

Alemtuzumab Clinical Information for Nurses

Lemtrada[®]



IOMSN

International Organization
of Multiple Sclerosis Nurses
International Organization
of Multiple Sclerosis Nurses



Objectives



- ▶ Upon completion of this program, the learner will:
 - ▶ Understand mechanism of action of Lemtrada™
 - ▶ Identify appropriate clinical situations for use of medication
 - ▶ Provide appropriate education for patients regarding Lemtrada
 - ▶ Provide information on the REMS associated with Lemtrada



LEMTRADA (Alemtuzumab) Indications and Usage

- LEMTRADA is indicated for the treatment of patients with relapsing forms of multiple sclerosis (MS).
- Because of its safety profile, the use of LEMTRADA should generally be reserved for patients who have had an inadequate response to two or more drugs indicated for the treatment of MS.

LEMTRADA (Alemtuzumab) Clinical Pharmacology & MOA

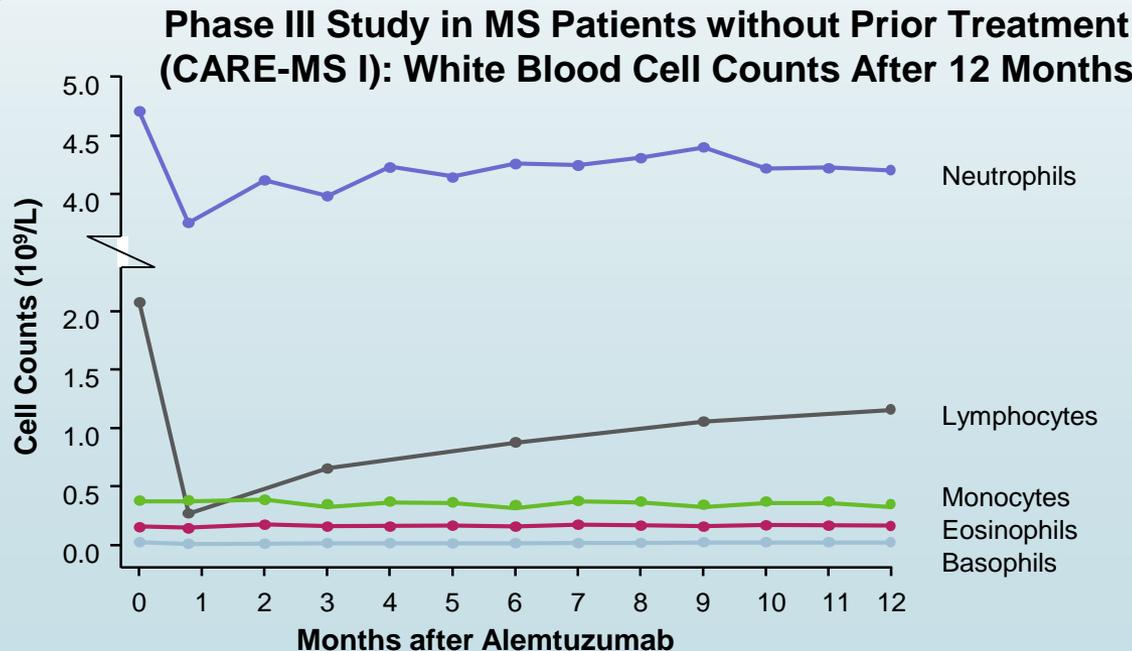
1: Depletion of B and T Lymphocytes

- The precise mechanism by which alemtuzumab exerts its therapeutic effects in multiple sclerosis is unknown but is presumed to involve binding to CD52, a cell surface antigen present on T and B lymphocytes, and on natural killer cells, monocytes, and macrophages.
- Following cell surface binding to T and B lymphocytes, alemtuzumab results in antibody-dependent cellular cytotoxicity and complement-mediated lysis.
- LEMTRADA depletes circulating T and B lymphocytes after each treatment course.
 - In clinical trials, the lowest cell counts occurred 1 month after a course of treatment at the time of the first post-treatment blood count.

LEMTRADA (Alemtuzumab) Clinical Pharmacology & MOA

2: Repopulation of B and T Lymphocytes

- Lymphocyte counts then increased over time:
 - B cell counts usually recovered within 6 months; T cell counts increased more slowly and usually remained below baseline 12 months after treatment
- Reconstitution of the lymphocyte population varies for the different lymphocyte subtypes



Care MS Trial Design

- ▶ 2-year randomized, open-label, rater-blinded trial compared alemtuzumab 12 mg with subcutaneous interferon beta-1a
- ▶ Given the very different side-effect profiles and route/frequency of administration of the two drugs, the neurologist assessing the EDSS, MSFC rater and MRI reader were blinded to the treatment assignment
- ▶ A blinded relapse adjudication committee confirmed relapses

Alemtuzumab versus interferon beta 1a as first-line treatment for patients with relapsing-remitting multiple sclerosis: a randomised controlled phase 3 trial.

[Cohen JA1, Coles AJ, Arnold DL, Confavreux C, Fox EJ, Hartung HP, Havrdova E, Selmaj KW, Weiner HL, Fisher E, Brinar VV, Giovannoni G, Stojanovic M, Ertik BI, Lake SL, Margolin DH, Panzara MA, Compston DA; CARE-MS I investigators, Lancet. 2012 Nov 24;380\(9856\):1819-28. doi: 10.1016/S0140-6736\(12\)61769-3. Epub 2012 Nov 1.](#)

LEMTRADA (Alemtuzumab) Clinical Study Overview

	CARE-MS II (Study 1)	CARE-MS I (Study 2)
Study design	Randomized, open-label, rater-blinded, active comparator controlled study in patients with RRMS	Randomized, open-label, rater-blinded, active comparator controlled study in patients with RRMS
Treatment Arms	Alemtuzumab 12 mg (n=426) SC IFNB-1a 44 µg (n=202)	Alemtuzumab 12 mg (n=376) SC IFNB-1a 44 µg (n=187)
Study Duration, yrs	2	2
Patient Population	EDSS ≤5 ≥1 relapse while on interferon beta or glatiramer acetate	EDSS ≤3 No prior treatment
Outcome measures	ARR over 2 years Time to 6-month confirmed disability progression ^a Change in T ₂ lesion volume	

EDSS=Expanded Disability Status Scale

^aDefined as ≥1 point increase above baseline EDSS (1.5 point increase for patients with baseline EDSS of 0) sustained for 6 months.

Co-primary endpoints for both trials

- ▶ Annualized relapse rate (ARR): Relapses were defined as new or worsening neurologic symptoms due to MS occurring in the absence of fever, lasting over 48 hours, occurring after 30 days of neurologic stability, and causing new findings on neurologic examination. A blinded relapse adjudication committee confirmed relapses
- ▶ Time to onset of 6 month sustained accumulation of disability (SAD):
Defined as an increase of at least 1 point on the EDSS from baseline EDSS ≥ 1.0 (1.5-point increase for patients with baseline EDSS of 0) sustained for 6 months. EDSS=Expanded Disability Status Scale; GA=glatiramer acetate; IFN=interferon.
- ▶ Study outcomes were considered positive if either one or both endpoints were achieved

Baseline patient characteristics

	CARE-MS-II		CARE-MS I	
	LEMTRADA (n=426)	Rebif (n=202)	LEMTRADA (n=376)	Rebif (n=187)
Mean age (SD)	34.8 (8.36)	35.8 (8.77)	33.0 (8.0)	33.2 (8.5)
Sex (% female)	66.0	65.0	64.6	65.2
Mean disease duration, years (SD)	4.5 (2.68)	4.7 (2.86)	2.1 (1.4)	2.0 (1.3)
Mean number of relapses in previous year (SD)	1.7 (0.86)	1.5 (0.75)	1.8 (0.8)	1.8 (0.8)
Mean EDSS (SD)	2.7 (1.26)	2.7 (1.21)	2.0 (0.8)	2.0 (0.8)
Patients with Gd-enhancing lesions (%)*	42.0	44.0	46.0	51.0
Mean number Gd-enhancing lesions (SD)	2.3 (6.02)	2.1 (4.95)	2.3 (5.1)	2.2 (4.9)

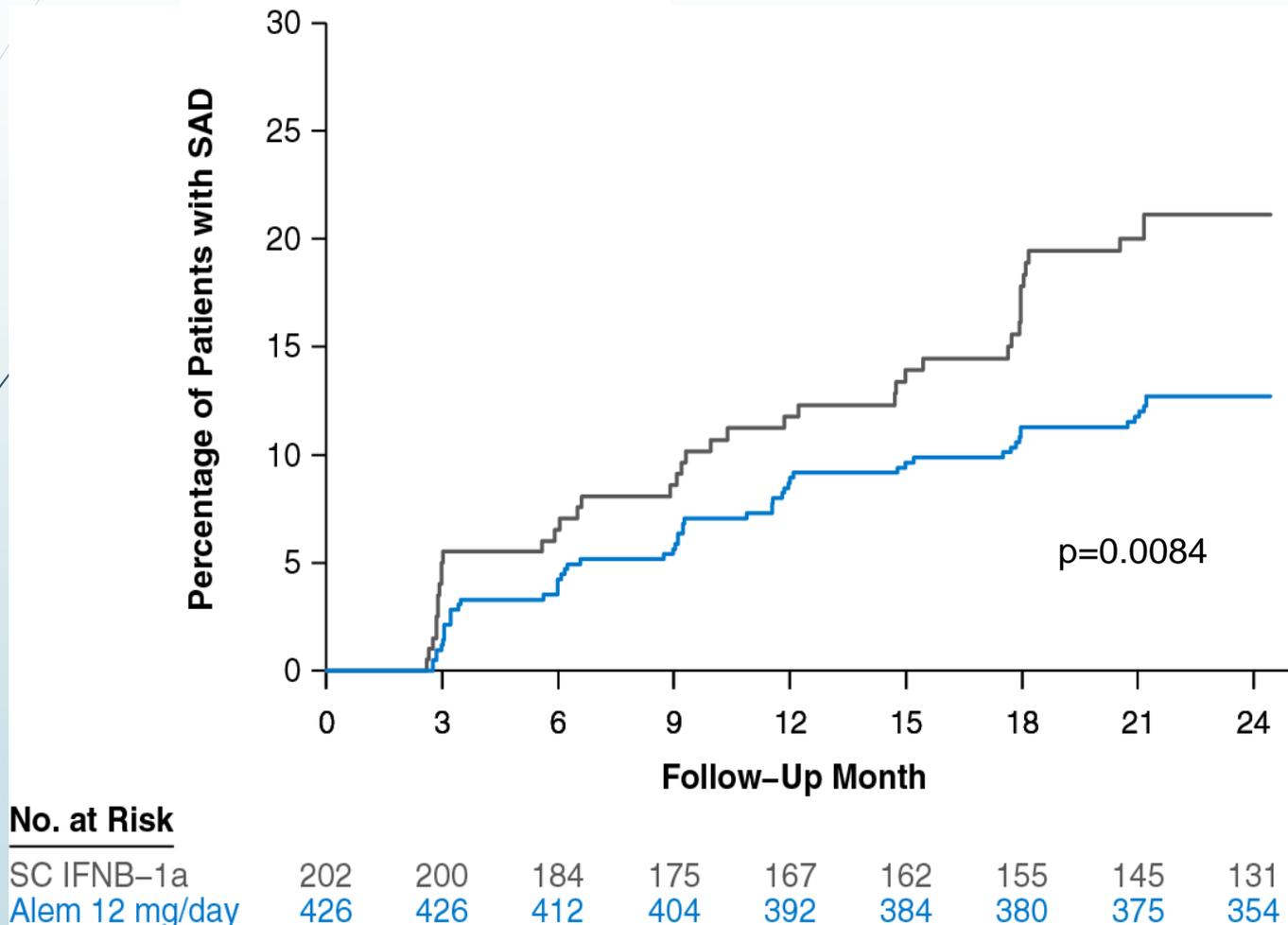
* The presence of Gd-enhancing lesions was not required for study entry.

LEMTRADA (Alemtuzumab) Clinical Studies: Efficacy Overview CARE-MS II

	LEMTRADA N=426	SC IFNB-1a N=202	
RELAPSE			P-value
ARR <i>Relative reduction vs. SC IFNB-1a</i>	0.26 49%	0.52	p<0.0001
Patients relapse-free	65%	47%	p<0.0001
DISABILITY			
Patients with 6-month SAD <i>Relative reduction vs. SC IFNB-1a</i>	13% 42%	21%	p=0.0084
MRI			
Change in T₂ lesion volume from baseline	-1.3%	-1.2%	p=0.14

LEMTRADA (Alemtuzumab) Clinical Studies: Disability CARE-MS II

Time to 6-Month Confirmed Disability Progression



LEMTRADA (Alemtuzumab) Clinical Studies: Efficacy Overview CARE-MS I

	LEMTRADA N=376	SC IFNB-1a N=187	
RELAPSE			P-value
ARR <i>Relative reduction vs. SC IFNB-1a</i>	0.18 55%	0.39	p<0.0001
Patients relapse-free	78%	59%	p<0.0001
DISABILITY			
Patients with 6-month SAD <i>Relative reduction vs. SC IFNB-1a</i>	8% 30%	11%	p=0.22
MRI			
Change in T₂ lesion volume from baseline	-9.3%	-6.5%	p=0.31

Summary of efficacy over 2 years

	Annualized Relapse Rate	Confirmed Disability Progression	T2 Lesion Volume*
CARE-MS II (patients who relapsed while on prior treatment for MS)	49% relative reduction (ARR: 0.26 vs 0.52; $P < 0.0001$)	65% relapse free vs 47% for Rebif ($P < 0.0001$)	42% relative risk reduction (13% vs 21%; $P = 0.0084$)
CARE-MS I (patients with no prior treatment for MS)	55% relative reduction (ARR: 0.18 vs 0.39; $P < 0.0001$)	78% relapse free vs 59% for Rebif ($P < 0.0001$)	-1.3% vs -1.2% change, LEMTRADA vs Rebif ($P = 0.14$)
		30% relative risk reduction (8% vs 11%; $P = 0.22$)	-9.3% vs -6.5% change, LEMTRADA vs Rebif ($P = 0.31$)

*Median percent change from baseline

Adverse reactions in pooled, 2-year, active-controlled studies in patients with RRMS

	LEMTRADA N=811 (%)	Rebif N=389 (%)		LEMTRADA N=811 (%)	Rebif N=389 (%)
Rash*	53	6	Fungal infection	13	4
Headache*	52	23	Arthralgia	12	9
Pyrexia*	29	9	Pain in extremity	12	9
Nasopharyngitis	25	19	Back pain	12	8
Nausea*	21	9	Diarrhea	12	6
Urinary tract infection	19	8	Sinusitis	11	8
Fatigue*	18	13	Oropharyngeal pain	11	5
Insomnia*	16	15	Paresthesia	10	8
Upper resp. infection	16	13	Dizziness*	10	5
Herpes viral infection	16	3	Abdominal pain	10	5
Urticaria*	16	2	Flushing*	10	4
Pruritus*	14	2	Vomiting	10	3
Thyroid gland disorders	13	3			

*Some of these events may have been due to infusion reactions in the LEMTRADA group.

Adverse reactions in pooled, 2-year, active-controlled studies in patients with RRMS (cont)

	LEMTRADA N=811 (%)	Rebif N=389 (%)		LEMTRADA N=811 (%)	Rebif N=389 (%)
Cough	9	4	Muscle spasms	6	5
Chills*	9	3	Myalgia	6	5
Dysgeusia*	8	7	↓ CD4 lymphocytes	6	2
Influenza	8	6	↓ CD8 lymphocytes	6	2
Dermatitis	8	5	Asthenia	5	4
Dyspepsia*	8	4	↓ T-lymphocyte count	5	3
Blood in urine	8	3	Erythema	5	2
Dyspnea*	8	1	Peripheral edema	5	2
Tachycardia*	8	1	Epistaxis	5	2
Anxiety	7	6	Neck Pain	5	2
Muscular weakness	7	6	Abnormal uterine bleeding	5	1
Bronchitis	7	4			
Chest discomfort*	7	2			

*Some of these events may have been due to infusion reactions in the LEMTRADA group.

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Clinical Contraindications

- ▶ LEMTRADA is contraindicated in patients who are infected with Human Immunodeficiency Virus (HIV) because LEMTRADA causes prolonged reductions of CD4+ lymphocyte counts

Warning: Autoimmunity, infusion reactions, and malignancies

- ▶ LEMTRADA causes serious, sometimes fatal, autoimmune conditions such as immune thrombocytopenia and anti-glomerular basement membrane disease. Monitor complete blood counts with differential, serum creatinine levels, and urinalysis with urine cell counts at periodic intervals for 48 months after the last dose of LEMTRADA.
- ▶ LEMTRADA causes serious and life-threatening infusion reactions. LEMTRADA must be administered in a setting with appropriate equipment and personnel to manage anaphylaxis or serious infusion reactions. Monitor patients for two hours after each infusion. Make patients aware that serious infusion reactions can also occur after the 2-hour monitoring period.
- ▶ LEMTRADA may cause an increased risk of malignancies, including thyroid cancer, melanoma, and lymphoproliferative disorders. Perform baseline and yearly skin exams.



Autoimmunity

- Because of the risk of autoimmunity, infusion reactions, and malignancies, LEMTRADA is available only through restricted distribution under a Risk Evaluation Mitigation Strategy (REMS) Program.
- Treatment with LEMTRADA can result in the formation of autoantibodies and increase the risk of serious autoimmune mediated conditions, and may increase the risk of other autoimmune conditions because of the broad range of autoantibody formation

Infusion reactions

- LEMTRADA causes cytokine release syndrome resulting in infusion reactions, some of which may be serious and life-threatening
 - 92% of LEMTRADA-treated patients experienced infusion reactions in clinical trials
 - Serious reactions occurred in 3% of these patients and included anaphylaxis in 2 patients (including anaphylactic shock)
 - In some patients, infusion reactions were reported more than 24 hours after LEMTRADA infusion

Infusion reactions observed in clinical trials			
Serious reactions		Other reactions	
<ul style="list-style-type: none">• Angioedema• Bronchospasm• Hypotension• Chest pain• Bradycardia• Tachycardia (including atrial fibrillation)	<ul style="list-style-type: none">• Transient neurologic symptoms• Hypertension• Headache• Pyrexia• Rash	<ul style="list-style-type: none">• Nausea• Urticaria• Pruritus• Insomnia• Chills• Flushing• Fatigue	<ul style="list-style-type: none">• Dyspnea• Pulmonary infiltrates• Dysgeusia• Dyspepsia• Dizziness• Pain

Premedication and monitoring for infusion reactions

Premedication on day of treatment

Corticosteroids

- Immediately prior to LEMTRADA infusion for the first 3 days of each treatment course
- In clinical trials, patients received 1000 mg of methylprednisolone

Antihistamines and/or Antipyretics

Monitoring for infusion reactions

- Consider pretreatment prior to LEMTRADA administration
- Monitor patients during and for at least 2 hours after each infusion
- Consider additional monitoring in patients with medical conditions which predispose them to cardiovascular or pulmonary compromise

- Infusion reactions may occur despite pretreatment

Malignancy

Malignancy	Occurrence in LEMTRADA-treated patients	Monitoring
Thyroid cancer	<ul style="list-style-type: none">0.3% of patients developed thyroid cancer (all papillary carcinoma) vs none in the interferon beta-1a-treated groupScreening for thyroid cancer was performed more frequently in the LEMTRADA-treated group because of the higher incidence of autoimmune thyroid disorders	Healthcare providers should monitor and patients self-monitor for symptoms of thyroid cancer
Melanoma	<ul style="list-style-type: none">In uncontrolled studies, 0.3% of patients developed melanoma or melanoma <i>in situ</i>	Perform baseline and yearly skin examinations
Lymphoproliferative disorders and lymphoma	<ul style="list-style-type: none">Cases of lymphoproliferative disorders and lymphoma have occurred in LEMTRADA-treated patients with MS	None specified

Because LEMTRADA is an immunomodulatory therapy, caution should also be exercised when initiating LEMTRADA in patients with pre-existing or ongoing malignancies

Autoimmune disorders

Hematological

Immune Thrombocytopenia (ITP)

- Occurred in 2% of LEMTRADA-treated patients in clinical studies in MS
- One LEMTRADA-treated patient developed ITP that went unrecognized prior to the implementation of monthly monitoring requirements, and died from an intracerebral hemorrhage
- ITP has been diagnosed more than 3 years after the last LEMTRADA dose

Other autoimmune cytopenias

- Autoimmune cytopenias occurred in LEMTRADA-treated MS patients in clinical trials
- Included neutropenia (0.1%), hemolytic anemia (0.2%), and pancytopenia (0.2%)
- One LEMTRADA-treated patient with autoimmune pancytopenia died from sepsis
- Obtain complete blood counts (CBCs) with differential prior to initiation of treatment and at monthly intervals thereafter until 48 months after the last infusion

Autoimmune disorders (cont'd)

Renal

Glomerular Nephropathies

- Occurred in 0.3% of LEMTRADA-treated patients in MS clinical trials and have been diagnosed up to 40 months after the last dose of LEMTRADA
- There are published and post-marketing cases of MS patients treated with alemtuzumab who developed anti-glomerular basement membrane (anti-GBM) disease and subsequently developed end stage renal disease requiring renal transplantation
- Refer to REMS slide for Lab Monitoring

Thyroid

Autoimmune thyroid disorders

- Occurred in 34% of LEMTRADA-treated patients in clinical studies
- Newly diagnosed thyroid disorders occurred throughout the uncontrolled clinical study follow-up period, more than 7 years after the first LEMTRADA dose
- Serious thyroid events occurred in 2% of patients. In patients with an ongoing thyroid disorder, LEMTRADA should be administered only if the potential benefit justifies the potential risks
- Thyroid disease poses special risks in women who are pregnant
- Refer to REMS slide for Lab Monitoring

Monitor for signs of autoimmunity because early detection and prompt treatment can help prevent serious and potentially fatal outcomes associated with these events

Infections

- Infections occurred in 71% of LEMTRADA-treated patients compared to 53% of patients treated with interferon beta-1a
 - Infections that occurred more frequently with LEMTRADA than interferon beta-1a included nasopharyngitis, urinary tract infection, upper respiratory tract infection, sinusitis, herpetic infections, influenza, bronchitis, TB, HBV/HCV, and fungal infections, especially oral and vaginal candidiasis
- Listeria meningitis has been reported in LEMTRADA-treated patients. Cases of listeria meningitis occurred within 1 month of alemtuzumab dosing. The duration of increased risk for listeria meningitis is unclear.
 - Patients should avoid or adequately heat foods that are potential sources of *Listeria monocytogenes*.
- Serious infections occurred in 3% of patients treated with LEMTRADA and 1% of patients treated with interferon beta-1a
 - Included appendicitis, gastroenteritis, pneumonia, herpes zoster, and tooth infection
- Consider delaying initiation of LEMTRADA in patients with active infection until the infection is fully controlled
- Concomitant use of LEMTRADA with antineoplastic or immunosuppressive therapies could increase the risk of immunosuppression

Additional safety information

- **Pneumonitis**, including hypersensitivity pneumonitis and pneumonitis with fibrosis, occurred in 6 of 1217 (0.5%) LEMTRADA-treated patients in clinical studies. Advise patients to report symptoms of pneumonitis (e.g., shortness of breath, cough, wheezing, chest pain or tightness, and hemoptysis)
- **Drug Products with Same Active Ingredient:** LEMTRADA contains the same active ingredient (alemtuzumab) found in CAMPATH[®]. If LEMTRADA is considered for use in a patient who has previously received CAMPATH, exercise increased vigilance for additive and long-lasting effects on the immune system

Use in special populations

- ▶ LEMTRADA should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus
- ▶ Because many drugs are excreted in human milk, and because of the potential for serious adverse reactions in nursing infants from LEMTRADA, 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
- ▶ Women of childbearing age should use effective contraceptive measures when receiving LEMTRADA and for 4 months following treatment
- ▶ Safety and effectiveness in pediatric patients less than 17 years of age have not been established. Use of LEMTRADA is not recommended in pediatric patients due to the risks of autoimmunity and infusion reactions, and because it may increase the risk of malignancies

LEMTRADA (Alemtuzumab) and Vaccinations

- ▶ Patients should complete any necessary immunizations at least 6 weeks prior to treatment with LEMTRADA.
- ▶ Prior to LEMTRADA treatment determine whether patients have a history of varicella or have been vaccinated for varicella zoster virus (VZV).
 - ▶ If not, test the patient for antibodies to VZV and consider vaccination for those who are antibody-negative.
 - ▶ Postpone treatment with LEMTRADA until 6 weeks after VZV vaccination.
- ▶ Do not administer live viral vaccines following a course of LEMTRADA. Patients treated with LEMTRADA have altered immunity and may be at increased risk of infection following administration of live viral vaccines.

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Baseline Labs prior to initiating tx with Lemtrada

- ▶ CBC-D
- ▶ Serum Creatinine
- ▶ UA with cell counts
- ▶ Test of thyroid function (i.e., TSH)
- ▶ Labs should be performed within 30 days of first infusion
- ▶ Annual HPV testing is also recommended

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Premedications prior to dosing Lemtrada

- ▶ Premedication of high dose corticosteroids (1000 mg of methylprednisolone or equivalent) immediately prior to infusions and for the first 3 days of each treatment course.
- ▶ Anti-viral prophylaxis for herpetic viral infections starting on the first day of each treatment course and continue for a minimum of 2 months following treatment with Lemtrada™ or until the CD+4 lymphocyte is ≥ 200 cells/mL, whichever occurs later.



Pre-infusion considerations

Treating patients with pre-infusion medications may be effective in helping to minimize and/or ameliorating reactions

Additional pre-infusion treatment may consist of :

- ▶ antihistamines such as famotidine (Pepcid) and/or diphenhydramine (Benadryl),
- ▶ acetaminophen (Tylenol).



Dosing Lemtrada

- The recommended dosage of Lemtrada is 12 mg/day intravenously for two treatment courses:
- The initial course: 12mg/day on 5 consecutive days (60mg total dose)
- The second course is 12mg/day 3 consecutive days (36mg total dose) administered 12 months after the first treatment course.



Lemtrada Preparation

- ▶ Inspect visually for particulate matter or discoloration
- ▶ Withdraw 1.2 mL from the vial and dilute into a 100 mL bag of sterile 0.9% Sodium Chloride, USP or 5% Dextrose in Water, USP
- ▶ Gently invert the bag to mix
- ▶ Protect diluted solution from light and store at room temperature or refrigerated; infusions need to be initiated within 8 hours of preparation



After Lemtrada Infusion

- Continued monitoring for 2 hours post infusion
- Instructions for immediate emergency attention
- Contact information
- Prescriptions
 - Antihistamine and antipyretics
 - Anti-emetics for nausea
 - Analgesics for pain

Lemtrada REMS

- ▶ LEMTRADA is available only through a restricted program under a REMS called the **LEMTRADA REMS Program**, because of the risks of autoimmunity, infusion reactions, and malignancies.
- ▶ Notable requirements of the LEMTRADA REMS Program include:
 - ▶ Prescribers must be certified with the program by enrolling and completing training.
 - ▶ Patients must enroll in the program and comply with ongoing monitoring requirements.
 - ▶ Pharmacies must be certified with the program and must only dispense to certified healthcare facilities that are authorized to receive LEMTRADA.
 - ▶ Healthcare facilities must enroll in the program and verify that patients are authorized before infusing LEMTRADA. Healthcare facilities must have on-site access to equipment and personnel trained to manage infusion reactions.
- ▶ Further information, including a list of qualified healthcare facilities, is available at 1 (855)-676-6326

Laboratory testing and monitoring for autoimmune disorders

- Conduct the following laboratory tests within 30 days of initiation and at periodic intervals until 48 months after the last treatment course of LEMTRADA in order to monitor for early signs of potentially serious adverse effects

	Laboratory Monitoring	Timing		
		Baseline	Frequency*	Duration [†]
ITP	Complete blood count (CBC) with differential	✓	Monthly	48 months
Glomerular nephropathies, including anti-GBM disease	Serum creatinine levels	✓	Monthly	48 months
	Urinalysis with urine cell counts	✓	Monthly	48 months
Thyroid disease	Thyroid function test	✓	Quarterly	48 months

*Following initial course of LEMTRADA.

[†]After last course of LEMTRADA, continue monitoring as clinically indicated.



Lemtrada REMS

Prescriber is also asked to:

- ▶ Submit the REMS patient authorization and baseline lab form to the REMS program within 30 days prior to the first infusion date.
- ▶ Submit to the REMS program the REMS patient status form 6 months after the first infusion and every 6 months thereafter until 48 months after the completion of the last infusion.
- ▶ Report any adverse events to the manufacturer.
- ▶ Notify the manufacturer if the patient is no longer under the care of the prescriber.



Lemtrada REMS: For Patients

- ▶ Patients must also be enrolled and authorized in order to receive LEMTRADA
- ▶ Enrollment Forms acknowledge that patients have been counseled on the benefits and risks of treatment with LEMTRADA and agree to follow the procedures outlined in the LEMTRADA REMS Program
- ▶ Patient will be provided with the LEMTRADA Patient Safety Information Card when they enroll
- ▶ Genzyme will maintain a database containing all prescribers, healthcare facility, and patient enrollment information



Discussion