New Advances in Disease-Modifying Therapies for Relapsing and Progressive Forms of Multiple Sclerosis

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KEYWORDS

• Multiple sclerosis • Treatment • Management • Neuroprotection • Myelin repair

KEY POINTS

- Treatment development in past years has been extremely active and a great number of disease-modifying treatments have emerged for treating multiple sclerosis (MS) patients.
- Newer drugs, some of them with newer mechanisms of action, are still being developed for treating MS patients.
- There is a growing interest in developing new drugs that will promote neuroprotection and/or myelin repair that may target the most degenerative component of the disease.

INTRODUCTION

Multiple sclerosis (MS) is a chronic autoimmune disease of the central nervous system (CNS) in which inflammation, demyelination, and axonal loss occurs from very early stages of the disease. It mainly affects young people, between 20 and 40 years old, with a female predominance.[1,2]

Treatment development in the past years has been extremely active and a great number of disease-modifying treatments have emerged for treating patients with MS. For the purpose of this review, the Food and Drug Administration (FDA) and the European Medicines Agency (EMA) Web pages were consulted; the ClinicalTrial.gov database was also searched using the following criteria: multiple sclerosis, interventional, with results, and first received from 2010 to March 2017. In this article, we

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discuss the newest drugs that, as of March 1, 2017, (1) are currently being evaluated by the FDA or the EMA or have been recently approved by these governmental agencies, and (2) are under development and have completed at least 1 phase 2 clinical trial with published results in the past 3 years (2014).

NEWLY RELEASED AND FORTHCOMING DRUGS

In recent years, a wealth of new therapies have been approved for the treatment of MS (Table 1). It is beyond the scope of this article to address them; instead, I discuss the newest drugs that, as of March 1, 2017, were currently being evaluated by the FDA or the EMA or that were approved by these governmental agencies during 2016.

Table 1
Current and forthcoming drugs for the treatment of multiple sclerosis

Drug	Posology	FDA/EMA Approval
Interferon beta 1b	Subcutaneous per 48 h	1993/1995
Interferon beta 1a	Intramuscular per 1 wk	1996/1997
Interferon beta 1b	Subcutaneous 3 times per week	2002/1998
Pegylated interferon beta	Subcutaneous per 2 wk	2014/2014
Glatiramer acetate	Subcutaneous per 24 h per 48 h	 1996/2001 2014/2014
Natalizumab	Intravenous per 4 wk	2006/2006
Fingolimod	Oral per 24 h	2010/2011
Teriflunomide	Oral per 24 h	2012/2013
Alemtuzumab	Intravenous per 1 y[a]	2014/2013
Dimethyl fumarate	Oral per 12 h	2013/2014
Daclizumab	Subcutaneous per 4 wk	2016/2016
Ocrelizumab	Intravenous per 6 mo	2017/awaiting
Cladribine	Oral per 1 y[b]	Under EMA review

Abbreviations: EMA, European Medicines Agency; FDA, US Food and Drug Administration.

[a] Alemtuzumab is administered in 2 treatment courses: in the first course, alemtuzumab is administered on 5 consecutive days; in the second course, alemtuzumab is administered on 5 consecutive days.

[b] The recommended treatment schedule has not been confirmed. In clinical trials, cladribine was administered in 2 treatment courses: in the first course, cladribine is taken for 5 consecutive days in the first month and for 5 consecutive days in the second month, this same treatment course is repeated a second time 12 months later.