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Position Statement

Vaccination Recommendations in Patients With Atopic Dermatitis Treated With JAK Inhibitors

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ABSTRACT

Atopic dermatitis therapy has undergone a revolutionary change with the introduction of Janus kinase (JAK) inhibitors. Despite their general safety profile, these immunomodulatory drugs require special precautions with respect to infection risk and vaccine administration. This document aims to provide dermatologists and other healthcare practitioners with comprehensive practical vaccination recommendations for adults and adolescent patients with atopic dermatitis who are receiving or are about to receive treatment with JAK inhibitors. While inactivated vaccines are safe and recommended during JAK treatment, live attenuated vaccines are contraindicated unless treatment is temporarily discontinued according to clinical guidelines. It is crucial to follow vaccination guidelines established by official agencies and tailor them to individual patient needs. Careful consideration and follow-up are essential to ensure patient safety and optimal therapeutic outcomes.

1 | Introduction

The introduction of targeted therapies such as Janus kinase inhibitors (JAKi) has marked a significant breakthrough in the treatment of atopic dermatitis (AD). The JAK signaling pathway plays a central role in modulating multiple immune axes involved in the immunopathogenesis of AD [1]. Among the JAKi approved for use in AD, notable oral formulations include abrocitinib, baricitinib, and upadacitinib [2, 3]. These drugs offer a new therapeutic option for patients with moderate to severe AD who have had an inadequate response to conventional treatments. While these agents are generally effective and safe, in terms of vaccinations, patients undergoing JAK therapies are considered to have some degree of immunosuppression. The use of JAKi in patients with AD raises concerns related to an increased risk of infections, given the critical role of JAKs in the immune response [4, 5]. AD itself may also predispose patients to secondary skin infections and systemic disorders [6, 7]. For this reason and for practical purposes, vaccination recommendations should be established to take into account the risk of contracting vaccine-preventable diseases, as well as the effectiveness and possible contraindications of the vaccine [8, 9]. Immunization rates among patients on biologics or JAKi have been reported to be low, with elderly individuals (≥65 years old) having considerably higher immunization rates against influenza, herpes zoster (HZ), pneumococcal pneumonia, and COVID-19 compared to non-elderly patients (19–64 years old) [10].

Although existing literature has explored vaccination strategies in dermatological and rheumatological patients treated with

biologic drugs and JAKi [11], this document offers a focused perspective tailored specifically to adult and adolescent patients with AD initiating treatment with oral JAKi. Our recommendations address the unique immunological considerations and vaccination needs of the AD population, filling a gap where AD-specific data remains limited. By providing targeted guidance, this document aims to ensure that vaccination protocols are both safe and effective, reducing the risk of infections and optimizing treatment outcomes in this specific patient group.

2 | Current Spanish Health Vaccination Recommendations

The evidence on vaccination for AD patients, and especially for AD patients treated with JAKi, is scarce. Therefore, most of the data originates from the summary of product characteristics of oral JAKi approved for AD and the experience published in the literature for AD and other inflammatory indications such as rheumatoid arthritis (RA) and psoriasis, among others. It is important to note that pathophysiological mechanisms, treatment protocols, and patient profiles may differ between AD and other inflammatory diseases, which should be considered when extrapolating vaccine data. Nonetheless, these recommendations represent a cautious and safety-focused starting point that could be refined as more AD-specific evidence becomes available.

In parallel, real-world evidence regarding vaccine uptake, immune response, and adverse events in AD patients treated with JAKi is virtually non-existent and is urgently needed. Currently, there are no comprehensive data in the literature regarding the efficacy and safety of immunization in patients on JAKi therapy, which underscores the critical need for further studies [11]. These missing real-world insights hinder our understanding of treatment safety and support the cautious vaccination recommendations outlined here. Continued data collection through registries and observational studies is essential to refine these guidelines further and improve patient care.

2.1 | Inactivated Vaccines

Inactivated vaccines are not contraindicated, although their efficacy may be reduced if the recommended vaccination schedules are not followed. According to local vaccination guidelines, inactivated vaccines should be administered 4 weeks before JAKi treatment or 4 weeks after finalization [12] (Table 1). If vaccination must be performed during the treatment, it is important to note that while these vaccines remain safe, their efficacy could be compromised due to the immunosuppressive effects of JAKi. Posology has to be considered, and it could be necessary to re-vaccinate the patient, but in general, it is well-accepted to continue JAKi without interruption or dose modification [12]. The requirements for specific inactivated vaccines for patients with AD are discussed below.

2.1.1 | Influenza

Influenza vaccines (excluding live attenuated influenza vaccines) are safe and effective in vulnerable patients with immunosuppressive diseases and in patients undergoing biological treatments [13]; therefore, they are recommended annually for all patients receiving a JAKi [9, 14]. In some inflammatory diseases such as RA, seroprotection has been found to be lower for certain strains of viruses in patients on non-JAKi biological treatment [15]. While a study on AD versus non-atopic patients reported that antibody responses for inactivated seasonal influenza vaccine in AD patients were similar to their non-atopic counterparts [16], it also found that patients with AD colonized with *Staphylococcus aureus* exhibited a reduced immune response to intradermal influenza vaccination (not marketed in Spain) but not to intramuscular vaccination compared to non-colonized AD patients. Consequently, intramuscular influenza immunization is preferred in these patients [16].

2.1.2 | Pneumococcal Vaccine

Pneumococcal vaccination should be systematically recommended for all AD patients on JAKi therapy [9, 14], since these patients have an increased risk of serious pneumococcal diseases [17]. The pneumococcal vaccine is recommended for patients ≥ 18 years old rather than ≥ 60 years old as in the general population [9]. There is a lack of evidence regarding impaired immunogenicity in patients undergoing JAKi treatments in AD; although it has been reported that baricitinib and upadacitinib produce an adequate serological response to the 13-valent pneumococcal conjugate vaccine (PCV-13) in RA patients [18, 19].

The immunization schedule in adult patients on immunosuppressive treatment such as JAKi involves receiving the PCV-13 initially, followed by the 23-valent pneumococcal polysaccharide vaccine (PPV-23) at an interval of 12 months (or at least 8 weeks) [20]. A booster dose of PPV-23 should be subsequently administered at least every 5 years [21].

TABLE 1 | Summary of interval recommendations for patients on oral JAK inhibitor (JAKi) therapy [12].

Treatment	Elimination time (5× half-lives)	Live attenuated vaccines		Inactivated vaccines	
		From vaccination to start of JAKi	From end of JAKi to vaccination	From vaccination to start of JAKi	From end of JAKi to vaccination
Abrocitinib	1 day	4 weeks	4 weeks	4 weeks	4 weeks[a]
Baricitinib	3 days				
Upadacitinib	3 days				

[a]Persons vaccinated within 14 days before starting immunosuppressive treatment or while receiving immunosuppressive therapy should be considered unvaccinated and should be vaccinated from 4 weeks after stopping treatment if immune competence has been restored.

It is important to highlight the potential future role of new conjugate vaccines (PPV-15, 20 or 21) with experience of use in several countries [22, 23]; and to what extent the PCV-13 and PPV-23 vaccines will change their indications and how this may affect vaccination schedules in AD patients treated with JAKi. For example, in several regions of Spain, use of the PPV-20 has been proposed as the preferred choice for vaccination to improve protection against additional serotypes, simplify the recommendations, and achieve better coverage in both the general population and risk groups [24, 25].

2.1.3 | Hepatitis B

Immunosuppressive treatment does not increase the risk of hepatitis B virus (HBV) infection, although the prognosis for those who become infected is worse than in the general population [9]. In addition, JAKi may raise the possibility of latent HBV reactivation in high-risk patients [26, 27]. Hepatitis B vaccines have shown good efficacy in several risk groups, although this is slightly reduced in several inflammatory diseases such as AD [28]. Ultimately, HBV vaccination is recommended in all patients on any JAKi treatment with unknown or negative titres [12].

2.1.4 | Hepatitis A

Indications for the hepatitis A vaccine are not clear in the vaccination guidelines for patients undergoing immunosuppressive treatments, although it seems increasingly apparent that vaccination should be done in case of risk of liver disease due to specific immunosuppressive treatment [12]. In the case of JAKi for the treatment of moderate to severe AD, an increase in hepatic enzymes and hepatic inflammation has been reported with the use of baricitinib [29]. Therefore, vaccination against hepatitis A in AD patients treated with baricitinib who have unknown or negative serology results is recommended [12]. Currently, there is no scientific evidence supporting similar recommendations for other JAKi.

2.1.5 | Herpes Zoster

According to the Spanish Ministry of Health, the herpes zoster (HZ) vaccine is a priority for patients starting treatment with JAKi [9]. In recent years, the incidence of HZ has increased worldwide due to the aging population. Vaccination against HZ is recommended for the general population aged ≥ 65 years old, modified to ≥ 18 years old for patients on JAKi treatment, preferably before starting these drugs [30, 31]. The inactivated HZ vaccine has demonstrated its safety and efficacy in patients undergoing JAKi treatment, who have an increased risk of developing HZ and, therefore, serious secondary complications from the infection [32, 33]. Initial evidence came from the use of tofacitinib in RA, but this was subsequently demonstrated to be a class effect, with a clear dose-dependent relationship. Other factors that seem to influence the risk of HZ infection include increasing age, combination with steroids and methotrexate, and being of Asian descent [34].

The vaccination regimen with the recombinant vaccine consists of two doses with an optimal interval of 2 months, which can be reduced to 1 month in urgent immunosuppression situations or according to clinical criteria related to the disease severity [12]. If another schedule is necessary, the second dose may be administered between two and 6 months after the first [30]. Ideally, vaccination should be carried out before the onset of immunosuppression or during the patient's optimal immunological window [31]. However, in cases where this is not feasible, it is widely agreed to proceed with HZ vaccination without interrupting or modifying JAKi treatment, ensuring continuous management of the underlying condition.

2.1.6 | COVID-19

It is recommended that patients with AD treated with oral JAKi receive an additional dose of the COVID-19 vaccine in accordance with current vaccination guidelines [35]. This booster should be administered at least 3 months after the completion of the primary vaccination series, following national and international recommendations for immunocompromised patients [36, 37]. In cases where patients are about to receive or increase the intensity of the immunosuppressive treatment, this interval could be reduced to 3 weeks to ensure a more robust immune response [35]. Subsequent booster doses may be required annually or as advised by updated public health guidelines.

Attenuation of the vaccine response may occur with systemic immunosuppression and JAKi used to treat AD [38, 39]. Studies report that patients with AD do not have an increased risk of immediate side effects [40, 41]. It is advised that, if feasible, the SARS-CoV-2 vaccine should be administered 2 weeks prior to the initiation of immunosuppressive therapy in order to ensure a sufficient immune response. For patients under treatment, non-live vaccines can be given without stopping treatment, but it is advisable to choose vaccines with proven higher efficacy [42].

2.2 | Live Attenuated Vaccines

Live attenuated vaccinations should not be administered to patients receiving immunosuppressive treatment or biologic drugs that cause severe immunosuppression [9]. For JAKi (abrocitinib, baricitinib, and upadacitinib), the use of live attenuated vaccines should be avoided during and immediately before treatment initiation [43–45]. However, if treatment initiation is not urgent, it is advisable to establish immunity against measles, rubella, mumps, and varicella before starting treatment, confirming adequate prior vaccination or measuring serological markers when necessary (one dose, 4 weeks before starting treatment) [9]. When live vaccines need to be delivered during active treatment, JAKi should be paused before and after live vaccine administration. Treatment discontinuation before live vaccines will minimize their effect on the immune response to the vaccine. The recommended duration to discontinue medication before live vaccination is based on the drug's half-life. Table 1 summarizes the minimum intervals for interrupting and resuming vaccine administration in

individuals on JAKi therapies [12]. Local health guidelines recommend administering live attenuated vaccines 4 weeks prior to the initiation of JAKi and for 4 weeks after treatment completion. The evaluation of vaccination timing should be individualized, considering the risks and benefits. Several circumstances may require a reduction in the recommended interval, such as international travel or concurrent chronic immunosuppressive treatments [12]. In these cases, it is crucial to involve preventive medicine specialists, who are best equipped to assess the specific needs of the patient and ensure the safety and efficacy of vaccination. The individualization of vaccine timing should be based on a careful assessment of the patient's overall health, immunosuppressive status, and travel urgency.

2.3 | Vaccination in Adolescent AD Patients (12–17 Years Old)

There is a widespread misconception that AD patients, and especially children, should avoid routine vaccinations. There is no proof that the recommended vaccinations during infancy have an impact on the development of AD or other atopic diseases. All children diagnosed with AD should follow their local or national immunization schedule, except for live attenuated vaccines [46]. During acute flares, vaccines should be avoided; in these cases, 2 weeks of consistent topical corticosteroid therapy followed by a normal vaccination procedure are recommended. Vaccines should be administered 2 weeks (inactivated) or 4 weeks (attenuated) before starting JAKi, but any necessary treatment should never be postponed [46].

Inactivated pneumococcal, SARS-CoV-2, and influenza vaccines should be given to all AD individuals ranging from 12 to 17 years old who are on JAKi [47]. Tetanus-diphtheria-pertussis (TDaP) and human papillomavirus (HPV) vaccinations should be administered in accordance with standard protocols [37] (Table 2).

Immunity against measles, mumps, rubella (MMR), and varicella should be confirmed before treatment initiation. To that end, the patient's disease and vaccination history should be reviewed and, if necessary, serological testing should be performed [9]. Live attenuated vaccines should be avoided while on JAKi treatment, but if required, their use should be considered on a case-by-case basis, weighing the risk of infection versus the risk of vaccination. Specific antibody titres to assess immunity could aid in decision-making. Primary MMR and varicella boosters may be necessary in this age range, and, as safety data is insufficient to make a positive recommendation, their use should be assessed individually under specific conditions [47]. In summary, risk–benefit assessment, the use of serological titers, and individualized decision-making, preferably before starting treatment, are essential to optimize outcomes.

3 | Vaccination and Screening in Individuals Requiring Treatment With JAK Inhibitors

Patients undergoing treatment with biological therapies and/or high doses of corticosteroids or other immunosuppressive drugs are considered to have high levels of immunosuppression. Consequently, the risk of contracting vaccine-preventable diseases should be reduced with an appropriate vaccination schedule. In this context, AD patients who are starting JAKi should be referred to the preventive medicine unit. JAKi have benefits in terms of their overall faster onset of action, which allows a rapid and robust response to signs and symptoms of AD, which could potentially

TABLE 2 | Recommendations for adolescent patients (12–17 years old) on oral JAK inhibitor therapy. Adapted from Rivero-Calle et al. [47].

Vaccine	Guidelines for immunocompromised patients	Observations
Influenza	> 9 years old, 1 dose annually	Yearly
SARS-CoV-2	> 12 years old, 2 + 1 doses (3 weeks between first and second dose; ≥ 4 weeks between second and third dose)	Current schedule: booster dose regardless of the previous doses (including no previous doses)
Pneumococcal	**PCV-15/20** 6 weeks—11 months: 3 doses +1 (2, 4, 6 and 11 months) 1–2 years: 2/3 doses 2–5 years: 2 doses (minimal interval 2 months) ≥ 6 years non-vaccinated: 1 dose **PCV-23** ≥ 2 years: 2 doses (5 years interval)	All immunocompetent children and adolescent PCV-15 + PPV-23 or PCV-20 alone Recall dose 5 years from the previous dose
TDaP	Schedule	Evaluate boosters on an individual basis
HPV	3 doses (0, 1–2 and 6 months)	Regardless of age, all 3 doses
MMR	2 doses (4 week interval)	Contraindicated from 4 weeks prior to JAKi and up to 6–24 months thereafter. Booster according to serology (single dose)
Varicella	2 doses (4 week interval)	Contraindicated from 4 weeks prior to JAKi and up to 4 weeks thereafter

Abbreviations: HPV, human papillomavirus; JAKi, JAK inhibitors; MMR, measles, mumps, rubella; PCV-15/20, 15-valent or 20-valent pneumococcal conjugated vaccine; PPV-23, 23-valent pneumococcal polysaccharide vaccine; TDaP, tetanus-diphtheria-pertussis.

be important in patients in whom a rapid improvement to their condition is needed; accordingly, special requirements in these patients should not be a drawback in relieving their symptoms, and the patient journey must be well defined. Table 3 summarizes pretreatment evaluation considerations [48, 49], where points 3 and 4 (infection risk assessment and evaluation of immunization status, respectively) are essential for the purpose of this document.

3.1 | Assessment of the Patient's Vaccination Status

The initial evaluation of the patient's immunization record is crucial. According to current vaccination standards, it is important to confirm that the patient is up to date with all required vaccinations, including specific vaccines to prevent infections that may be especially relevant in patients with AD, such as varicella, HZ, and the pneumococcal vaccine. If the vaccination history is unclear or records are absent, it may be prudent to consider obtaining antibody titres before initiation of JAKi [48, 49].

3.2 | HBV Screening

To assess immunity, screening tests for quantitative HBV surface antigen (HBsAg), HBV surface antibody (HBsAb) and HBV core antibody (HBcAb) should be carried out before starting the treatment; up-to-date vaccination is recommended in low-titre patients [50].

TABLE 3 | Evaluations prior to JAKi treatment initiation. Adapted from Munera-Campos et al. [48].

Pre-JAK inhibitors assessments
1. Physical examination and anamnesis
a. Estimation of overall risk of thromboembolic disease, cancer
b. Estimation of overall cardiovascular risk
c. Skin examination
2. Baseline blood tests
a. Complete blood count
b. Liver function
c. Kidney function
d. Lipid levels
3. Infection risk assessment
a. HBV serology
b. HCV and HIV serology recommended
c. Tuberculosis screening recommended
4. Evaluation of immunization status
a. Follow national and regional vaccination guidelines
b. Check history of varicella and HZ infection and previous vaccination
c. Live and live-attenuated vaccines are contraindicated in patients on JAKi therapy
5. Evaluation of concomitant medication
a. Increased risk of immunosuppression when combined with other drugs. The use of JAKi with cyclosporine or other systemic immunosuppressants is not recommended in AD

Abbreviations: HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HZ, herpes zoster; JAKi, JAK inhibitors.

3.3 | Tuberculosis Prevention in Candidates for JAKi Treatment

The risk of *Mycobacterium tuberculosis* infection is increased in patients with chronic inflammatory diseases and immunosuppressive therapy. Consequently, it is essential to identify latent tuberculosis infection and begin preventive treatment to reduce the likelihood of developing active disease in these patients [51]. Diagnostic methods are based on the tuberculin skin test (TST) and interferon-gamma release assay (IGRA). The IGRA test is not used as a screening test for the general population, but it is used to identify people who are at high risk of TB since it seems to perform better than the TST [52]. Preventive treatment is recommended in all patients who are candidates for immunosuppressive therapy who present a positive result in any of the diagnostic methods employed (latent tuberculosis), once active tuberculosis has been ruled out [51].

4 | Comparison of Spanish and European Guidelines

While the vaccination recommendations in Spain align closely with European guidelines, there are some local and regional differences that reflect the distinct healthcare systems and vaccination policies [53]. Both the Spanish and European recommendations emphasize the safety of inactivated vaccines for immunocompromised patients, including those on JAK inhibitors, and emphasize the avoidance of live attenuated vaccines due to the immunosuppressive effects of these therapies [2, 9]. However, these recommendations are designed with the same objectives: to ensure that AD patients on JAK inhibitors are protected from vaccine-preventable diseases while minimizing risks. Given the elevated risk of infections such as HZ in these patients, vaccination strategies are encouraged in both Spain and Europe; however, further studies are necessary to confirm their efficacy in this specific population [54]. Our guidance is intended to be adaptable to other settings and consistent with overarching principles of immunization in immunocompromised patients. While the general approach is similar across all European Union countries, specific recommendations, including vaccine choices and schedules, may vary by country based on local epidemiological context and available resources.

5 | Conclusions and Future Perspectives

Vaccination in patients with AD starting treatment with oral JAKi should be managed with a careful and personalized strategy to maximize the safety and efficacy of vaccines while minimizing the risks of disease exacerbation or infections. Patient education on the risks and benefits of vaccination during immunosuppressive therapy and shared decision-making are also essential to ensure adherence and the successful implementation of preventive measures.

Figure 1 summarizes the key steps required for safe initiation of JAKi treatment, especially in terms of immunization and

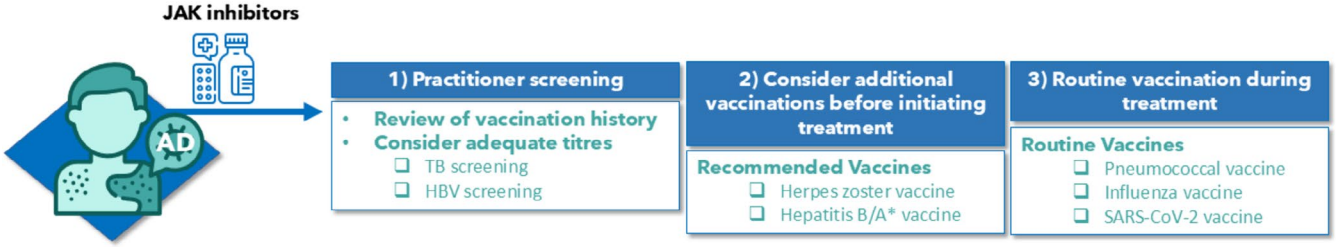

FIGURE 1 | Procedures required for the safe initiation of JAK inhibitor treatment, especially in terms of immunization and screening. AD, atopic dermatitis; HBV, hepatitis B virus; TB, tuberculosis. *Baricitinib is the only JAK inhibitor recommended with hepatitis A vaccine.

screening. While inactivated vaccines are usually safe and recommended, live-attenuated vaccines are generally considered contraindicated due to their impact on the safety or effectiveness of these vaccines. It is crucial to follow vaccination recommendations established by official agencies and to adapt them according to individual patient needs. This document also addresses for the first time the special considerations of adolescent patients (aged 12–17 years) on treatment with JAKi. The development of specific guidelines and further studies in this field will help to improve the care and safety of patients with AD treated with JAKi.

6 | Multiple Choice Questions

1. Before starting JAK inhibitor treatment, it is recommended to screen for and vaccinate against which of the following diseases if serological markers indicate low immunity?
   a. Hepatitis B
   b. Tetanus
   c. Diphtheria
   d. Pertussis
   e. All are correct
2. What is the recommendation for live attenuated vaccines relative to JAK inhibitor treatment?
   a. Live attenuated vaccines can be administered during JAK inhibitor treatment
   b. Live attenuated vaccines can be administered 2 weeks before initiation of JAK inhibitor treatment
   c. Live attenuated vaccines can be administered 4 weeks before initiation and 2 months after treatment completion
   d. Live attenuated vaccines can be administered 1 week before initiation
   e. Live-attenuated vaccines are contraindicated during JAK inhibitor treatment
3. What is the preferred vaccination strategy for AD patients about to start JAK inhibitors to prevent hepatitis B?
   a. Vaccination only if traveling to endemic areas
   b. Vaccination for all patients regardless of serology
   c. Vaccination for patients with unknown or negative serologies
   d. No vaccination needed
   e. Vaccination only if liver enzymes are elevated
4. Which vaccine is recommended annually for all patients receiving immunosuppressive treatments?
   a. Hepatitis B vaccine
   b. Pneumococcal vaccine
   c. Influenza vaccine
   d. Hepatitis A vaccine
   e. MMR vaccine
5. What should be done if the vaccination history is unclear or records are absent for AD patients starting JAK inhibitor therapy?
   a. No vaccination needed
   b. Administer all vaccines immediately
   c. Obtain vaccine titres prior to initiation of JAK inhibitors
   d. Delay JAK inhibitor therapy indefinitely
   e. Only administer live vaccines

Correct Answers

1a, 2e, 3c, 4c, 5c.

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Conflicts of Interest

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Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

References

1. I. H. Huang, W. H. Chung, P. C. Wu, and C. B. Chen, "JAK-STAT Signaling Pathway in the Pathogenesis of Atopic Dermatitis: An Updated Review," *Frontiers in Immunology* 13 (2022): 1068260.

2. A. Wollenberg, M. Kinberger, B. Arents, et al., "European Guideline (EuroGuiDerm) on Atopic Eczema: Part I – Systemic Therapy," *Journal of the European Academy of Dermatology and Venereology* 36, no. 9 (2022): 1409–1431.

3. C. García-Melendo, X. Cubiró, and L. Puig, "Inhibidores de JAK: Usos en Dermatología. Parte 2: Aplicaciones en Psoriasis, Dermatitis Atópica y Otras Dermatosis," *Actas Dermo-Sifiliográficas* 112 (2021): 586–600.

4. C. Samuel, H. Cornman, A. Kambala, and S. G. Kwatra, "A Review on the Safety of Using JAK Inhibitors in Dermatology: Clinical and Laboratory Monitoring," *Dermatology and Therapy* 13, no. 3 (2023): 729–749.

5. P. A. Ireland, M. Verheyden, N. Jansson, D. Sebaratnam, and J. Sullivan, "Infection Risk With JAK Inhibitors in Dermatoses: A Meta-Analysis," *International Journal of Dermatology* 64, no. 1 (2025): 24–36.

6. M. G. Brewer, S. R. Monticelli, M. C. Moran, B. L. Miller, L. A. Beck, and B. M. Ward, "Conditions That Simulate the Environment of Atopic Dermatitis Enhance Susceptibility of Human Keratinocytes to Vaccinia Virus," *Cells* 11, no. 8 (2022): 1337.

7. J. I. Silverberg, J. M. Gelfand, D. J. Margolis, et al., "Association of Atopic Dermatitis With Allergic, Autoimmune, and Cardiovascular Comorbidities in US Adults," *Annals of Allergy, Asthma & Immunology* 121, no. 5 (2018): 604–612.

8. R. Fan and J. M. Cohen, "Vaccination Recommendations for Psoriasis and Atopic Dermatitis Patients on Biologic Therapy: A Practical Guide," *Yale Journal of Biology and Medicine* 95, no. 2 (2022): 249–255.

9. Ministerio de Sanidad, Vacunación en Grupos de Riesgo: Inmunodeficiencias, https://www.sanidad.gob.es/areas/promocionPrevencion/vacunaciones/programasDeVacunacion/riesgo/docs/Inmunodeficiencias.pdf.

10. M. G. Hren and S. Khattri, "Low Rates of Vaccination Among Atopic Dermatitis, Alopecia Areata, Psoriasis, and Psoriatic Arthritis Patients on Biologics," *Archives of Dermatological Research* 316, no. 6 (2024): 285.

11. J. Narbutt, Z. Zuber, A. Lesiak, N. Bien, and J. C. Szepietowski, "Vaccinations in Selected Immune-Related Diseases Treated With Biological Drugs and JAK Inhibitors-Literature Review and Statement of Experts From Polish Dermatological Society," *Vaccine* 12, no. 1 (2024): 82.

12. Sociedad Andaluza de Medicina Preventiva SPyGS, "Guía de Vacunación en Pacientes Tratados Con Anticuerpos Monoclonales y Otros Agentes Biológicos: Una Revisión Actualizada," (2023).

13. M. Bosaeed and D. Kumar, "Seasonal Influenza Vaccine in Immunocompromised Persons," *Human Vaccines & Immunotherapeutics* 14, no. 6 (2018): 1311–1322.

14. Advisory Committe on Immunization Practices (ACIP), Recommendations 2024, https://www.cdc.gov/vaccines/acip/recommendations.html.

15. Y. Huang, H. Wang, and W. W. S. Tam, "Is Rheumatoid Arthritis Associated With Reduced Immunogenicity of the Influenza Vaccination? A Systematic Review and Meta-Analysis," *Current Medical Research and Opinion* 33, no. 10 (2017): 1901–1908.

16. D. Y. M. Leung, B. Jepson, L. A. Beck, et al., "A Clinical Trial of Intradermal and Intramuscular Seasonal Influenza Vaccination in Patients With Atopic Dermatitis," *Journal of Allergy and Clinical Immunology* 139, no. 5 (2017): 1575–1582.

17. J. A. Jung, H. Kita, B. P. Yawn, et al., "Increased Risk of Serious Pneumococcal Disease in Patients With Atopic Conditions Other Than Asthma," *Journal of Allergy and Clinical Immunology* 125, no. 1 (2010): 217–221.

18. K. Winthrop, J. I. Vargas, E. Drescher, et al., "Evaluation of Response to 13-Valent Conjugated Pneumococcal Vaccination in Patients With Rheumatoid Arthritis Receiving Upadacitinib: Results From a Phase 2 Open-Label Extension Study," *RMD Open* 8, no. 1 (2022): e002110.

19. K. L. Winthrop, C. O. Bingham, 3rd, W. J. Komocsar, et al., "Evaluation of Pneumococcal and Tetanus Vaccine Responses in Patients With Rheumatoid Arthritis Receiving Baricitinib: Results From a Long-Term Extension Trial Substudy," *Arthritis Research & Therapy* 21, no. 1 (2019): 102.

20. Ministerio de Sanidad, Vacunas y Programas de Vacunación: Enfermedad Neumocócica Invasiva 2024, https://www.sanidad.gob.es/areas/promocionPrevencion/vacunaciones/vacunas/ciudadanos/enfNeumococicaInvasiva.htm.

21. Sociedad Española de Medicina Preventiva, Salud Pública y Gestión Sanitaria, "Consenso Sobre la Vacunación Frente a Neumococo en el Adulto," (2022).

22. M. Kobayashi, A. J. Leidner, R. Gierke, et al., "Use of 21-Valent Pneumococcal Conjugate Vaccine Among U.S. Adults: Recommendations of the Advisory Committee on Immunization Practices - United States, 2024," *MMWR. Morbidity and Mortality Weekly Report* 73, no. 36 (2024): 793–798.

23. A. J. Scheen, R. Louis, and M. Moutschen, "Apexxnar(R), 20-Valent Pneumococcal Conjugate Vaccine," *Revue Médicale de Liège* 77, no. 11 (2022): 678–683.

24. Vacunación frente a neumococo en el adulta, "Información Para Profesionales Sanitarios. Comunidad de Madrid," (2023), https://www.comunidad.madrid/sites/default/files/doc/sanidad/prev/doc_tecnico_vacunacion_frente_a_neumococo_en_el_adulto_def.pdf.

25. *Programa Vacunación Frente Neumococo* (Junta Castilla y León, 2024), https://www.saludcastillayleon.es/profesionales/es/vacunacion es/programa-vacunacion-frente-neumococo.

26. M. Harigai, K. Winthrop, T. Takeuchi, et al., "Evaluation of Hepatitis B Virus in Clinical Trials of Baricitinib in Rheumatoid Arthritis," *RMD Open* 6, no. 1 (2020): e001095.

27. Y. C. Tien, H. H. Yen, C. F. Li, et al., "Changes in Hepatitis B Virus Surface Antibody Titer and Risk of Hepatitis B Reactivation in HBsAg-Negative/HBcAb-Positive Patients Undergoing Biologic Therapy for Rheumatic Diseases: A Prospective Cohort Study," *Arthritis Research & Therapy* 20, no. 1 (2018): 246.

28. D. P. Patel, J. R. Treat, and L. Castelo-Socio, "Decreased Hepatitis B Vaccine Response in Pediatric Patients With Atopic Dermatitis, Psoriasis, and Morphea," *Vaccine* 35, no. 35 Pt B (2017): 4499–4500.

29. Agency EM, Baricitinib Smpc 2017, https://ec.europa.eu/health/documents/community-register/2017/20170213136870/anx_136870_es.pdf.

30. Sociedad Española de Medicina Preventiva, Salud Pública y Gestión Sanitaria, "Consenso Sobre la Vacunación Frente a Herpes Zóster," (2022).

31. Ministerio de sanidad, Recomendaciones de Vacunación Frente a Herpes Zóster, https://www.sanidad.gob.es/areas/promocionPrevencion/vacunaciones/vacunas/profesionales/zoster.htm#:~:text=Se%20recomienda%20la%20vacunaci%C3%B3n%20en,poblaci%C3%B3n%20que%20cumple%2080%20a%C3%B1os.

32. D. Manzar, N. Nair, E. Suntres, M. Rodrigues, and M. Abu-Hilal, "Systematic Review and Network Meta-Analysis of the Risk of Herpes Zoster With Biological Therapies and Selective Janus Kinase-1 Inhibitors in Atopic Dermatitis," *Postepy Dermatologii I Alergologii* 41, no. 1 (2024): 72–77.

33. E. L. Simpson, J. I. Silverberg, A. Nosbaum, et al., "Integrated Safety Update of Abrocitinib in 3802 Patients With Moderate-To-Severe Atopic Dermatitis: Data From More Than 5200 Patient-Years With up to 4 Years of Exposure," *American Journal of Clinical Dermatology* 25, no. 4 (2024): 639–654.

34. F. Marra, E. Lo, V. Kalashnikov, and K. Richardson, "Risk of Herpes Zoster in Individuals on Biologics, Disease-Modifying Antirheumatic Drugs, and/or Corticosteroids for Autoimmune Diseases: A Systematic Review and Meta-Analysis," *Open Forum Infectious Diseases* 3, no. 4 (2016): ofw205.

35. Ministerio de Sanidad, "Recomendaciones de Vacunación Frente a Gripe y COVID-19 en la Temporada 2024–2025," (2024).

36. U.S. Department of Health and Human Services, "Recommended Adult Immunization Schedule for Ages 19 Years or Older," (2024).

37. Consejo interterritorial del sistema nacional de salud, "Vacunación-Inmunización Específica en Menores y Adolescente (<18 Años) Con Condiciones de Riesgo," *Calendario Recomendado Año* (2024).

38. J. P. Thyssen, C. Vestergaard, S. Barbarot, et al., "European Task Force on Atopic Dermatitis: Position on Vaccination of Adult Patients With Atopic Dermatitis Against COVID-19 (SARS-CoV-2) Being Treated With Systemic Medication and Biologics," *Journal of the European Academy of Dermatology and Venereology* 35, no. 5 (2021): e308–e311.

39. R. A. Waldman and J. M. Grant-Kels, "Dermatology Patients on Biologics and Certain Other Systemic Therapies Should Receive a "Booster" Messenger RNA COVID-19 Vaccine Dose: A Critical Appraisal of Recent Food and Drug Administration and Advisory Committee on Immunization Practices Recommendations," *Journal of the American Academy of Dermatology* 85, no. 5 (2021): 1113–1116.

40. L. Shin, S. Shahsavari, J. Laborada, C. Lee, J. P. Thyssen, and J. J. Wu, "COVID-19 Vaccine Side Effects in Patients With and Without Atopic Dermatitis," *Journal of the European Academy of Dermatology and Venereology* 37, no. 2 (2023): e138–e140.

41. S. Chirasuthat, Y. Ratanapokasatit, K. Thadanipon, and K. Chanprapaph, "Immunogenicity, Effectiveness, and Safety of COVID-19 Vaccines Among Patients With Immune-Mediated Dermatological Diseases: A Systematic Review and Meta-Analysis," *Acta Dermato-Venereologica* 104 (2024): adv40009.

42. O. Simonetti, G. Radi, E. Molinelli, G. Rizzetto, F. Diotallevi, and A. Offidani, "Recommendations for Dermatologists Treating Patients With Atopic Dermatitis During the Covid-19 Pandemic: A Look Into the Past for a Conscious Vaccination Management," *Human Vaccines & Immunotherapeutics* 17, no. 10 (2021): 3268–3275.

43. EMA, "SmPC Abrocitinib," (2023), https://www.ema.europa.eu/en/documents/product-information/cibinqo-epar-product-information_en.pdf.

44. EMA, SmPC Baricitinib 2023, https://ec.europa.eu/health/documents/community-register/2017/20170213136870/anx_136870_en.pdf.

45. EMA, "SmPC Upadacitinib," (2019), https://www.ema.europa.eu/en/documents/product-information/rinvoq-epar-product-information_en.pdf.

46. A. Wollenberg, S. Barbarot, T. Bieber, et al., "Consensus-Based European Guidelines for Treatment of Atopic Eczema (Atopic Dermatitis) in Adults and Children: Part I," *Journal of the European Academy of Dermatology and Venereology* 32, no. 5 (2018): 657–682.

47. I. Riviero-Calle, T. del Rosal-Rabes, E. Garrote-Llanos, et al., "Documento de Consenso de la Sociedad Española de Infectología Pediátrica y el Comité Asesor de Vacunas de la Asociación Española de Pediatría Para la Vacunación en Inmunodeprimidos," *Anales de Pediatría* 99, no. 6 (2023): 403–421.

48. M. Munera-Campos and J. M. Carrascosa, "Janus Kinase Inhibitors in Atopic Dermatitis: New Perspectives," *Actas Dermo-Sifiliográficas* 114, no. 8 (2023): 680–707.

49. C. Haag, A. Alexis, V. Aoki, et al., "A Practical Guide to Using Oral Janus Kinase Inhibitors for Atopic Dermatitis From the International Eczema Council," *British Journal of Dermatology* 192, no. 1 (2024): 135–143.

50. A. Goyal, K. Goyal, and J. F. Merola, "Screening and Vaccinations in Patients Requiring Systemic Immunosuppression: An Update for Dermatologists," *American Journal of Clinical Dermatology* 16, no. 3 (2015): 179–195.

51. P. Rodriguez-Jimenez, I. Mir-Viladrich, P. Chicharro, et al., "Prevention and Treatment of Tuberculosis Infection in Candidates for Biologic Therapy: A Multidisciplinary Consensus Statement Adapted to the Dermatology Patient," *Actas Dermo-Sifiliográficas (English Edition)* 109, no. 7 (2018): 584–601.

52. Centers for Disease Control and Prevention. *Interferon-Gamma Release Assays (IGRAs) – Blood Tests for TB Infection [Internet]* (CDC, Atlanta, 2022), https://www.cdc.gov/tb/hcp/testing-diagnosis/interferon-gamma-release-assay.html.

53. ECDC, "Vaccines Schedules in All Countries in the EU/EEA: European Centre for Disease Prevention and Control," (2025), https://vaccine-schedule.ecdc.europa.eu/.

54. L. Corbella-Bagot, C. Riquelme-McLoughlin, and D. Morgado-Carrasco, "Long-Term Safety Profile and Off-Label Use of JAK Inhibitors in Dermatological Disorders," *Actas Dermo-Sifiliográficas* 114, no. 9 (2023): 784–801.