

MS DISEASE-MODIFYING THERAPIES

Dose · mechanism · side effects · monitoring

Drug	Indication	Dose	Mechanism / effect	Side effects	Monitoring
Self-injectables					
IFN β-1a (Avonex, 1996)	RRMS	30 mcg IM weekly	Modulates T- and B-cell function; downregulates inflammatory cytokines. ↓Relapses ~30%; ↓CIS→CDMS ~50%	Flu-like symptoms, headache, leukopenia, anemia, depression/suicide, hepatotoxicity, thyroid dysfunction, injection-site necrosis (SQ). Neutralizing antibodies. Pregnancy C	CBC, LFTs, TSH/free T4; screen for depression
IFN β-1a (Rebif, 1998)	RRMS	44 mcg SQ 3x/wk	As above	As above; washout 1 month	As above
Peginterferon β-1a (Plegridy, 2014)	RRMS	125 mcg SQ q2 wk	As above (pegylated)	As above	As above
IFN β-1b (Betaseron, 2009)	RRMS	250 mcg SQ EOD	As above	As above	As above
Glatiramer acetate (Copaxone 1997, Glatopa 2015)	RRMS	20 mg SQ daily or 40 mg SQ 3x/wk	Immunomodulator	Injection-site pain & lipatrophy; post-injection reaction (chest/neck tightness, tachycardia, dyspnea, anxiety). No washout. Pregnancy B	None required
Ofatumumab (Kesimpta, 2020)	RRMS, active SPMS, CIS	20 mg SC weeks 0/1/2, then monthly	Fully-human anti-CD20 mAb; B-cell depletion (self-injected)	Injection reactions, infections, ↓ immunoglobulins, HBV reactivation. No live vaccines	Pre: HBV screen, Ig levels, LFTs, vaccines; then infections/Ig/LFTs
Oral					
Fingolimod (Gilenya, 2010)	RRMS	0.5 mg daily	S1P-receptor modulator; sequesters T-cells in lymph nodes. ↓Relapses 54%, ↓EDSS 30%, ↓MRI 74% (T2)	Bradyarrhythmia/AV block, macular edema, PRES, lymphopenia, PML, transaminitis, VZV meningoencephalitis, malignancy. Pregnancy C; washout 2 mo	Pre: CBC, EKG, LFT, VZV IgG (vaccinate if neg); 1st-dose monitoring; then CBC/LFT q6m, fundus at 6m
Siponimod (Mayzent, 2018)	RRMS, SPMS	2 mg daily (titrate)	S1P modulator (subtypes 1 & 5, spares 3 → less cardiac). ↓Relapses 55%, ↓disability progression 21%, ↓MRI 79% (T2)	Bradyarrhythmia/AV block, macular edema (1.8%), lymphopenia, PML, transaminitis, malignancy. Pregnancy C	Pre: CYP2C9 testing (avoid in 3/3), CBC, EKG, LFT, VZV IgG; fundus screen; then CBC/LFT q6m
Ozanimod (Zeposia, 2020)	RRMS, CIS, active SPMS	0.92 mg daily (7-day titration)	S1P modulator (subtypes 1 & 5)	Bradycardia (less; no 1st-dose obs if no cardiac hx), macular edema, ↑LFTs, HTN, ↓lymphocytes; MAOIs contraindicated ; tyramine-rich foods (HTN)	Pre: CBC, LFT, EKG, VZV, ophtho if DM/uveitis; then CBC/LFT, BP, skin
Ponesimod (Ponvory, 2021)	RRMS, active SPMS, CIS	20 mg daily (14-day titration)	Selective S1P ₁ modulator	Bradycardia (titration), macular edema, ↑LFTs, HTN, ↓FEV ₁ , infections	Pre: CBC, LFT, EKG, VZV, ophtho; PFT if indicated; then CBC/LFT, BP, skin
Teriflunomide (Aubagio, 2012)	RRMS	14 mg daily	Depletes pyrimidine pool; disrupts T-cell/APC interaction. ↓Relapses 31%, ↓EDSS 30%, ↓MRI 67% (T2)	Alopecia, hepatotoxicity. Pregnancy X (men & women); washout with cholestyramine/charcoal	Pre: LFTs, pregnancy test; then LFTs q6m, BP
Dimethyl fumarate (Tecfidera, 2013)	CIS, RRMS, SPMS	120 mg BID x7d then 240 mg BID	Activates Nrf2 antioxidant pathway; shifts Th1→Th2. ↓Relapses 53%, ↓EDSS 38%, ↓MRI 85% (T2)	Flushing 40% (give ASA), GI upset 15% (give with fatty food), transaminitis, lymphopenia, PML if lymph <500. Pregnancy C; washout 1 mo	Pre: CBC (lymph >1000), LFT; then CBC q6m
Diroximel fumarate (Vumerity, 2019)	CIS, RRMS, SPMS	231 mg BID x7d then 462 mg BID	Same active metabolite as DMF, less GI upset	Flushing 40%, less GI upset, transaminitis, lymphopenia, PML if lymph <500. Pregnancy C; washout 1 mo	Pre: CBC (lymph >1000), LFT; then CBC q6m
Monomethyl fumarate (Bafiertam, 2020)	CIS, RRMS, active SPMS	95 mg BID x7d then 190 mg BID	Bioequivalent active metabolite (MMF) of DMF / diroximel; Nrf2 activator	Flushing, GI upset (less), transaminitis, lymphopenia, PML if lymph <500. Pregnancy C; washout 1 mo	Pre: CBC (lymph >1000), LFT; then CBC q6m
Cladribine (Mavenclad, 2019)	RRMS (failed other drugs)	4 cycles of 4 days at weeks 0, 23, 43, 66 (total 3.5 mg/kg)	Purine antimetabolite; depletes B & T lymphocytes. ↓Relapses 58%, ↓EDSS 33%	Headache, URI, lymphopenia (if <200 give acyclovir), liver injury, malignancy	Pre: CBC, LFT, HIV, TB, hepatitis panel, VZV IgG, cancer screen; then cancer screen, CBC
IV infusions					
Natalizumab (Tysabri, 2006)	RRMS	300 mg IV q4 wk (max 3 yr; via MS TOUCH)	α4-integrin antagonist; blocks CNS lymphocyte migration. ↓Relapses 68%, ↓EDSS 42%, ↓MRI 83% (T2)	Infusion reactions, PML , neutralizing antibodies. Washout 3 mo	Pre: serum JCV Ab w/index; JCV Ab + PML screen q6m
Alemtuzumab (Lemtrada, 2014)	RRMS (failed 2 drugs)	12 mg IV daily x5d, then x3d one year later (give steroids with first 3 infusions)	Anti-CD52; destroys T-cells, NK cells, monocytes. ↓Relapses 55%, ↓EDSS 30%	Infusion reactions; autoimmune (ITP 2%, thyroid 34%, anti-GBM 0.3%, hemolysis); cancer (thyroid, melanoma, lymphoma); HSV/VZV 16%. Pregnancy C; washout 3 mo	Acyclovir ppx; CBC, Cr, UA q1m x48 mo; TSH q3m; yearly skin exam
Ocrelizumab (Ocrevus, 2017)	RRMS, PPMS	300 mg IV x2 (2 wk apart), then 600 mg IV q6 mo (pre-medicate steroids + antihistamine). SC option: Ocrevus Zunovo (2024)	Anti-CD20; depletes B-cells via ADCC & CDC	Infusion reactions (34%), breast cancer 0.7%, URTI. Contraindicated in active HBV; no live vaccines	Pre: HBV screen; observe 1 h post-infusion; delay if active infection
Ublituximab (Briumvi, 2022)	RRMS, active SPMS, CIS	150 mg IV, then 450 mg at day 15 & q24 wk	Glycoengineered anti-CD20 mAb; B-cell depletion (ADCC)	Infusion reactions, infections, ↓ immunoglobulins, HBV reactivation. No live vaccines	Pre: HBV screen, Ig, LFTs; premedicate; observe post-infusion (first 2)

How to choose a DMT

1 · According to type of MS

MS type	Recommended DMTs
Relapsing MS (RRMS / active SPMS)	First line: interferons, glatiramer, fingolimod, siponimod, ozanimod, ponesimod, teriflunomide, dimethyl / diroximel / monomethyl fumarate, natalizumab, ocrelizumab, ofatumumab, ublituximab. Second line: alemtuzumab, cladribine
PPMS	Ocrelizumab

2 · According to pregnancy category

Pregnancy category	DMTs
Class B	Glatiramer acetate
Class C	Interferons, fingolimod, dimethyl fumarate, natalizumab, alemtuzumab
Class X	Teriflunomide
Not categorized	Ocrelizumab, ofatumumab, ublituximab, siponimod, ozanimod, ponesimod, diroximel & monomethyl fumarate, cladribine (newer agents — PLLR labeling). Cladribine contraindicated in pregnancy & active malignancy.

3 · According to form of administration

Route	DMTs
Oral	Fingolimod, siponimod, ozanimod, ponesimod, dimethyl / diroximel / monomethyl fumarate, teriflunomide, cladribine
IM	Interferon β -1a (Avonex)
SC	Interferons (Rebif, Betaseron, Plegridy), glatiramer acetate, ofatumumab
Infusion (IV)	Natalizumab, ocrelizumab, alemtuzumab, ublituximab

4 · According to side-effect profile

DMT	Limiting side effects
Interferons	Depression, hepatotoxicity, injection reaction
S1P modulators (fingolimod, siponimod, ozanimod, ponesimod)	Bradycardia, AV block, macular edema, lymphopenia, $\uparrow$ LFTs
Teriflunomide	Alopecia, hepatotoxicity, teratogenicity
Fumarates	GI upset, flushing (less with diroximel), lymphopenia
Natalizumab	PML risk
Alemtuzumab	Autoimmune disorders, cancer, HSV/VZV infection
Anti-CD20 (ocrelizumab, ofatumumab, ublituximab)	Infusion/injection reactions, $\downarrow$ immunoglobulins, HBV reactivation

5 · According to screening measures needed

DMT	Pre-screening	Follow-up labs
Interferons	CBC, LFTs, TSH	CBC, LFTs, TSH q6 months
Glatiramer	None	None
S1P modulators	ECG, CBC, VZV, LFT, ophtho (+ CYP2C9 for siponimod)	CBC, LFT, BP, skin exam, OCT q6 months
Teriflunomide	hCG, LFT, TB	ALT monthly $\times 6$ mo then q6 mo, BP
Fumarates	CBC	CBC q6 months
Natalizumab	JCV Ab index, baseline MRI	JC titer q6 months
Alemtuzumab	CBC, Cr, TSH	CBC, Cr, UA q1m $\times 48$ mo; TSH q3m
Anti-CD20	CBC, hCG, HBV, Ig, vaccines	Ig & CBC periodically (CD19 optional)