancy
- 8.2 Lactation
- 8.4 Pediatric Use
- 8.5 Geriatric Use

10 OVERDOSAGE

11 DESCRIPTION

12 CLINICAL PHARMACOLOGY

- 12.1 Mechanism of Action
- 12.3 Pharmacokinetics

14 CLINICAL STUDIES

- 14.1 Treatment of Primary Humoral Immunodeficiency
- 14.2 Treatment of Chronic Immune Thrombocytopenic Purpura

15 REFERENCES

16 HOW SUPPLIED/STORAGE AND HANDLING

17 PATIENT COUNSELING INFORMATION

* Sections or subsections omitted from the full prescribing information are not listed.

FULL PRESCRIBING INFORMATION

WARNING: THROMBOSIS, RENAL DYSFUNCTION and ACUTE RENAL FAILURE

- **Thrombosis may occur with immune globulin products, including GAMMAPLEX 10%. Risk factors may include: advanced age, prolonged immobilization, hypercoagulable conditions, history of venous or arterial thrombosis, use of estrogens, indwelling central vascular catheters, hyperviscosity and cardiovascular risk factors. Thrombosis may occur in the absence of known risk factors [see *Warnings and Precautions (5.2)*, *Patient Counseling Information (17)*].**
- **Renal dysfunction, acute renal failure, osmotic nephrosis, and death¹ may occur in predisposed patients who receive immune globulin intravenous (IGIV) products.**
- **Patients predisposed to renal dysfunction include those with any degree of pre-existing renal insufficiency, diabetes mellitus, age greater than 65 years, volume depletion, sepsis, paraproteinemia, or patients receiving known nephrotoxic drugs [see *Warnings and Precautions (5.1)*]. Renal dysfunction and acute renal failure occur more commonly in patients receiving IGIV products containing sucrose. GAMMAPLEX 10% does not contain sucrose.**
- **For patients at risk of thrombosis, renal dysfunction or acute renal failure, administer GAMMAPLEX 10% at the minimum dose and infusion rate practicable. Ensure adequate hydration in patients before administration. Monitor for signs and symptoms of thrombosis and assess blood viscosity in patients at risk for hyperviscosity [see *Dosage and Administration (2.1, 2.3)*, *Warnings and Precautions (5.2)*].**

1 INDICATIONS AND USAGE

1.1 Primary Humoral Immunodeficiency (PI)

GAMMAPLEX 10% is an Immune Globulin Intravenous (Human), 10% Liquid indicated for replacement therapy in primary humoral immunodeficiency (PI) in adults and pediatric patients 2 years of age and older. This includes, but is not limited to, the humoral immune defect in common variable immunodeficiency, X-linked agammaglobulinemia, congenital agammaglobulinemia, Wiskott-Aldrich syndrome, and severe combined immunodeficiencies.

1.2 Chronic Immune Thrombocytopenic Purpura (ITP)

GAMMAPLEX 10% is indicated for the treatment of chronic immune thrombocytopenic purpura (ITP) in adults to raise platelet counts.

2 DOSAGE AND ADMINISTRATION

For Intravenous Use Only

2.1 Dosage

Table 1: Recommended Dosage and Administration for GAMMAPLEX 10%

Indication	Dose	Initial infusion rate	Maintenance infusion rate (if tolerated)
PI	300-800 mg/kg (3-8 mL/kg) every 3-4 weeks	0.5 mg/kg/min (0.005 mL/kg/min) for 15 minutes	Increase gradually every 15 minutes to 8 mg/kg/min (0.08 mL/kg/min)
ITP	1 g/kg (10 mL/kg) for 2 consecutive days	0.5 mg/kg/min (0.005 mL/kg/min) for 15 minutes	Increase gradually every 15 minutes to 8 mg/kg/min (0.08 mL/kg/min)

Treatment of Primary Humoral Immunodeficiency

As there are significant differences in the half-life of IgG among patients with PI, the frequency and amount of immunoglobulin therapy may vary from patient to patient. The proper amount can be determined by monitoring clinical response.

The recommended dose of GAMMAPLEX 10% for patients with PI is 300 to 800 mg/kg (3 to 8 mL/kg), administered every 3 to 4 weeks. If a patient has been exposed to measles, it may be prudent to administer an extra dose of Immune Globulin Intravenous as soon as possible and within 6 days of exposure. A dose of 400 mg/kg should provide a serum level > 240 mIU/mL of measles antibodies for at least two weeks. If a patient is at risk of future measles exposure and receives a dose of less than 530 mg/kg every 3-4 weeks, the dose should be increased to at least 530 mg/kg. This should provide a serum level of 240 mIU/mL of measles antibodies for at least 22 days after infusion. Adjust the dosage over time to achieve the desired serum trough levels and clinical response. If a patient misses a dose, administer the missed dose as soon as possible, and then resume scheduled treatments every 3 or 4 weeks, as applicable.

Treatment of Chronic Immune Thrombocytopenic Purpura

The recommended dose of GAMMAPLEX 10% for patients with ITP is 1 g/kg (10 mL/kg) on 2 consecutive days, providing a total dose of 2 g/kg. Carefully consider the relative risks and benefits before prescribing the high dose regimen (i.e. 1 g/kg/day for 2 days) in patients at increased risk of thrombosis, hemolysis, acute kidney injury, or volume overload [see *Warnings and Precautions* (5)]. Adequate data on the platelet response to the low dose regimen (e.g. 400 mg/kg per day for 5 consecutive days) are not available for GAMMAPLEX 10%.

2.2 Preparation and Handling

- GAMMAPLEX 10% is a clear or slightly opalescent, colorless or pale yellow liquid. Visually inspect parenteral drug products for particulate matter and discoloration prior to administration whenever solution and container permit. Do not use if the solution is cloudy or turbid, or if it contains particulate matter
- GAMMAPLEX 10% vials are for single use only. Dispose of partially used or unused product

- GAMMAPLEX 10% contains no antimicrobial preservatives. Therefore, prompt administration after preparation is necessary
- Do not shake
- Administer GAMMAPLEX 10% at room temperature (up to 25°C [77°F])
- Do not use any solution that has been frozen [*see How Supplied/ Storage and Handling (16)*]
- Infuse GAMMAPLEX 10% using a separate infusion line
- Do not mix GAMMAPLEX 10% with other intravenous medications (including normal saline) or other IGIV products
- An infusion pump may be used to control the rate of administration
- For administration of large doses, pool multiple vials using aseptic technique

2.3 Administration

- Hydrate the patient adequately prior to the initiation of infusion
- Infuse GAMMAPLEX 10% intravenously using an intravenous infusion set. See Table 1 for recommended infusion rates
- Monitor vital signs throughout the infusion
- Slow or stop the infusion if adverse reactions occur
- If symptoms subside, the infusion may be resumed at a lower rate that is comfortable for the patient
- The observation time of patients after GAMMAPLEX 10% administration may vary. If the patient (a) has not received GAMMAPLEX 10% or another IgG product, (b) is switched from an alternative IGIV product or (c) has had a long interval since the previous infusion, prolong the observation time for adverse reactions after GAMMAPLEX 10% infusion
- Certain severe adverse reactions may be related to the rate of infusion. Slowing or stopping the infusion often allows the reaction to disappear
- Close monitoring of the infusion rate in pediatric patients is recommended
- Ensure that patients with pre-existing renal insufficiency are not volume depleted
- For patients at increased risk of renal dysfunction, thrombotic events, or volume overload, administer GAMMAPLEX 10% at the minimum infusion rate practicable. Consider discontinuing GAMMAPLEX 10% administration if renal function deteriorates [*see Boxed Warning, Warnings and Precautions (5.1, 5.2, 5.8)*]

3 DOSAGE FORMS AND STRENGTHS

GAMMAPLEX 10% is a liquid solution containing 10% IgG (100 mg/mL).

4 CONTRAINDICATIONS

- GAMMAPLEX 10% is contraindicated in patients who have had an anaphylactic or severe systemic reaction to the administration of human immune globulin
- GAMMAPLEX 10% is contraindicated in IgA-deficient patients with antibodies to IgA and a history of hypersensitivity

5 WARNINGS AND PRECAUTIONS

5.1 Renal Dysfunction/Failure

Acute renal dysfunction/failure, osmotic nephropathy, and death¹ may occur upon use of human IGIV products. Ensure that patients are not volume depleted before administering GAMMAPLEX 10%. In patients who are at risk of developing renal dysfunction, because of pre-existing renal insufficiency, predisposition to acute renal failure (such as diabetes mellitus, hypovolemia, overweight, use of concomitant nephrotoxic medicinal products or age >65 years), administer GAMMAPLEX 10% at the minimum infusion rate practicable [see *Dosage and Administration (2.3)*].

Periodic monitoring of renal function and urine output is particularly important in patients judged to be at increased risk of developing acute renal failure. Assess renal function, including measurement of blood urea nitrogen (BUN) and serum creatinine, before the initial infusion of GAMMAPLEX 10% and at appropriate intervals thereafter. If renal function deteriorates, consider discontinuing GAMMAPLEX 10%.

5.2 Thrombotic Events

Thrombosis may occur following treatment with immune globulin products, including GAMMAPLEX 10%². Risk factors may include: advanced age, prolonged immobilization, hypercoagulable conditions, history of venous or arterial thrombosis, use of estrogens, indwelling central vascular catheters, hyperviscosity and cardiovascular risk factors. Thrombosis may occur in the absence of known risk factors.

Consider baseline assessment of blood viscosity in patients at risk for hyperviscosity, including those with cryoglobulins, fasting chylomicronemia/markedly high triacylglycerols (triglycerides), or monoclonal gammopathies. For patients at risk of thrombosis, administer GAMMAPLEX 10% at the minimum dose and infusion rate practicable. Ensure adequate hydration in patients before administration. Monitor for signs and symptoms of thrombosis and assess blood viscosity in patients at risk for hyperviscosity [see *Boxed Warning, Dosage and Administration (2.3), Patient Counseling Information (17)*].

5.3 Hypersensitivity

Severe hypersensitivity reactions may occur [see *Contraindications (4)*]. In case of hypersensitivity, discontinue GAMMAPLEX 10% infusion immediately and institute appropriate treatment. Medications such as epinephrine should be available for immediate treatment of acute hypersensitivity reactions.

GAMMAPLEX 10% contains trace amounts of IgA (<20 micrograms/mL) [see *Description (11)*]. Patients with known antibodies to IgA may have a greater risk of developing potentially severe hypersensitivity and anaphylactic reactions. GAMMAPLEX 10% is contraindicated in patients with antibodies against IgA and a history of hypersensitivity reaction [see *Contraindications (4)*].

5.4 Hyperproteinemia, Increased Serum Viscosity, and Hyponatremia

Hyperproteinemia, increased serum viscosity, and hyponatremia may occur in patients receiving IGIV therapy. It is critical to clinically distinguish true hyponatremia from a pseudohyponatremia that is associated with or causally related to hyperproteinemia with concomitant decreased calculated serum osmolality or elevated osmolar gap, because treatment aimed at decreasing serum free water in patients with pseudohyponatremia may lead to volume depletion, a further increase in serum viscosity, and a possible predisposition to thrombotic events².

5.5 Aseptic Meningitis Syndrome (AMS)

AMS may occur with IGIV treatment. AMS usually begins within several hours to 2 days following IGIV treatment. Discontinuation of IGIV treatment has resulted in remission of AMS within several days without sequelae³.

AMS is characterized by the following signs and symptoms: severe headache, nuchal rigidity, drowsiness, fever, photophobia, painful eye movements, nausea, and vomiting [see *Patient Counseling Information (17)*]. Cerebrospinal fluid (CSF) studies frequently reveal pleocytosis up to several thousand cells per cubic millimeter, predominantly from the granulocytic series, and elevated protein levels up to several hundred mg/dL, but negative culture results. Conduct a thorough neurological examination on patients exhibiting such signs and symptoms, including CSF studies, to rule out other causes of meningitis. AMS may occur more frequently in association with high doses (2 g/kg) and/or rapid infusion of IGIV.

5.6 Hemolysis

GAMMAPLEX 10% may contain blood group antibodies that can act as hemolysins and induce *in vivo* coating of red blood cells (RBCs) with immunoglobulin, causing a positive direct antiglobulin test (DAT) (Coombs' test) result and hemolysis⁴. Delayed hemolytic anemia can develop subsequent to IGIV therapy due to enhanced RBC sequestration; acute hemolysis, consistent with intravascular hemolysis, has been reported⁵. Cases of severe hemolysis-related renal dysfunction/failure or disseminated intravascular coagulation have occurred following infusion of IGIV.

The following risk factors may be associated with the development of hemolysis following IGIV administration: high doses (e.g. ≥ 2 g/kg), given either as a single administration or divided over several days, and non-O blood group⁶. Other individual patient factors, such as an underlying inflammatory state (as may be reflected by, for example, elevated C-reactive protein or erythrocyte sedimentation rate), have been hypothesized to increase the risk of hemolysis following administration of IGIV⁷, but their role is uncertain. Hemolysis has been reported following administration of IGIV for a variety of indications, including ITP and PI⁴.

Closely monitor patients for clinical signs and symptoms of hemolysis, particularly patients with risk factors noted above. Consider appropriate laboratory testing in higher risk patients, including measurement of hemoglobin or hematocrit prior to infusion and within approximately 36 to 96 hours post infusion. If clinical signs and symptoms of hemolysis or a significant drop in hemoglobin or hematocrit have been observed, perform confirmatory laboratory testing. If transfusion is indicated for patients who develop hemolysis with clinically compromising anemia after receiving IGIV, perform adequate cross-matching to avoid exacerbating on-going hemolysis.

5.7 Transfusion-related Acute Lung Injury (TRALI)

Noncardiogenic pulmonary edema may occur in patients following IGIV treatment⁸. TRALI is characterized by severe respiratory distress, pulmonary edema, hypoxemia, normal left ventricular function and fever. Symptoms typically appear within 1 to 6 hours following treatment.

Monitor patients for pulmonary adverse reactions. If TRALI is suspected, perform

appropriate tests for the presence of anti-neutrophil antibodies in both the product and the patient's serum.

TRALI may be managed using oxygen therapy with adequate ventilatory support.

5.8 Volume Overload

Carefully consider the relative risks and benefits before prescribing the high dose regimen (for chronic ITP) in patients at increased risk of volume overload.

5.9 Transmissible Infectious Agents

As GAMMAPLEX 10% is made from human blood, it may carry a risk of transmitting infectious agents, e.g. viruses, the variant Creutzfeldt-Jakob disease (vCJD) agent and, theoretically, the Creutzfeldt-Jakob disease (CJD) agent. No cases of transmission of viral diseases or CJD have been associated with the use of GAMMAPLEX 10%. All infections suspected by a physician possibly to have been transmitted by this product should be reported by the physician or other healthcare providers to **BPL Inc. 1-844-427-5872 or MedInfo@BPL-US.com.**

Before prescribing GAMMAPLEX 10%, the physician should discuss the risks and benefits of its use with the patient [*see Patient Counseling Information (17)*].

5.10 Laboratory Tests

- After infusion of immunoglobulin, the transitory rise of the various passively transferred antibodies in the patient's blood may yield positive serological testing results, with the potential for misleading interpretation
- Passive transmission of antibodies to erythrocyte antigens (e.g. A, B, and D) may cause a positive direct or indirect antiglobulin (Coombs') test
- Clinically assess patients with known renal dysfunction, diabetes mellitus, age greater than 65 years, volume depletion, sepsis, paraproteinemia, or those receiving nephrotoxic agents, and monitor as appropriate (BUN, serum creatinine, urine output) during therapy with GAMMAPLEX 10%
- Consider baseline assessment of blood viscosity in patients at risk for hyperviscosity, including those with polycythemia, cryoglobulins, fasting chylomicronemia/markedly high triglycerides, or monoclonal gammopathies
- Consider measuring hemoglobin or hematocrit at baseline and approximately 36 to 96 hours post infusion in patients at higher risk of hemolysis. If signs and/or symptoms of hemolysis are present after an infusion of GAMMAPLEX 10%, perform appropriate laboratory testing for confirmation
- If TRALI is suspected, perform appropriate tests for the presence of anti-neutrophil antibodies in both the product and patient's serum

6 ADVERSE REACTIONS

The safety information for GAMMAPLEX 10% is based on the clinical trial evaluating the bioequivalence of GAMMAPLEX 10% to GAMMAPLEX 5% in subjects with PI. The safety of GAMMAPLEX 10% has not been established in patients with ITP. However, the safety profile for GAMMAPLEX 5% has been studied in subjects with ITP, and it is anticipated that the safety profile for both formulations are comparable for ITP patients. Hence adverse reaction (AR) information is presented for GAMMAPLEX 5% where relevant. ARs

are adverse events that were deemed by the investigators as causally related to GAMMAPLEX 10%.

There were no serious ARs observed with GAMMAPLEX 10% in the clinical trial in adult or pediatric subjects with PI.

Serious ARs observed with GAMMAPLEX 5% in clinical trial subjects with ITP were headache, vomiting and dehydration. In addition, following a review of the data, 4 subjects (11%) were considered to have experienced asymptomatic suspected treatment-emergent hemolysis [see *Clinical Trials Experience (6.1)*].

The following potential serious ARs are described above and/or elsewhere in the labeling:

- Thrombotic Events [see *Warnings and Precautions (5.2)*]
- Hemolysis [see *Warnings and Precautions (5.6)*]

The most common ARs occurring in $\geq 5\%$ of adult subjects receiving GAMMAPLEX 10% in the PI clinical trial were headache (4 subjects, 12.5%), migraine (2 subjects, 6.3%) and pyrexia (2 subjects, 6.3%) and for pediatric subjects 3 years of age and older, in the same study, headache (3 subjects, 20.0%); other ARs occurred in a single pediatric subject. Overall, ARs which occurred in $\geq 5\%$ of the adult and pediatric subjects combined are shown in Table 2.

The most common ARs occurring in $\geq 5\%$ of adult subjects receiving GAMMAPLEX 5% in the chronic ITP clinical trial were headache (10 subjects, 28.6%), vomiting (6 subjects, 17.1%), pyrexia (5 subjects, 14.3%), nausea (3 subjects, 8.6%), arthralgia (2 subjects, 5.7%) and dehydration (2 subjects, 5.7%).

6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice.

Primary Humoral Immunodeficiency Study

A multicenter, open-label, randomized two-period crossover study (bioequivalence study) evaluated the PK, safety and tolerability of GAMMAPLEX 10% and GAMMAPLEX 5% in 33 adults aged 17 to 55 years with PI. Twenty one (63.6%) subjects were female and 12 (36.4%) were male; 33 (100%) were White, of which 1 (3.0%) was Hispanic or Latino. The safety analysis included all 33 subjects for GAMMAPLEX 5% and 32 subjects for GAMMAPLEX 10%. One subject withdrew consent during the first infusion of GAMMAPLEX 5%, citing inconvenience of the study visits. Thirty two subjects received at least five infusions of each product either on a 28-day or 21-day cycle. The mean doses per infusion for GAMMAPLEX 10% were 491.7 mg/kg and 499 mg/kg respectively, and were similar for GAMMAPLEX 5% [see *Clinical Studies (14.1)*]. No subjects were on regular systemic corticosteroids at entry to, or during the study. Twelve (36.4%) adult subjects received short courses of corticosteroids, from a single dose to a maximum of 6 days duration, for various clinical conditions. No subjects received corticosteroids as premedications for GAMMAPLEX infusions. The use of local anesthetics, antipyretics, antihistamines, analgesics, and antiemetics before infusion was allowed; three (9.1%) adult subjects received a total of 5 courses of such premedication.

While on GAMMAPLEX 10%, 10 of the adults (31.3%) had an adverse reaction (AR) with a similar proportion (12; 36.4%) when on GAMMAPLEX 5%. Headache was the most

commonly reported AR with both formulations of GAMMAPLEX. In total, 166 infusions of GAMMAPLEX 10% and 163 infusions of GAMMAPLEX 5% were given to adults during the study.

Two subjects had a positive direct antiglobulin (Coombs') test (DAT; DCT) result at some stage in the study. For one adult, the test was positive before starting in the study and it remained positive throughout, but without evidence of hemolysis. One other adult had a positive DAT one week after an infusion of GAMMAPLEX 5% but there was no evidence of hemolysis and no positive DAT results when receiving GAMMAPLEX 10%. No other adults had a positive DAT during the study.

In the same study, 15 pediatric subjects with PI, 3 years of age and older, received GAMMAPLEX 10%. All subjects were White, of which 2 (13.3%) were Hispanic or Latino. The mean doses per infusion were 552.9 mg/kg for subjects on the 28-day cycle (n=8) and 514.7 mg/kg for subjects on the 21-day cycle (n=7), overall range 343 to 745 mg/kg. Two subjects were in the 2-5 year age group, 7 were in the 6-11 year age group and 6 were in the 12-15 year age group. Fourteen subjects completed the study with at least 5 infusions of GAMMAPLEX 10% (pediatric subjects only received GAMMAPLEX 10% in this study); 82 infusions were given in total. Two pediatric subjects received IV methylprednisolone as premedication for each infusion. Local anesthetics, antipyretics, antihistamines and analgesics were allowed.

While on GAMMAPLEX 10%, 6 (40%) pediatric subjects had an AR. Headache was the most common with 3 subjects (20%) reporting a total of 4 events. All other ARs were not reported by more than a single pediatric subject. One pediatric subject had a positive direct antiglobulin (Coombs') test without evidence of hemolysis.

Table 2 lists the ARs occurring in at least 5% of all subjects (adult and pediatric combined) with PI treated with GAMMAPLEX 10% in the clinical study.

**Table 2: Adverse Reactions (ARs*)
Occurring in \geq 5% of Subjects with PI
Receiving GAMMAPLEX 10% (Adult and
Pediatric Subjects Combined)**

Preferred Term	Subjects (%) [n=32]	Events
Headache	7 (14.9)	16
Migraine	3 (6.4)	3
Pyrexia	3 (6.4)	3

* Adverse Reactions (ARs) are defined as adverse events considered by the investigators to have been possibly, probably, or definitely related to administration of GAMMAPLEX.

Chronic Immune Thrombocytopenic Purpura Study

The safety of GAMMAPLEX 10% has not been established in patients with ITP. However, the safety profile for GAMMAPLEX 5% has been studied in subjects with ITP, and it is anticipated that the safety profile for both formulations are comparable for ITP patients. The following is a summary of the study of GAMMAPLEX 5% in chronic ITP. In a multicenter, open-label, non-randomized clinical trial, 35 subjects with chronic ITP were

treated with a nominal dose of 1000 mg/kg on each of two consecutive days (total dose 2000 mg/kg). Doses of GAMMAPLEX 5% ranged from 482 to 1149 mg/kg on an infusion day. The median total dose per subject was 2035 mg/kg. Pre-medication with antihistamine or analgesic drugs was permitted if required, but corticosteroids were not permitted prior to infusion as pre-medication. Ten subjects received corticosteroids for ITP during the trial and one additional subject received corticosteroids as pre-medication in violation of the protocol. All 35 subjects received at least one infusion of clinical trial drug, and all but one subject completed the first course of treatment.

Fifteen subjects (42.9%) reported at least one AR (63 in total); the most commonly reported being headache (10 subjects, 28.6%), vomiting (6 subjects, 17.1%), pyrexia (5 subjects, 14.3%), nausea (3 subjects, 8.6%), arthralgia (2 subjects, 5.7%) and dehydration (2 subjects, 5.7%). Three subjects experienced a total of five serious ARs. Of the five serious ARs, one subject had three concurrently (vomiting, dehydration and headache) and two subjects each had one serious AR (headache). One of these latter two subjects discontinued from the clinical trial because of the severe headache. Table 3 lists the ARs in more than $\geq 5\%$ of subjects. Based on a review of clinical and laboratory data, 4/35 subjects (11%) with drops in hemoglobin exceeding 2 g/dL following administration of GAMMAPLEX 5% were considered to have experienced suspected treatment-emergent hemolysis. Milder treatment-emergent hemolysis could not be excluded for an additional 7 subjects, giving a total of 11 of 35 subjects (31%) for whom hemolysis could not be excluded (not including an additional two subjects who lacked follow-up testing for hemolysis, so their hemolysis status was considered unassessable). Data for two subjects were consistent with possible intravascular hemolysis, including one subject who may also have had an element of extravascular hemolysis. Nine of the possible hemolysis cases were mild and appeared consistent with possible extravascular hemolysis.

There was no evidence of transmission of HBV, HCV, HIV and parvovirus B19 during this clinical trial.

Table 3: Adverse Reactions (ARs*) Occurring in $\geq 5\%$ of Subjects with ITP

Adverse Reactions	Subjects (%) [n=35]	Events
Headache	10 (28.6)	19
Vomiting	6 (17.1)	8
Pyrexia	5 (14.3)	6
Nausea	3 (8.6)	3
Arthralgia	2 (5.7)	3
Dehydration	2 (5.7)	2

* Adverse Reactions (ARs) are defined as adverse events considered by the investigators to have been possibly, probably, or definitely related to administration of GAMMAPLEX.

6.2 Postmarketing Experience

Because adverse reactions are voluntarily reported post-approval from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to product exposure.

GAMMAPLEX 10% Postmarketing Experience

The following adverse reactions have been identified and reported during the postmarketing use of GAMMAPLEX 10%:

- *Cardiovascular*: Tachycardia, Thromboembolism, Hypertension, Flushing
- *Gastrointestinal*: Nausea
- *General/Body as a Whole*: Chills, Chest discomfort, Pyrexia
- *Musculoskeletal*: Back pain, Polymyositis
- *Neurological*: Headache
- *Respiratory*: Dyspnea
- *Integumentary*: Rash, Urticaria
- *Investigations*: Blood Pressure increased, Blood Pressure diastolic decreased

The following adverse reactions have been identified during postmarketing use of intravenous immune globulins⁹:

- *Infusion reactions*: Hypersensitivity (e.g. anaphylaxis), headache, diarrhea, tachycardia, fever, fatigue, dizziness, malaise, chills, flushing, urticaria or other skin reactions, wheezing or other chest discomfort, nausea, vomiting, rigors, back pain, myalgia, arthralgia, and changes in blood pressure
- *Renal*: Acute renal dysfunction/failure, osmotic nephropathy
- *Respiratory*: Apnea, Acute Respiratory Distress Syndrome (ARDS), TRALI, cyanosis, hypoxemia, pulmonary edema, dyspnea, bronchospasm, pulmonary embolism
- *Cardiovascular*: Cardiac arrest, thromboembolism, vascular collapse, hypotension, myocardial infarction
- *Neurological*: Coma, loss of consciousness, seizures, tremor, aseptic meningitis syndrome, migraine
- *Integumentary*: Stevens-Johnson syndrome, epidermolysis, erythema multiforme, dermatitis (e.g. bullous dermatitis)
- *Hematologic*: Pancytopenia, leukopenia, hemolysis, positive direct antiglobulin (Coombs') test
- *Musculoskeletal*: Musculoskeletal pain
- *Gastrointestinal*: Hepatic dysfunction, abdominal pain
- *General/Body as a Whole*: Pyrexia, rigors

7 DRUG INTERACTIONS

- Transitory rise of the various passively transferred antibodies in the patient's blood after infusion of immunoglobulin may yield positive serological testing results, with the potential for misleading interpretation. Passive transmission of antibodies to erythrocyte antigens (e.g. A, B, and D) may cause a positive direct or indirect antiglobulin (Coombs') test.
- Passive transfer of antibodies may transiently interfere with the immune response to live virus vaccines such as measles, mumps, rubella and varicella.^{10, 11} Inform the immunizing physician of recent therapy with GAMMAPLEX 10% so that appropriate measures may be taken [see *Patient Counseling Information (17)*].

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

Animal reproduction studies have not been conducted with GAMMAPLEX 10%. It is also not known whether GAMMAPLEX 10% can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. GAMMAPLEX 10% should be given to a pregnant woman only if clearly needed. Immunoglobulins cross the placenta from maternal circulation increasingly after 30 weeks of gestation.¹²

8.2 Lactation

Risk Summary

Use of GAMMAPLEX 10% has not been evaluated in breast-feeding mothers.

8.4 Pediatric Use

In pediatric subjects 3 years of age and older, the pharmacokinetics, dosage and safety are similar to those in adults.

Treatment of Primary Humoral Immunodeficiency

GAMMAPLEX 10% was evaluated in 13 pediatric patients with primary humoral immunodeficiency (2 between ages of 3 to 5, 6 between ages of 6 to 11, and 5 between ages of 12 to 15). No pediatric-specific dose requirements were necessary to achieve the desired serum IgG levels [see *Clinical Studies (14)*]. The safety and pharmacokinetics of GAMMAPLEX 10% were assessed in pediatric subjects 3 years of age and older with PI [see *Clinical Studies (14)*].

Treatment of Chronic Immune Thrombocytopenic Purpura

The safety and effectiveness of GAMMAPLEX 10% has not been established in pediatric patients with ITP. GAMMAPLEX 5% was evaluated in three (3) pediatric subjects with chronic ITP (two aged 6 years and one aged 12 years). This number of pediatric patients was too small for separate evaluation from the adult patients for efficacy [see *Clinical Studies (14)*].

8.5 Geriatric Use

Use caution when administering GAMMAPLEX 10% to patients aged 65 years and over who are judged to be at increased risk of developing renal insufficiency or thrombotic events [see *Boxed Warning, Warnings and Precautions (5.1, 5.2)*]. Do not exceed recommended doses, and administer GAMMAPLEX 10% at the minimum infusion rate practicable.

No subjects over the age of 55 years were included in the clinical study of GAMMAPLEX 10%. Eight (8) patients with PI at or over the age of 65 years were included within the clinical evaluation of GAMMAPLEX 5%. The number of geriatric patients was too small for separate evaluation from the younger patients for safety or efficacy [see *Clinical Studies (14)*].

10 OVERDOSAGE

Overdosage may lead to fluid overload and hyperviscosity, particularly in the elderly and

in patients with renal impairment.

11 DESCRIPTION

GAMMAPLEX 10% is a ready to use sterile solution of polyclonal human Immunoglobulin G for intravenous administration that contains glycine and polysorbate 80 as stabilizers. Specifically, GAMMAPLEX 10% contains approximately 10 g normal human immunoglobulin and 200-300 mM glycine in 100 mL of buffer solution containing: <30 mM acetate, <30 mM sodium chloride and 1-6 mg polysorbate 80. Immunoglobulin G purity is $\geq 98\%$, the pH is in the range of 4.9 to 5.3, and osmolality is not less than 240 mOsmol/kg (typically 280 mOsmol/kg). The distribution of the four IgG subclasses reflects that of normal plasma. The content of IgA is less than 20 micrograms/mL. The anti-D and anti-A/anti-B hemagglutinin content of the drug product is strictly controlled to specification.

GAMMAPLEX 10% contains no reducing carbohydrate stabilizers (e.g. sucrose, maltose) and no preservative.

GAMMAPLEX 10% is prepared from large pools of human plasma by a combination of cold ethanol fractionation and ion exchange chromatography. Fab functions tested include antigen binding activity, and Fc functions tested include complement activation and rubella antibody-mediated hemolysis.

GAMMAPLEX 10% is manufactured from plasma, obtained from healthy US donors, who have passed viral screening tests. All donors are subjected to medical examinations, laboratory tests, and a review of their medical history before being allowed to donate blood or plasma.

All plasma donations are screened for antibody to HIV-1/2 and hepatitis C virus (HCV), and hepatitis B surface antigen (HBsAg). Additional testing of donations is carried out in plasma mini-pools (512 donations per pool) that undergo nucleic acid amplification testing (NAT) for HIV, hepatitis B virus (HBV), HCV, hepatitis A virus (HAV) and parvovirus B19.

Further testing is carried out on the manufacturing pools for HBsAg, and antibody to HIV-1/2; HCV and parvovirus B19 are also tested by NAT, with the limit for B19 set to not exceed 10^4 IU B19 DNA per mL plasma.

There are three processing steps specifically designed to remove or inactivate viruses:

- 1) Solvent/Detergent treatment is targeted to enveloped viruses;
- 2) A virus filtration step designed to remove small viruses including non-enveloped viruses, on a size exclusion basis; and
- 3) The terminal low pH incubation step is identified as contributing to the overall viral clearance capacity for enveloped and non-enveloped viruses.

The capacity of the manufacturing process to remove and/or inactivate enveloped and non-enveloped viruses has been validated by laboratory spiking studies on a scaled down process model. Overall virus reduction was calculated only from steps that were mechanistically independent from each other.

In addition, each step was validated to provide robust virus reduction. Table 5 presents the contribution of each process step to virus reduction and the overall process

reduction.

Table 5: Viral Reduction by Process Step

Virus	Type (Envelope/Genome)	Size (nm)	Process Log ₁₀ Reduction of Virus (LRV) over manufacturing step			Total LRV
			Solvent Detergent	20 nm filtration	Terminal low pH/elevated temperature incubation	
HIV	Env/RNA	80-100	>6.8	I	>6.0	>12.8
SIN	Env/RNA	70	>6.7	6.2	>6.8	>19.7
WNV	Env/RNA	50	>6.4	I	NT	>6.4
BVDV	Env/RNA	40-60	>5.6	I	>4.6	>10.2
IBR	Env/DNA	200	>5.0	I	>5.4	>10.4
HAV	Non-Env/RNA	30	NA	>4.8	1.3	>6.1
EMC	Non-Env/RNA	30	NA	>4.8	3.4	>8.2
CPV	Non-Env/RNA	18-24	NA	3.2	1.0	4.2

HIV: Human immunodeficiency virus

SIN: Sindbis virus, model for hepatitis C virus (HCV)

WNV: West Nile Virus

BVDV: Bovine viral diarrhea virus, model for HCV

IBR: Infectious bovine rhinotracheitis, bovine herpes virus model for enveloped DNA viruses including hepatitis B

HAV: Hepatitis A virus

EMC: Encephalomyocarditis, model for HAV

CPV: Canine parvovirus, model for human parvovirus B19

NA: Not applicable, solvent detergent step is limited to the inactivation of enveloped viruses

I: Inactivation by the product intermediate precluded the accurate estimation of the removal of these viruses by the filtration step

NT: Not tested

B19: Viral clearance of human parvovirus B19 was investigated experimentally at the 20 nm filtration step. The estimated Log reduction Factor obtained was 6.0

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Treatment of Primary Humoral Immunodeficiency

GAMMAPLEX 10% is a replacement therapy for primary humoral immunodeficiency. GAMMAPLEX 10% acts through a broad spectrum of opsonic and neutralizing IgG antibodies against pathogens and their toxins involving antigen binding and effector functions.^{13,14} However, the mechanism of action in PI has not been fully elucidated.

Treatment of Chronic Immune Thrombocytopenic Purpura

The mechanism of action of high doses of immunoglobulins in the treatment of chronic

ITP has not been fully elucidated.

12.3 Pharmacokinetics

Treatment of Primary Humoral Immunodeficiency

In the cross-over clinical trial assessing bioequivalence, safety and tolerability between GAMMAPLEX 10% and GAMMAPLEX 5% in PI, the pharmacokinetics (PK) of these products was assessed after administration to 30 adult subjects on 28-day (n = 16) or 21-day (n = 14) infusion cycles. Blood samples for PK analysis were obtained after at least five infusions.

The dose of GAMMAPLEX 10% ranged from 361-691 mg/kg for subjects on a 28-day cycle and from 254-794 mg/kg for those on a 21-day cycle. The doses of GAMMAPLEX 5% were similar to those of GAMMAPLEX 10% in this cross-over study. Table 6 compares the other PK variables parameters for GAMMAPLEX 10% and GAMMAPLEX 5% for both the 21-day and 28-day cycle regimens.

GAMMAPLEX 10% was pharmacokinetically equivalent to GAMMAPLEX 5% in adults.

PK outcomes after administration of GAMMAPLEX 10% were assessed in 13 pediatric subjects. Six subjects were on a 28-day regimen and 7 were on a 21-day regimen; doses for the PK assessments ranged from 400 to 745 mg/kg and 355 to 702 mg/kg respectively. Results are shown in Table 6 together with those from the adults in the study.

Table 6: Pharmacokinetic Parameters of GAMMAPLEX 10% compared with GAMMAPLEX 5% in Adults, and GAMMAPLEX 10% in Pediatric Subjects (corrected for baseline concentration)

Indication: Parameter (unit)	ADULTS				PEDIATRICS		
	GAMMAPLEX 10%		GAMMAPLEX 5%		GAMMAPLEX 10%		
	28-day Dosing Interval (n=16)	21-day Dosing Interval (n=14)	28-day Dosing Interval (n=16)	21-day Dosing Interval (n=14)	2-5 years (n=2)	6-11 years (n=6)	12-15 years (n=5)
	Mean* (CV%)	Mean* (CV%)	Mean* (CV%)	Mean* (CV%)	Mean* (CV%)	Mean* (CV%)	Mean* (CV%)
C _{max} (mg/dL)	1090 (20.5)	1150 (27.6)	1020 (23.6)	1090 (21.6)	1120 (33.5)	907 (37.9)	977 (34.9)
T _{max} (hr) [†]	2.87 (1.6-31)	2.70 (1.8-7.8)	3.73 (2.1-9.0)	3.68 (2.2-5.7)	3.24 (2.8-3.7)	2.76 (2.0-5.1)	2.33 (1.7-4.5)
AUC [‡] (days*mg/dL)	7830 (30.2)	6980 (33.0)	7230 (35.3)	6380 (32.8)	7620 (70.0)	6160 (71.1)	6650 (31.9)
Half-Life (hr)	123 (32.3)	118 (39.3)	132 (45.8)	119 (48.7)	167 (9.14)	111 (37.3)	144 (16.0)
Clearance (dL/day/kg)	0.0635 (24.0)	0.0674 (21.9)	0.0684 (37.6)	0.0743 (38.6)	0.0716 (19.3)	0.0845 (39.7)	0.0787 (19.3)
Volume of Distribution (dL/kg)	0.498 (27.4)	0.528 (50.3)	0.569 (38.4)	0.536 (32.6)	0.688 (7.45)	0.571 (28.8)	0.711 (26.4)

C_{\max} = maximum observed concentration

T_{\max} = time at which C_{\max} was apparent

* Geometric mean

† Median and range are presented for t_{\max}

‡ $AUC_{0-\tau}$ = area under the concentration versus time curve within a dosing interval, τ = dosing interval

14 CLINICAL STUDIES

14.1 Treatment of Primary Humoral Immunodeficiency

Pharmacokinetics, Safety and Tolerability study

A cross-over clinical trial assessed bioequivalence, safety and tolerability between GAMMAPLEX 10% and GAMMAPLEX 5% in PI after administration to 33 adult subjects on 28-day ($n = 19$) or 21-day ($n = 14$) infusion cycles, of whom 30 (90.9%) completed the PK component [see *Pharmacokinetics (12.3)*]. Thirty-two subjects completed the study of whom 12 were male and 20 were female. All adults were aged between 17 and 55 years. The mean doses of GAMMAPLEX 10% were 491.7 mg/kg for those on a 28-day cycle and 499.0 mg/kg for those on a 21-day cycle. For GAMMAPLEX 5%, the doses were similar: 473.5 and 502.1 mg/kg respectively. The maximum infusion rate was 0.08 mL/kg/min for each product and this rate was achieved by all adult subjects. In this study, PK bioequivalence was used as a surrogate marker for efficacy. Nevertheless, an *ad hoc* comparison was made between the products for the number of subjects reporting an infection while on each product. Comparing the number of subjects developing infections of any severity or type while on GAMMAPLEX 10% (22/32) with the period on GAMMAPLEX 5% (17/32) using the McNemar test provided an exact p value of 0.180, confirming the relevance of PK as a surrogate marker. No subject had an acute serious bacterial infection (SABI) during the study.

The pediatric population in the study comprised 15 subjects who received only GAMMAPLEX 10%, of whom 8 were on a 28-day cycle and 7 on a 21-day cycle. Of these, 13 completed the PK component (6 on a 28-day cycle and 7 on a 21-day cycle) [see *Pharmacokinetics (12.3)*]. There were two subjects in the 2-5 year age group, 7 in the 6-11 year age group and 6 in the 12-15 year age group. The mean dose across all infusions was 535.1 mg/kg. All pediatric subjects tolerated an infusion rate of 0.04 mL/kg/min and 8 subjects (53.3%) tolerated an infusion rate of 0.08 mL/kg/min for all infusions.

Overall, in the population receiving GAMMAPLEX 10%, the PK results (the surrogate for efficacy in this study) and the types and frequencies of adverse reactions were similar for the adult and pediatric populations.

14.2 Treatment of Chronic Immune Thrombocytopenic Purpura

The crossover bioequivalence study described in 14.1, above, did not include subjects with ITP. The results of the bioequivalence study comparing GAMMAPLEX 10% to GAMMAPLEX 5% in subjects with PI are supportive of the potential effectiveness of GAMMAPLEX 10% in the treatment of chronic ITP.

In a Phase 3 multicenter, open-label clinical trial to evaluate the efficacy and safety of GAMMAPLEX 5% in chronic ITP, of the 35 subjects enrolled from various ethnic groups, 9 were male and 26 were female. The age range was between 6 and 69 years. Subjects

received intravenous infusions on two consecutive days (1 course) and then observed for a further 30 days. Individuals were given the option of a further two courses of treatment (if required), where only safety variables were assessed. Doses of GAMMAPLEX 5% ranged from 482 to 1149 mg/kg on Day 1 and Day 2. The median total dose per subject was 2035 mg/kg. Subjects received a total of 94 infusions (48 treatment courses).

All 35 subjects received at least one infusion of clinical trial drug, and all but one subject completed the first course of treatment.

The primary analysis was based on the platelet count achieved by Day 9 after the first course of treatment with GAMMAPLEX 5%, response being defined as a platelet count of $50 \times 10^9/L$ or greater. Response to treatment on or before Day 9 was achieved by 29 of 35 subjects (82.9%), and the one-sided 97.5% lower confidence limit of the response rate was 66.4%, which met the *a priori* success criterion that required it to be greater than 60%.

Efficacy analyses included the duration of response, and changes in the incidences of bleeding or hemorrhage. At Day 32, the median (+ SD) platelet count ($24 + [90] \times 10^9/L$) was still higher than the baseline value, and 11 of 33 subjects (33.3%) continued to show response of platelet counts of $50 \times 10^9/L$ or greater. The median duration of platelet count response for the responders was 10 days.

Table 7: Median Platelet Count (Standard deviation) and Number and Percent of Subjects with a Platelet Count $> 50 \times 10^9/L$ during the clinical trial.

Number of days in clinical trial	Day 1	Day 2	Day 3	Day 5	Day 9	Day 14	Day 21	Day 32
Median Platelet count ($\times 10^9/L$) (Std Dev)	12.0 (11.4)	50.0 (36.4)	93.0 (97.3)	121.5 (151.9)	100.5 (201.3)	15.5 (113.0)	30.0 (80.0)	24.0 (89.9)
Number (n/N) and percent of subjects with a platelet count $\geq 50 \times 10^9/L$	0/35 (0.0%)	18/35 (51.4%)	22/32 (68.8%)	25/32 (78.1%)	22/32 (68.8%)	11/30 (36.7%)	10/29 (34.5%)	11/33 (33.3%)

GAMMAPLEX 5% infusions given on Days 1 and 2.

There was an increase in platelet counts for the majority of subjects, and an overall reduction in the manifestations of bleeding after treatment compared to baseline (Day 1). Petechiae, hematomas and gastrointestinal, pulmonary and genitourinary bleeds were all either reduced or absent by Day 32.

There were no thromboembolic episodes reported in the clinical trial; and vital signs, biochemical, hematological and virology tests did not reveal any unexpected pathophysiology or toxicity.

15 REFERENCES

1. Gupta N, Ahmed I, Nissel-Horowitz S, Patel D, Mehrotra B. Intravenous gammaglobulin-associated acute renal failure. *Am J Hematol* 2001; 66:151-152.
2. Dalakas MC. High-dose intravenous immunoglobulin and serum viscosity: risk of precipitating thromboembolic events. *Neurology* 1994; 44:223-226.

3. Gabor EP. Meningitis and skin reaction after intravenous immune globulin therapy. *Ann Intern Med* 1997; 127:1130.
4. Wilson JR, Bhoopalam N, Fisher M. Hemolytic anemia associated with intravenous immunoglobulin. *Muscle Nerve* 1997; 20:1142-1145.
5. Kessary-Shoham H, Levy Y, Shoenfeld Y, Lorber M, Gershon H. *In vivo* administration of intravenous immunoglobulin (IVIg) can lead to enhanced erythrocyte sequestration. *J Autoimmun* 1999; 13:129-135.
6. Kahwaji J, Barker E, Pepkowitz S, et al. Acute Hemolysis After High-Dose Intravenous Immunoglobulin Therapy in Highly HLA Sensitized Patients. *Clin J Am Soc Nephrol* 2009;4:1993-1997.
7. Daw Z, Padmore R, Neurath D, et al. Hemolytic transfusion reactions after administration of intravenous immune (gamma) globulin: A case series analysis. *Transfusion* 2008;48:1598-1601.
8. Rizk A, Gorson KC, Kenney L, Weinstein R. Transfusion-related acute lung injury after the infusion of IVIG. *Transfusion* 2001; 41:264-268.
9. Pierce LR, Jain N. Risks associated with the use of intravenous immunoglobulin. *Trans Med Rev* 2003; 17:241-251.
10. Siber GA, Werner BG, Halsey NA, Reid R, Almeida-Hill J, Garrett SC, Thompson C, Santosham M. Interference of immune globulin with measles and rubella immunization. *J Pediatr* 1993; 122:204-211.
11. Salisbury D, Ramsay M, Noakes K, eds. Immunisation against infectious disease. The Stationery Office (TSO), London: UK Department of Health, 2009; p426.
12. Sidiropoulos D, Herrmann U, Morell A, von Muralt G, Barandun S. Transplacental passage of intravenous immunoglobulin in the last trimester of pregnancy. *J Pediatr* 1986; 109:505-508.
13. Wood P, Stanworth S, Burton J, Jones A, Peckham DG, Chapel H. Recognition, clinical diagnosis and management of patients with primary antibody deficiencies: a systematic review. *Clin Exp Immunol* 2007; 149:410-423.
14. Simon H, Späth P. IVIG – Mechanisms of action. *Allergy* 2003; 58(7):543-52.

16 HOW SUPPLIED/STORAGE AND HANDLING

GAMMAPLEX 10% is supplied in a single use, clear Type II glass bottle, closed with a stopper and oversealed with a tamper-evident cap. The components used in the packaging for GAMMAPLEX 10% are not made with natural rubber latex.

The following presentations of GAMMAPLEX 10% are available:

Grams and Fill Size	Carton NDC Number	Vial NDC Number
5 g in 50 mL	64208-8235-5	64208-8235-1
10 g in 100 mL	64208-8235-6	64208-8235-2
20 g in 200 mL	64208-8235-7	64208-8235-3

Each vial has a label with a peel-off strip showing the product name and batch number.

When stored between 2°C [35.6°F] and 25°C [77°F]), GAMMAPLEX 10% has a shelf life of 36 months.

Keep GAMMAPLEX 10% in its original carton to protect it from light.

Do not shake.

Do not use GAMMAPLEX 10% beyond the expiration date on the product label.

Do not freeze.

17 PATIENT COUNSELING INFORMATION

Inform patients to immediately report the following signs and symptoms to their healthcare professional:

- Decreased urine output, sudden weight gain, fluid retention/edema, and/or shortness of breath [*see Warnings and Precautions (5.1)*]
- Acute chest pain, shortness of breath, leg pain, and swelling of the legs/feet [*see Warnings and Precautions (5.2)*]
- Severe headache, neck stiffness, drowsiness, fever, sensitivity to light, painful eye movements, nausea and vomiting [*see Warnings and Precautions (5.5)*]
- Increased heart rate, fatigue, yellowing of skin or eyes, dark-colored urine [*see Warnings and Precautions (5.6)*]
- Trouble breathing, chest pain, blue lips or extremities, fever [*see Warnings and Precautions (5.7)*]

Inform patients that GAMMAPLEX 10% is made from human plasma and may contain infectious agents that can cause disease. While the risk that GAMMAPLEX 10% can transmit an infection has been reduced by screening plasma donors for prior exposure, testing donated plasma, and inactivating or removing certain viruses during manufacturing, patients should report any symptoms that concern them [*see Warnings and Precautions (5.9)*].

Inform patients that GAMMAPLEX 10% can interfere with their immune response to live viral vaccines (e.g. measles, mumps, and rubella), and instruct patients to notify their healthcare professional of this potential interaction when they are receiving vaccinations [*see Drug Interactions (7)*].

Instruct patients to immediately report symptoms of thrombosis. These symptoms may include: pain and/or swelling of an arm or leg with warmth over the affected area, discoloration of an arm or leg, unexplained shortness of breath, chest pain or discomfort that worsens on deep breathing, unexplained rapid pulse, numbness or weakness on one side of the body.

Manufactured by:
Bio Products Laboratory Ltd.,
Elstree,
WD6 3BX.
United Kingdom.
U.S. License No. 1811

U.S. Distributor:
BPL Inc.,
302 E. Pettigrew Street,
Suite C-190,
Durham, NC 27701

U.S.A.

PRINCIPAL DISPLAY PANEL - 50 mL Bottle Label

NDC 64208-8235-1

Immune Globulin Intravenous (Human)
Gammaplex[®] 10%

5 g

50 mL

solution for infusion

- For intravenous use only
- Directions for use: Read enclosed package insert before use. Use immediately after piercing cap
- Do not freeze
- Do not use unless clear and free from deposit
- Maximum infusion rate 0.08 mL/kg per minute
- Store between 2°C and 25°C (35.6°F and 77°F) protected from light

Rx only
GSCUS3L

Distributor: BPL USA, Inc., 302 E. Pettigrew Street,
Suite C-190, Durham, NC 27701 USA

Manufactured by: Bio Products Laboratory Ltd.,
Elstree, Borehamwood, WD6 3BX. U.K.

U.S. License No. 1811

NDC 64208-8235-1
Immune Globulin Intravenous (Human) Gammaplex[®] 10%
solution for infusion

5g
50 mL

Rx only GSCUS3L

- For intravenous use only
- Directions for use: Read enclosed package insert before use. Use immediately after piercing cap
- Do not freeze
- Do not use unless clear and free from deposit
- Maximum infusion rate 0.08 mL/kg per minute
- Store between 2°C and 25°C (35.6°F and 77°F) protected from light

(01)00364208823558

Distributor: BPL USA, Inc., 302 E. Pettigrew Street, Suite C-190, Durham, NC 27701 USA | Manufactured by: Bio Products Laboratory Ltd., Elstree, Borehamwood, WD6 3BX. U.K. | U.S. License No. 1811

bpl

PRINCIPAL DISPLAY PANEL - 50 mL Bottle Carton

NDC: 64208-8235-5

Immune Globulin
Intravenous (Human)
Gammaplex[®] 10%

5 g

solution for infusion

For intravenous use only

Rx only

1 vial

50 mL

Bio Products Laboratory



PRINCIPAL DISPLAY PANEL - 100 mL Bottle Label

NDC 64208-8235-2

Immune Globulin Intravenous (Human)
 Gammalex® 10%

10 g

100 mL

solution for infusion

- For intravenous use only

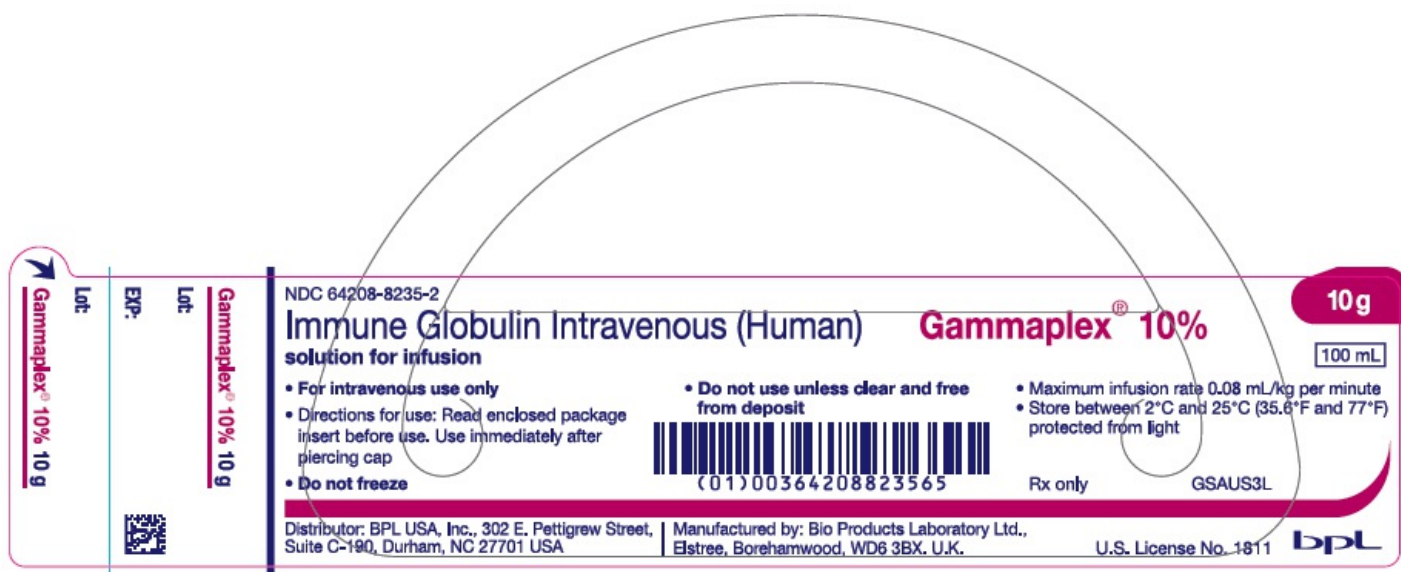
- Directions for use: Read enclosed package insert before use. Use immediately after piercing cap
- Do not freeze
- Do not use unless clear and free from deposit
- Maximum infusion rate 0.08 mL/kg per minute
- Store between 2°C and 25°C (35.6°F and 77°F) protected from light

Rx only
GSAUS3L

Distributor: BPL USA, Inc., 302 E. Pettigrew Street,
Suite C-190, Durham, NC 27701 USA

Manufactured by: Bio Products Laboratory Ltd.,
Elstree, Borehamwood, WD6 3BX. U.K.

U.S. License No. 1811



PRINCIPAL DISPLAY PANEL - 100 mL Bottle Carton

NDC: 64208-8235-6

Immune Globulin
Intravenous (Human)
Gammaplex® 10%

10 g

solution for infusion

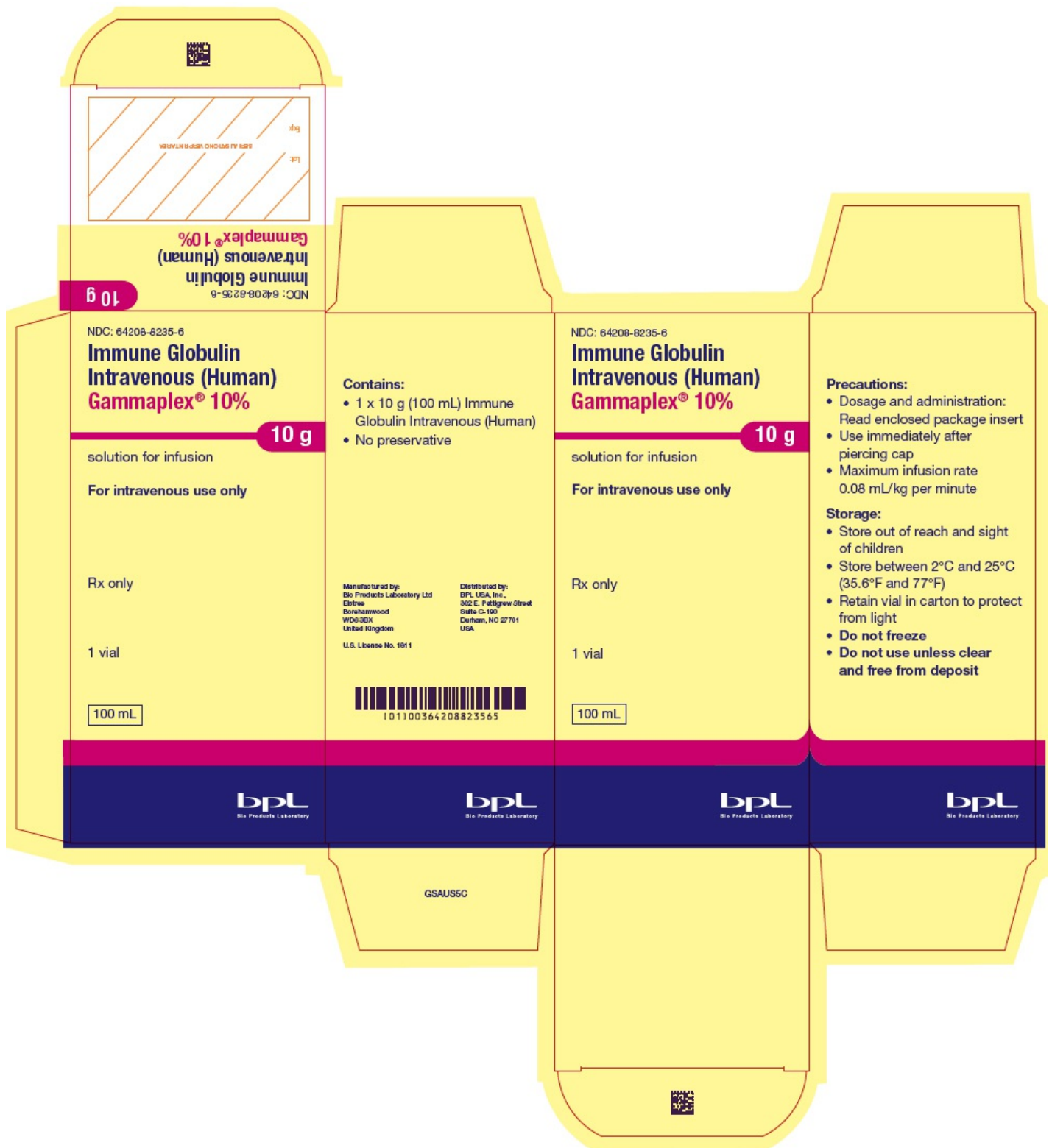
For intravenous use only

Rx only

1 vial

100 mL

Bio Products Laboratory



PRINCIPAL DISPLAY PANEL - 200 mL Bottle Label

NDC: 64208-8235-3

Immune Globulin Intravenous (Human)
Gammaplex® 10%

20 g

200 mL

solution for infusion

- For intravenous use only
- Directions for use:
Read enclosed package insert before use. Use immediately after piercing cap
- Do not freeze
- Do not use unless clear and free from deposit
- Maximum infusion rate 0.08 mL/kg per minute
- Store between 2°C and 25°C (35.6°F and 77°F) protected from light

Rx only
GSBUS3L

Distributor: BPL USA, Inc., 302 E. Pettigrew Street,
Suite C-190, Durham, NC 27701 USA

Manufactured by: Bio Products Laboratory Ltd.,
Elstree, Borehamwood, WD6 3BX. U.K.

U.S. License No. 1811

The image shows the principal display panel of a 200 mL bottle carton for Gammaplex 10% Immune Globulin Intravenous (Human) solution for infusion. The panel is white with blue and red accents. At the top left, there is a vertical label with 'Gammaplex 10% 20 g' and 'Lit'. At the top right, there is a blue oval with '20 g' and a white box with '200 mL'. The main text includes 'NDC: 64208-8235-3', 'Immune Globulin Intravenous (Human)', and 'Gammaplex® 10% solution for infusion'. Below this, there are three columns of bullet points: 'For intravenous use only', 'Directions for use: Read enclosed package insert before use. Use immediately after piercing cap', 'Do not freeze', 'Do not use unless clear and free from deposit', 'Maximum infusion rate 0.08 mL/kg per minute', and 'Store between 2°C and 25°C (35.6°F and 77°F) protected from light'. At the bottom, there is a barcode with the number '01700364208823572', 'Rx only', 'GSBUS3L', and distributor/manufacturing information. The BPL logo is at the bottom right.

NDC: 64208-8235-3
Immune Globulin Intravenous (Human)
Gammaplex® 10%
solution for infusion

20 g
200 mL

- For intravenous use only
- Directions for use:
Read enclosed package insert before use. Use immediately after piercing cap
- Do not freeze
- Do not use unless clear and free from deposit
- Maximum infusion rate 0.08 mL/kg per minute
- Store between 2°C and 25°C (35.6°F and 77°F) protected from light

Rx only GSBUS3L

Distributor: BPL USA, Inc., 302 E. Pettigrew Street, Suite C-190, Durham, NC 27701 USA | Manufactured by: Bio Products Laboratory Ltd., Elstree, Borehamwood, WD6 3BX. U.K. | U.S. License No. 1811 **bpl**

PRINCIPAL DISPLAY PANEL - 200 mL Bottle Carton

NDC: 64208-8235-7

Immune Globulin
Intravenous (Human)
Gammalex[®] 10%

20 g

solution for infusion

For intravenous use only

Rx only

1 vial

200 mL

Bio Products Laboratory



GAMMAPLEX

human immunoglobulin g solution

Product Information

Product Type	PLASMA DERIVATIVE	Item Code (Source)	NDC:64208-8235
Route of Administration	INTRAVENOUS		

Active Ingredient/Active Moiety

Ingredient Name	Basis of Strength	Strength
HUMAN IMMUNOGLOBULIN G (UNII: 66Y330CJHS) (HUMAN IMMUNOGLOBULIN G - UNII:66Y330CJHS)	HUMAN IMMUNOGLOBULIN G	5 g in 50 mL

Inactive Ingredients

Ingredient Name	Strength
GLYCINE (UNII: TE7660XO1C)	0.9 g in 50 mL
POLYSORBATE 80 (UNII: 6OZP39ZG8H)	0.001 g in 50 mL
SODIUM CHLORIDE (UNII: 451W47IQ8X)	
ACETATE ION (UNII: 569DQM74SC)	

Packaging

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:64208-8235-5	1 in 1 CARTON		
1	NDC:64208-8235-1	50 mL in 1 BOTTLE, GLASS; Type 0: Not a Combination Product		
2	NDC:64208-8235-6	1 in 1 CARTON		
2	NDC:64208-8235-2	100 mL in 1 BOTTLE, GLASS; Type 0: Not a Combination Product		
3	NDC:64208-8235-7	1 in 1 CARTON		
3	NDC:64208-8235-3	200 mL in 1 BOTTLE, GLASS; Type 0: Not a Combination Product		

Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
BLA	BLA125329	04/07/2017	

Labeler - Bio Products Laboratory Limited (216845337)

Establishment

Name	Address	ID/FEI	Business Operations
Bio Products Laboratory Limited		216845337	ANALYSIS, LABEL, MANUFACTURE, PACK, STERILIZE