

HIGHLIGHTS OF PRESCRIBING INFORMATION

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

CAMPATH® (alemtuzumab)
Injection for intravenous use
Initial U.S. Approval: 2001

WARNING: CYTOPENIAS, INFUSION REACTIONS, and INFECTIONS

See full prescribing information for complete boxed warning. Serious, including fatal, cytopenias, infusion reactions and infections can occur (5.1 – 5.3).

- Limit doses to 30 mg (single) and 90 mg (cumulative weekly); higher doses increase risk of pancytopenia (2.1).
- Escalate dose gradually and monitor patients during infusion. Withhold therapy for Grade 3 or 4 infusion reactions (5.2).
- Administer prophylaxis against *Pneumocystis jiroveci* pneumonia (PCP) and herpes virus infections (2.2, 5.3).

INDICATIONS AND USAGE

Campath is a CD52-directed cytolytic antibody indicated as a single agent for the treatment of B-cell chronic lymphocytic leukemia (B-CLL) (1).

DOSAGE AND ADMINISTRATION

- Administer as an IV infusion over 2 hours (2.1).
- Escalate to recommended dose of 30 mg/day three times per week for 12 weeks (2.1).
- Premedicate with oral antihistamine and acetaminophen prior to dosing (2.2).

DOSAGE FORMS AND STRENGTHS

30 mg/1 mL single use vial (3).

CONTRAINDICATIONS

None (4).

WARNINGS AND PRECAUTIONS

Cytopenias:

- Obtain complete blood counts (CBC) and platelet counts at weekly intervals during therapy and CD4 counts after therapy until recovery to ≥ 200 cells/ μ L (5.4).
- Discontinue for autoimmune or severe hematologic adverse reactions (5.1).

Infections:

- Campath induces severe and prolonged lymphopenia and increases risk of infection. If a serious infection occurs, withhold treatment until infection resolves (5.3).
- Do not administer live viral vaccines to patients who have recently received Campath (5.5).

ADVERSE REACTIONS

Most common adverse reactions ($\geq 10\%$): cytopenias, infusion reactions, cytomegalovirus (CMV) and other infections, nausea, emesis, diarrhea, and insomnia (6).

To report SUSPECTED ADVERSE REACTIONS, contact Genzyme Corporation at 1-877-4-CAMPATH (1-877-422-6728) or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch

See 17 for PATIENT COUNSELING INFORMATION

Revised: 9/2014

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1 **FULL PRESCRIBING INFORMATION**

WARNING: CYTOPENIAS, INFUSION REACTIONS, and INFECTIONS

Cytopenias: Serious, including fatal, pancytopenia/marrow hypoplasia, autoimmune idiopathic thrombocytopenia, and autoimmune hemolytic anemia can occur in patients receiving Campath. Single doses of Campath greater than 30 mg or cumulative doses greater than 90 mg per week increase the incidence of pancytopenia [see **WARNINGS AND PRECAUTIONS (5.1)**].

Infusion Reactions: Campath administration can result in serious, including fatal, infusion reactions. Carefully monitor patients during infusions and withhold Campath for Grade 3 or 4 infusion reactions. Gradually escalate Campath to the recommended dose at the initiation of therapy and after interruption of therapy for 7 or more days [see **DOSAGE AND ADMINISTRATION (2)** and **WARNINGS AND PRECAUTIONS (5.2)**].

Infections: Serious, including fatal, bacterial, viral, fungal, and protozoan infections can occur in patients receiving Campath. Administer prophylaxis against *Pneumocystis jiroveci* pneumonia (PCP) and herpes virus infections [see **DOSAGE AND ADMINISTRATION (2.2)** and **WARNINGS AND PRECAUTIONS (5.3)**].

2

3 **1 INDICATIONS AND USAGE**

4 Campath is indicated as a single agent for the treatment of B-cell chronic lymphocytic
5 leukemia (B-CLL).

6 **2 DOSAGE AND ADMINISTRATION**

7 **2.1 Dosing Schedule and Administration**

8 • Administer as an IV infusion over 2 hours. **Do not administer as intravenous push**
9 **or bolus.**

10 • Recommended Dosing Regimen

11 ○ Gradually escalate to the maximum recommended single dose of 30 mg.

12 Escalation is required at initiation of dosing or if dosing is held ≥ 7 days

13 during treatment. Escalation to 30 mg ordinarily can be accomplished in 3 - 7

14 days.

15

- 16 ○ Escalation Strategy:
- 17 ○ Administer 3 mg daily until infusion reactions are \leq grade 2 [*see*
- 18 *ADVERSE REACTIONS (6.1)*].
- 19 ○ Then administer 10 mg daily until infusion reactions are \leq grade 2.
- 20 ○ Then administer 30 mg/day three times per week on alternate days (e.g.,
- 21 Mon-Wed-Fri). The total duration of therapy, including dose escalation, is
- 22 12 weeks.
- 23 • **Single doses of greater than 30 mg or cumulative doses greater than 90 mg per**
- 24 **week increase the incidence of pancytopenia.**

25 **2.2 Recommended Concomitant Medications**

- 26 • Premedicate with diphenhydramine (50 mg) and acetaminophen (500-1000 mg) 30
- 27 minutes prior to first infusion and each dose escalation. Institute appropriate
- 28 medical management (e.g. steroids, epinephrine, meperidine) for infusion reactions
- 29 as needed [*see* *BOXED WARNING, WARNINGS AND PRECAUTIONS (5.2)* and
- 30 *ADVERSE REACTIONS (6.1)*].
- 31 • Administer trimethoprim/sulfamethoxazole DS twice daily (BID) three times per
- 32 week (or equivalent) as *Pneumocystis jiroveci* pneumonia (PCP) prophylaxis.
- 33 • Administer famciclovir 250 mg BID or equivalent as herpetic prophylaxis.
- 34 Continue PCP and herpes viral prophylaxis for a minimum of 2 months after completion
- 35 of Campath or until the CD4+ count is \geq 200 cells/ μ L, whichever occurs later [*see*
- 36 *BOXED WARNING* and *WARNINGS AND PRECAUTIONS (5.3)*].

37 **2.3 Dose Modification**

- 38 • Withhold Campath during serious infection or other serious adverse reactions until
- 39 resolution.
- 40 • Discontinue Campath for autoimmune anemia or autoimmune thrombocytopenia.
- 41 • There are no dose modifications recommended for lymphopenia.
- 42
-

43
44**Dose Modification for Neutropenia or Thrombocytopenia**[see **WARNINGS AND PRECAUTIONS (5.1)**]

Hematologic Values	Dose Modification*
ANC < 250/ μ L and/or platelet count \leq 25,000/ μ L	
For first occurrence:	Withhold Campath therapy. Resume Campath at 30 mg when ANC \geq 500/ μ L and platelet count \geq 50,000/ μ L.
For second occurrence:	Withhold Campath therapy. Resume Campath at 10 mg when ANC \geq 500/ μ L and platelet count \geq 50,000/ μ L.
For third occurrence:	Discontinue Campath therapy.
\geq 50% decrease from baseline in patients initiating therapy with a baseline ANC \leq 250/ μ L and/or a baseline platelet count \leq 25,000/ μ L	
For first occurrence:	Withhold Campath therapy. Resume Campath at 30 mg upon return to baseline value(s).
For second occurrence:	Withhold Campath therapy. Resume Campath at 10 mg upon return to baseline value(s).
For third occurrence:	Discontinue Campath therapy.

45 *If the delay between dosing is \geq 7 days, initiate therapy at Campath 3 mg and escalate to 10 mg and then
 46 to 30 mg as tolerated [see **DOSAGE AND ADMINISTRATION (2.1)**].
 47

48 **2.4 Preparation and Administration**

49 Parenteral drug products should be inspected visually for particulate matter and
 50 discoloration prior to administration. If particulate matter is present or the solution is
 51 discolored, the vial should not be used. **DO NOT SHAKE VIAL.**

52 Use aseptic technique during the preparation and administration of Campath. Withdraw
 53 the necessary amount of Campath from the vial into a syringe.

- 54 • To prepare the 3 mg dose, withdraw 0.1 mL into a 1 mL syringe calibrated in
 55 increments of 0.01 mL.
- 56 • To prepare the 10 mg dose, withdraw 0.33 mL into a 1 mL syringe calibrated in
 57 increments of 0.01 mL.
- 58 • To prepare the 30 mg dose, withdraw 1 mL in either a 1 mL or 3 mL syringe
 59 calibrated in 0.1 mL increments.

60 Inject syringe contents into 100 mL sterile 0.9% Sodium Chloride USP or 5% Dextrose
 61 in Water USP. **Gently invert the bag to mix the solution.** Discard syringe.

62 **The vial contains no preservatives and is intended for single use only. DISCARD**
63 **VIAL including any unused portion after withdrawal of dose.**

64 Use within 8 hours after dilution. Store diluted Campath at room temperature (15-30°C)
65 or refrigerated (2-8°C). Protect from light.

66 **2.5 Incompatibilities**

67 Campath is compatible with polyvinylchloride (PVC) bags and PVC or polyethylene-
68 lined PVC administration sets. Do not add or simultaneously infuse other drug substances
69 through the same intravenous line.

70 **3 DOSAGE FORMS AND STRENGTHS**

71 30 mg/1 mL single use vial

72 **4 CONTRAINDICATIONS**

73 None

74 **5 WARNINGS AND PRECAUTIONS**

75 **5.1 Cytopenias**

76 Severe, including fatal, autoimmune anemia and thrombocytopenia, and prolonged
77 myelosuppression have been reported in patients receiving Campath.

78 In addition, hemolytic anemia, pure red cell aplasia, bone marrow aplasia, and hypoplasia
79 have been reported after treatment with Campath at the recommended dose. Single doses
80 of Campath greater than 30 mg or cumulative doses greater than 90 mg per week increase
81 the incidence of pancytopenia.

82 Withhold Campath for severe cytopenias (except lymphopenia). Discontinue for
83 autoimmune cytopenias or recurrent/persistent severe cytopenias (except lymphopenia)
84 [*see* [DOSAGE AND ADMINISTRATION \(2.3\)](#)]. No data exist on the safety of Campath
85 resumption in patients with autoimmune cytopenias or marrow aplasia [*see* [ADVERSE](#)
86 [REACTIONS \(6.1\)](#)].

87 **5.2 Infusion Reactions**

88 Adverse reactions occurring during or shortly after Campath infusion include pyrexia,
89 chills/rigors, nausea, hypotension, urticaria, dyspnea, rash, emesis, and bronchospasm. In
90 clinical trials, the frequency of infusion reactions was highest in the first week of

91 treatment. Monitor for the signs and symptoms listed above and withhold infusion for
92 Grade 3 or 4 infusion reactions [see *ADVERSE REACTIONS (6.1)*].

93 The following serious, including fatal, infusion reactions have been identified in post-
94 marketing reports: syncope, pulmonary infiltrates, acute respiratory distress syndrome
95 (ARDS), respiratory arrest, cardiac arrhythmias, myocardial infarction, acute cardiac
96 insufficiency, cardiac arrest, angioedema, and anaphylactoid shock.

97 Initiate Campath according to the recommended dose-escalation scheme [see *DOSAGE*
98 *AND ADMINISTRATION (2)*]. Premedicate patients with an antihistamine and
99 acetaminophen prior to dosing. Institute medical management (e.g., glucocorticoids,
100 epinephrine, meperidine) for infusion reactions as needed [see *DOSAGE AND*
101 *ADMINISTRATION (2.2)*]. If therapy is interrupted for 7 or more days, reinstitute
102 Campath with gradual dose escalation [see *DOSAGE AND ADMINISTRATION (2.3)* and
103 *ADVERSE REACTIONS (6)*].

104 **5.3 Immunosuppression/Infections**

105 Campath treatment results in severe and prolonged lymphopenia with a concomitant
106 increased incidence of opportunistic infections [see *ADVERSE REACTIONS (6.1)*].
107 Administer PCP and herpes viral prophylaxis during Campath therapy and for a
108 minimum of 2 months after completion of Campath or until the CD4+ count is ≥ 200
109 cells/ μL , whichever occurs later [see *DOSAGE AND ADMINISTRATION (2.2)*].
110 Prophylaxis does not eliminate these infections.

111 Routinely monitor patients for CMV infection during Campath treatment and for at least
112 2 months following completion of treatment. Withhold Campath for serious infections
113 and during antiviral treatment for CMV infection or confirmed CMV viremia (defined as
114 polymerase chain reaction (PCR) positive CMV in ≥ 2 consecutive samples obtained 1
115 week apart) [see *ADVERSE REACTIONS (6.1)*]. Initiate therapeutic ganciclovir (or
116 equivalent) for CMV infection or confirmed CMV viremia [see *DOSAGE AND*
117 *ADMINISTRATION (2.3)*].

118 Administer only irradiated blood products to avoid transfusion associated Graft versus
119 Host Disease (TAGVHD), unless emergent circumstances dictate immediate transfusion.¹

120 In patients receiving Campath as initial therapy, recovery of CD4+ counts to ≥ 200
121 cells/ μL occurred by 6 months post-treatment; however at 2 months post-treatment, the
122 median was 183 cells/ μL . In previously treated patients receiving Campath, the median

123 time to recovery of CD4+ counts to ≥ 200 cells/ μL was 2 months; however, full recovery
124 (to baseline) of CD4+ and CD8+ counts may take more than 12 months [see **BOXED**
125 **WARNING** and **ADVERSE REACTIONS (6)**].

126 **5.4 Laboratory Monitoring**

127 Obtain complete blood counts (CBC) at weekly intervals during Campath therapy and
128 more frequently if worsening anemia, neutropenia, or thrombocytopenia occurs. Assess
129 CD4+ counts after treatment until recovery to ≥ 200 cells/ μL [see **WARNINGS AND**
130 **PRECAUTIONS (5.3)** and **ADVERSE REACTIONS (6)**].

131 **5.5 Immunization**

132 The safety of immunization with live viral vaccines following Campath therapy has not
133 been studied. Do not administer live viral vaccines to patients who have recently received
134 Campath. The ability to generate an immune response to any vaccine following Campath
135 therapy has not been studied.

136 **6 ADVERSE REACTIONS**

137 The following adverse reactions are discussed in greater detail in other sections of the
138 label:

- 139 • Cytopenias [see **WARNINGS AND PRECAUTIONS (5.1)**]
- 140 • Infusion Reactions [see **WARNINGS AND PRECAUTIONS (5.2)**]
- 141 • Immunosuppression/Infections [see **WARNINGS AND PRECAUTIONS (5.3)**]

142 The most common adverse reactions with Campath are: infusion reactions (pyrexia,
143 chills, hypotension, urticaria, nausea, rash, tachycardia, dyspnea), cytopenias
144 (neutropenia, lymphopenia, thrombocytopenia, anemia), infections (CMV viremia, CMV
145 infection, other infections), gastrointestinal symptoms (nausea, emesis, abdominal pain),
146 and neurological symptoms (insomnia, anxiety). The most common serious adverse
147 reactions are cytopenias, infusion reactions, and immunosuppression/infections.

148 **6.1 Clinical Trials Experience**

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

152 The data below reflect exposure to Campath in 296 patients with CLL of whom 147 were
153 previously untreated and 149 received at least 2 prior chemotherapy regimens. The
154 median duration of exposure was 11.7 weeks for previously untreated patients and 8
155 weeks for previously treated patients.

156 *Lymphopenia:* Severe lymphopenia and a rapid and sustained decrease in lymphocyte
157 subsets occurred in previously untreated and previously treated patients following
158 administration of Campath. In previously untreated patients, the median CD4+ was 0
159 cells/ μ L at one month after treatment and 238 cells/ μ L [25-75% interquartile range 115
160 to 418 cells/ μ L at 6 months post-treatment [see [WARNINGS AND PRECAUTIONS](#)
161 [\(5.3\)](#)].

162 *Neutropenia:* In previously untreated patients, the incidence of Grade 3 or 4 neutropenia
163 was 42% with a median time to onset of 31 days and a median duration of 37 days. In
164 previously treated patients, the incidence of Grade 3 or 4 neutropenia was 64% with a
165 median duration of 28 days. Ten percent of previously untreated patients and 17% of
166 previously treated patients received granulocyte colony stimulating factors.

167 *Anemia:* In previously untreated patients, the incidence of Grade 3 or 4 anemia was 12%
168 with a median time to onset of 31 days and a median duration of 8 days. In previously
169 treated patients, the incidence of Grade 3 or 4 anemia was 38%. Seventeen percent of
170 previously untreated patients and 66% of previously treated patients received either
171 erythropoiesis stimulating agents, transfusions or both.

172 *Thrombocytopenia:* In previously untreated patients, the incidence of Grade 3 or 4
173 thrombocytopenia was 14% with a median time to onset of 9 days and a median duration
174 of 14 days. In previously treated patients, the incidence of Grade 3 or 4
175 thrombocytopenia was 52% with a median duration of 21 days. Autoimmune
176 thrombocytopenia was reported in 2% of previously treated patients with one fatality.

177 *Infusion reactions:* Infusion reactions, which included pyrexia, chills, hypotension,
178 urticaria, and dyspnea, were common. Grade 3 and 4 pyrexia and/or chills occurred in
179 approximately 10% of previously untreated patients and in approximately 35% of
180 previously treated patients. The occurrence of infusion reactions was greatest during the
181 initial week of treatment and decreased with subsequent doses of Campath. All patients
182 were pretreated with antipyretics and antihistamines; additionally, 43% of previously
183 untreated patients received glucocorticoid pre-treatment.

184 *Infections:* In the study of previously untreated patients, patients were tested weekly for
185 CMV using a PCR assay from initiation through completion of therapy, and every 2
186 weeks for the first 2 months following therapy. CMV infection occurred in 16% (23/147)
187 of previously untreated patients; approximately one-third of these infections were serious
188 or life threatening. In studies of previously treated patients in which routine CMV
189 surveillance was not required, CMV infection was documented in 6% (9/149) of patients;
190 nearly all of these infections were serious or life threatening.

191 Other infections were reported in approximately 50% of patients across all studies. Grade
192 3 - 5 sepsis ranged from 3% to 10% across studies and was higher in previously treated
193 patients. Grade 3 - 4 febrile neutropenia ranged from 5 to 10% across studies and was
194 higher in previously treated patients. Infection-related fatalities occurred in 2% of
195 previously untreated patients and 16% of previously treated patients. There were 198
196 episodes of other infection in 109 previously untreated patients; 16% were bacterial, 7%
197 were fungal, 4% were other viral, and in 73%, the organism was not identified.

198 *Cardiac:* Cardiac dysrhythmias occurred in approximately 14% of previously untreated
199 patients. The majority were tachycardias and were temporally associated with infusion;
200 dysrhythmias were Grade 3 or 4 in 1% of patients.

201 *Previously Untreated Patients*

202 [Table 1](#) contains selected adverse reactions observed in 294 patients randomized (1:1) to
203 receive Campath or chlorambucil as first line therapy for B-CLL. Campath was
204 administered at a dose of 30 mg intravenously three times weekly for up to 12 weeks.
205 The median duration of therapy was 11.7 weeks with a median weekly dose of 82 mg
206 (25-75% interquartile range: 69 mg – 90 mg).

207

Table 1

Per Patient Incidence of Selected ¹ Adverse Reactions in Treatment Naive B-CLL Patients					
		Campath (n=147)		Chlorambucil (n=147)	
		All Grades ² %	Grades 3-4 %	All Grades %	Grades 3-4 %
Blood and Lymphatic System Disorders	Lymphopenia	97	97	9	1
	Neutropenia	77	42	51	26
	Anemia	76	13	54	18
	Thrombocytopenia	71	13	70	14
General Disorders and Administration Site Conditions	Pyrexia	69	10	11	1
	Chills	53	3	1	0
Infections and Infestations	CMV viremia ³	55	4	8	0
	CMV infection	16	5	0	0
	Other infections	74	21	65	10
Skin and Subcutaneous Tissue Disorders	Urticaria	16	2	1	0
	Rash	13	1	4	0
	Erythema	4	0	1	0
Vascular Disorders	Hypotension	16	1	0	0
	Hypertension	14	5	2	1
Nervous System Disorders	Headache	14	1	8	0
	Tremor	3	0	1	0
Respiratory, Thoracic and Mediastinal Disorders	Dyspnea	14	4	7	3
Gastrointestinal Disorders	Diarrhea	10	1	4	0
Psychiatric Disorders	Insomnia	10	0	3	0
	Anxiety	8	0	1	0
Cardiac Disorders	Tachycardia	10	0	1	0

209 ¹Adverse reactions occurring at a higher relative frequency in the Campath arm

210 ²NCI CTC version 2.0 for adverse reactions; NCI CTCAE version 3.0 for laboratory values

211 ³CMV viremia (without evidence of symptoms) includes both cases of single PCR positive test results and of
 212 confirmed CMV viremia (≥ 2 occasions in consecutive samples 1 week apart). For the latter, ganciclovir (or
 213 equivalent) was initiated per protocol.

214 Previously Treated Patients

215 Additional safety information was obtained from 3 single arm studies of 149 previously
 216 treated patients with CLL administered 30 mg Campath intravenously three times weekly
 217 for 4 to 12 weeks (median cumulative dose 673 mg [range 2 – 1106 mg]; median duration
 218 of therapy 8.0 weeks). Adverse reactions in these studies not listed in Table 1 that

219 occurred at an incidence rate of > 5% were fatigue, nausea, emesis, musculoskeletal pain,
220 anorexia, dysesthesia, mucositis, and bronchospasm.

221 **6.2 Immunogenicity**

222 As with all therapeutic proteins, there is potential for immunogenicity. Using an ELISA
223 assay, anti-human antibodies (HAHA) were detected in 11 of 133 (8.3%) previously
224 untreated patients. In addition, two patients were weakly positive for neutralizing activity.
225 Limited data suggest that the anti-Campath antibodies did not adversely affect tumor
226 response. Four of 211 (1.9%) previously-treated patients were found to have antibodies
227 to Campath following treatment.

228 The incidence of antibody formation is highly dependent on the sensitivity and specificity
229 of the assay. Additionally, the observed incidence of antibody (including neutralizing
230 antibody) positivity in an assay may be influenced by several factors including assay
231 methodology, sample handling, timing of sample collection, concomitant medications,
232 and underlying disease. For these reasons, comparison of the incidence of antibodies to
233 Campath with the incidence of antibodies to other products may be misleading.

234 **6.3 Postmarketing Experience**

235 The following adverse reactions were identified during post-approval use of Campath.
236 Because these reactions are reported voluntarily from a population of uncertain size, it is
237 not always possible to reliably estimate their frequency or establish a causal relationship
238 to Campath exposure. Decisions to include these reactions in labeling are typically based
239 on one or more of the following factors: (1) seriousness of the reaction, (2) reported
240 frequency of the reaction, or (3) strength of causal connection to Campath.

241 Fatal infusion reactions: [*see* [WARNINGS AND PRECAUTIONS \(5.2\)](#)].

242 Cardiovascular: congestive heart failure, cardiomyopathy, decreased ejection fraction
243 (some patients had been previously treated with cardiotoxic agents).

244 Immune disorders: Goodpasture's syndrome, Graves' disease, aplastic anemia, Guillain
245 Barré syndrome, chronic inflammatory demyelinating polyradiculoneuropathy, serum
246 sickness, fatal transfusion associated Graft versus Host Disease.

247 Infections: Epstein-Barr Virus (EBV) including EBV-associated lymphoproliferative
248 disorder, progressive multifocal leukoencephalopathy (PML), re-activation of latent
249 viruses.

250 Metabolic: tumor lysis syndrome

251 Neurologic: optic neuropathy

252 **7 DRUG INTERACTIONS**

253 No formal drug interaction studies have been performed with Campath.

254 **8 USE IN SPECIFIC POPULATIONS**

255 **8.1 Pregnancy**

256 **Pregnancy Category C**

257 Animal reproduction studies have not been conducted with Campath. IgG antibodies,
258 such as Campath, can cross the placental barrier. It is not known whether Campath can
259 cause fetal harm when administered to a pregnant woman or can affect reproduction
260 capacity. Campath should be given to a pregnant woman only if clearly needed.

261 **8.3 Nursing Mothers**

262 Excretion of Campath in human breast milk has not been studied; it is not known whether
263 this drug is excreted in human milk. IgG antibodies, such as Campath, can be excreted in
264 human milk. Because many drugs are excreted in human milk and because of the
265 potential for serious adverse reactions in nursing infants from Campath, a decision should
266 be made whether to discontinue nursing or to discontinue the drug, taking into account
267 the elimination half-life of Campath and the importance of the drug to the mother.

268 **8.4 Pediatric Use**

269 Safety and effectiveness have not been established in pediatric patients.

270 **8.5 Geriatric Use**

271 Of 147 previously untreated B-CLL patients treated with Campath, 35% were \geq age 65
272 and 4% were \geq age 75. Of 149 previously treated patients with B-CLL, 44% were \geq 65
273 years of age and 10% were \geq 75 years of age. Clinical studies of Campath did not include
274 sufficient number of subjects age 65 and over to determine whether they respond
275 differently than younger subjects. Other reported clinical experience has not identified
276 differences in responses between the elderly and younger patients.

277 **10 OVERDOSAGE**

278 Across all clinical experience, the reported maximum single dose received was 90 mg.
279 Bone marrow aplasia, infections, or severe infusions reactions occurred in patients who
280 received a dose higher than recommended.

281 One patient received an 80 mg dose by IV infusion and experienced acute bronchospasm,
282 cough, and dyspnea, followed by anuria and death. Another patient received two 90 mg
283 doses by IV infusion one day apart during the second week of treatment and experienced
284 a rapid onset of bone marrow aplasia.

285 There is no known specific antidote for Campath overdose. Treatment consists of drug
286 discontinuation and supportive therapy.

287 **11 DESCRIPTION**

288 Campath (alemtuzumab) is a recombinant DNA-derived humanized monoclonal antibody
289 (Campath-1H) directed against the 21-28 kD cell surface glycoprotein, CD52. Campath-
290 1H is an IgG1 kappa antibody with human variable framework and constant regions, and
291 complementarity-determining regions from a murine (rat) monoclonal antibody
292 (Campath-1G). The Campath-1H antibody has an approximate molecular weight of 150
293 kD. Campath is produced in mammalian cell (Chinese hamster ovary) suspension culture
294 in a medium containing neomycin. Neomycin is not detectable in the final product.

295 Campath is a sterile, clear, colorless, isotonic solution (pH 6.8-7.4) for injection. Each
296 single use vial of Campath contains 30 mg alemtuzumab, 8.0 mg sodium chloride, 1.44
297 mg dibasic sodium phosphate, 0.2 mg potassium chloride, 0.2 mg monobasic potassium
298 phosphate, 0.1 mg polysorbate 80, and 0.0187 mg disodium edetate dihydrate. No
299 preservatives are added.

300 **12 CLINICAL PHARMACOLOGY**

301 **12.1 Mechanism of Action**

302 Campath binds to CD52, an antigen present on the surface of B and T lymphocytes, a
303 majority of monocytes, macrophages, NK cells, and a subpopulation of granulocytes. A
304 proportion of bone marrow cells, including some CD34⁺ cells, express variable levels of
305 CD52. The proposed mechanism of action is antibody-dependent cellular-mediated lysis
306 following cell surface binding of Campath to the leukemic cells.

307 **12.2 Pharmacodynamics**

308 *Cardiac Electrophysiology*

309 The effect of multiple doses of alemtuzumab (12 mg/day for 5 days) on the QTc interval
310 was evaluated in a single-arm study in 53 patients without malignancy. No large changes
311 in the mean QTc interval (i.e., > 20 ms) were detected in the study. A mean increase in
312 heart rate of 22 to 26 beats/min was observed for at least 2 hours following the initial
313 infusion of alemtuzumab. This increase in heart rate was not observed with subsequent
314 doses.

315 **12.3 Pharmacokinetics**

316 Campath pharmacokinetics were characterized in a study of 30 previously treated B-CLL
317 patients in whom Campath was administered at the recommended dose and schedule.
318 Campath pharmacokinetics displayed nonlinear elimination kinetics. After the last 30 mg
319 dose, the mean volume of distribution at steady-state was 0.18 L/kg (range 0.1 to 0.4
320 L/kg). Systemic clearance decreased with repeated administration due to decreased
321 receptor-mediated clearance (i.e., loss of CD52 receptors in the periphery). After 12
322 weeks of dosing, patients exhibited a seven-fold increase in mean AUC. Mean half-life
323 was 11 hours (range 2 to 32 hours) after the first 30 mg dose and was 6 days (range 1 to
324 14 days) after the last 30 mg dose.

325 Comparisons of AUC in patients ≥ 65 years (n=6) versus patients < 65 years (n=15)
326 suggested that no dose adjustments are necessary for age. Comparisons of AUC in female
327 patients (n=4) versus male patients (n=17) suggested that no dose adjustments are
328 necessary for gender.

329 The pharmacokinetics of Campath in pediatric patients have not been studied. The effects
330 of renal or hepatic impairment on the pharmacokinetics of Campath have not been
331 studied.

332 **13 NONCLINICAL TOXICOLOGY**

333 **13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility**

334 No long-term studies in animals have been performed to establish the carcinogenic or
335 mutagenic potential of Campath, or to determine its effects on fertility in males or
336 females.

337 **14 CLINICAL STUDIES**

338 **14.1 Previously Untreated B-CLL Patients**

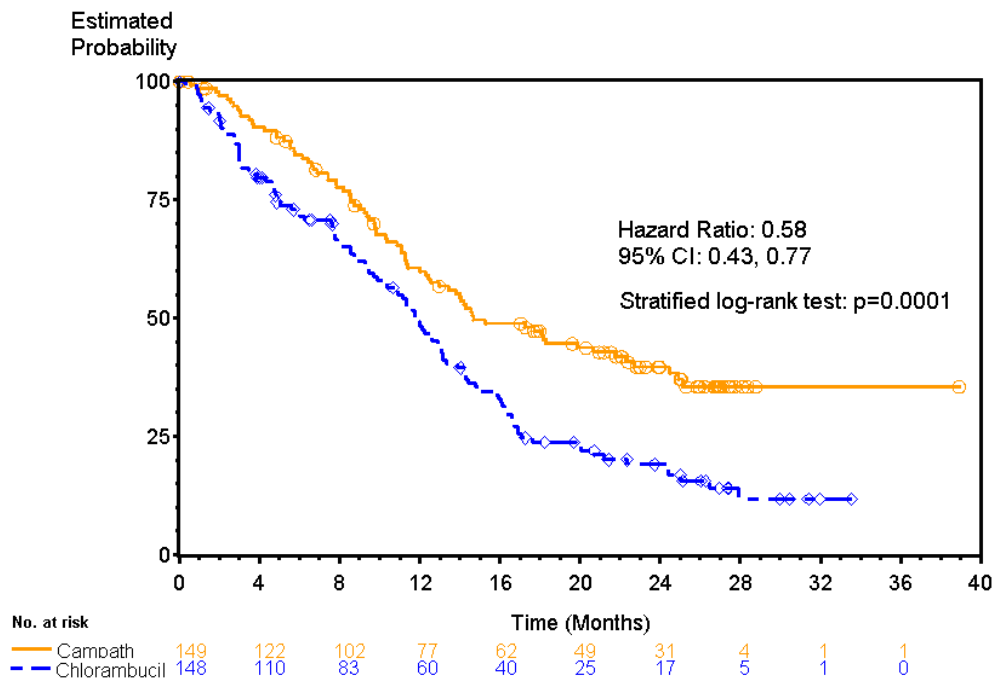
339 Campath was evaluated in an open-label, randomized (1:1) active-controlled study in
 340 previously untreated patients with B-CLL, Rai Stage I-IV, with evidence of progressive
 341 disease requiring therapy. Patients received either Campath 30 mg IV 3 times/week for a
 342 maximum of 12 weeks or chlorambucil 40 mg/m² PO once every 28 days, for a maximum
 343 of 12 cycles.

344 Of the 297 patients randomized, the median age was 60 years, 72% were male, 99% were
 345 Caucasian, 96% had a WHO performance status 0-1, 23% had maximum lymph node
 346 diameter ≥ 5cm, 34% were Rai Stage III/IV, and 8% were treated in the U.S.

347 Patients randomized to receive Campath experienced longer progression free survival
 348 (PFS) compared to those randomized to receive chlorambucil (median PFS 14.6 months
 349 vs. 11.7 months, respectively). The overall response rates were 83% and 55% (p <
 350 0.0001) and the complete response rates were 24% and 2% (p < 0.0001) for Campath and
 351 chlorambucil arms, respectively. The Kaplan-Meier curve for PFS is shown in Figure 1.

352 **Figure 1**

353 **Progression Free Survival in Previously Untreated B-CLL Patients¹**



355 ¹Log-rank test adjusted for Rai Stage (I-II vs. III-IV).

356 **14.2 Previously Treated B-CLL Patients**

357 Campath was evaluated in three multicenter, open-label, single arm studies of 149
358 patients with B-CLL previously treated with alkylating agents, fludarabine, or other
359 chemotherapies. Patients were treated with the recommended dose of Campath, 30 mg
360 intravenously, three times per week for up to 12 weeks. Partial response rates of 21 to
361 31% and complete response rates of 0 to 2% were observed.

362 **15 REFERENCES**

363 ¹ American Association of Blood Banks, America's Blood Centers, American Red Cross.
364 Circular of Information for the Use of Human Blood and Blood Components. July 2002.

365 **16 HOW SUPPLIED/STORAGE AND HANDLING**

366 Campath (alemtuzumab) is supplied in single-use clear glass vials containing 30 mg of
367 alemtuzumab in 1 mL of solution. Each carton contains three Campath vials (NDC
368 58468-0357-3) or one Campath vial (NDC 58468-0357-1).

369 Store Campath at 2-8°C (36-46°F). Do not freeze. If accidentally frozen, thaw at 2-8°C
370 before administration. Protect from direct sunlight.

371 **17 PATIENT COUNSELING INFORMATION**

372 *Cytopenias:* Advise patients to report any signs or symptoms such as bleeding, easy
373 bruising, petechiae or purpura, pallor, weakness or fatigue [*see WARNINGS AND*
374 *PRECAUTIONS (5.1) and ADVERSE REACTIONS (6.1)*].

375 *Infusion Reactions:* Advise patients of the signs and symptoms of infusion reactions and
376 of the need to take premedications as prescribed [*see WARNINGS AND PRECAUTIONS*
377 *(5.2) and OVERALL ADVERSE REACTIONS (6.1)*].

378 *Infections:* Advise patients to immediately report symptoms of infection (e.g. pyrexia)
379 and to take prophylactic anti-infectives for PCP (trimethoprim/sulfamethoxazole DS or
380 equivalent) and for herpes virus (famciclovir or equivalent) as prescribed [*see*
381 *WARNINGS AND PRECAUTIONS (5.3) and ADVERSE REACTIONS (6.1)*].

382 Advise patients that irradiation of blood products is required [*see WARNINGS AND*
383 *PRECAUTIONS (5.3)*].

384 Advise patients that they should not be immunized with live viral vaccines if they have
385 recently been treated with Campath [*see WARNINGS AND PRECAUTIONS (5.5)*].

Campath/Alemtuzumab

386 Advise male and female patients with reproductive potential to use effective
387 contraceptive methods during treatment and for a minimum of 6 months following
388 Campath therapy [*see [NONCLINICAL TOXICOLOGY \(13.1\)](#)*].

389 Manufactured and distributed by: Genzyme Corporation, Cambridge, MA 02142

390 Campath is a registered trademark of Genzyme Corporation.

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