DIRECTIONS in RESIDENCY
DERMATOLOGY WORLD
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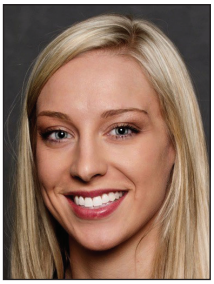
Biologics update 2019

by Elise M. Craig, DO

DRUG & TARGET	CLASS & MECHANISM	FDA APPROVED INDICATIONS	OFF-LABEL USES IN DERMATOLOGY	ROUTE & STORAGE	MONITORING	SIDE EFFECTS & ADVERSE EVENTS	NOTES
TNF- α							
Adalimumab (Humira)	TNF-α inhibitor Fully human recombinant antibody; binds specifically to TNF-α, blocking interaction with p55 and p75 cell surfaces.	*Dermatologic:* → Plaque psoriasis → Hidradenitis suppurativa (HS) (12 years and older) *Other:* → AS → Crohn's disease → Pediatric CD → JIA → PsA → RA → UC → Uveitis	→ PG → Behcet's disease → Aphthous stomatitis → Other neutrophilic dermatoses → Vasculitis → Pustular dermatosis → PRP → IgA pemphigus → Cutaneous sarcoidosis → Disseminated GA → SAPHO syndrome → Relapsing polychondritis	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins) May be stored at room temp for 14 days in original carton protected from light, if needed.	*Before starting:* Test for TB and hepatitis B. Consider CBC, Cr, LFT, hepatitis C and HIV. *Interval monitoring:* Annual TB Test. Routine TBSE.	**Common:** Injection site reaction, URI, rash, UTI, headache, nausea, HLD, abdominal or back pain, flu-like symptoms, HTN, hypersensitivity reactions. **Rare but serious:** CHF; melanoma & NMSC; uveitis; central demyelinating disorders; cytopenias; new-onset psoriasis (especially palmoplantar pustulosis); cutaneous small vessel vasculitis; eczematous eruptions; lichenoid dermatitis. **Black Box Warnings:** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases.	Avoid live vaccines and concurrent administration with IL-1 antagonists (ie; anakinra). Certain needle covers contain latex. Efficacy may wane over time due to development of anti drug antibodies. MTX can be given concurrent to decrease risk of antibody formation. Lupus-like syndromes and autoimmune hepatitis can arise in patients on TNF-α inhibitors. Should not be given with azathioprine, risk of hepatosplenic T cell lymphoma.
Certolizumab pegol (Cimzia)	TNF-α inhibitor Recombinant humanized pegylated antibody Fab' fragment that binds to TNF-α. Selectively neutralizes TNF-α but does not neutralize lymphotoxin α (TNF-B).	*Dermatologic:* → Plaque psoriasis *Other:* → AS → Crohn's disease → PsA → RA	Not well established.	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins). Molecular structure does not cross placental barrier.	*Before starting:* Test for TB and hepatitis B. Consider CBC, Cr, LFT, hepatitis C and HIV. *Interval monitoring:* Annual TB Test. Routine TBSE.	**Common:** UTI, abdominal pain, HA, nausea, allergic reactions, injection site reaction, URI, rash. **Rare but serious:** CHF; melanoma & NMSC; uveitis; central demyelinating disorders; cytopenias; new-onset psoriasis (especially palmoplantar pustulosis); cutaneous small vessel vasculitis; eczematous eruptions; lichenoid dermatitis. **Black Box Warnings:** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases.	Avoid live vaccines and concurrent administration with IL-1 antagonists (ie; anakinra). The needle shield inside the removable cap of the prefilled syringe contains latex. May interfere with aPTT tests. Efficacy may wane over time due to development of anti drug antibodies. MTX can be given concurrent to decrease risk of Ab formation. Lupus-like syndromes and autoimmune hepatitis can arise in patients on TNF-α inhibitors. Should not be given with azathioprine, risk of hepatosplenic T cell lymphoma.

TNF- α continued on p. 2



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This new chart is an update of the **Dermatology Biologics** chart created and compiled by Emily **Milam, MD**, in 2017.

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TNF- α (cont·)							
Etanercept (Enbrel)	TNF-α inhibitor Dimeric fusion protein w/ extracellular ligand-binding portion of human TNF receptor linked to the Fc portion of IgG1. Inhibits binding of TNF-α and TNF-B to cell surface TNF receptors, rendering TNF biologically inactive.	*Dermatologic:* → Adult plaque psoriasis → Pediatric plaque psoriasis (4 years or older) *Other:* → AS → JIA → PsA → RA	→ PG → Behcet's disease → Aphthous stomatitis → Other neutrophilic dermatoses → Subcorneal pustular dermatosis → GVHD → Severe SCLE → Autoimmune bullous disease → Lichen planus → Dermatomyositis → SAPHO syndrome → Scleroderma → Generalized GA → MRH → EAC → Hailey-Hailey	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins).	*Before starting:* Test for TB and hepatitis B. Consider CBC, Cr, LFT, hepatitis C and HIV. *Interval monitoring:* Annual TB Test. Routine TBSE.	**Common:** diarrhea, pruritus, fever, urticarial reaction, injection site reaction, URI, rash. **Rare but serious:** CHF; melanoma & NMSC; uveitis; central demyelinating disorders; cytopenias; new-onset psoriasis (especially palmoplantar pustulosis); cutaneous small vessel vasculitis; eczematous eruptions; lichenoid dermatitis. **Black Box Warnings:** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases.	Avoid live vaccines and concurrent administration with IL-1 antagonists (ie; anakinra). Syringe contains latex. Lupus-like syndromes and autoimmune hepatitis can arise in patients on TNF-α inhibitors. However, some case reports show improvement in SCLE with etanercept. Avoid concomitant use with cyclophosphamide, and abatacept. Efficacy may wane over time due to development of anti drug antibodies. MTX can be given concurrent to decrease risk of Ab formation. Should not be given with azathioprine, risk of hepatosplenic T cell lymphoma.
Golimumab (Simponi)	TNF-α inhibitor Fully humanized recombinant IgG1k monoclonal Ab that binds to both the soluble and transmembrane bioactive forms of human TNF-α.	*Dermatologic:* None *Other:* → AS → PsA → RA → UC	→ Uveitis → Crohn's disease	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins). May be stored at room temp for 30 days in original carton protected from light, if needed.	*Before starting:* Test for TB and hepatitis B. Consider CBC, Cr, LFT, hepatitis C and HIV. *Interval monitoring:* Annual TB Test. Routine TBSE.	**Common:** HSV outbreak, ALT/ALT elevation, HTN, fever, dizziness, paresthesias, injection site reaction, URI, rash. **Rare but serious:** CHF; melanoma & NMSC; uveitis; central demyelinating disorders; cytopenias; new-onset psoriasis (especially palmoplantar pustulosis); cutaneous small vessel vasculitis; eczematous eruptions; lichenoid dermatitis. **Black Box Warnings:** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases.	Avoid live vaccines and concurrent administration with IL-1 antagonists (ie; anakinra). Syringe contains latex. Efficacy may wane over time due to development of anti drug antibodies. MTX can be given concurrent to decrease risk of antibody formation. Lupus-like syndromes and autoimmune hepatitis can arise in patients on TNF-α inhibitors. Should not be given with azathioprine, risk of hepatosplenic T cell lymphoma.

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TNF- α (cont.)							
Infliximab (Remicade)	TNF-α inhibitor Chimeric (human-mouse) IgG1k monoclonal Ab specific for human TNF-α. Neutralizes the biological activity of TNF-α by binding w/ high affinity to the soluble and transmembrane forms of TNF-α, inhibiting it from binding w/ its receptors.	*Dermatologic:* → Psoriasis *Other:* → Adult and pediatric Crohn's → Adult and pediatric UC → AS → PsA → RA	→ PG → Bechet's disease → Granulomatous cheilitis → Vasculitides → PRP → Reactive arthritis → Subcorneal pustular dermatoses → HS → GVHD → Sjogren's → SLE → Dermatomyositis → Scleroderma → Sarcoidosis → Granuloma annulare → Pemphigus vulgaris → SAPHO syndrome → TEN → NLD	IV	*Before starting:* Test for TB and hepatitis B. Consider CBC, Cr, LFT, hepatitis C and HIV. *Interval monitoring:* Annual TB Test. Routine TBSE.	**Common:** Infusion-related reactions, including fever, chills, pruritus, hypo- or hypertension, chest pain, urticaria, shortness of breath; nausea, headache, abdominal pain, dyspepsia, rash, URI, arthralgia. **Rare but serious:** Anaphylaxis; CHF; melanoma & NMSC; uveitis; central demyelinating disorders; cytopenias; new-onset psoriasis (especially palmoplantar pustulosis); cutaneous small vessel vasculitis; eczematous **Black Box Warnings:** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases. eruptions; lichenoid dermatitis,hepatotoxicity, allergic reactions, serum-sickness, cervical cancer. ***Black Box Warnings:*** 1. Serious and fatal infections 2. Lymphoma and other malignancies Screen for: CHF, IBD, demyelinating diseases. **Contraindications:** Allergy to murine proteins. Moderate to severe heart failure.	Avoid live vaccines and concurrent administration with IL-1 antagonists (ie; anakinra). Efficacy may wane over time due to development of neutralizing antichimeric antibodies. MTX can be given concurrent to decrease risk of antibody formation. Lupus-like syndromes and autoimmune hepatitis can arise in patients on TNF-α inhibitors. Should not be given with azathioprine, risk of hepatosplenic T cell lymphoma.
CD20							
Rituximab (Rituxan)	CD20 inhibitor Chimeric monoclonal Ab that binds to CD20 antigen found on surface of mature B cells and causes apoptosis of these cells or existing plasma cells.	*Dermatologic:* → Pemphigus vulgaris *Other:* → CCL → Non-Hodgkin B-cell lymphoma → RA	→ Cutaneous B-cell lymphoma → Autoimmune bullous dermatoses (bullous pemphigoid, paraneoplastic pemphigus, EBA) → SLE → Cutaneous lupus → Dermatomyositis → Chronic GVHD → Vasculitis → Other B-cell-mediated autoimmune and inflammatory diseases.	IV Severe infusion reactions can occur (typically with the first infusion). IV methylprednisone 100 mg typically given prior to infusion. Doses vary widely by indication.	*Before starting:* Test for Tb and hepatitis B. Consider testing hepatitis C & CBC. *Interval monitoring:* Annual TB and consider semi-frequent CBCs.	Serious infections (bacterial, fungal, and viral) can occur up to 1 year after completing therapy, or reactivation of viral infections (especially hepatitis B). Reported cases of bowel obstruction and perforation, cardiac arrhythmias and angina, SJS/TEN, and onset of paraneoplastic pemphigus. **Contraindications:**Hypersensitivity to murine proteins; serious infections. Take precaution in patients with history of angioedema or hypotension. **Black Box Warnings:** 1. Serious or fatal infusion reactions 2. Severe mucocutaneous reactions (i.e. SJS/TEN, paraneoplastic pemphigus). 3. HBV reactivation 4. PML	Avoid live vaccines. Cases of PML have been reported. Tumor lysis syndrome can occur in lymphoma patients. Efficacy may decrease over time due to development of neutralizing antichimeric antibodies.

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IgE							
Omalizumab (Xolair)	IgE inhibitor Humanized IgG1 recombinant monoclonal Ab. Blocks IgE's high affinity Fc receptor, decreasing IgE and blocking its attachment to mast cells, basophils, and dendritic cells.	*Dermatologic:* → Chronic idiopathic urticaria *Other:* → Asthma		SubQ Chronic urticaria 150 or 300 mg q4 weeks (max of 150 mg per injection site). Doses in CIU are not dependent on serum IgE or body weight.	*Before starting:* Consider serum total IgE levels and PFTs.	**Common:** Injection site reactions, arthritis, rash, fever, pruritus, URIs. **Rare but serious:** Anaphylaxis and malignancy. **Black Box Warnings:** 1. Anaphylaxis after first dose, and even after >1 year of treatment	Live virus vaccines should be given cautiously during omalizumab treatment until more data are available.
IL-1							
Anakinra (Kineret)	IL-1 receptor inhibitor Recombinant form of human IL-1 receptor antagonist.	*Dermatologic:* None *Other:* → RA → Neonatal onset multisystem inflammtory disease (NOMID).	→ Urticarial lesions associated with Schnitzler's Syndrome → Periodic fever syndromes. → PG	SubQ Adult RA Dose → 100 mg/daily. For CrCl <30, consider q48h dosing. Pediatric Dose: 1-2mg/kg	*Before starting:* Baseline Cr, CBC, TB. *Interval monitoring:* CBC and Cr monthly x 3 months, then q3 months.	**Common:** Injection site reaction, URI, HA, nausea, vomiting, diarrhea, fever, rash, arthralgia, abdominal pain, flu-like symptoms. **Rare but serious:** Malignancy, neutropenia, & thrombocytopenia. Avoid in patients with severe renal impairment, active infections, asthma, or hypersensitivity to E. coli proteins.	Avoid live vaccines. Syringe contains latex. Do not give concurrently with other TNF- α modifiers. Efficacy may wane due to development of anti drug antibodies.
IL-4							
Dupilumab (Dupixent)	IL-4 receptor inhibitor Humanized IgG1 monoclonal Ab that binds to and inhibits the alpha subunit of the IL-4 receptor, which interferes with IL-4 and IL-13 cytokines.	*Dermatologic:* → Adult atopic dermatitis (18+) → Adolescent atopic dermatitis (ages 12-17) *Other:* → Asthma → CRSwNP	→ Prurigo nodularis → Chronic pruritus → Urticaria → ACD → BP → AA	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins) Adult AD → 600 mg (two 300 mg injections) week 0, then 300 mg q2 weeks.	No baseline or routine tests recommended. Consider CBC with diff q6 months.	**Common:** Injection site reactions, conjunctivitis, HSV outbreak, dry eyes. **Rare but serious:** Keratitis, serum sickness-like reaction, hypersensitivity reaction. Use with caution in patients with acute asthma or possible helminth infection.	Avoid live vaccines.

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IL-12/23							
Ustekinumab (Stelara)	IL-12/IL-23 antagonist Human IgG1k monoclonal Ab that binds w/ high affinity and specificity to p40 protein subunit of both the IL-12 and IL-23 cytokines.	*Dermatologic:* → Psoriasis → Adolescent psoriasis (12 years or older) *Other:* → PsA → Crohn's disease → UC	→ HS → PRP → SLE → AA → Aphthous stomatitis → PG → BP	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins) May be stored at room temp for 4 hours in original carton protected from light, if needed.	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test	**Common:** URIs, HA, injection site reaction, back pain, fatigue. **Rare but serious:** Possible increased risk of adverse cardiovascular events, severe infections, NMSC, malignancy, hypersensitivity reactions including anaphylaxis, non-infectious pneumonia, and eczematous eruptions. Pustular and erythrodermic psoriasis cases have been noted post-marketing.	Avoid live vaccines. Syringe contains latex. Patients deficient in IL-12/IL-23 have increased risk of severe infections with mycobacteria and Salmonella.
IL-17							
Brodalumab (Siliq)	IL-17 receptor antagonist Humanized IgG2 monoclonal Ab that blocks IL-17 receptor A, inhibiting its interactions with IL-17A, IL-17F, IL-17C, IL-17A/F, and IL-25.	*Dermatologic:* → Psoriasis	→ RA	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins)	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** Injection site reactions, increased risk of infection, arthralgia, HA, fatigue, diarrhea, nausea, oropharyngeal pain, myalgia, influenza, and tinea infections. **Rare but serious:** neutropenia. **Black Box Warnings:** 1. Suicidal ideation and behavior.	Avoid live vaccines. Efficacy may decrease over time due to development of neutralizing antibodies. Only avaiable through a restricted program, Siliq Risk Evaluation & Mitigation Strategy (REMS), because of risk of suicidal behavior and ideation. Screen for history of IBD. IL-17 treatment may develop new or cause flaring.
Ixekizumab (Taltz)	IL-17 inhibitor Humanized IgG4 monoclonal Ab that selectively binds with IL-17A and interferes with its binding to the IL-17 receptor.	*Dermatologic:* → Psoriasis *Other:* → AS → PsA	→ RA	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins) May be stored at room temp for 5 days in original carton protected from light, if needed.	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** Injection site reactions, increased risk of infection, URI, nausea, tinea infections. **Rare but serious:** New or exacerbated cases of IBD, hypersensitivity reaction, neutropenia, thrombocytopenia.	Avoid live vaccines. Efficacy may decrease over time due to development of neutralizing antibodies. Screen for history of IBD. IL-17 treatment may develop new or cause flaring.

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IL-17 (cont.)							
Secukinumab (Cosentyx)	IL-17 inhibitor Humanized IgG1 monoclonal Ab that binds to IL-17A cytokine and inhibits its interaction with IL-17 receptor.	*Dermatologic:* → Psoriasis *Other:* → AS → PsA	→ RA → HS	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins)	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** Injection site reactions, increased risk of infection, HSV, nasopharyngitis, diarrhea, URIs. **Rare but serious:** Anaphylactic or hypersensitivity reactions, severe infections, eczematous reactions, and neutropenia.	Avoid live vaccines. Removable cap of pen and prefilled syringe contains latex. Efficacy may decrease over time due to development of neutralizing antibodies. Screen for history of IBD. IL-17 treatment may develop new or cause flaring.
IL-23							.
Guselkumab (Tremfya)	IL-23 inhibitor Recombinant humanized monoclonal Ab; selectively blocks IL-23.	*Dermatologic:* → Psoriasis	→ HS → Pediatric psoriasis → Oral lichen planus → PsA	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins).	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** URI, HA, injection site reactions, arthralgia, diarrhea, gastroenteritis, tinea infections, HSV, elevated liver enzymes.	Avoid live vaccines. Studies for use in PsA are in progress.
Risankizumab (Skyrizi)	IL-23 inhibitor Humanized IgG1 monoclonal Ab that selectively binds to the p19 subunit of IL-23 cytokine and inhibits its interaction with IL-23 receptor.	*Dermatologic:* → Psoriasis	→ PsA → UC → Crohn's disease	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins).	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** URI, HA, injection site reactions, fatigue and tinea infections.	Avoid live vaccines. NOT made with latex. Studies for use in PsA are in progress.
Tildrazkizumab (Ilumya)	IL-23 inhibitor Humanized IgG1/k monoclonal Ab that selectively binds to the p19 subunit of IL-23 and inhibits its interaction with IL-23 receptor.	*Dermatologic:* → Psoriasis	Not well established.	SubQ, store in refrigerator protected from light. Allow to reach room temp before injecting (~30 mins). May be stored at room temp for 30 days in original carton protected from light, if needed	*Before starting:* Test for TB. *Interval monitoring:* Annual TB test.	**Common:** URI, HA, injection site reactions, diarrhea. **Rare but serious:** Hypersensitivity reactions, neutropenia, severe infections.	Avoid live vaccines. Syringe does NOT contain latex Studies for use in PsA are in progress.

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JAK Inhibitors							
Baricitinib (Olumiant)	JAK1 and JAK2 inhibitor Partially inhibits JAK1 and JAK2 enzymatic activity, thereby reducing the phosphorylation and activation of STATs.	*Dermatologic:* None *Other:* → RA	→ AA → AD	PO	*Before starting:* Test for TB, CBC w. diff, hepatitis panel, and lipids. *Interval Monitoring:* - CBC at 4 and 8 weeks, then q3 months. - Periodic CMP - Lipids 12 weeks after starting.	**Common:** URI, UTI, herpes zoster, lipid elevations, nausea, herpes simplex, AST/ALT increase. **Rare but serious:** Increased risk of infections, NMSC, pancytopenia, reactivation of TB, arterial and venous thrombosis, viral reactivation, GI perforation. NOT recommended for patients with severe hepatic or renal impairment.	Avoid live vaccines.
Ruxolitinib (Jakafi)	JAK1 and JAK2 inhibitor Inhibits JAKs, intracellular enzymes that transmit signals arising from cytokine or growth factor receptor interactions, decreasing downstream ILs and hematopoiesis.	*Dermatologic:* None *Other:* → Polycythemia vera → Myelofibrosis → Acute GVHD (12 years or older).	→ AA → Chronic GVHD → Vitiligo	PO Dose is disease specific and based on platelet count.	*Before starting:* Test for TB, CBC w. diff, hepatitis panel, and lipids. *Interval Monitoring:* - CBC at 4 and 8 weeks, then q3 months. - Periodic CMP - Lipids 4-6 weeks after starting.	**Common:** URI, nausea, UTI, herpes zoster, lipid elevations, HA, diarrhea, transient lymphocytosis, bruising, dizziness. **Rare but serious:** Increased risk of infections, NMSC, pancytopenia, reactivation of TB, thrombosis. NOT recommended for patients with severe hepatic or renal impairment.	Avoid live vaccines. Avoid use with fluconazole doses of greater than 200 mg daily.
Tofacitinib (Xeljanz)	JAK3 inhibitor Inhibits JAKs, intracellular enzymes that transmit signals arising from cytokine or growth factor receptor interactions, decreasing downstream interferons, ILs and erythropoietin.	*Dermatologic:* None *Other:* → RA → PsA → UC	→ AA → Psoriasis →AD → Vitiligo → Crohn's disease → PG	PO	*Before starting:* Test for TB, CBC w. diff, hepatitis panel, and lipids. *Interval monitoring:* - CBC at 4 and 8 weeks, then q3 months. - Periodic CMP - Lipids 4-6 weeks after starting.	**Common:** URI, nausea, UTI, herpes zoster, lipid elevations, HA, diarrhea, ALT/AST increase, Cr increase, transient lymphocytosis. **Rare but serious:** Increased risk of infections, NMSC, pancytopenia, reactivation of TB, GI perforation, blood clots, and death. NOT recommended for patients with severe hepatic or renal impairment. **Black Box Warnings:** 1. Serious & fatal infections (including new TB or reactivation) 2. Lymphoma and other malignancies	Avoid live vaccines. Okay to use with MTX. Do not use in combination with other biologics or immunosuppressants. Do not initiate if absolute lymphocyte count <500 cells/mm3, an absolute neutrophil count (ANC) <1000 cells/mm3 or hemoglobin <9 g/dL.

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PDE-4							
Apremilast (Otezla)	PDE-4 inhibitor Small molecule that selectively inhibits PDE-4, increasing intracellular cAMP, which decreases inflammatory TNF-α and IL-23, and increases anti-inflammatory IL-10.	*Dermatologic:* → Psoriasis → Behcet's disease *Other* → PsA	→ AA → HS → AD	PO	*Before starting:* None indicated *Interval monitoring:* None indicated	**Common:** Diarrhea, nausea, vomiting, weight loss, HA, back pain, fatigue, insomnia, URI. Use with caution in patients with depression, suicidal ideation, and CrCl <30.	GI side effects often improve after first few weeks of treatment. Use with cytochrome P450 enzyme inducers (rifampin, phenobarbital, carbamazepine, phenytoin) is not recommended as they reduce systemic exposure of apremilast.

Abbreviations:
AA = Alopecia areata
Ab = Antibody
AD = Atopic dermatitis
AS = Ankylosing spondylitis
CD = Crohn's disease
CRSwNP = Chronic rhinosinusitis with nasal polyposis
GVHD = Graft versus host disease
HS = Hidradenitis suppurativa
HSV = herpes simplex virus
IBD = Inflammatory bowel disease
JIA = Juvenile idiopathic arthritis
MRH = Multicentric reticulohistiocytosis
PDE = Phosphodiesterase
PG = Pyoderma gangrenosum
PRP = Pityriasis rubra pilaris
PsA = Psoriatic arthritis
RA = Rheumatoid arthritis
SCLE = Subacute cutaneous lupus erythematosus
TEN = Toxic epidermal necrolysis

PSORIASIS guide on p. 7

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TNF = Tumor necrosis factor

PSORIASIS DOSING GUIDE

Drug	Initial Dosing Regimen	First 52 Weeks	Second 52 Weeks
Tildrakizumab (Ilumya)	100 mg administered at week 0, week 4, and q12 weeks thereafter	6 doses	4 doses
Ustekinumab (Stelara)	For pts >100kg, 90 mg administered at week 0, week 4, and q12 weeks thereafter. For pts 60-100kg, 45 mg administered at week 0, week 4, and q12 wks thereafter. For adolescents <60kgs, 0.75 mg/kg administered at week 0, week 4, and q12 wks thereafter.	6 doses	4 doses
Rizankizumab (Skyrizi)	150 mg (two 75 mg injections) administered at week 0, week 4, and q12 weeks thereafter.	6 doses (2 injections/dose)	4 doses (2 injections/dose)
Guselkumab (Tremfya)	100mg at week 0, week 4, then q8 weeks thereafter	8 doses	6 doses
Infliximab (Remicade)	5mg/kg given as an IV induction regimen at 0, 2, and 6 weeks, followed by maintenance regimen of 5 mg/kg q8 wks thereafter. Doses ranging from 3-10 mg/kg have been used. Infusion should be administered over 2 or more hours.	8 infusions	6 infusions
Secukinumab (Cosentyx)	300 mg (two 150 mg injections) at weeks 0, 1, 2, 3, and 4 followed by 300 mg q4 weeks. 150 mg may be acceptable for some patients.	17 doses (2 injections/dose)	13 doses (2 injections/dose)
Ixekizumab (Taltz)	160 mg (two 80 mg injections) at week 0, then 80 mg weeks 2, 4, 6, 8, 10, and 12, then 80 mg q4 weeks.	18 doses	13 doses
Certolizumab pegol (Cimzia)	400 mg (2 injections of 200 mg) every other week. With body weight ≤ 90 kg, consider a dose of 400 mg (2 injections of 200 mg each) at weeks 0, 2, and 4, followed by 200 mg every other week.	26 doses (2 injections/ dose)	26 doses (2 injections/dose)
Adalimumab (Humira)	80 mg week 0, followed by 40 mg every other week (starting 1 week after initial dose).	27 doses	26 doses
Brodalumab (Siliq)	210 mg at weeks 0, 1, and 2, followed by 210 mg q2 weeks.	28 doses	26 doses
Etanercept (Enbrel)	Adult: 50mg twice weekly x 3 months, followed by 50mg once weekly. Pediatric: <63kg: 0.8mg/kg weekly (maximum of 50mg). ≥63kg: 50mg weekly.	64 doses	52 doses
Apremilast (Otezla)	10 mg on day 1, 10 mg BID day 2, 10 mg in the am and 20 mg in the pm day 3, 20 BID day 4, 20 mg in the am and 30 mg in the pm day 5, 30 mg BID day 6, and continue with 30 mg BID daily. - If CrCl <30, start 10mg daily x 3 days, then 20mg daily x 2 days, then 30mg daily.	729 doses	730 doses

Sources:

1. Wolverton, S. Comprehensive Dermatologic Drug Therapy: Saunders Elsevier; 2013.
2. Bolognia J, Jorizzo J, Schaffer I. Dermatology. Philadelphia: Elsevier; 2017.
3. https://www.accessdata.fda.gov/drugsatfda_docs/label/2012/125036s0144lbl.pdf
4. http://www.rxabbvie.com/pdf/humira.pdf
5. http://media.celgene.com/content/uploads/otezla-pi.pdf
6. http://www.kineretrx.com/pdf/Full-Prescribing-Information-English.pdf
7. https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/761032lbl.pdf
8. https://www.cimzia.com/sites/default/files/docs/Prescribing_Information.pdf
9. https://www.regeneron.com/sites/default/files/Dupixent_FPI.pdf
10. https://www.fda.gov/downloads/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/UCM143346.pdf
11. http://pi.amgen.com/~/media/amgen/repositorysites/pi-amgen-com/enbrel/enbrel_pi.pdf
12. https://www.simponi.com/shared/product/simponi/prescribing-information.pdf
13. https://www.tremfyahcp.com/pdf/PrescribingInformation.pdf
14. http://www.janssenlabels.com/package-insert/product-monograph/prescribing-information/REMICADE-pi.pdf
15. http://uspl.lilly.com/taltz/taltz.html#pi
16. https://www.gene.com/download/pdf/xolair_prescribing.pdf
17. https://www.gene.com/download/pdf/rituxan_prescribing.pdf
18. https://www.pharma.us.novartis.com/sites/www.pharma.us.novartis.com/files/cosentyx.pdf
19. http://labeling.pfizer.com/ShowLabeling.aspx?id=959
20. https://www.stelarahcp.com/sites/www.stelarahcp.com/files/prescribing-information-stelara.pdf?v=11
21. Ahn CS, Dothard EH, Garner ML, Feldman SR, Huang WW. To test or not to test? An updated evidence-based assessment of the value of screening and monitoring tests when using systemic biologic agents to treat psoriasis and psoriatic arthritis. J Am Acad Dermatol. 2015;73(3):420-8.e1.
22. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6694799/
23. https://www.rxabbvie.com/pdf/skyrizi_pi.pdf
24. https://www.ilumya.com/pdfs/Sun_Pharma_ILUMYA_US_Prescribing_Information.pdf
25. https://www.jakafi.com/pdf/prescribing-information.pdf
26. https://www.jaad.org/article/S0190-9622(06)02085-8/fulltext#sec4.13.3
27. https://www.fda.gov/drugs/drug-safety-and-availability/fda-approves-boxed-warning-about-increased-risk-blood-clots-and-death-higher-dose-arthritis-and
28. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6820255/
29. https://www.ncbi.nlm.nih.gov/pubmed/30768788
30. https://jamanetwork.com/journals/jamadermatology/article-abstract/2717575