

Infection Risks and the Importance of Vaccinations

For People With Multiple Myeloma

The goal of this brochure is to help enhance and encourage informative discussions with your healthcare team about vaccinations.



Ask your healthcare team about your infection risk and vaccinations that may be right for you.

The topics and materials discussed in this brochure are not intended to replace discussions with your healthcare provider. Your healthcare providers are the most valuable resources for answering questions you may have regarding cancer, treatment, your health, and your well-being.



ONCOLOGY



Reasons Why People With Multiple Myeloma Are at Risk of Infections

Multiple myeloma impairs the immune system¹

Factors that may impact immune system function in people with multiple myeloma:



Age:

Multiple myeloma usually affects older people, who are more vulnerable to infections because immune response declines with age. Older people may also have comorbidities that can alter immune responses.²⁻⁴



Immunosuppression:

Most people with multiple myeloma produce fewer B-cells and T-cells that play an important role in fighting infections and other diseases.⁴



Treatments:

Multiple myeloma treatments used throughout the disease course may influence immune system responses, for example:

- **Steroids:** Corticosteroids that are used at high doses may increase immunosuppression (prevent or interfere with the development of an immune response), thereby lowering your ability to fight infections^{4,5}
- **Immune and targeted therapies:** Immunomodulatory agents, proteasome inhibitors, and monoclonal antibodies can cause myelosuppression (lower blood cell counts)⁶
- **Conventional chemotherapy:** Chemotherapy can suppress the immune system and lower the number of immune system cells, such as white blood cells³
- **Stem cell transplant:** The stem cell transplant process may also decrease the number of white blood cells and weaken the immune system³

Infections in people with multiple myeloma could cause potentially life-threatening events

Infections are common disease complications and unfortunately remain a major cause of hospitalizations and death.⁴

For people with multiple myeloma:

- The risk of infection may be up to 10 times higher than for the general population⁷
- Death rates of multiple myeloma patients due to infections are lower where vaccination rates are higher, such as in the United States⁸

Vaccinations Are Important for Protecting People With Multiple Myeloma From Infections

What vaccines do:

Train your immune system to recognize invading germs and make antibodies.⁹

What vaccines don't do:

Cause disease or put you at risk of its complications.⁹

What happens when you receive a vaccine?

When you receive a vaccine, your immune system responds by⁹:

- Recognizing the invading pathogen, such as a virus or bacteria
- Producing antibodies
- Remembering the pathogen so your body can fight infection

If you are then exposed to the pathogen in the future, your immune system can quickly destroy it before you become unwell. The vaccine is therefore a safe, smart way to produce an immune response in the body without causing illness.⁹

Terms to know about vaccines and vaccinations

Pathogen: a disease-causing organism, such as a bacteria or virus.¹⁰

Antigen: a part of the pathogen that causes the formation of antibodies.¹⁰

Vaccine: a tiny weakened nondangerous fragment of the organism and includes parts of the antigen.¹⁰

Live-attenuated vaccine: uses a weakened (or attenuated) form of the pathogen that causes a disease. Live vaccines create a strong and long-lasting immune response, sometimes giving lifetime protection. Examples include measles, mumps, rubella (MMR), and chickenpox vaccines.¹¹

Inactivated vaccine: uses a killed version of the pathogen that causes disease. Protection is not as strong as with live vaccines, so several doses over time (booster shots) may be required. Examples include rabies and flu (shot form only) vaccines.¹¹

Vaccination: the administration of a vaccine that uses your body's natural defenses to build resistance to specific infections and makes your immune system stronger.⁹

Vaccinations Are Important for Protecting People With Multiple Myeloma From Infections



Who is recommended to receive vaccines?

- Centers for Disease Control and Prevention (CDC) recommend that most immunocompromised people, such as people with multiple myeloma, should receive vaccinations¹²
- Close or household contacts of a person with multiple myeloma should be up to date with vaccines^{13,14}
- Check guidelines from credible sources, such as the CDC and National Comprehensive Cancer Network (NCCN[®]) for specific vaccination recommendations
- Consult with your healthcare team for their recommendations



Who is NOT recommended to receive vaccines?

- People who are severely immunocompromised¹⁴⁻¹⁶
- Someone experiencing or recently exposed to an infection^{13,16}
- If you have had CAR-T therapy, vaccination should be delayed for at least 3 months after treatment ends to maximize vaccine efficacy¹³
- On a case-by-case basis according to the advice of your oncologist and/or internist¹⁵



Special circumstances: after hematopoietic stem cell transplant (HSCT)

- After HSCT, the antibodies for various pathogens that you had before, such as pneumococci (pathogen that causes pneumonia), are significantly reduced and you may be more susceptible to infections^{17,18}
- The NCCN has specific guidelines and a schedule for the vaccines you should receive after stem cell transplant^{13,14,18}
- People who have had an HSCT should be vaccinated with vaccines administered during early childhood: pneumococci, *Haemophilus influenzae* and meningococci, influenza, and recombinant VZV vaccine¹⁸
- Vaccination after HSCT should be delayed for at least 3 months after treatment ends to maximize vaccine efficacy¹³
- If you have had an HSCT, consult with your healthcare team about whether and when to receive any vaccinations

Abbreviations: CAR-T=chimeric antigen receptor T-cells; COVID-19=coronavirus disease 2019; VZV=varicella zoster virus.

Questions You May Wish to Ask Your Healthcare Team About Vaccinations

1. Should I be vaccinated for flu, pneumonia, shingles, and/or COVID-19 or any other vaccinations?

2. When should I get the vaccines and who will provide them for me?

3. What are the concerns with getting vaccinated?

4. Should I get antibody testing after the COVID-19 vaccine? If so, how often?

5. How will I know if the COVID-19 vaccine is effective and I have sufficient antibody response?

6. Should I get a third mRNA COVID-19 vaccination dose, and if so, when?

7. What about a booster or second dose of the Johnson & Johnson COVID-19 vaccine?

8. Can I mix and match COVID-19 vaccines, and if so, which combinations are right for me?

My recommended vaccinations

Flu
Date: _____

Pneumonia
Date: _____

Shingles
Date: _____

Zoster
Date: _____

COVID-19
Date: _____
Date: _____
Date: _____

mRNA
COVID-19
third dose
Date: _____

Other Vaccines
Date: _____

Vaccinations for Immunocompromised People, Including Those With Multiple Myeloma

Some health organizations have recommendations and guidelines for vaccines for people who are immunocompromised, such as those living with multiple myeloma or other types of cancer. Other organizations have guidelines specific to people with multiple myeloma. Consult with your healthcare team on which vaccinations are right for you.

Vaccination	Influenza	Pneumonia	Varicella zoster (shingles) ¹⁸
Recommending Organization(s)	EMN, WHO, CDC/ACIP, and NCCN ^{14,18,19}	CDC, EMN, and NCCN ^{12,14,18}	EMN
Considerations	Immunocompromised patients should only receive the inactivated influenza vaccine. ^{14,19}	There are 2 vaccines ^{14,18} : <ol style="list-style-type: none"> 1. Pneumococcal conjugate vaccine, or PCV13. 2. Pneumococcal polysaccharide vaccine, or PPSV23. <ul style="list-style-type: none"> • These should not be administered during the same visit • If both are to be administered, pneumococcal conjugate vaccine should be administered first 	Multiple myeloma patients should receive the recombinant vaccine.
Timing	<ul style="list-style-type: none"> • Annually before flu season starts¹⁹ • During some period either before or after interventions that compromise immunity may be appropriate¹⁹ 	Specifics of dosing schedule are dependent on age and prior vaccination for pneumonia. ^{12,14}	2 doses, by injection, 2 to 6 months apart.

Abbreviations: ACIP=Advisory Committee on Immunization Practices; CAR-T=chimeric antigen receptor T-cells; CDC=Centers for Disease Control and Prevention; COVID-19=coronavirus disease 2019; EMN=European Myeloma Network; FDA=Food and Drug Administration; IMF=International Myeloma Foundation; NCCN=National Comprehensive Cancer Network; WHO=World Health Organization.

COVID-19 vaccines were originally available under Emergency Use Authorization (EUA). On August 23, 2021, the Pfizer mRNA vaccine, now called Comirnaty[®], was the first COVID-19 vaccine to be officially approved for individuals 16 years of age and older by the FDA. Third doses of Comirnaty[®] for people who are immunocompromised are still available under EUA.²⁰

COVID-19*		
CDC ²¹	IMF ²²	NCCN ¹³
People who are moderately to severely immunocompromised—including those who are receiving active cancer treatment for cancers of the blood, received a stem cell transplant within the last 2 years, or are taking medicine to suppress the immune system—are recommended to receive an additional dose of mRNA COVID-19 vaccine after their initial 2 doses.	“Strongly recommends that patients with multiple myeloma (MM), smoldering multiple myeloma (SMM), or monoclonal gammopathy of undetermined significance (MGUS) receive a COVID-19 vaccination with the Pfizer or Moderna vaccines, whichever is available.”	<ul style="list-style-type: none"> • Patients with active cancer and those on treatment should be prioritized for vaccination and should be immunized when any vaccine that has been authorized for use by the FDA is available to them—this includes any of the available FDA approved vaccines • All patients with active hematologic malignancies are recommended to receive a third dose regardless of whether they are receiving cancer therapy. <i>This applies only to a third dose of the Pfizer-BioNTech mRNA vaccine (Comirnaty[®]) and the Moderna mRNA vaccine because there is insufficient data on an additional dose of the Janssen/Johnson & Johnson COVID-19 vaccine</i> • Care partners and household or close contacts should be immunized whenever possible
Additional dose of mRNA vaccine should be given at least 28 days after the second dose of the Pfizer-BioNTech COVID-19 vaccine or the Moderna COVID-19 vaccine.		Delay COVID-19 vaccine for at least 3 months after stem cell transplant or CAR-T therapy.

*Recommendations current as of September 2021. Please consult with your healthcare team for the most up-to-date information.

Additional Online Resources*

Centers for Disease Control and Prevention (CDC)

www.cdc.gov

International Myeloma Foundation (IMF)

www.myeloma.org
1-800-452-2873

The Leukemia and Lymphoma Society (LLS)

www.lls.org
1-800-955-4572

Multiple Myeloma Research Foundation (MMRF)

www.themmr.org
1-203-229-0464

Myeloma Crowd

www.myelomacrowd.org
1-800-709-1113

National Comprehensive Cancer Network (NCCN) for Patients

www.nccn.org/patientresources

World Health Organization (WHO)

www.who.int/health-topics/vaccines-and-immunization

*We hope you will use the resources above to find the people, tools, and education that will enable you to become an active participant in your care. Takeda Oncology is not affiliated with these organizations. By listing these resources, Takeda Oncology is not endorsing any service or group and we are not responsible for the content of these sites or services. They are provided here for informational purposes and are not meant to replace your healthcare provider's medical advice.

References: 1. Kumar SK, Anderson KC. Immune therapies in multiple myeloma. *Clin Cancer Res.* 2016;22(22):5453-5460. 2. Montecino-Rodriguez E, Berent-Maoz B, Dorshkind K. Causes, consequences, and reversal of immune system aging. *J Clin Invest.* 2013;123(3):958-965. 3. American Cancer Society. Infections in people with cancer. July 13, 2021. Accessed August 5, 2021. <https://www.cancer.org/content/dam/CRC/PDF/Public/8896.00.pdf> 4. Chari A, Samur MK, Martinez-Lopez J, et al. Clinical features associated with COVID-19 outcome in multiple myeloma: first results from the International Myeloma Society data set. *Blood.* 2020;136(26):3033-3040. 5. Stedman's Medical Dictionary. Immunosuppression. Accessed September 28, 2021. <https://stedmansonline.com> 6. Brigle K, Pierre A, Finley-Oliver E, Faiman B, Tariman JD, Miceli T. Myelosuppression, bone disease, and acute renal failure: evidence-based recommendations for oncologic emergencies. *Clin J Oncol Nurs.* 2017;21(5 Suppl):60-76. 7. Multiple Myeloma Research Foundation. Infections and vaccinations in multiple myeloma. November 22, 2019. Accessed September 21, 2021. <https://themmr.org/2019/11/22/infections-and-vaccinations-in-multiple-myeloma/> 8. Thompson MA, Costello CL, Berdeja JG, et al. Multiple myeloma (MM) vaccination (influenza, FV and pneumococcal, PV) rates worldwide and impact on infection, hospitalization, and death. Presented at: 2020 ASCO Annual Meeting; May 29-31, 2020; virtual. 9. World Health Organization. Vaccines and immunization: what is vaccination? December 30, 2020. Accessed August 5, 2021. <https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-what-is-vaccination> 10. World Health Organization (WHO). How do vaccines work? December 8, 2020. Accessed August 5, 2021. <https://www.who.int/news-room/feature-stories/detail/how-do-vaccines-work> 11. U.S. Department of Health & Human Services. Vaccine types. April 29, 2021. Accessed August 5, 2021. <https://www.hhs.gov/immunization/basics/types/index.html> 12. Centers for Disease Control and Prevention. Immunization schedules. Table 2. Recommended adult immunization schedule by medical Condition and other indications, United States, 2021. February 12, 2021. Accessed August 5, 2021. <https://www.cdc.gov/vaccines/schedules/hcp/imz/adult-conditions.html#table-conditions> 13. NCCN®. Recommendations of the NCCN COVID-19 vaccination advisory committee. Version 4.0. 14. National Comprehensive Cancer Network® (NCCN®) Clinical Practice Guidelines in Oncology (NCCN Guidelines®). Prevention and treatment of cancer-related infections. Version 1.2021. 15. Shah MK, Kamboj M. Immunizing cancer patients: Which patients? Which vaccines? When to give? *Oncology (Williston Park).* 2018;32(5):254-258, C3. 16. Centers for Disease Control and Prevention. General best practice guidelines for immunization: best practices guidance of the Advisory Committee on Immunization Practices (ACIP). Contraindications and precautions. May 4, 2021. Accessed August 5, 2021. <https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html> 17. Henriques-Normark B, Tuomanen EI. The pneumococcus: epidemiology, microbiology, and pathogenesis. *Cold Spring Harb Perspect Med.* 2013;3(7):a010215. 18. Ludwig H, Boccadoro M, Moreau P, et al. Recommendations for vaccination in multiple myeloma: a consensus of the European Myeloma Network. *Leukemia.* 2021;35(1):31-44. 19. Grohskopf LA, Alyanak E, Broder KR, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices - United States, 2020-21 Influenza Season. *MMWR Recomm Rep.* 2020;69(8):1-24. 20. US Food and Drug Administration. FDA approves first COVID-19 vaccine. August 23, 2021. Accessed October 3, 2021. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-covid-19-vaccine> 21. Centers for Disease Control and Prevention. COVID-19 vaccines for moderately to severely immunocompromised people. September 2, 2021. Accessed September 29, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/immuno.html> 22. International Myeloma Foundation. COVID-19 vaccination and myeloma patients. August 13, 2021. Accessed September 29, 2021. <https://www.myeloma.org/covid-19-vaccination-myeloma-patients>

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