Comparison of MS Disease-Modifying Therapies
Overview

There are now 15 medications that are approved by the US Food and Drug Administration (FDA) to treat MS. These are often called Disease Modifying Therapies (DMTs) or Disease Modifying Drugs (DMDs) because they modify the progression of MS. All of these medications have been shown to slow the course of MS in multiple well-designed research studies. These medications are (in alphabetical order):

- Alemtuzumab (Lemtrada)
- Daclizumab (Zinbryta)
- Dimethyl fumarate (Tecfidera)
- Fingolimod (Gilenya)
- Glatiramer acetate (Copaxone, Glatopa)
- Interferons
  - Interferon beta-1a (Avonex, Plegridy, Rebif)
  - Interferon beta-1b (Betaseron, Extavia)
- Mitoxantrone (Novantrone)
- Natalizumab (Tysabri)
- Ocrelizumab (Ocrevus)
- Teriflunomide (Aubagio)

**What do DMTs do?** These medications slow the course of MS. Patients taking DMTs have fewer attacks, milder disease courses and less disability. These medicines are not expected to reverse nervous system damage that was done in the past, but rather lessen the chance of damage occurring in the future. While people are taking the medications, the course of the disease is slowed, but if the medications are discontinued the MS reverts to its previous course.

**Which DMT is the best?** Our Center does not believe that any one of these medications is “the best”. Similarly, there is no consensus within the medical field about which medication is best. Rather, each medication has advantages and disadvantages that must be weighed for each patient. Which DMTs is most medically effective is not known.

**But I have read that one of the DMTs is the best one.** The only way to determine which medication works the best is to do a head-to-head study of one medication versus another. These types of studies are needed to determine the effectiveness and side effects of the DMTs compared to each other. Very few of these studies have been done. More information on head-to-head studies of DMTs is available on our website.

In the absence of head-to-head data, a number of claims have been made about these medications that we do not agree with. Much of this is driven by marketing claims that reflect a
misrepresentation of the data. More information about these claims can be found on our website pages titled:

- Differences in MS attacks with various DMTs
- Differences in disability with various DMTs
- Differences in MRI findings with various DMTs
- Neutralizing antibodies with various DMTs

**Factors that are important in choosing a DMT.** Since no one DMT is “the best” from a medical standpoint, other non-medical factors often play a large role in determining which medication a patient selects. The following issues should be considered in determining which first line DMT might best fit a person and their lifestyle. Further details can be found under separate listing for each medication on our website.

- **Year marketed:** The longer a medication is on the market, but more is known about the side effects. When medications are first released on the market 2-4,000 patients have been on the medication for about 3-4 years. This is usually enough to identify side effects that might affect about 1/1000 people. It also only identifies side effects that occur during only a short time of use of the medication. Rare side effects often take tens of thousands of patients to identify. Some side effects may only occur after years of use.

- **How given:** There are oral or injected DMTs. The injected medications may be given intramuscularly, subcutaneously or intravenously. Intramuscular and subcutaneous injections are usually self-administered by the patient, though some have friends/family assist. An important factor in determining discomfort is the diameter of the needle. All of the needles used for these injections are quite thin. Needle sizes are measured in gauges according to the Stubs Iron Wire Gauge system. The sizes of these needles are 27 gauge (0.01625 inch diameter) to 30 gauge (0.01225 inch diameter).

  Intramuscular injections are given in the thigh or shoulder muscles. Intramuscular injections in the buttocks require medical training. Subcutaneous injections are given on the back of the arm, thigh, abdomen or buttock.

  Intravenous infusions are given in an infusion center. The rate of the infusion and time it takes varies with the medication.

- **Frequency:** Frequency varies by the medication. Check the table of disease modifying therapies and pages for individual medications for details.

- **Side effects:** Our pages on individual medications lists the major side effects of these medications. Side effects must be weighed against the efficacy of the medication.
A cautionary note: The FDA looks at potential side effects in research studies using both the treatment arm and the placebo arm of the study. In addition to true side effects, they evaluate potential side effects. Previously they evaluated any symptom that occurred in 2% or more of a research population. Currently they evaluate any symptom that occurred in 5% or more of the research population. If any symptom that occurs that frequently is more common in the treatment arm, it goes on the list as a potential side effect. Most of these are not true side effects. For example, if 50 patients in the placebo arm of a study had headaches, and 51 in the treatment arm had headaches, then headaches would be listed as a side effect of that drug. The listing on the package insert required by the FDA, and the list that the pharmacist gives the patient would both list this as a side effect even though it is not really caused by the medication. When evaluating these lists of side effects, keep in mind that common symptoms may end up on the side effect list that the pharmacist or internet give you, but they may not be caused by the medication.