

# REMICADE™

(infliximab)

for IV Injection

## DESCRIPTION:

REMICADE™ (infliximab) is a chimeric IgG1κ monoclonal antibody with an approximate molecular weight of 149,100 daltons. It is composed of human constant and murine variable regions. Infliximab binds specifically to human tumor necrosis factor alpha (TNFα) with an association constant of  $10^{10} \text{ M}^{-1}$ . Infliximab is produced by a recombinant cell line cultured by continuous perfusion and is purified by a series of steps that includes measures to inactivate and remove viruses.

REMICADE is supplied as a sterile, white, lyophilized powder for intravenous infusion. Following reconstitution with 10 mL of Sterile Water for Injection, USP, the resulting pH is approximately 7.2. Each single-use vial contains 100 mg infliximab, 500 mg sucrose, 0.5 mg polysorbate 80, 2.2 mg monobasic sodium phosphate and 6.1 mg dibasic sodium phosphate. No preservatives are present.

## CLINICAL PHARMACOLOGY:

### General

Infliximab neutralizes the biological activity of TNFα by binding with high affinity to the soluble and transmembrane forms of TNFα and inhibits binding of TNFα with its receptors.<sup>1-4</sup> Infliximab does not neutralize TNFβ (lymphotoxin α), a related cytokine that utilizes the same receptors as TNFα. Biological activities attributed to TNFα include: induction of pro-inflammatory cytokines such as IL-1 and IL-6, enhancement of leukocyte migration by increasing endothelial layer permeability and expression of adhesion molecules by endothelial cells and leukocytes, activation of neutrophil and eosinophil functional activity, induction of acute phase reactants and other liver proteins, as well as tissue degrading enzymes produced by synoviocytes and/or chondrocytes. Cells expressing transmembrane TNFα bound by infliximab can be lysed *in vitro* by complement or effector cells.<sup>2</sup> Infliximab inhibits the functional activity of TNFα in a wide variety of *in vitro* bioassays utilizing human fibroblasts, endothelial cells, neutrophils,<sup>3</sup> B and T lymphocytes and epithelial cells. Anti-TNFα antibodies reduce disease activity in the cotton-top tamarin colitis model, and decrease synovitis and joint erosions in a murine model of collagen-induced arthritis. Infliximab prevents disease in transgenic mice that develop polyarthritis as a result of constitutive expression of human TNFα, and, when administered after disease onset, allows eroded joints to heal.

### Pharmacodynamics

Elevated concentrations of TNFα have been found in the joints of rheumatoid arthritis patients<sup>5</sup> and the stools of Crohn's disease patients<sup>6</sup> and correlate with elevated disease activity. In Crohn's disease, treatment with REMICADE reduced infiltration of inflammatory cells and TNFα production in inflamed areas of the intestine, and reduced the proportion of mononuclear cells from the lamina propria able to express TNFα and interferon γ.<sup>4</sup> In rheumatoid arthritis, treatment with REMICADE reduced infiltration of inflammatory cells into inflamed areas of the joint as well as expression of molecules mediating cellular adhesion [E-selectin, intercellular adhesion molecule-1 (ICAM-1) and vascular cell adhesion molecule-1 (VCAM-1)], chemoattraction [interleukin 8 (IL-8) and monocyte chemotactic protein (MCP-1)] and tissue degradation [matrix

metalloproteinase (MMP) 1 and 3].<sup>4</sup> After treatment with REMICADE, patients with Crohn's disease or rheumatoid arthritis exhibited decreased levels of serum interleukin 6 (IL-6) and C-reactive protein (CRP) compared to baseline. Peripheral blood lymphocytes from REMICADE-treated patients showed no significant decrease in number or in proliferative responses to *in vitro* mitogenic stimulation when compared to cells from untreated patients.

### **Pharmacokinetics**

Single intravenous infusions of 1 to 20 mg/kg showed a predictable and linear relationship between the dose administered and the maximum serum concentration and area under the concentration-time curve. The volume of distribution at steady state was independent of dose and indicated that infliximab was distributed primarily within the vascular compartment. Median pharmacokinetic results for the recommended doses of 3 mg/kg in rheumatoid arthritis and 5 mg/kg in Crohn's disease indicate that the terminal half-life of infliximab is 8.0 to 9.5 days.

Following an initial dose of REMICADE, repeated infusions at 2 and 6 weeks in fistulizing Crohn's disease and rheumatoid arthritis patients resulted in predictable concentration-time profiles following each treatment. No systemic accumulation of infliximab occurred upon continued repeated treatment with 3 mg/kg or 10 mg/kg at 4- or 8-week intervals in rheumatoid arthritis patients or patients with moderate or severe Crohn's disease retreated with 4 infusions of 10 mg/kg REMICADE at 8-week intervals. No major differences in clearance or volume of distribution were observed in patient subgroups defined by age or weight. It is not known if there are differences in clearance or volume of distribution between gender subgroups or in patients with marked impairment of hepatic or renal function.

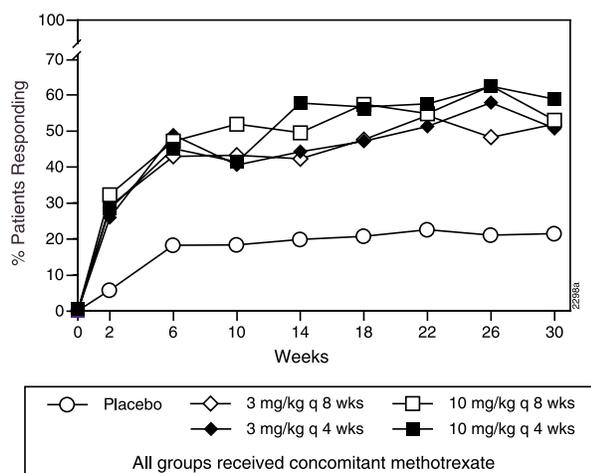
## **CLINICAL STUDIES:**

### **Rheumatoid Arthritis**

The safety and efficacy of REMICADE when given in conjunction with methotrexate (MTX) were assessed in a multicenter, randomized, double-blind, placebo-controlled study of 428 patients with active rheumatoid arthritis despite treatment with MTX (the Anti-TNF Trial in Rheumatoid Arthritis with Concomitant Therapy or ATTRACT). The median age of patients enrolled was 54 years, with a median duration of disease of 8.4 years and a median number of swollen and tender joints of 20 and 31 respectively. All patients were to have received MTX for  $\geq 6$  months and be on a stable dose  $\geq 12.5$  mg/week for 4 weeks prior to study. All REMICADE and placebo groups continued their stable dose of MTX and folic acid.

In addition to MTX, patients received placebo, 3 mg/kg or 10 mg/kg of REMICADE by intravenous infusion at weeks 0, 2 and 6 followed by additional infusions every four or eight weeks thereafter. Concurrent use of stable doses of oral corticosteroids (10 mg/day) and/or nonsteroidal anti-inflammatory drugs was also permitted. The primary endpoint was the proportion of patients at week 30 who attained an improvement in signs and symptoms as measured by the American College of Rheumatology criteria, (ACR 20). An ACR 20 response is defined as at least a 20% improvement in both tender and swollen joint counts and in 3 of the following 5 criteria: physician global assessment, patient global assessment, functional/disability measure, visual analog pain scale and erythrocyte sedimentation rate (ESR) or CRP.

At week 30, 43/86 (50%) of patients treated every 8 weeks with 3 mg/kg of REMICADE plus MTX attained an ACR 20 compared with 18/88 (20%) of patients treated with placebo plus MTX ( $p < 0.001$ ). Higher doses and/or more frequent administrations did not result in higher response rates. Results are shown in Figure 1.



**Figure 1 Percentage of Patients who Achieved an ACR 20**

At week 30, the ACR 50 response was 27% for patients treated with 3 mg/kg REMICADE every 8 weeks plus MTX, compared to 5% for patients treated with placebo plus MTX ( $p < 0.001$ ). The ACR 70 response was 8% for patients treated with 3 mg/kg REMICADE every 8 weeks plus MTX and 0% for patients treated with placebo plus MTX. Patients receiving 3 mg/kg REMICADE every 8 weeks demonstrated superior improvement in all ACR response components except HAQ compared to patients treated with placebo plus MTX (Table 1). Data on use of REMICADE without concurrent MTX are limited (see *PRECAUTIONS, Immunogenicity*).<sup>7,8</sup>

Table 1  
 MEDIAN VALUES AT BASELINE & WEEK 30 FOR ACR COMPONENTS

Parameter	Placebo + MTX		3 mg/kg q 8 wks REMICADE + MTX	
	Baseline	30 weeks	Baseline	30 weeks
No. of Tender Joints	24	16	32	12
No. of Swollen Joints	19	13	19	9
Pain <sup>a</sup>	6.7	5.9	7.0	3.8
Physician's Global Assessment <sup>a</sup>	6.5	5.0	6.1	2.6
Patient's Global Assessment <sup>a</sup>	6.2	5.5	6.6	3.6
Disability Index (HAQ) <sup>b</sup>	1.8	1.5	1.8	1.5
CRP (mg/dL)	3.0	2.3	3.1	0.8
ESR (mm/hr)	39	35	40	24

<sup>a</sup> Visual Analog Scale (0=best, 10=worst)

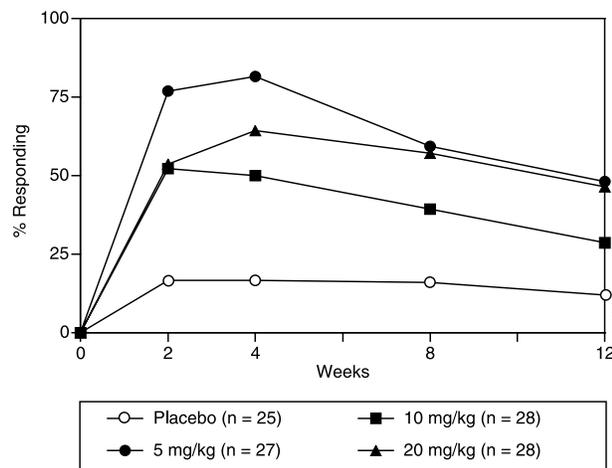
<sup>b</sup> Health Assessment Questionnaire, measurement of 8 categories: dressing and grooming, arising, eating, walking, hygiene, reach, grip, and activities

### Active Crohn's Disease

The safety and efficacy of REMICADE were assessed in a randomized, double-blind, placebo-controlled dose ranging study of 108 patients with moderate to severe active Crohn's disease<sup>9</sup> [Crohn's Disease Activity Index (CDAI)  $\geq 220 \leq 400$ ]. All patients had experienced an inadequate response to prior conventional therapies, including corticosteroids (60% of patients), 5-aminosalicylates (5-ASA) (60%) and/or 6-mercaptopurine/azathioprine (6-MP/AZA) (37%). Concurrent use of stable dose regimens of corticosteroids, 5-ASA, 6-MP and/or AZA was permitted and 92% of patients continued to receive at least one of these medications.

The study was divided into three phases. In the first phase, patients were randomized to receive a single intravenous (IV) dose of placebo, 5, 10 or 20 mg/kg of REMICADE. The primary endpoint was the proportion of patients who experienced a clinical response, defined as a decrease in CDAI by  $\geq 70$  points from baseline at the 4-week evaluation and without an increase in Crohn's disease medications or surgery for Crohn's disease. Patients who responded at week 4 were followed to week 12. Secondary endpoints included the proportion of patients who were in clinical remission at week 4 (CDAI  $< 150$ ), and clinical response over time.

At week 4, four of twenty-five (16%) of the placebo patients achieved a clinical response vs. twenty-two of twenty-seven (82%) of the patients receiving 5 mg/kg REMICADE ( $p < 0.001$ , two-sided, Fisher's Exact test). One of twenty-five (4%) placebo patients and thirteen of twenty-seven (48%) patients receiving 5 mg/kg REMICADE achieved a CDAI  $< 150$  at week 4. The maximum response to any dose of REMICADE was observed within 2 to 4 weeks. The proportion of patients responding gradually diminished over the 12 weeks of the evaluation period. There was no evidence of a dose response; doses higher than 5 mg/kg did not result in a greater proportion of responders. Results are shown in Figure 2.



**Figure 2. Response ( $\geq 70$  point decrease in CDAI) to a Single IV REMICADE or Placebo Dose.**

During the 12-week period following infusion, patients treated with REMICADE compared to placebo demonstrated improvement in outcomes measured by the Inflammatory Bowel Disease Questionnaire.

In the second phase, 29 patients who did not respond to the single dose of 5, 10 or 20 mg/kg of REMICADE entered the open label phase and received a single 10 mg/kg dose of REMICADE 4 weeks after the initial dose. Ten of twenty-nine (34%) patients experienced a response 4 weeks after receiving the second dose.

Patients who remained in clinical response at week 8 during the first or second phase were eligible for the retreatment phase. Seventy-three patients were re-randomized at week 12 to receive 4 infusions of placebo or 10 mg/kg REMICADE at 8-week intervals (weeks 12, 20, 28, 36) and were followed to week 48. In the limited data set available, no significant differences were observed between the REMICADE and placebo re-treated groups.

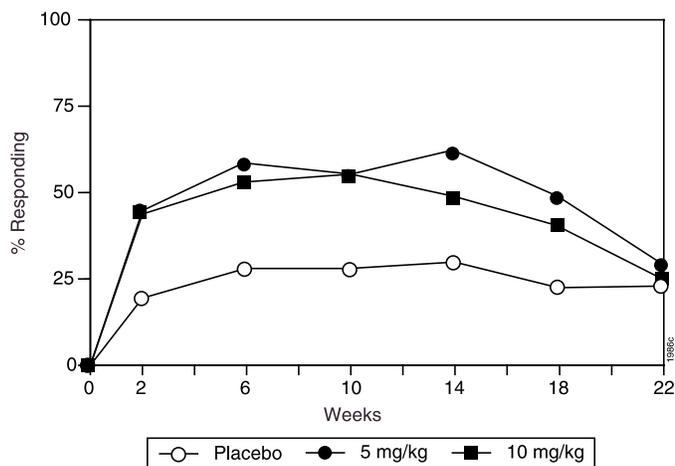
### Fistulizing Crohn's Disease

The safety and efficacy of REMICADE were assessed in a randomized, double-blind, placebo controlled study of 94 patients with fistulizing Crohn's disease with fistula(s) that were of at least 3 months duration.<sup>10</sup> Concurrent use of stable doses of corticosteroids, 5-ASA, antibiotics, MTX, 6-MP and/or AZA was permitted, and 83% of patients continued to receive at least one of these medications. Fifty-two (55%) had multiple cutaneously draining fistulas, 90% of patients had fistula(s) in the perianal area and 10% had abdominal fistula(s).

Patients received 3 doses of placebo, 5 or 10 mg/kg REMICADE at weeks 0, 2 and 6 and were followed up to 26 weeks. The primary endpoint was the proportion of patients who experienced a clinical response, defined as  $\geq 50\%$  reduction from baseline in the number of fistula(s) draining upon gentle compression, on at least two consecutive visits, without an increase in medication or surgery for Crohn's disease.

Eight of thirty-one (26%) patients in the placebo arm achieved a clinical response vs. twenty-one of the thirty-one (68%) patients in the 5 mg/kg REMICADE arm ( $p = 0.002$ , two-sided, Fisher's Exact test). Eighteen of thirty-two (56%) patients in the 10 mg/kg arm achieved a clinical response.

The median time to onset of response in the REMICADE-treated group was 2 weeks. The median duration of response was 12 weeks; after 22 weeks there was no difference between either dose of REMICADE and placebo in the proportion of patients in response (Figure 3). New fistula(s) developed in approximately 15% of both REMICADE and placebo-treated patients.



**Figure 3 Response [fistula(s) closure] with Three Doses of REMICADE or Placebo.**

Seven of sixty (12%) evaluable REMICADE-treated patients, compared to one of thirty-one (3.5%) placebo-treated patients, developed an abscess in the area of fistulas between 8 and 16 weeks after the last infusion of REMICADE. Six of the REMICADE patients who developed an abscess had experienced a clinical response (see *ADVERSE REACTIONS, Infections*).

Dose regimens other than dosing at weeks 0, 2 and 6 have not been studied. Studies have not been done to assess the effects of REMICADE on healing of the internal fistular canal, on closure of non-cutaneously draining fistulas (e.g., entero-entero), or on cutaneously draining fistulas in locations other than perianal and periabdominal.

## INDICATIONS AND USAGE:

### Rheumatoid Arthritis

REMICADE, in combination with methotrexate, is indicated for the reduction in signs and symptoms of rheumatoid arthritis in patients who have had an inadequate response to methotrexate.

### Crohn's Disease

REMICADE is indicated for the reduction in signs and symptoms of Crohn's disease in patients with moderately to severely active Crohn's disease who have had an inadequate response to conventional therapy.

**The safety and efficacy of therapy continued beyond a single dose have not been established (see *DOSAGE AND ADMINISTRATION*).**

REMICADE is indicated for the reduction in the number of draining enterocutaneous fistulae in patients with fistulizing Crohn's disease.

**The safety and efficacy of therapy continued beyond three doses have not been studied (see *DOSAGE AND ADMINISTRATION*).**

## CONTRAINDICATIONS:

REMICADE should not be administered to patients with known hypersensitivity to any murine proteins or other component of the product.

## WARNINGS:

### RISK OF INFECTIONS

**SERIOUS INFECTIONS, INCLUDING SEPSIS AND FATAL INFECTIONS, HAVE BEEN REPORTED IN PATIENTS RECEIVING TNF-BLOCKING AGENTS. MANY OF THE SERIOUS INFECTIONS IN PATIENTS TREATED WITH REMICADE HAVE OCCURRED IN PATIENTS ON CONCOMITANT IMMUNOSUPPRESSIVE THERAPY THAT, IN ADDITION TO THEIR CROHN'S DISEASE OR RHEUMATOID ARTHRITIS, COULD PREDISPOSE THEM TO INFECTIONS. CAUTION SHOULD BE EXERCISED WHEN CONSIDERING THE USE OF REMICADE IN PATIENTS WITH A CHRONIC INFECTION OR A HISTORY OF RECURRENT INFECTION. REMICADE SHOULD NOT BE GIVEN TO PATIENTS WITH A CLINICALLY IMPORTANT, ACTIVE INFECTION. PATIENTS WHO DEVELOP A NEW INFECTION WHILE UNDERGOING TREATMENT WITH REMICADE SHOULD BE MONITORED CLOSELY. IF A PATIENT DEVELOPS A SERIOUS INFECTION OR SEPSIS, REMICADE THERAPY SHOULD BE DISCONTINUED (see *ADVERSE REACTIONS, Infections*).**

### Hypersensitivity

REMICADE has been associated with hypersensitivity reactions that vary in their time of onset. Most hypersensitivity reactions, which include urticaria, dyspnea, and/or hypotension, have occurred during or within 2 hours of infliximab infusion. However, in some cases, serum sickness-like reactions have been observed in Crohn's disease patients 3 to 12 days after REMICADE therapy was reinstated following an extended period without REMICADE treatment. Symptoms associated with these reactions include fever, rash, headache, sore throat, myalgias,

polyarthralgias, hand and facial edema and/or dysphagia. These reactions were associated with marked increase in antibodies to infliximab, loss of detectable serum concentrations of REMICADE, and possible loss of drug efficacy. REMICADE should be discontinued for severe reactions. Medications for the treatment of hypersensitivity reactions (e.g., acetaminophen, antihistamines, corticosteroids and/or epinephrine) should be available for immediate use in the event of a reaction (see *ADVERSE REACTIONS, Infusion-related Reactions*).

## **PRECAUTIONS:**

### **Autoimmunity**

Treatment with REMICADE may result in the formation of autoantibodies and, rarely, in the development of a lupus-like syndrome. If a patient develops symptoms suggestive of a lupus-like syndrome following treatment with REMICADE, treatment should be discontinued (see *ADVERSE REACTIONS, Autoantibodies/Lupus-like Syndrome*).

### **Malignancy**

Patients with long duration of Crohn's disease or rheumatoid arthritis and chronic exposure to immunosuppressant therapies are more prone to develop lymphomas (see *ADVERSE REACTIONS, Malignancies/Lymphoproliferative Disease*). The impact of treatment with REMICADE on these phenomena is unknown.

### **Immunogenicity**

Treatment with REMICADE can be associated with the development of antibodies to infliximab (also referred to as human antichimeric antibodies, HACA). One hundred thirty-four of the 199 Crohn's disease patients treated with REMICADE were evaluated for the development of infliximab-specific antibodies; 18 (13%) were antibody-positive (the majority at low titer, <1:20). Patients who were antibody-positive were more likely to experience an infusion reaction (see *ADVERSE REACTIONS, Infusion-related Reactions*). Antibody development was lower among rheumatoid arthritis and Crohn's disease patients receiving immunosuppressant therapies such as 6-MP, AZA or MTX. With repeated dosing of REMICADE, serum concentrations of infliximab were higher in rheumatoid arthritis patients who received concomitant MTX. There are limited data available on the development of antibodies to infliximab in patients receiving long-term treatment with REMICADE. Because immunogenicity analyses are product-specific, comparison of antibody rates to those from other products is not appropriate.

### **Vaccinations**

No data are available on the response to vaccination or on the secondary transmission of infection by live vaccines in patients receiving anti-TNF therapy. It is recommended that live vaccines not be given concurrently.

### **Drug Interactions**

Specific drug interaction studies, including interactions with MTX, have not been conducted. The majority of patients in rheumatoid arthritis or Crohn's disease clinical trials received one or more concomitant medications. In rheumatoid arthritis, concomitant medications besides MTX were nonsteroidal anti-inflammatory agents, folic acid, corticosteroids and/or narcotics. Concomitant Crohn's disease medications were antibiotics, antivirals, corticosteroids, 6-MP/AZA and aminosalicylates. Patients with Crohn's disease who received immunosuppressants tended to experience fewer infusion reactions compared to patients on no immunosuppressants (see *PRECAUTIONS, Immunogenicity* and *ADVERSE REACTIONS, Infusion-related Reactions*).

### **Carcinogenesis, Mutagenesis and Impairment of Fertility**

Long-term studies in animals have not been performed to evaluate the carcinogenic potential. No clastogenic or mutagenic effects of infliximab were observed in the *in vivo* mouse micronucleus test or the *Salmonella-Escherichia coli* (Ames) assay, respectively. Chromosomal aberrations were not observed in an assay performed using human lymphocytes. It is not known whether infliximab can impair fertility in humans. No impairment of fertility was observed in a fertility and general reproduction toxicity study conducted in mice using an analogous antibody that selectively inhibits the functional activity of mouse TNF $\alpha$ .

### **Pregnancy Category C**

Since infliximab does not cross-react with TNF $\alpha$  in species other than humans and chimpanzees, animal reproduction studies have not been conducted with REMICADE. It is not known whether REMICADE can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity while infliximab is present in the serum (see *CLINICAL PHARMACOLOGY, Pharmacokinetics*). REMICADE should be given to a pregnant woman only if clearly needed. No evidence of maternal toxicity, embryotoxicity or teratogenicity was observed in a developmental toxicity study conducted in mice using an analogous antibody that selectively inhibits the functional activity of mouse TNF $\alpha$ .

### **Nursing Mothers**

It is not known whether infliximab is excreted in human milk or absorbed systemically after ingestion. Because many drugs and immunoglobulins are excreted in human milk, and because of the potential for adverse reactions in nursing infants from REMICADE, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

### **Pediatric Use**

Safety and effectiveness of REMICADE in patients with juvenile rheumatoid arthritis and in pediatric patients with Crohn's disease have not been established.

### **Geriatric Use**

In the ATTRACT study, no overall differences were observed in effectiveness or safety in the 72 patients aged 65 or older compared to younger patients. In Crohn's disease studies, there were insufficient numbers of patients aged 65 and over to determine whether they respond differently from patients aged 18 to 65. Because there is a higher incidence of infections in the elderly population in general, caution should be used in treating the elderly (see *ADVERSE REACTIONS, Infections*).

### **ADVERSE REACTIONS:**

A total of 771 patients were treated with REMICADE in clinical trials. In both rheumatoid arthritis and Crohn's disease trials, approximately 5% of patients discontinued REMICADE because of adverse experiences. The most common reasons for discontinuation of treatment were dyspnea, urticaria and headache.

## **Infusion-related Reactions**

### *Acute infusion reactions*

An infusion reaction was defined as any adverse event occurring during the infusion or within 1 to 2 hours after the infusion. Seventeen percent of REMICADE-treated patients in all clinical trials experienced an infusion reaction compared to 7% of placebo-treated patients. Among the 3284 REMICADE infusions, 4% were accompanied by nonspecific symptoms such as fever or chills, 1% were accompanied by pruritus or urticaria, 1% were accompanied by cardiopulmonary reactions (primarily chest pain, hypotension, hypertension or dyspnea), and 0.1% were accompanied by combined symptoms of pruritus/urticaria and cardiopulmonary reactions. Less than 2% of patients discontinued REMICADE because of infusion reactions, and all patients recovered with treatment and/or discontinuation of infusion. REMICADE infusions beyond the initial infusion in rheumatoid arthritis patients were not associated with a higher incidence of reactions.

Patients with Crohn's disease who became positive for antibodies to infliximab were more likely to develop infusion reactions than were those who were negative (36% vs. 11% respectively). Use of concomitant immunosuppressant agents appeared to reduce the frequency of antibodies to infliximab and infusion reactions (see *PRECAUTIONS, Immunogenicity and Drug Interactions*).

### *Reactions following readministration*

In a clinical trial of forty patients with Crohn's disease retreated with infliximab following a 2 to 4 year period without infliximab treatment, 10 patients experienced adverse events manifesting 3 to 12 days following infusion of which 6 were considered serious. Signs and symptoms included myalgia and/or arthralgia with fever and/or rash, with some patients also experiencing pruritus, facial, hand or lip edema, dysphagia, urticaria, sore throat, and headache. Patients experiencing these adverse events had not experienced infusion-related adverse events associated with their initial infliximab therapy. Of the 40 patients enrolled, these adverse events occurred in 9 of 23 (39%) who had received liquid formulation which is no longer in use and 1 of 17 (6%) who received lyophilized formulation. The clinical data are not adequate to determine if occurrence of these reactions is due to differences in formulation. Patients' signs and symptoms improved substantially or resolved with treatment in all cases. There are insufficient data on the incidence of these events after drug-free intervals of less than 2 years. However, these events have been observed infrequently in clinical trials and post-marketing surveillance at intervals of less than 1 year.

## **Infections**

In REMICADE clinical trials, infections were reported by 26% of REMICADE-treated patients (average of 27 weeks of follow-up) and by 16% of placebo-treated patients (average of 20 weeks of follow-up). The infections most frequently reported were upper respiratory tract infections (including, sinusitis, pharyngitis, and bronchitis) and urinary tract infections. No increased risk of serious infections or sepsis has been observed with Remicade compared to placebo. Among REMICADE-treated patients, these serious infections included pneumonia, cellulitis, pyelonephritis and sepsis. In the ATTRACT study, one patient died with disseminated tuberculosis and one died with disseminated coccidioidomycosis. The relationship to REMICADE is unknown (see *WARNINGS, Risk of Infections*). Twelve percent of patients with fistulizing Crohn's disease developed a new abscess 8 to 16 weeks after the last infusion of REMICADE (see *CLINICAL STUDIES, Fistulizing Crohn's Disease*).

### **Autoantibodies/Lupus-like Syndrome**

Patients were tested for autoantibodies at multiple time points. In the rheumatoid arthritis ATTRACT study, 23% of REMICADE-treated patients developed antinuclear antibodies (ANA) between screening and last evaluation, compared to 6% of placebo-treated patients. Anti-dsDNA antibodies developed in approximately 4% of REMICADE-treated patients, compared to none of the placebo-treated patients. No association was seen between REMICADE dose/schedule and development of ANA or anti-dsDNA.

Of Crohn's disease patients treated with REMICADE who were evaluated for antinuclear antibodies (ANA), 34% developed ANA between screening and last evaluation. Anti-dsDNA antibodies developed in approximately 9% of Crohn's disease patients treated with REMICADE. The development of anti-dsDNA antibodies was not related to either the dose or duration of REMICADE treatment. However, baseline therapy with an immunosuppressant in Crohn's disease patients was associated with reduced development of anti-dsDNA antibodies (3% compared to 21% in patients not receiving any immunosuppressant). Crohn's disease patients were approximately 2 times more likely to develop anti-dsDNA antibodies if they were ANA-positive at study entry.

Three patients developed clinical symptoms consistent with a lupus-like syndrome, two with rheumatoid arthritis and one with Crohn's disease. All three patients improved following discontinuation of therapy and appropriate medical treatment (see *PRECAUTIONS, Autoimmunity*).

### **Malignancies/Lymphoproliferative Disease**

Five new and 2 recurrent malignancies were observed in 6 of 771 patients treated with REMICADE for up to 36 weeks in clinical trials. These were non-Hodgkin's B-cell lymphoma, breast cancer, melanoma, squamous cell cancer of the skin, and basal cell cancer. There are insufficient data to determine whether Remicade contributed to the development of these malignancies. The observed rates and incidences were similar to those expected for the populations studied<sup>11,12</sup> (see *PRECAUTIONS, Malignancy*).

### **Other Adverse Reactions**

Adverse events occurring at a frequency of at least 5% in trials in patients with rheumatoid arthritis or Crohn's disease are shown in Table 2. Patients with Crohn's disease who were treated with REMICADE were more likely than patients with rheumatoid arthritis to experience adverse events associated with gastrointestinal symptoms.

Table 2  
ADVERSE EVENTS IN RHEUMATOID ARTHRITIS AND CROHN'S DISEASE TRIALS

	RHEUMATOID ARTHRITIS		CROHN'S DISEASE	
	Placebo (n=133)	REMICADE (n= 555)	Placebo (n=56)	REMICADE (n=199)
Avg. weeks of follow-up	22.3	26.9	14.7	27.0
Respiratory				
Upper respiratory infection	13%	20%	9%	16%
Coughing	5%	10%	0%	5%
Sinusitis	3%	9%	2%	5%
Rhinitis	4%	8%	4%	6%
Pharyngitis	5%	8%	5%	9%
Bronchitis	2%	4%	2%	7%
Gastrointestinal				
Nausea	17%	14%	4%	17%
Abdominal Pain	7%	8%	4%	12%
Vomiting	10%	5%	0%	9%
Other				
Headache	10%	20%	21%	23%
Rash	4%	9%	5%	6%
Fatigue	5%	6%	5%	11%
Fever	4%	6%	7%	10%
Back pain	2%	6%	4%	5%
Pain	4%	6%	5%	9%
Urinary tract infection	3%	6%	4%	3%
Pruritus	0%	5%	2%	5%
Moniliasis	2%	3%	0%	5%

Serious adverse events by body system that occurred in all patients treated with REMICADE at frequencies <2% are as follows:

*Body as a whole:* abdominal hernia, chest pain, fall, pain

*Blood:* splenic infarction, splenomegaly

*Cardiovascular:* hypertension, hypotension, syncope

*Central & Peripheral Nervous:* dizziness, headache, upper motor neuron lesion

*Collagen:* lupus erythematosus syndrome, rheumatoid nodules

*Ear and Hearing:* ceruminosis

*Gastrointestinal:* abdominal pain, Crohn's disease, diarrhea, gastric ulcer, intestinal obstruction, intestinal perforation, intestinal stenosis, nausea, pancreatitis, proctalgia, vomiting

*Heart Rate and Rhythm:* palpitation, tachycardia

*Liver and Biliary:* cholecystitis

*Metabolic and Nutritional:* dehydration, pancreatic insufficiency, weight decrease

*Musculoskeletal:* arthropathy, back pain, bone fracture, myalgia, tendon disorder, tendon injury

*Myo-, Endo-, Pericardial and Coronary Valve:* cardiac failure, myocardial ischemia

*Neoplasms:* lymphoma

*Platelet, Bleeding and Clotting:* thrombocytopenia

*Psychiatric:* anxiety, confusion, delirium, depression, somnolence, suicide attempt

*Red Blood Cell:* anemia

*Resistance Mechanism:* abscess, cellulitis, fever, infection bacterial, sepsis

*Respiratory:* adult respiratory distress syndrome, bronchitis, coughing, dyspnea, pleurisy, pneumonia, pulmonary infiltration, respiratory insufficiency

*Skin and Appendages:* furunculosis, rash, increased sweating

*Urinary:* azotemia, dysuria, hydronephrosis, kidney infarction, renal failure, ureteral obstruction

*Vascular (Extracardiac):* brain infarction, pulmonary embolism, thrombophlebitis deep

*White cell and Reticuloendothelial:* leukopenia, lymphadenopathy

A greater proportion of patients enrolled into the ATTRACT trial who received REMICADE plus MTX experienced mild, transient elevations (<2 times the upper limit of normal) in AST or ALT (37% each) compared to patients treated with placebo plus MTX (AST: 24%, ALT: 29%). Five (1.5%) patients treated with REMICADE and MTX experienced more prolonged elevations in their ALT.

## **OVERDOSAGE:**

Single doses up to 20 mg/kg have been administered without any direct toxic effect. In case of overdose, it is recommended that the patient be monitored for any signs or symptoms of adverse reactions or effects and appropriate symptomatic treatment instituted immediately.

## **DOSAGE AND ADMINISTRATION:**

### Rheumatoid Arthritis

The recommended dose of REMICADE is 3 mg/kg given as an intravenous infusion followed with additional 3 mg/kg doses at 2 and 6 weeks after the first infusion then every 8 weeks thereafter. Remicade should be given in combination with methotrexate.

### Crohn's Disease

The recommended dose of REMICADE is 5 mg/kg given as a single intravenous infusion for treatment of moderately to severely active Crohn's disease. In patients with fistulizing disease, an initial 5 mg/kg dose should be followed with additional 5 mg/kg doses at 2 and 6 weeks after the first infusion.

**There are insufficient safety and efficacy data for the use of REMICADE in Crohn's disease beyond the recommended duration (see *WARNINGS, Hypersensitivity; ADVERSE REACTIONS, Infusion-related Reactions; and INDICATIONS AND USAGE*).**

**Preparation and administration instructions: Use aseptic technique.**

REMICADE vials do not contain antibacterial preservatives. Therefore, the vials after reconstitution should be used immediately, not re-entered or stored. The diluent to be used for reconstitution is 10 mL of Sterile Water for Injection, USP. The total dose of the reconstituted product must be further diluted to 250 mL with 0.9% Sodium Chloride Injection, USP. The infusion concentration should range between 0.4 mg/mL and 4 mg/mL. The REMICADE infusion should begin within 3 hours of preparation.

1. Calculate the dose and the number of REMICADE vials needed. Each REMICADE vial contains 100 mg of infliximab. Calculate the total volume of reconstituted REMICADE solution required.
2. Reconstitute each REMICADE vial with 10 mL of Sterile Water for Injection, USP, using a syringe equipped with a 21-gauge or smaller needle. Remove the flip-top from the vial and wipe the top with an alcohol swab. Insert the syringe needle into the vial through the center of the rubber stopper and direct the stream of Sterile Water for Injection, USP, to the glass wall of the vial. Do not use the vial if the vacuum is not present. Gently swirl the solution by rotating the vial to dissolve the lyophilized powder. Avoid prolonged or vigorous agitation. **DO NOT SHAKE.** Foaming of the solution on reconstitution is not unusual. Allow the reconstituted solution to stand for 5 minutes. The solution should be colorless to light yellow and opalescent, and the solution may develop a few translucent particles as infliximab is a protein. Do not use if opaque particles, discoloration, or other foreign particles are present.
3. Dilute the total volume of the reconstituted REMICADE solution dose to 250 mL with 0.9% Sodium Chloride Injection, USP, by withdrawing a volume of 0.9% Sodium Chloride Injection, USP, equal to the volume of reconstituted REMICADE from the 0.9% Sodium Chloride Injection, USP, 250 mL bottle or bag. Slowly add the total volume of reconstituted REMICADE solution to the 250 mL infusion bottle or bag. Gently mix.
4. The infusion solution must be administered over a period of not less than 2 hours and must use an infusion set with an in-line, sterile, non-pyrogenic, low-protein-binding filter (pore size of 1.2- $\mu$ m or less). Any unused portion of the infusion solution should not be stored for reuse.
5. No physical biochemical compatibility studies have been conducted to evaluate the co-administration of REMICADE with other agents. REMICADE should not be infused concomitantly in the same intravenous line with other agents.
6. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration, whenever solution and container permit. If visibly opaque particles, discoloration or other foreign particulates are observed, the solution should not be used.

**Storage**

Store the lyophilized product under refrigeration at 2°C to 8°C (36°F to 46°F). Do not freeze. Do not use beyond the expiration date. This product contains no preservative.

## HOW SUPPLIED:

REMICADE (infliximab) lyophilized concentrate for IV injection is supplied in individually-boxed single-use vials in the following strength:

NDC 57894-030-01      100 mg infliximab in a 20-mL vial

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