

**FUZEON- enfuvirtide**  
**Genentech, Inc.**

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**HIGHLIGHTS OF PRESCRIBING INFORMATION**

**These highlights do not include all the information needed to use FUZEON safely and effectively. See full prescribing information for FUZEON.**

**FUZEON® (enfuvirtide) for Injection**

**Initial U.S. Approval: 2003**

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

FUZEON is an HIV-1 fusion inhibitor indicated for use in combination with other antiretroviral agents for the treatment of HIV-1 infection in treatment-experienced patients with HIV-1 replication despite ongoing antiretroviral therapy. (1)

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

- Adults: Recommended FUZEON dose of 90 mg (1 mL) twice daily injected subcutaneously into the upper arm, anterior thigh, or abdomen. FUZEON should not be injected near any anatomical areas where large nerves course close to the skin. (2.1)
- Pediatric Patients (6 to 16 years of age): Recommended 2 mg/kg twice daily up to a maximum dose of 90 mg twice daily injected subcutaneously. Weight should be monitored periodically and the FUZEON dose should be adjusted accordingly. (2.2)
- FUZEON must only be reconstituted with 1 mL of Sterile Water for Injection provided in the Convenience Kit. (2.3)
- Reconstituted FUZEON must be injected immediately or kept refrigerated in the original vial. It must be used within 24 hours. (2.3)

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

- Lyophilized powder: 108 mg/vial (3)

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

- Hypersensitivity to FUZEON or any of its components. (4)

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

- Injection Site Reaction: 98% of subjects experienced at least one injection site reaction during FUZEON treatment in randomized, controlled, open-label, multicenter trials. Manifestations included pain and discomfort, erythema, nodules and cysts, and ecchymosis. (5.1)
- Biojector® 2000: Administration of FUZEON with Biojector 2000 may result in neuralgia and/or paresthesia, bruising and hematomas. Patients receiving anticoagulants or persons with hemophilia, or other coagulation disorders, may have a higher risk of post-injection bleeding. (5.2)
- Pneumonia: Monitor for signs and symptoms of pneumonia in HIV-infected patients, especially those predisposed to pneumonia (e.g., low initial CD4 cell count). (5.3)
- Hypersensitivity: FUZEON should be discontinued immediately upon signs and symptoms of systemic hypersensitivity reactions. (5.4)
- Immune Reconstitution: Patients treated with combination antiretroviral therapy, including FUZEON, may experience immune reconstitution syndrome requiring further evaluation and treatment. (5.6)

----- **ADVERSE REACTIONS** -----

Most common adverse reactions are local injection site reactions, diarrhea, nausea, and fatigue. (6.1)

**To report SUSPECTED ADVERSE REACTIONS, contact Genentech at 1-888-835-2555 or FDA at 1-800-FDA-1088 or [www.fda.gov/medwatch](http://www.fda.gov/medwatch).**

----- **DRUG INTERACTIONS** -----

- No dose adjustments of FUZEON or the co-administered drug is needed when FUZEON is administered concomitantly with other antiretroviral or non-antiretroviral drugs. (7, 12.3)

----- **USE IN SPECIFIC POPULATIONS** -----

- Pregnancy: No evidence of harm to the fetus was observed in animal reproduction studies and FUZEON should be used only if clearly needed. (8.1)
- Nursing mothers: Do not breast-feed while receiving FUZEON therapy. (8.3)
- Pediatric Use: Safety and pharmacokinetics of FUZEON have not been established in pediatric patients < 6 years of age. Limited efficacy data for pediatric patients ≥ 6 years of age. (8.4)

- Geriatric Use: No data available for patients  $\geq 65$  years of age. (8.5)

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling.

Revised: 12/2015

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## FULL PRESCRIBING INFORMATION

### 1 INDICATIONS AND USAGE

FUZEON<sup>®</sup> in combination with other antiretroviral agents is indicated for the treatment of HIV-1 infection in treatment-experienced patients with evidence of HIV-1 replication despite ongoing antiretroviral therapy.

This indication is based on results from two controlled studies of 48 weeks duration. Subjects enrolled were treatment-experienced adults; many had advanced disease. There are no studies of FUZEON in antiretroviral naive subjects.

### 2 DOSAGE AND ADMINISTRATION

#### 2.1 Adults

The recommended dose of FUZEON is 90 mg (1 mL) twice daily injected subcutaneously into the upper arm, anterior thigh or abdomen. Each injection should be given at a site different from the preceding injection site, and only where there is no current injection site reaction from an earlier dose. FUZEON should not be injected near any anatomical areas where large nerves course close to the skin, such as near the elbow, knee, groin or the inferior or medial section of the buttocks, skin abnormalities, including directly over a blood vessel, into moles, scar tissue, bruises, or near the navel, surgical scars, tattoos or burn sites. Additional detailed information regarding the administration of FUZEON is described in the FUZEON *Injection Instructions*.

#### 2.2 Pediatric Patients

Insufficient data are available to establish a dose recommendation of FUZEON in pediatric patients below the age of 6 years. In pediatric patients 6 years through 16 years of age, the recommended dosage of FUZEON is 2 mg/kg twice daily up to a maximum dose of 90 mg twice daily injected subcutaneously into the upper arm, anterior thigh or abdomen. Each injection should be given at a site different from the preceding injection site and only where there is no current injection site reaction from an earlier dose. FUZEON should not be injected into moles, scar tissue, bruises or the navel. Table 1 contains dosing guidelines for FUZEON based on body weight. Weight should be monitored periodically and the FUZEON dose adjusted accordingly.

**Table 1 Pediatric Dosing Guidelines**

Weight		Dose per bid Injection (mg/dose)	Injection Volume (90 mg enfuvirtide per mL)
Kilograms (kg)	Pounds (lbs)		
11.0 to 15.5	24 to 34	27	0.3 mL
15.6 to 20.0	>34 to 44	36	0.4 mL
20.1 to 24.5	>44 to 54	45	0.5 mL
24.6 to 29.0	>54 to 64	54	0.6 mL
29.1 to 33.5	>64 to 74	63	0.7 mL
33.6 to 38.0	>74 to 84	72	0.8 mL
38.1 to 42.5	>84 to 94	81	0.9 mL
≥42.6	>94	90	1.0 mL

#### 2.3 Directions for Use

For more detailed instructions, see FUZEON *Injection Instructions*.

Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration.

### **Subcutaneous Administration**

FUZEON must only be reconstituted with 1 mL of Sterile Water for Injection provided in the Convenience Kit. After adding sterile water, the vial should be gently tapped for 10 seconds and then gently rolled between the hands to avoid foaming and to ensure all particles of drug are in contact with the liquid and no drug remains on the vial wall. The vial should then be allowed to stand until the powder goes completely into solution, which could take up to 45 minutes. Reconstitution time can be reduced by gently rolling the vial between the hands until the product is completely dissolved. Before the solution is withdrawn for administration, the vial should be inspected visually to ensure that the contents are fully dissolved in solution, and that the solution is clear, colorless and without bubbles or particulate matter. If the FUZEON is foamy or jelled, allow more time for it to dissolve. If there is evidence of particulate matter, the vial must not be used and should be returned to the pharmacy.

FUZEON contains no preservatives. Once reconstituted, FUZEON should be injected immediately or kept refrigerated in the original vial until use. Reconstituted FUZEON must be used within 24 hours. The subsequent dose of FUZEON can be reconstituted in advance and must be stored in the refrigerator in the original vial and used within 24 hours. Refrigerated reconstituted solution should be brought to room temperature before injection and the vial should be inspected visually again to ensure that the contents are fully dissolved in solution and that the solution is clear, colorless, and without bubbles or particulate matter.

A vial is suitable for single use only; unused portions must be discarded (see *FUZEON Injection Instructions*).

Patients should contact their healthcare provider for any questions regarding the administration of FUZEON. Information about the self-administration of FUZEON may also be obtained by calling the toll-free number 1-877-4-FUZEON (1-877-438-9366) or at the FUZEON website, [www.FUZEON.com](http://www.FUZEON.com). Patients should be taught to recognize the signs and symptoms of injection site reactions and instructed when to contact their healthcare provider about these reactions.

## **3 DOSAGE FORMS AND STRENGTHS**

Lyophilized powder for injection: 108 mg enfuvirtide per vial

## **4 CONTRAINDICATIONS**

FUZEON is contraindicated in patients with known hypersensitivity to FUZEON or any of its components [*see Warnings and Precautions (5.4)*].

## **5 WARNINGS AND PRECAUTIONS**

### **5.1 Local Injection Site Reactions (ISRs)**

The majority of subjects (98%) receiving FUZEON in randomized, controlled, open-label, multicenter clinical trials had at least one local injection site reaction; ISRs occurred throughout treatment with FUZEON. Manifestations may include pain and discomfort, induration, erythema, nodules and cysts, pruritus, and ecchymosis [*see Adverse Reactions (6)*]. Reactions are often present at more than one injection site. Patients must be familiar with the *FUZEON Injection Instructions* in order to know how to inject FUZEON appropriately and how to monitor carefully for signs or symptoms of cellulitis or local infection.

### **5.2 Administration with Biojector® 2000**

Nerve pain (neuralgia and/or paresthesia) lasting up to 6 months associated with administration at anatomical sites where large nerves course close to the skin, bruising and hematomas have occurred with use of the Biojector 2000 needle-free device for administration of FUZEON. Patients receiving anticoagulants or persons with hemophilia, or other coagulation disorders, may have a higher risk of post-injection bleeding.

### **5.3 Pneumonia**

An increased rate of bacterial pneumonia was observed in subjects treated with FUZEON in the Phase 3 clinical trials compared to the control arm. The incidence of pneumonia was 2.7% or 3.2 events/100 patient-years in subjects receiving FUZEON+background regimen. On analysis of all diagnoses of pneumonia (pneumonia, bacterial pneumonia, bronchopneumonia, and related terms) in T20-301 and T20-302, an increased rate of bacterial pneumonia was observed in subjects treated with FUZEON compared to the control arm (6.9%, 6.7 pneumonia events per 100 patient-years versus 0.6 events per 100 patient-years, respectively). Approximately half of the study subjects with pneumonia required hospitalization. Three subject deaths in the FUZEON arm were attributed to pneumonia; all three had serious concomitant AIDS-related illnesses that contributed to their deaths. Risk factors for pneumonia included low initial CD4 lymphocyte count, high initial viral load, intravenous drug use, smoking, and a prior history of lung disease.

Because it was unclear whether the higher incidence rate of pneumonia was related to FUZEON use, an observational study in 1850 HIV-infected patients (740 FUZEON treated patients and 1110 non-FUZEON treated patients) was conducted to evaluate the risk of pneumonia in patients treated with FUZEON. A total of 123 patients had a confirmed or probable pneumonia event in this study (62 in the FUZEON treatment arm with 1962 patient-years of observation and 61 in the non-FUZEON treatment arm with 3378 patient-years of observation). The incidence of pneumonia was 3.2 events/100 patient-years in the FUZEON treatment arm and 1.8 events/100 patient-years in the non-FUZEON treatment arm. The hazard ratio, adjusting for other baseline risk factors, was 1.34 (95% C.I. = 0.90 – 2.00). Based on this observational study, it is not possible to exclude an increased risk of pneumonia in patients treated with FUZEON compared to non-FUZEON treated patients.

It is unclear if the increased incidence of pneumonia is related to FUZEON use. However, because of these findings, patients with HIV-1 infection should be carefully monitored for signs and symptoms of pneumonia, especially if they have underlying conditions which may predispose them to pneumonia. Risk factors for pneumonia included low initial CD4 cell count, high initial viral load, intravenous drug use, smoking, and a prior history of lung disease.

### **5.4 Hypersensitivity Reactions**

Systemic hypersensitivity reactions have been associated with FUZEON therapy and may recur on re-challenge. Hypersensitivity reactions have occurred in <1% of subjects studied and have included combinations of: rash, fever, nausea and vomiting, chills, rigors, hypotension, and/or elevated serum liver transaminases. Other adverse events that may be immune mediated and have been reported in subjects receiving FUZEON include primary immune complex reaction, respiratory distress, glomerulonephritis, and Guillain-Barre syndrome. Patients developing signs and symptoms suggestive of a systemic hypersensitivity reaction should discontinue FUZEON and should seek medical evaluation immediately. Therapy with FUZEON should not be restarted following systemic signs and symptoms consistent with a hypersensitivity reaction. Risk factors that may predict the occurrence or severity of hypersensitivity to FUZEON have not been identified.

### **5.5 Non-HIV Infected Individuals**

There is a theoretical risk that FUZEON use may lead to the production of anti-enfuvirtide antibodies which cross react with HIV gp41. This could result in a false positive HIV test with an ELISA assay; a confirmatory western blot test would be expected to be negative. FUZEON has not been studied in non-HIV infected individuals.

## 5.6 Immune Reconstitution Syndrome

Immune reconstitution syndrome has been reported in patients treated with combination antiretroviral therapy, including FUZEON. During the initial phase of combination antiretroviral treatment, patients whose immune system responds may develop an inflammatory response to indolent or residual opportunistic infections (such as *Mycobacterium avium* infection, cytomegalovirus, *Pneumocystis jirovecii* pneumonia [PCP] or tuberculosis), which may necessitate further evaluation and treatment.

Autoimmune disorders (such as Graves' disease, polymyositis, and Guillain-Barré syndrome) have also been reported to occur in the setting of immune reconstitution, however, the time to onset is more variable, and can occur many months after initiation of treatment.

## 6 ADVERSE REACTIONS

The following adverse reactions are discussed in greater detail in other sections:

- Administration with Biojector<sup>®</sup> 2000 [see Warnings and Precautions (5.2)]
- Pneumonia [see Warnings and Precautions (5.3)]
- Hypersensitivity Reactions [see Warnings and Precautions (5.4)]

### 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 practice.

The overall safety profile of FUZEON is based on 2131 subjects who received at least 1 dose of FUZEON during various clinical trials. This includes 2051 adults, 658 of whom received the recommended dose for greater than 48 weeks, and 63 pediatric subjects.

Assessment of treatment-emergent adverse events is based on the pooled data from the two randomized, controlled, open-label, multicenter trials in treatment-experienced subjects, T20-301 (TORO 1) and T20-302 (TORO 2).

#### Local Injection Site Reactions

Local injection site reactions were the most frequent adverse events associated with the use of FUZEON. In T20-301 and T20-302, 98% of subjects had at least one local injection site reaction (ISR). A total of 7% of subjects discontinued treatment with FUZEON because of ISRs (4%) or difficulties with injecting FUZEON (3%) such as injection fatigue and inconvenience. Eighty-five percent of subjects experienced their first ISR during the initial week of treatment; ISRs continued to occur throughout treatment with FUZEON. For most subjects the severity of signs and symptoms associated with ISRs did not change during the 48 weeks of treatment. The majority of ISRs were associated with erythema, induration, the presence of nodules or cysts, and mild to moderate pain at the injection site (Table 2). In addition, the average duration of individual ISRs was between three and seven days in 41% of subjects and more than seven days in 24% of subjects. Also, the numbers of ISRs per subject at any one time was between six to 14 ISRs in 26% of subjects and more than 14 ISRs in 1.3% of subjects. Infection at the injection site (including abscess and cellulitis) was reported in 1.7% of adult subjects.

**Table 2 Summary of Individual Signs/Symptoms Characterizing Local Injection Site Reactions to Enfuvirtide in Studies T20-301 and T20-302 Combined (% of Subjects) Through 48 Weeks**

Event Category	N=663		
	Any Severity Grade	% of Subjects with Grade 3 Reactions	% of Subjects with Grade 4 Reactions
Pain/Discomfort *	96%	11%	0%
		20%	10%

Induration	90%	59% >25 but <50 mm	18% ≥50 mm
Erythema	91%	22% >50 but <85 mm	10% ≥85 mm
Nodules and Cysts	80%	23% >3 cm average diameter	0.2% Draining
Pruritus †	65%	3%	NA
Ecchymosis	52%	5% >3 but ≤5 cm	2% >5 cm

\* Grade 3 = severe pain requiring prescription non-topical analgesics or limiting usual activities.

Grade 4 = severe pain requiring hospitalization or prolongation of hospitalization, resulting in death, or persistent or significant disability/incapacity, or life-threatening, or medically significant.

† Grade 3 = refractory to topical treatment or requiring oral or parenteral treatment.

Grade 4 = not applicable.

### Other Adverse Events

In T20-301 and T20-302, after study week 8, subjects on background alone who met protocol defined criteria for virological failure were permitted to revise their background regimens and add FUZEON. Exposure on FUZEON+background was 557 patient-years, and to background alone 162 patient-years. Due to this difference in exposure, safety results are expressed as the number of patients with an adverse event per 100 patient-years of exposure. For FUZEON+background, adverse events are also displayed by percent of subjects.

The events most frequently reported in subjects receiving FUZEON+background regimen, excluding ISRs, were diarrhea (38 per 100 patient-years or 31.7%), nausea (27 per 100 patient-years or 22.8%), and fatigue (24 per 100 patient-years or 20.2%). These events were also commonly observed in subjects that received background regimen alone: diarrhea (73 per 100 patient-years), nausea (50 per 100 patient-years), and fatigue (38 per 100 patient-years).

Treatment-emergent adverse events, regardless of causality and excluding ISRs, from Phase 3 studies are summarized for adult subjects, in Table 3. Any Grade 2 or above events occurring at ≥2 percent of subjects and at a higher rate in subjects treated with FUZEON are summarized in Table 3; events that occurred at a higher rate in the control arms are not displayed.

Rates of adverse events for subjects who switched to FUZEON after virological failure were similar.

**Table 3 Rates of Treatment-Emergent Adverse Events\* (≥Grade 2) Reported in ≥2% of Subjects Treated with FUZEON† (Pooled Studies T20-301/T20-302 at 48 Weeks)**

Adverse Event (by System Organ Class)	FUZEON+Background Regimen (N=663)	FUZEON+Background Regimen (N=663)	Background Regimen (N=334)
	663 subjects total	557 total patient-years	162 total patient-years
	% frequency	rate/100 patient-years	rate/100 patient-years
Weight Decreased	6.6%	7.9	6.2
Sinusitis	6.0%	7.2	4.9
Abdominal Pain	3.9%	4.7	3.7

Cough	3.9%	4.7	2.5
Herpes Simplex	3.5%	4.1	3.7
Appetite Decreased	3.2%	3.8	2.5
Pancreatitis	3.0%	3.6	2.5
Pain in Limb	2.9%	3.4	3.1
Pneumonia (see text below)	2.7%	3.2	0.6
Myalgia	2.7%	3.2	1.2
Influenza-Like Illness	2.4%	2.9	1.9
Folliculitis	2.4%	2.9	2.5
Anorexia	2.3%	2.7	1.9
Dry Mouth	2.1%	2.5	1.9
Conjunctivitis	2.0%	2.3	1.9

\* Excludes Injection Site Reactions

† Events listed occurred more frequently in subjects treated with FUZEON (based on rates/100 patient-years).

### Less Common Events

The following adverse events have been reported in 1 or more subjects; however, a causal relationship to FUZEON has not been established.

*Immune System Disorders:* worsening abacavir hypersensitivity reaction

*Renal and Urinary Disorders:* glomerulonephritis; tubular necrosis; renal insufficiency; renal failure (including fatal cases)

*Blood and Lymphatic Disorders:* thrombocytopenia; neutropenia; fever; lymphadenopathy

*Endocrine and Metabolic:* hyperglycemia

*Infections:* sepsis; herpes simplex

*Nervous System Disorders:* taste disturbance; Guillain-Barre syndrome (fatal); sixth nerve palsy; peripheral neuropathy

*Cardiac Disorders:* unstable angina pectoris

*Gastrointestinal Disorders:* constipation; abdominal pain upper

*General:* asthenia

*Hepatobiliary Disorders:* toxic hepatitis; hepatic steatosis

*Investigations:* increased amylase; increased lipase; increased AST; increased GGT; increased triglycerides

*Psychiatric Disorders:* insomnia; depression; anxiety; suicide attempt

*Respiratory, Thoracic, and Mediastinal Disorders:* pneumopathy; respiratory distress; cough

*Skin and Subcutaneous Tissue Disorders:* pruritus

### Laboratory Abnormalities

Table 4 shows the treatment-emergent laboratory abnormalities that occurred in at least 2 subjects per 100 patient-years and more frequently in those receiving FUZEON+background regimen than background regimen alone from T20-301 and T20-302.



**Table 4 Treatment-Emergent Laboratory Abnormalities in ≥2% of Subjects Receiving FUZEON\* (Pooled Studies T20-301 and T20-302 at 48 Weeks)**

Laboratory Parameters	Grading	FUZEON+Background Regimen (N=663)	FUZEON+Background Regimen (N=663)	Background Regimen (N=334)
		663 subjects total	557 total patient-years	162 total patient-years
		% frequency	rate/100 patient-years	rate/100 patient-years
Eosinophilia				
1-2 X ULN ( $0.7 \times 10^9/L$ )	$0.7-1.4 \times 10^9/L$	9.1%	10.8	3.7
>2 X ULN ( $0.7 \times 10^9/L$ )	$>1.4 \times 10^9/L$	1.8%	2.2	1.8
ALT				
Grade 3	$>5-10 \times$ ULN	4.1%	4.8	4.3
Grade 4	$>10 \times$ ULN	1.2%	1.4	1.2
Creatine Phosphokinase (U/L)				
Grade 3	$>5-10 \times$ ULN	6.9%	8.3	8.0
Grade 4	$>10 \times$ ULN	2.6%	3.1	8.6

\* Events listed occurred more frequently in subjects treated with FUZEON (based on rates/100 patient-years).

### Adverse Events in Pediatric Patients

FUZEON has been studied in 63 pediatric subjects 5 through 16 years of age with duration of FUZEON exposure ranging from 1 dose to 134 weeks. Adverse experiences seen during clinical trials were similar to those observed in adult subjects, although infections at site of injection (cellulitis or abscess) were more frequent in adolescents than in adults, with 4 events occurring in 3 of 28 (11%) subjects.

### 6.2 Postmarketing Experience

The following adverse reaction has been identified during postapproval use of FUZEON. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

#### Skin and Subcutaneous Tissue Disorders

Cutaneous amyloidosis at the injection site.

## 7 DRUG INTERACTIONS

See also Clinical Pharmacology (12.3)

### 7.1 Potential for FUZEON to Affect Other Drugs

Based on the results from an *in vitro* human microsomal study, enfuvirtide is not an inhibitor of CYP450 enzymes. In an *in vivo* human metabolism study (N=12), FUZEON at the recommended dose of 90 mg twice daily did not alter the metabolism of CYP3A4, CYP2D6, CYP1A2, CYP2C19 or CYP2E1 substrates.

### 7.2 Potential for Other Drugs to Affect Enfuvirtide

Based on the available data, co-administration of FUZEON and other drugs which are inducers or inhibitors of CYP450 is not expected to alter the pharmacokinetics of enfuvirtide. No dose adjustments are needed when FUZEON is co-administered with other antiretroviral and non-antiretroviral drugs.

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

#### *Pregnancy Category B*

Reproduction studies have been performed in rats and rabbits at doses up to 27 times and 3.2 times the adult human dose on a m<sup>2</sup> basis and have revealed no evidence of impaired fertility or harm to the fetus due to enfuvirtide. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed.

#### **Antiretroviral Pregnancy Registry**

To monitor maternal-fetal outcomes of pregnant women exposed to FUZEON and other antiretroviral drugs, an Antiretroviral Pregnancy Registry has been established. Physicians are encouraged to register patients by calling 1-800-258-4263.

### 8.3 Nursing Mothers

**The Centers for Disease Control and Prevention recommends that HIV-infected mothers not breast-feed their infants to avoid the risk of postnatal transmission of HIV.** It is not known whether enfuvirtide is excreted in human milk. Because of both the potential for HIV transmission and the potential for serious adverse reactions in nursing infants, **mothers should be instructed not to breast-feed if they are receiving FUZEON.**

Studies where radio-labeled <sup>3</sup>H-enfuvirtide was administered to lactating rats indicated that radioactivity was present in the milk. It is not known whether the radioactivity in the milk was from radio-labeled enfuvirtide or from radio-labeled metabolites of enfuvirtide (i.e., amino acids and peptide fragments).

### 8.4 Pediatric Use

The safety and pharmacokinetics of FUZEON have been evaluated in the age groups of 6 to 16 years of age supported by evidence from adequate and well-controlled studies of FUZEON in adults. Limited efficacy data are available in pediatric subjects 6 years of age and older [see *Clinical Pharmacology (12.3)*].

Sixty-three HIV-1 infected pediatric subjects ages 5 through 16 years have received FUZEON in two open-label, single-arm clinical trials. Adverse experiences, including ISRs, were similar to those observed in adult subjects.

T20-204 was an open-label, multicenter trial that evaluated the safety and antiviral activity of FUZEON in treatment-experienced pediatric subjects. Eleven subjects from 6 to 12 years were enrolled (median age of 9 years). Median baseline CD4 cell count was 495 cells/ $\mu$ L and the median baseline HIV-1 RNA was 4.6 log<sub>10</sub> copies/mL.

Ten of the 11 study subjects completed 48 weeks of chronic therapy. At week 48, 6/11 (55%) subjects had  $\geq 1$  log<sub>10</sub> decline in HIV-1 RNA and 4/11 (36%) subjects were below 400 copies/mL of HIV-1 RNA. The median changes from baseline (for the As Treated population) in HIV-1 RNA and CD4 cell count were -1.48 log<sub>10</sub> copies/mL and +122 cells/ $\mu$ L, respectively.

T20-310 was an open-label, multicenter trial that evaluated the pharmacokinetics, safety, and antiviral activity of FUZEON in treatment-experienced pediatric subjects and adolescents. Fifty-two subjects from 5 through 16 years were enrolled (median age of 12 years). Median baseline CD4 cell count was

117 cells/ $\mu$ L and the median baseline HIV-1 RNA was 5.0 log<sub>10</sub> copies/mL.

Thirty-two of the 52 study subjects completed 48 weeks of chronic therapy. At week 48, 17/52 (33%) of subjects had  $\geq 1$  log<sub>10</sub> decline in HIV-1 RNA, 11/52 (21%) of subjects were below 400 copies/mL of HIV-1 RNA and 5/52 (10%) were below 50 copies/mL. The median changes from baseline (for the As Treated population) in HIV-1 RNA and CD4 cell count were -1.17 log<sub>10</sub> copies/mL and +106 cells/ $\mu$ L, respectively.

### **8.5 Geriatric Use**

Clinical studies of FUZEON did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. In general, appropriate caution should be exercised in the administration and monitoring of FUZEON in elderly patients reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy.

### **8.6 Use in Patients with Hepatic Impairment**

No dose adjustments of enfuvirtide are needed in patients with hepatic impairment [see *Clinical Pharmacology* (12.3)].

### **8.7 Use in Patients with Renal Impairment**

No dose adjustments of enfuvirtide are needed in patients with renal impairment [see *Clinical Pharmacology* (12.3)].

## **10 OVERDOSAGE**

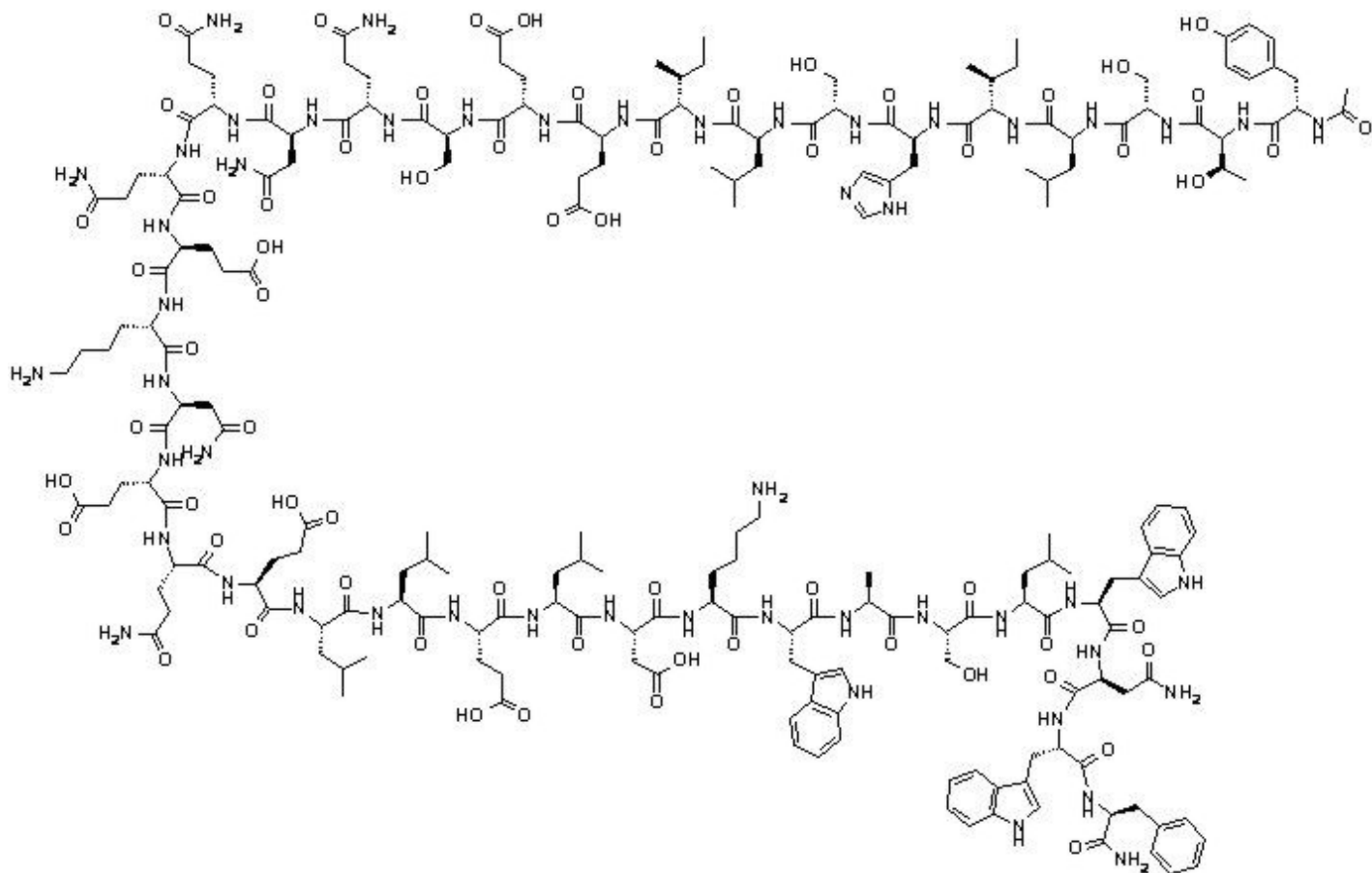
There are no reports of human experience of acute overdose with FUZEON. The highest dose administered to 12 subjects in a clinical trial was 180 mg as a single dose subcutaneously. There is no specific antidote for overdose with FUZEON. Treatment of overdose should consist of general supportive measures.

## **11 DESCRIPTION**

FUZEON (enfuvirtide) is an inhibitor of the fusion of HIV-1 with CD4 cells. Enfuvirtide is a linear 36-amino acid synthetic peptide with the N-terminus acetylated and the C-terminus is a carboxamide. It is composed of naturally occurring L-amino acid residues.

Enfuvirtide is a white to off-white amorphous solid. It has negligible solubility in pure water and the solubility increases in aqueous buffers (pH 7.5) to 85-142 g/100 mL. The empirical formula of enfuvirtide is C<sub>204</sub>H<sub>301</sub>N<sub>51</sub>O<sub>64</sub>, and the molecular weight is 4492. It has the following primary amino acid sequence:

CH<sub>3</sub>CO-Tyr-Thr-Ser-Leu-Ile-His-Ser-Leu-Ile-Glu-Glu-Ser-Gln-Asn-Gln-Gln-Glu-Lys-Asn-Glu-Gln-Glu-Leu-Leu-Glu-Leu-Asp-Lys-Trp-Ala-Ser-Leu-Trp-Asn-Trp-Phe-NH<sub>2</sub> and the following structural formula:



The drug product, FUZEON (enfuvirtide) for Injection, is a white to off-white, sterile, lyophilized powder. Each single-use vial contains 108 mg of enfuvirtide for the delivery of 90 mg. Prior to subcutaneous administration, the contents of the vial are reconstituted with 1 mL of Sterile Water for Injection to provide the delivery of 1 mL of the solution. Each 1 mL of the reconstituted solution contains approximately 90 mg of enfuvirtide with approximate amounts of the following excipients: 22.55 mg of mannitol, 2.39 mg of sodium carbonate (anhydrous), and sodium hydroxide and hydrochloric acid for pH adjustment as needed. The reconstituted solution has an approximate pH of 9.0.

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Enfuvirtide is an antiviral drug [see *Clinical Pharmacology (12.4)*].

### 12.3 Pharmacokinetics

The pharmacokinetic properties of enfuvirtide were evaluated in HIV-1 infected adult and pediatric subjects.

#### Absorption

Following a 90-mg single subcutaneous injection of FUZEON into the abdomen in 12 HIV-1 infected subjects, the mean ( $\pm$ SD)  $C_{\max}$  was  $4.59 \pm 1.5 \mu\text{g/mL}$ , AUC was  $55.8 \pm 12.1 \mu\text{g}\cdot\text{h/mL}$  and the median  $T_{\max}$  was 8 hours (ranged from 3 to 12 h). The absolute bioavailability (using a 90-mg intravenous dose as a reference) was  $84.3\% \pm 15.5\%$ . Following 90-mg twice daily dosing of FUZEON subcutaneously in combination with other antiretroviral agents in 11 HIV-1 infected subjects, the mean ( $\pm$ SD) steady-state  $C_{\max}$  was  $5.0 \pm 1.7 \mu\text{g/mL}$ ,  $C_{\text{trough}}$  was  $3.3 \pm 1.6 \mu\text{g/mL}$ ,  $\text{AUC}_{0-12\text{h}}$  was  $48.7 \pm 19.1 \mu\text{g}\cdot\text{h/mL}$ , and the median  $T_{\max}$  was 4 hours (ranged from 4 to 8 h).

Absorption of the 90-mg dose was comparable when injected into the subcutaneous tissue of the abdomen, thigh or arm.

### **Distribution**

The mean ( $\pm$ SD) steady-state volume of distribution after intravenous administration of a 90-mg dose of FUZEON (N=12) was  $5.5 \pm 1.1$  L.

Enfuvirtide is approximately 92% bound to plasma proteins in HIV-infected plasma over a concentration range of 2 to 10  $\mu$ g/mL. It is bound predominantly to albumin and to a lower extent to  $\alpha$ -1 acid glycoprotein.

The CSF levels of enfuvirtide (measured from 2 hours to 18 hours after administration of enfuvirtide) in 4 HIV-infected subjects were below the limit of quantification (0.025  $\mu$ g/mL).

### **Metabolism/Elimination**

As a peptide, enfuvirtide is expected to undergo catabolism to its constituent amino acids, with subsequent recycling of the amino acids in the body pool.

Mass balance studies to determine elimination pathway(s) of enfuvirtide have not been performed in humans.

*In vitro* studies with human microsomes and hepatocytes indicate that enfuvirtide undergoes hydrolysis to form a deamidated metabolite at the C-terminal phenylalanine residue, M3. The hydrolysis reaction is not NADPH dependent. The M3 metabolite is detected in human plasma following administration of enfuvirtide, with an AUC ranging from 2.4% to 15% of the enfuvirtide AUC.

Following a 90-mg single subcutaneous dose of enfuvirtide (N=12) the mean  $\pm$ SD elimination half-life of enfuvirtide is  $3.8 \pm 0.6$  h and the mean  $\pm$ SD apparent clearance was  $24.8 \pm 4.1$  mL/h/kg. Following 90-mg twice daily dosing of FUZEON subcutaneously in combination with other antiretroviral agents in 11 HIV-1 infected subjects, the mean  $\pm$ SD apparent clearance was  $30.6 \pm 10.6$  mL/h/kg.

### **Special Populations**

#### Hepatic Impairment

Formal pharmacokinetic studies of enfuvirtide have not been conducted in subjects with hepatic impairment.

#### Renal Impairment

Analysis of plasma concentration data from subjects in clinical trials indicated that the clearance of enfuvirtide is not affected in patients with creatinine clearance greater than 35 mL/min. The results of a renal impairment study indicate clearance of enfuvirtide was reduced by 38% in subjects with severe renal impairment (CL = 11 – 35 mL/min; n = 4) and by 14 - 28% in subjects with end-stage renal disease maintained on dialysis (n = 8) compared to subjects with normal renal function (CL >80 mL/min; n = 8). Hemodialysis did not significantly alter enfuvirtide clearance.

No dose adjustment is recommended for patients with impaired renal function.

#### Gender and Weight

Analysis of plasma concentration data from subjects in clinical trials indicated that the clearance of enfuvirtide is 20% lower in females than males after adjusting for body weight.

Enfuvirtide clearance decreases with decreased body weight irrespective of gender. Relative to the clearance of a 70-kg male, a 40-kg male will have 20% lower clearance and a 110-kg male will have a 26% higher clearance. Relative to a 70-kg male, a 40-kg female will have a 36% lower clearance and a 110-kg female will have the same clearance.

No dose adjustment is recommended for weight or gender.

#### Race

Analysis of plasma concentration data from subjects in clinical trials indicated that the clearance of enfuvirtide was not different in Blacks compared to Caucasians. Other pharmacokinetic studies suggest no difference between Asians and Caucasians after adjusting for body weight.

### Pediatric Patients

The pharmacokinetics of enfuvirtide have been studied in 23 pediatric subjects aged 6 through 16 years at a dose of 2 mg/kg. Enfuvirtide pharmacokinetics were determined in the presence of concomitant medications including antiretroviral agents. A dose of 2 mg/kg twice daily (maximum 90 mg twice daily) provided enfuvirtide plasma concentrations similar to those obtained in adult subjects receiving 90 mg twice daily.

In the 23 pediatric subjects receiving the 2 mg/kg twice daily dose, the mean  $\pm$ SD steady-state AUC was  $56.3 \pm 22.3 \mu\text{g}\cdot\text{h/mL}$ ,  $C_{\text{max}}$  was  $6.3 \pm 2.4 \mu\text{g/mL}$ ,  $C_{\text{trough}}$  was  $3.1 \pm 1.5 \mu\text{g/mL}$ , and apparent clearance was  $40 \pm 17 \text{ mL/h/kg}$  [see *Use in Specific Populations (8.4)*].

### Geriatric Patients

The pharmacokinetics of enfuvirtide have not been studied in patients over 65 years of age.

### Drug Interactions

See also Drug Interactions (7)

Table 5 shows the results of the drug-drug interaction studies conducted between FUZEON and the following drugs: ritonavir, saquinavir/ritonavir, and rifampin.

**Table 5 Effect of Ritonavir, Saquinavir/Ritonavir, and Rifampin on the Steady-State Pharmacokinetics of Enfuvirtide (90 mg bid)\***

Coadministered Drug	Dose of Coadministered Drug	N	% Change of Enfuvirtide Pharmacokinetic Parameters <sup>†‡</sup> (90% CI)		
			$C_{\text{max}}$	AUC	$C_{\text{trough}}$
Ritonavir	200 mg, q12h, 4 days	12	↑24 (↑9 to ↑41)	↑22 (↑8 to ↑37)	↑14 (↑2 to ↑28)
Saquinavir/ Ritonavir	1000/100 mg, q12h, 4 days	12	↔	↑14 (↑5 to ↑24)	↑26 (↑17 to ↑35)
Rifampin	600 mg, qd, 10 days	12	↔	↔	↓15 (↓22 to ↓7)

\* All studies were performed in HIV-1+ subjects using a sequential crossover design.

† ↑ = Increase; ↓ = Decrease; ↔ = No Effect (↑ or ↓ <10%)

‡ No interactions were clinically significant.

## 12.4 Microbiology

### Mechanism of Action

Enfuvirtide interferes with the entry of HIV-1 into cells by inhibiting fusion of viral and cellular membranes. Enfuvirtide binds to the first heptad-repeat (HR1) in the gp41 subunit of the viral envelope glycoprotein and prevents the conformational changes required for the fusion of viral and cellular membranes.

### Antiviral Activity in Cell Culture

The antiviral activity of enfuvirtide was assessed by infecting different CD4 cell types with laboratory and clinical isolates of HIV-1. The median  $\text{EC}_{50}$  value for baseline clinical isolates was 4.10 nM (ranged from 0.089 to 107 nM; 0.4 to 480 ng/mL) by the cMAGI assay (n=130) and was 55.9 nM (1.56

to 1675 nM; 7 to 7526 ng/mL) by a recombinant phenotypic entry assay (n=627). Enfuvirtide was similarly active in cell culture against clades A, AE, C, D, F, and G (median EC<sub>50</sub> value was 7.01 nM; range 3.78 to 27.9 nM; 17-126 ng/mL), and R5, X4, and dual tropic viruses. Enfuvirtide has no activity against HIV-2.

Enfuvirtide exhibited additive to synergistic effects in cell culture assays when combined with individual members of various antiretroviral classes, including lamivudine, zidovudine, indinavir, nelfinavir, and efavirenz.

### **Drug Resistance**

HIV-1 isolates with reduced susceptibility to enfuvirtide have been selected in cell culture. Genotypic analysis of these resistant isolates showed mutations that resulted in amino acid substitutions at the enfuvirtide binding HR1 domain positions 36 to 38 of the HIV-1 envelope glycoprotein gp41. Phenotypic analysis of site-directed mutants in positions 36 to 38 in an HIV-1 molecular clone showed a 5-fold to 684-fold decrease in susceptibility to enfuvirtide.

In clinical trials, HIV-1 isolates with reduced susceptibility to enfuvirtide have been recovered from subjects failing a FUZEON containing regimen. Posttreatment HIV-1 virus from 277 subjects experiencing protocol defined virological failure at 48 weeks exhibited a median decrease in susceptibility to enfuvirtide of 33.4-fold (range 0.4-6318-fold) relative to their respective baseline virus. Of these, 249 had decreases in susceptibility to enfuvirtide of greater than 4-fold and all but 3 of those 249 exhibited genotypic changes in the codons encoding gp41 HR1 domain amino acids 36 to 45. Substitutions in this region were observed with decreasing frequency at amino acid positions 38, 43, 36, 40, 42, and 45. Mutations or polymorphisms in other regions of the envelope (e.g., the HR2 region or those yet to be identified) as well as co-receptor usage and density may affect susceptibility to enfuvirtide.

### **Cross-resistance**

HIV-1 clinical isolates resistant to nucleoside analogue reverse transcriptase inhibitors (NRTI), non-nucleoside analogue reverse transcriptase inhibitors (NNRTI), and protease inhibitors (PI) were susceptible to enfuvirtide in cell culture.

## **13 NONCLINICAL TOXICOLOGY**

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

#### **Carcinogenesis**

Long-term animal carcinogenicity studies of enfuvirtide have not been conducted.

#### **Mutagenesis**

Enfuvirtide was neither mutagenic nor clastogenic in a series of *in vivo* and *in vitro* assays including the Ames bacterial reverse mutation assay, a mammalian cell forward gene mutation assay in AS52 Chinese Hamster ovary cells or an *in vivo* mouse micronucleus assay.

#### **Impairment of Fertility**

Enfuvirtide produced no adverse effects on fertility in male or female rats at doses up to 1.6 times the maximum recommended adult human daily dose on a m<sup>2</sup> basis.

## **14 CLINICAL STUDIES**

### **14.1 Description of Clinical Studies**

#### **Studies in Antiretroviral Experienced Patients**

T20-301 and T20-302 were randomized, controlled, open-label, multicenter trials in HIV-1 infected

subjects. Subjects were required to have either (1) viremia despite 3 to 6 months prior therapy with a nucleoside reverse transcriptase inhibitor (NRTI), non-nucleoside reverse transcriptase inhibitor (NNRTI), and protease inhibitor (PI) or (2) viremia and documented resistance or intolerance to at least one member in each of the NRTI, NNRTI, and PI classes.

All subjects received an individualized background regimen consisting of 3 to 5 antiretroviral agents selected on the basis of the subject's prior treatment history and baseline genotypic and phenotypic viral resistance measurements. Subjects were then randomized at a 2:1 ratio to FUZEON 90 mg twice daily with background regimen or background regimen alone.

After week 8, subjects on either treatment arm who met protocol defined criteria for virological failure were permitted to revise their background regimens; those on background regimen alone were also permitted to add FUZEON.

Demographic characteristics for studies T20-301 and T20-302 are shown in Table 6. Subjects had prior exposure to a median of 12 antiretrovirals for a median of 7 years.

**Table 6 T20-301 and T20-302 Pooled Subject Demographics**

	<b>FUZEON+Background Regimen</b>	<b>Background Regimen</b>
	<b>N=663</b>	<b>N=334</b>
Sex		
Male	90%	90%
Female	10%	10%
Race		
White	89%	89%
Black	8%	7%
Mean Age (yr)	42	43
(range)	(16-67)	(24-82)
Median Baseline HIV-1 RNA (log <sub>10</sub> copies/mL)	5.2	5.1
(range)	(3.5-6.7)	(3.7-7.1)
Median Baseline CD4 Cell Count (cells/mm <sup>3</sup> )	89	97
(range)	(1-994)	(1-847)

The disposition and efficacy outcomes of T20-301 and T20-302 are shown in Table 7.

**Table 7 Outcomes at Week 48 (Pooled Studies T20-301 and T20-302)**

<b>Outcomes</b>	<b>FUZEON+Background Regimen 90 mg bid N=663</b>	<b>Background Regimen N=334</b>
Virological Responder (at least 1 log <sub>10</sub> below baseline)	304 (46%)	61 (18%)
Virological Non-responder:		
• Switch	0	220 (66%)
• Completed 48 weeks randomized regimen*	191 (29%)	12 (4%)



		<b>Continued Background Regimen (N=112)</b>	<b>Switched to FUZEON (N=220)</b>
Discontinued due to insufficient treatment response <sup>†</sup>	37 (5%)	13 (12%)	22 (10%)
Discontinued due to adverse reactions/intercurrent illness/labs	46 (7%)	9 (8%)	13 (6%)
Deaths	15 (2%)	5 (4%)	2 (1%)
Discontinued due to injection:			
• Injection site reactions	27 (4%)	NA	10 (5%)
• Difficulty with injecting FUZEON <sup>‡</sup>	18 (3%)	NA	2 (1%)
Discontinued due to other reasons <sup>§</sup>	25 (4%)	14 (13%)	6 (3%)

\* Includes never responded, rebound, and missing RNA data.

† Includes study discontinuation for virological failure and insufficient response as per the judgment of the investigator.

‡ Includes difficulties with injection, such as injection fatigue and inconvenience.

§ Includes lost to follow-up, treatment refusal, and non-compliance.

At 48 weeks, 154 (23%) of subjects in the FUZEON+background regimen and 27 (8%) in the background regimen alone had HIV-1 RNA levels <50 copies/mL, and 225 (34%) of subjects receiving FUZEON+background regimen had HIV-1 RNA levels <400 copies/mL compared to 44 (13%) in the background regimen alone. Subjects achieving HIV-1 RNA levels <50 copies/mL were included in the <400 copies/mL category and both categories were incorporated in the overall virologic responder category of achieving HIV-1 RNA at least 1 log<sub>10</sub> below baseline.

The mean log change in HIV-1 RNA from baseline was -1.4 log<sub>10</sub> copies/mL in subjects receiving FUZEON+background and -0.5 in those receiving background alone. The mean change in CD4 cell count from baseline to week 48 was +91 cells/mm<sup>3</sup> in the FUZEON+background arm and +45 cells/mm<sup>3</sup> in the background alone arm.

Subjects in the FUZEON+background arm achieved a better virologic and immunologic outcome than subjects in the background alone arm across all subgroups based on baseline CD4 cell count, baseline HIV-1 RNA, number of prior ARVs or number of active ARVs in the background regimen.

## **16 HOW SUPPLIED/STORAGE AND HANDLING**

### **16.1 How Supplied**

FUZEON (enfuvirtide) for Injection is a white to off-white, sterile, lyophilized powder and it is packaged in a single-use clear glass vial containing 108 mg of enfuvirtide for the delivery of approximately 90 mg/1 mL when reconstituted with 1 mL of Sterile Water for Injection.

FUZEON is available in a Convenience Kit containing 60 single-use vials of FUZEON (90 mg strength), 60 vials (2 cartons of 30 each) of Sterile Water for Injection (1 mL per vial), 60 reconstitution

syringes (3 cc), 60 administration syringes (1 cc), Package Insert, Patient Package Insert, and Injection Instructions (NDC 0004-0381-40).

## 16.2 Storage Conditions

Store at 25°C (77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature].

Reconstituted solution should be stored in the original vial under refrigeration at 2° to 8°C (36° to 46°F) and used within 24 hours.

## 17 PATIENT COUNSELING INFORMATION

See FDA-Approved Patient Labeling (Patient Information)

To assure safe and effective use of FUZEON, the following information and instructions should be given to patients:

- Patients should be informed that injection site reactions occur in almost all patients taking FUZEON. Patients must be familiar with the FUZEON *Injection Instructions* for instructions on how to appropriately inject FUZEON and how to carefully monitor for signs or symptoms of cellulitis or local infection. Patients should be instructed when to contact their healthcare provider about these reactions.
- Patients should be made aware that an increased rate of bacterial pneumonia was observed in subjects treated with FUZEON in clinical trials. Patients should be advised to seek medical evaluation immediately if they develop signs or symptoms suggestive of pneumonia (cough with fever, rapid breathing, shortness of breath) [see *Warnings and Precautions (5.3)*].
- Patients should be advised of the possibility of a systemic hypersensitivity reaction to FUZEON. Patients should be advised to discontinue therapy and immediately seek medical evaluation if they develop signs/symptoms of systemic hypersensitivity such as combinations of rash, fever, nausea and vomiting, chills, rigors, and/or hypotension [see *Warnings and Precautions (5.4)*].
- FUZEON is not a cure for HIV-1 infection and patients may continue to experience illnesses associated with HIV-1 infection, including opportunistic infections. Patients should remain under the care of a physician when using FUZEON.

Patients should be advised to avoid doing things that can spread HIV-1 infection to others.

- **Do not share needles or other injection equipment.**
- **Do not share personal items that can have blood or body fluids on them, like toothbrushes and razor blades.**
- **Do not have any kind of sex without protection.** Always practice safe sex by using a latex or polyurethane condom to lower the chance of sexual contact with semen, vaginal secretions, or blood.
- **Do not breastfeed.** We do not know if FUZEON can be passed to your baby in your breast milk and whether it could harm your baby. Also, mothers with HIV-1 should not breastfeed because HIV-1 can be passed to the baby in the breast milk.
- FUZEON must be taken as part of a combination antiretroviral regimen. Use of FUZEON alone may lead to rapid development of virus resistant to FUZEON and possibly other agents of the same class.
- Patients and caregivers must be instructed in the use of aseptic technique when administering FUZEON in order to avoid injection site infections. Appropriate training for FUZEON reconstitution and self-injection must be given by a healthcare provider, including a careful review of the FUZEON Patient Package Insert and FUZEON *Injection Instructions*. The first injection should be performed under the supervision of an appropriately qualified healthcare provider. It is recommended that the patient and/or caregiver's understanding and use of aseptic injection techniques and procedures be periodically re-evaluated.
- Patients and caregivers should be instructed on the preferred anatomical sites for administration (upper arm, abdomen, anterior thigh). FUZEON should not be injected near any anatomical areas

where large nerves course close to the skin, such as near the elbow, knee, groin or the inferior or medial sections of the buttocks, skin abnormalities, including directly over a blood vessel, into moles, scar tissue, bruises, or near the navel, surgical scars, tattoos or burn sites.

- Patients and caregivers should be instructed in the proper techniques for preparation, injection and disposal of needles and syringes (including not recapping needles) in order to avoid needle stick injuries. Patients should be told not to reuse needles or syringes, and be instructed in safe disposal procedures including the use of a puncture-resistant container for disposal of used needles and syringes. Patients must be instructed on the safe disposal of full containers as per local requirements. Caregivers who experience an accidental needle stick after patient injection should contact a healthcare provider immediately.
- Patients should contact their healthcare provider for any questions regarding the administration of FUZEON.
- Patients should inform their healthcare provider if they are pregnant, plan to become pregnant or become pregnant while taking this medication.
- Patients should inform their healthcare provider if they are breast-feeding.
- Patients should not change the dose or dosing schedule of FUZEON or any antiretroviral medication without consulting their healthcare provider.
- Patients should contact their healthcare provider immediately if they stop taking FUZEON or any other drug in their antiretroviral regimen.
- Patients should be told that they can obtain more information on the self-administration of FUZEON at [www.FUZEON.com](http://www.FUZEON.com) or by calling 1-877-4-FUZEON (1-877-438-9366).

Patients should be advised that no studies have been conducted on the ability to drive or operate machinery while taking FUZEON. If patients experience dizziness while taking FUZEON, they should be advised to talk to their healthcare provider before driving or operating machinery.

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## **Patient Information**

**FUZEON® (few'-zee-on)**

**enfuvirtide (en-few'-ver-tide)**

**Injection**

This leaflet contains important information for patients and their caregivers about FUZEON. Please read this leaflet and FUZEON *Injection Instructions* carefully before you start using FUZEON. Always read this leaflet each time you get your FUZEON prescription refilled. There may be new important information about the use of FUZEON.

This information does not take the place of talking with your healthcare provider about your medical conditions or treatment.

## **What is FUZEON?**

FUZEON is a medicine called an HIV (human immunodeficiency virus) fusion inhibitor. FUZEON is always used with other anti-HIV medicines to treat adults and children ages 6 years and older with HIV infection.

FUZEON blocks HIV's ability to infect healthy CD4 cells. When used with other anti-HIV medicines, FUZEON can reduce the amount of HIV in the blood and increase the number of CD4 cells. This may keep your immune system healthy, so it can help fight infection.

### **General information about FUZEON**

**FUZEON does not cure HIV infection or AIDS** and you may continue to experience illnesses associated with HIV-1 infection, including opportunistic infections. You should remain under the care of a doctor when using FUZEON.

Avoid doing things that can spread HIV-1 infection.

- **Do not share needles or other injection equipment.**
- **Do not share personal items that can have blood or body fluids on them, like toothbrushes and razor blades.**
- **Do not have any kind of sex without protection.** Always practice safe sex by using a latex or polyurethane condom to lower the chance of sexual contact with semen, vaginal secretions, or blood.

### **Who should not use FUZEON?**

Do not use FUZEON if you are allergic to any of the ingredients in FUZEON. See the end of this leaflet for a list of ingredients in FUZEON.

### **Tell your healthcare provider:**

- **if you are pregnant or plan to become pregnant.** We do not know if FUZEON can harm your unborn child. You and your healthcare provider will need to decide if FUZEON is right for you. If you use FUZEON while you are pregnant, talk to your healthcare provider about how you can be in the Antiretroviral Pregnancy Registry.
- **if you are breast-feeding. Do not breastfeed.** We do not know if FUZEON can be passed to your baby in your breast milk and whether it could harm your baby. Also, mothers with HIV-1 should not breastfeed because HIV-1 can be passed to the baby in the breast milk.
- **about all your medical conditions.**
- **about all the medicines you use,** including prescription and non-prescription medicines, vitamins, and herbal supplements. FUZEON has not been tested with all medicines. FUZEON does not affect other anti-HIV medicines or the medicine rifampin (also known as rifampicin, Rifadin<sup>®</sup> or Rimactane<sup>®</sup>). You can take FUZEON at the same times or at different times than your other anti-HIV medicines.

### **How should I use FUZEON?**

Before you use FUZEON, make sure you understand all of the information in this leaflet and the FUZEON *Injection Instructions* that come with your medicine. You or your caregiver should be trained by a healthcare provider before injecting it. If you do not understand all the information or are having a hard time mixing or injecting FUZEON, talk with your healthcare provider.

- Use FUZEON with other anti-HIV medicines. You can take FUZEON at the same time or at a different time than your other anti-HIV medicines.
- **Do not use FUZEON as your only anti-HIV medicine.**
- FUZEON must be injected. FUZEON does not work if the medicine is swallowed.
- Do not mix other medicines in the same syringe with FUZEON.
- FUZEON is given under the skin by injection (a "shot") in the upper arm, upper leg or stomach two times a day. See the FUZEON *Injection Instructions* that come with your medicine for step-by-step instructions about how to inject FUZEON.

- Do not inject FUZEON in the same area as you did the time before. Do not inject FUZEON into the following areas: near the elbow, knee, groin, the lower or inner buttocks, directly over a blood vessel, around the navel (belly button), scar tissue, a bruise, a mole, a surgical scar, tattoo or burn site, or where there is an injection site reaction.
- If the FUZEON is foamy or jelled, allow more time for it to dissolve. Do not inject FUZEON if you see particles floating in the FUZEON vial after you mix it up.
- You can use FUZEON whether you have eaten or not. Food does not affect FUZEON. However, you must keep taking your other medicines the way you did before.
- Do not change your dose or stop taking FUZEON without first talking with your healthcare provider.
- See your healthcare provider regularly while using FUZEON.
- When your FUZEON supply runs low, be sure to have it refilled. This is very important because the amount of virus in your blood may increase if the medicine is stopped for even a short time. If you miss or skip doses of FUZEON, HIV may develop resistance to FUZEON and become harder to treat.
- If you miss a dose of FUZEON, take the missed dose as soon as you can and then take your next dose as scheduled. If you have missed a dose of FUZEON and it is close to the time when you are supposed to take your next dose, wait and take the next dose as regularly scheduled. Do not take two doses of FUZEON at the same time.
- If you take too much FUZEON, call your healthcare provider right away. We do not know what can happen if you take too much FUZEON. You will be watched very carefully if you take too much FUZEON.
- **It is important that you put your used syringes into a special sharps container after injecting FUZEON.** Your healthcare provider will give you more instructions about the safe disposal of your used syringes. **Do not put them in a trash can.** If you do not have a sharps container, call your healthcare provider or pharmacist to get one before using FUZEON.

### **What should I avoid while using FUZEON?**

- Avoid doing anything that can spread HIV infection since FUZEON does not stop you from passing the HIV infection to others.
- Do not share needles or other injection equipment.
- Do not share personal items that can have blood or body fluids on them, like toothbrushes or razor blades.
- Do not have any kind of sex without protection. Always practice safer sex by using a latex or polyurethane condom or other barrier method to reduce the chance of sexual contact with semen, vaginal secretions or blood.
- Do not drive or operate heavy machinery if FUZEON makes you feel dizzy.

### **What are the possible side effects of FUZEON?**

#### **Injection site reactions**

**FUZEON causes injection site reactions.** Almost all people get injection site reactions with FUZEON. Reactions are usually mild to moderate but occasionally may be severe. Reactions on the skin where FUZEON is injected include:

- itching
- swelling
- redness
- pain or tenderness
- hardened skin
- bumps

These reactions generally happen within the first week of FUZEON treatment and usually happen again

as you keep using FUZEON. A reaction at one skin injection site usually lasts for less than 7 days.

Injection site reactions may be worse when injections are given again in the same place on the body or when the injection is given deeper than it should be (for example, into the muscle).

If you are worried about the reaction you are having, call your healthcare provider to help you decide if you need medical care. **If the injection site reaction you are having is severe, call your healthcare provider right away.** If you have an injection site reaction, you can discuss with your healthcare provider ways to help the symptoms.

An injection site can get infected. It is important to follow the FUZEON *Injection Instructions* that come with your medicine to lower your chances of getting an injection site infection. **Call your healthcare provider right away if there are signs of infection at the injection site such as oozing, increasing heat, swelling, redness or pain.**

### **Injection using Biojector® 2000**

Shooting nerve pain and tingling lasting up to 6 months from injecting close to large nerves or near joints, and bruising and/or collections of blood under the skin have been reported with use of the Biojector 2000 needle-free device to inject FUZEON. If you are taking any blood thinners, or have hemophilia or any other bleeding disorder, you may be at higher risk of bruising or bleeding after using the Biojector.

### **Pneumonia**

Patients with HIV get bacterial pneumonia more often than patients without HIV. Patients taking FUZEON with other HIV medicines may get bacterial pneumonia more often than patients not receiving FUZEON. It is unclear if this is related to the use of FUZEON. **You should contact your healthcare provider right away if you have a cough, fever or trouble breathing.** Patients are more likely to get bacterial pneumonia if they had a low number of CD4 cells, increased amount of HIV in the blood, intravenous (injected into the vein) drug use, smoking or had experienced lung disease in the past. It is unclear if pneumonia is related to FUZEON.

### **Allergic reactions**

**FUZEON can cause serious allergic reactions.** Symptoms of a serious allergic reaction with FUZEON can include:

- trouble breathing
- fever with vomiting and a skin rash
- blood in your urine
- swelling of your feet

**Call your healthcare provider right away if you get any of these symptoms.**

### **Other side effects**

The following side effects were seen more often in patients using FUZEON with their other anti-HIV medicines than in patients not using FUZEON with their other anti-HIV medicines:

- pain and numbness in feet or legs
- loss of sleep
- depression
- decreased appetite
- sinus problems
- enlarged lymph nodes
- weight decrease
- weakness or loss of strength
- muscle pain
- constipation

- pancreas problems

These are not all the side effects of FUZEON. For more information, ask your healthcare provider or pharmacist.

If you have questions about side effects, ask your healthcare provider. **Report any new or continuing symptoms to your healthcare provider.** Your healthcare provider will tell you what to do and may be able to help you with these side effects.

### **How is FUZEON stored?**

FUZEON vials not mixed with sterile water can be stored at room temperature (59° to 86°F). FUZEON should be refrigerated if it cannot be stored at room temperature.

The Sterile Water for Injection (diluent) may be stored at room temperature (59° to 86°F).

After FUZEON has been mixed with the sterile water, the vial can be stored in a refrigerator for up to 24 hours.

Do not use FUZEON or sterile water after the expiration date on the vials. Do not keep FUZEON that is out of date or that you no longer need.

If you have more questions about how to store FUZEON, ask your healthcare provider or pharmacist or call 1-877-4-FUZEON.

### **General information about the safe and effective use of FUZEON**

Medicines are sometimes prescribed for conditions not mentioned in patient information leaflets. Do not use FUZEON for a condition for which it was not prescribed. Do not give FUZEON to other people, even if they have the same symptoms you have. It may harm them. **Keep FUZEON and all medicines out of the reach of children.**

This leaflet summarizes the most important information about FUZEON. If you would like more information, talk with your healthcare provider or see the section, "*Where can I get more information about FUZEON?*" in this leaflet. You can ask your healthcare provider or pharmacist for information about FUZEON that is written for health professionals.

### **What are the ingredients in FUZEON?**

Active Ingredient: enfuvirtide

Inactive Ingredients: mannitol, sodium carbonate, sodium hydroxide, and hydrochloric acid

### **How is FUZEON supplied?**

FUZEON comes packaged as a Convenience Kit containing the following:

- 60 vials of FUZEON
- 60 vials of Sterile Water for Injection (2 cartons of 30 each)
- syringes for mixing (3 cc)
- syringes for injecting (1 cc)
- Patient Package Insert
- Injection Instructions

**Call your healthcare provider or pharmacist if you need more supplies.**

### **Where can I get more information about FUZEON?**

The best source for more information about FUZEON is your healthcare provider. More information about FUZEON can be found at [www.FUZEON.com](http://www.FUZEON.com) and 1-877-4-FUZEON (1-877-438-9366).

FUZEON is a trademark of Hoffmann-La Roche Inc.

FUZEON has been jointly developed by Alexion Pharmaceuticals, Inc. and Hoffmann-La Roche Inc.

FUZEON is manufactured by Hoffmann-La Roche Inc.

Distributed by:

**Genentech USA, Inc.**

A Member of the Roche Group

1 DNA Way

South San Francisco, CA 94080-4990

Licensed from:



Revised: December 2015

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Representative sample of labeling (see the HOW SUPPLIED section for complete listing):

**PRINCIPAL DISPLAY PANEL - Kit Carton**

NDC 0004-0381-40

**Fuzeon<sup>®</sup>**

(enfuvirtide) for Injection

**90 mg**

For Subcutaneous use after reconstitution.

Each vial contains 108 mg enfuvirtide to provide delivery of 90 mg.

**60 Single Use Vials**

GTIN 00300040381405

**Rx only**

**Package Contains:**

Monthly Convenience Kit

60 Vials, FUZEON<sup>®</sup> 90 mg vial,

NDC 0004-0380-01

60 Vials, Sterile Water for Injection

1 mL per vial

60 1cc Syringes (for administration)

60 3cc Syringes (for reconstitution)

**Genentech**



NDC 0004-0381-40

# Fuzeon<sup>®</sup>

## (enfuvirtide) for Injection

### 90 mg

For Subcutaneous use after reconstitution.  
Each vial contains 108 mg enfuvirtide to provide delivery of 90 mg.

**60 Single Use Vials**

**Ronly**

**Package Contains:**  
Monthly Convenience Kit  
60 Vials, FUZEON<sup>®</sup> 90 mg vial,  
NDC 0004-0380-01  
60 Vials, Sterile Water for Injection  
1 mL per vial  
60 1cc Syringes (for administration)  
60 3cc Syringes (for reconstitution)

GTIN 0030040381405

Genentech

## FUZEON

enfuvirtide kit

### Product Information

<b>Product Type</b>	HUMAN PRESCRIPTION DRUG	<b>Item Code (Source)</b>	NDC:0004-0381
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### Packaging

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1	NDC:0004-0381-40	1 in 1 CARTON	04/10/2012	

### Quantity of Parts

Part #	Package Quantity	Total Product Quantity
<b>Part 1</b>	60 VIAL, SINGLE-USE	60 mL
<b>Part 2</b>	60 VIAL, SINGLE-DOSE	60 mL

## Part 1 of 2

## FUZEON

enfuvirtide injection, powder, lyophilized, for solution

### Product Information

<b>Route of Administration</b>	SUBCUTANEOUS
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**Active Ingredient/Active Moiety**

Ingredient Name	Basis of Strength	Strength
Enfuvirtide (UNII: 19OWO1T3ZE) (Enfuvirtide - UNII:19OWO1T3ZE)	Enfuvirtide	90 mg in 1 mL

**Inactive Ingredients**

Ingredient Name	Strength
Mannitol (UNII: 3OWL53L36A)	
sodium carbonate (UNII: 45P3261C7T)	
Sodium hydroxide (UNII: 55X04QC32I)	
Hydrochloric acid (UNII: QTT17582CB)	

**Packaging**

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1		1 mL in 1 VIAL, SINGLE-USE ; Type 1: Convenience Kit of Co-Package		

**Marketing Information**

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
NDA	NDA021481	04/10/2012	

**Part 2 of 2****STERILE WATER**

water injection

**Product Information**

Route of Administration	SUBCUTANEOUS
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**Inactive Ingredients**

Ingredient Name	Strength
Water (UNII: 059QF0K00R)	

**Packaging**

#	Item Code	Package Description	Marketing Start Date	Marketing End Date
1		1 mL in 1 VIAL, SINGLE-DOSE; Type 1: Convenience Kit of Co-Package		

## Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
NDA	NDA021481	04/10/2012	

## Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
NDA	NDA021481	04/10/2012	

**Labeler** - Genentech, Inc. (080129000)

## Establishment

Name	Address	ID/FEI	Business Operations
F. Hoffmann-La Roche Ltd		485244961	PACK(0004-0381) , LABEL(0004-0381)

## Establishment

Name	Address	ID/FEI	Business Operations
Corden Pharma Colorado, Inc.		076470525	API MANUFACTURE(0004-0381)

## Establishment

Name	Address	ID/FEI	Business Operations
Roche Diagnostics GmbH		315028860	MANUFACTURE(0004-0381) , ANALYSIS(0004-0381)

## Establishment

Name	Address	ID/FEI	Business Operations
Sharp Corporation		143696495	PACK(0004-0381) , LABEL(0004-0381)

Revised: 7/2017

Genentech, Inc.