

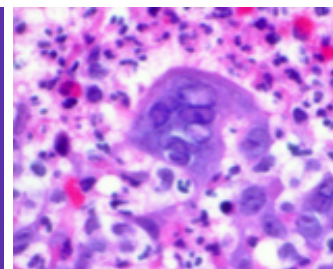


eLITERATURE REVIEW

eMedicalDermatology Review

Presented by
The Johns Hopkins University
School of Medicine, The Institute
for Johns Hopkins Nursing, and The
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June 2007: VOLUME 1, NUMBER 2

New Developments in Biologic Therapy for Psoriasis



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Welcome...

Johns Hopkins University School of Medicine, The Institute for Johns Hopkins Nursing and The University of Tennessee College of Pharmacy are pleased to welcome you to the second issue of **eMedicalDermatology Review**. Over the course of this series, we will be reporting on issues critical to providing the safest and most effective care for patients with medical dermatological conditions.

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In This Issue...

Five biologic therapies have already been introduced for the treatment of psoriasis or psoriatic arthritis, and several others are in development. While biologic therapy has rapidly gained acceptance in the dermatology community, reports of side effects are increasing as the use of these agents grows.

In this issue we review information about a new biologic agent (anti IL-12/23) for psoriasis, present data on the efficacy of TNF- α blockers for psoriasis, examine clinical outcomes in patients switched from one TNF- α blocker to another, and review the current literature on the side effects of TNF- α blockers.

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Guest Faculty Disclosure

Mark Lebwohl, MD, has disclosed that he has received grants for clinical research and educational activities from, has served as an advisor, consultant and speaker to, and has served as an investigator for Abbott, Amgen, Astellas, Centocor, Genentech and Novartis.

Unlabeled/Unapproved Uses

The author has indicated that there will be references to unlabeled/unapproved uses of drugs or products in this presentation. Etanercept for hepatitis C is off-label; Etanercept, adalimumab and infliximab are off-label for lupus.

LEARNING OBJECTIVES

The Johns Hopkins University School of Medicine and The Institute for Johns Hopkins Nursing take responsibility for the content, quality, and the scientific integrity of this CE activity.

At the conclusion of this activity, participants should be able to:

- Discuss new biologic therapies recently introduced or in development for psoriasis
- Describe the current evidence concerning the side effects of specific biologic agents
- Detail clinical outcomes occurring when switching patients from one biologic agent to another

COMMENTARY



When biologics first became available for psoriasis, they were met with great excitement because they held the promise that we could treat psoriasis effectively while avoiding the nephrotoxicity of cyclosporine, and the bone marrow and hepatotoxicity of methotrexate. Dermatologists quickly learned that the early biologics were not reliably effective and were much too expensive, leading to skepticism about their use.

The skeptics did not dissuade development, however, and we now have highly effective biologic therapies for psoriasis. Five biologic agents are currently available for the treatment of psoriasis or psoriatic arthritis, including: adalimumab, alefacept, efalizumab, etanercept, and infliximab. The efficacy of biologics is variable, but can be impressive: the Poulalhon study found that even in patients who have failed three systemic therapies, infliximab achieved 75% improvement in PASI scores in 68% of patients. Krueger's report on the early results of an extraordinarily effective novel biologic agent, anti IL-12/23, which targets the p40 component of the latter cytokines, shows that even a single subcutaneous injection of the lowest dose tested achieved PASI 75 in 52% of patients. 81% of those who received four weekly injections of the double dose achieved PASI 75.

Unfortunately, as we gain more experience with biologics, we are likely to encounter more side effects, some of which may or may not be related to these newly introduced drugs. Bongartz et al published a widely quoted article suggesting that TNF blockers increase the risk of serious infections and malignancy. Shortly after publication of this article, numerous letters to the editor and commentaries pointed out flaws in the study^[1-3]. Specifically, etanercept, a TNF blocker, was excluded from the study analyses, and many of the malignancies reported were basal cell carcinomas and lymphomas. If these are subtracted from the total, the risk of malignancy may not be increased. It was also suggested that the risk of malignancy might be related to the severity of rheumatoid arthritis rather than the drugs, and the risk for disease progression was far greater than the risk of serious side effects^[1].

In a letter to the editor, representatives of the FDA noted these discrepancies: they requested that the analyses be adjusted for duration of exposure; requested meta-analyses for all three TNF inhibitors; and compared the number of malignancies reported to the number expected based on an established database — the Surveillance, Epidemiology, End Results database (SEER). Compared to the SEER database, they did not find an increase in malignancies for any of the TNF inhibitors^[2].

Apart from potential risks of malignancy and infection, a number of additional side effects have emerged, as reported by Cohen et al. There have been numerous cases of psoriasis or psoriasis-like skin lesions developing in patients with rheumatoid arthritis or Crohn's disease who do not have a personal or family history of psoriasis. The temporal association with TNF- α inhibitor therapy is not clear, but in those instances where psoriasis develops quickly upon re-introduction of a second TNF- α inhibitor, the association is difficult to dispute. Moreover, involvement of pubic skin and palms and soles is commonly reported in this setting, not only in the patients discussed here, but in other reports as well.

Finally, the association of TNF inhibitor therapy and autoimmunity is confirmed by Poulalhon. 18 of 25 patients studied (72%) had antinuclear antibodies. Of the 18 patients, 17 had IgM anti-DSDNA-AB, but only four had IgG anti-DSDNA-AB, an increase that was not statistically significant. Of interest, IgG anti-DSDNA-AB poses more of a risk for the development of systemic lupus erythematosus than IgM, which may explain why there are very few cases of infliximab-induced lupus.

While real or potential side effects must be considered when prescribing biologic therapies for psoriasis, they must be weighed against the benefits of biologic therapies. In patients with mild disease, there is little reason to consider any



treatment that might have significant side effects. However, in those with potentially destructive joint disease or quality-of-life-destroying skin lesions, the small risks are usually worth taking.

References

1. Shoor S. [Review: anti-tumor necrosis factor antibody therapy for rheumatoid arthritis increases risk for serious infection and malignancy](#). ACP J Club. 2006;145(3):65.
2. Okada SK, Siegel JN. [Risk of serious infections and malignancies with anti-TNF antibody therapy in rheumatoid arthritis](#). JAMA. 2006;296(18):2201-2; author reply 2203-4.
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ANTI IL-12/23: A NEW TREATMENT FOR PSORIASIS

Krueger GG, Langley RG, Leonardi C, Yeilding N, Guzzo C, Wang Y, Dooley LT, Lebwohl M; **CNTO 1275 Psoriasis Study Group**. **A human interleukin-12/23 monoclonal antibody for the treatment of psoriasis**. N Engl J Med. 2007;356(6):580-92.

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Human interleukin-12 activates CD4+ T cells and natural killer cells, resulting in release of interferon- γ and tumor necrosis factor- α . Interleukin-23 activates T cells that express interleukin-17, which in turn results in keratinocyte expression of inducible nitric oxide synthase. The human monoclonal antibody studied in this trial targets p40, a component of both IL-12 and IL-23.

Four doses were studied in this double-blind placebo-controlled trial. Subjects were treated with either a solitary injection of the low dose (45 mg) anti IL-12/23; a double dose (90 mg); 4 weekly 45 mg doses (180 mg total); or 4 weekly 90 mg doses (360 mg total). Sixty-four patients were studied in each group as well as in the placebo control group. At Week 16, patients with a physicians' global assessment less than excellent received an additional injection of their original dose. At Week 20, the patients in the placebo group were treated with a single 90 mg injection. To enter into the study, patients had moderate-to-severe psoriasis that made them candidates for phototherapy or systemic therapy, and at least a 10% body surface area involvement. The average body surface area affected in patients in this trial was 25%.

The investigators report dramatic results. 52% of patients who received the single low dose of anti IL-12/23 achieved PASI 75. In the 90 mg, 180 mg, and 360 mg dose groups, 59%, 67%, and 81% achieved PASI 75 respectively, showing a clear dose-dependent response. Only 37% of patients in the treatment group did not achieve an excellent response, thus making them eligible to receive an additional Week 16 dose. The proportion of patients achieving PASI 50, PASI 75, and PASI 90 remained fairly stable throughout Week 24 of the study.

Four percent of patients in the active treatment groups discontinued the trial as a result of adverse events, compared to 3% in the placebo group. Infections occurred in 43% of patients undergoing active treatment, compared to 39% of patients in the placebo group. Adverse events or infections did not correlate with dose.

Serious adverse events included hospitalizations for cellulitis and pneumonia in two patients in the active treatment groups. Although two patients in the active treatment groups also had myocardial infarctions, both had prior risk factors for heart disease; one patient with hypertension and hyperlipidemia had a stroke. There were also three malignancies in the active treatment groups: one patient

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with a basal cell carcinoma, one with a cutaneous squamous cell carcinoma, and one with prostate cancer. In comparison, a solitary basal cell carcinoma as well as a hospitalization for exacerbation of psoriasis occurred in the placebo group. Blood chemistries and hematologies were similar between the active and placebo groups.

In summary, this anti IL-12/23 human monoclonal antibody was highly effective for psoriasis, resulting in dose-dependent improvement and sustained remissions. While this trial was too small to detect uncommon adverse events, there were no signals suggesting a major risk for malignancy, infection, or other serious adverse events.

INFLIXIMAB EFFECTIVE FOR PSORIASIS THAT IS REFRACTORY TO NUMEROUS THERAPIES, BUT ASSOCIATED WITH HIGH DEGREE OF AUTOANTIBODY FORMATION

Poulalhon N, Begon E, Lebbé C, Lioté F, Lahfa M, Bengoufa D, Morel P, Dubertret L, Bachelez H. **A follow-up study in 28 patients treated with infliximab for severe recalcitrant psoriasis: evidence for efficacy and high incidence of biological autoimmunity.** British Journal of Dermatology. 2007;156:329-336.

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Infliximab is a TNF blocker that is highly effective for rheumatoid arthritis, spondyloarthritis, and Crohn's disease, and has been proven to be one of the most effective treatments available for psoriasis and psoriatic arthritis. More than 60% of patients with rheumatoid arthritis treated with infliximab develop antinuclear antibodies (ANA) as well as antidouble-stranded-DNA antibodies (anti-DSDNA-AB) and anticardiolipin antibodies. ANA have also been reported in Crohn's disease patients treated with infliximab, although the frequency is somewhat less than that reported in rheumatoid arthritis. ANA are more commonly found in patients treated with infliximab than those treated with etanercept.

There is limited data on the development of autoantibodies in psoriasis patients treated with infliximab. In an earlier study, approximately 25% of patients developed ANA 6 months after starting a course of 3 infliximab infusions, but there was no data on ANA titers or IgM or IgG isotypes of anti-DSDNA-AB. Moreover, there have been no studies showing what happens to ANA following discontinuation of the treatment.

Twenty patients with severe plaque psoriasis, five with psoriatic erythroderma, and three with generalized pustular psoriasis were recruited for the study. All had disease that was refractory to 3 or more systemic treatments. As might be expected considering the stringent entry criteria, psoriasis was generally severe with a median PASI score of 28. Thirteen patients had psoriatic arthritis. The patients were treated with infusions of infliximab (5 mg/kg) at baseline, Week 2, Week 6, and every 8 weeks thereafter.

Therapeutic efficacy was dramatic in this difficult-to-treat group of patients, with a median improvement in PASI score of 88.1%. 88% achieved PASI 50, 68% PASI 75, and 52% PASI 90. Of the 5 patients with psoriatic erythroderma, PASI 75 was achieved in 3 patients and PASI 90 in 2 patients. Of the 3 patients with generalized pustular psoriasis, clearing occurred within 15 days of infliximab therapy in 2 patients, with only residual keratoderma in 1 patient. Infliximab was discontinued in the latter 3 patients because of a suspected infusion reaction, a

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flare of plaque psoriasis, and loss of vascular access. Two of the 3 patients experienced relapse of their pustular psoriasis 12 and 22 months after the last infusion, and one was still clear of pustular lesions 9 months after therapy.

Three patients (12%) had ANA at baseline and 18 (72%) had ANA at Week 22. 16 of the 18 patients had a homogeneous ANA fluorescence pattern, 10 had a speckled pattern, and 4 a nucleolar pattern. At Week 22, 7 of the 25 patients with ANAs had titers $\geq 1/1600$; the median titer was 1/400 compared to baseline titers $\leq 1/80$ among the 3 patients with ANAs before starting infliximab. 17 of the 18 patients with positive ANAs at Week 22 had IgM anti-DSDNA-AB compared to 0 at baseline. Only 4 patients had IgG anti-DSDNA-AB at Week 22 compared to 0 at baseline, a difference that was not statistically significant. Of 8 patients checked for anti-ENA antibodies, none were positive either at baseline or at Week 22. Only 4 patients were tested for anticardiolipin antibodies: 1 was positive for anticardiolipin IgM at Week 22, and another had anticardiolipin IgG at baseline and at Week 22. No patients had clinical features of the antiphospholipid syndrome. Antihistone antibodies were negative in 6 patients as well. Further, use of methotrexate did not have any impact on the prevalence of any autoantibodies.

Of patients who discontinued infliximab, 9 had ANA and anti-DSDNA-AB checked at their last infusions and again between 5 and 21.7 months later. All 9 had positive ANA and IgM anti-DSDNA-AB and one had IgG anti-DSDNA-AB. After discontinuation, 8 of 9 patients still had ANA at a median titer of 1/400 compared to a median of 1/1600 at the time of discontinuation. Four of the patients still had IgM anti-DSDNA-AB, and titers were reduced in three but slightly increased in one patient. No patients met criteria for systemic lupus erythematosus, although 3 patients developed symmetric peripheral polyarthralgias. The 3 patients had ANA and IgM anti-DSDNA-AB at Week 22, and 1 had IgG anti-DSDNA-AB. Measurement of antihistone autoantibodies was negative; ESR, CBC, and urinary sediment were normal; and there were no other features of lupus. One patient's joint symptoms resolved despite continued infliximab therapy. The authors suggested the possibility that the joint pains might be related to a serum sickness-like infusion reaction. Psoriatic arthritis was also considered.

In summary: infliximab is highly effective, even in patients who have failed multiple systemic therapies for psoriasis. It is also rapidly effective for generalized pustular psoriasis and is effective for erythrodermic psoriasis. A high proportion of patients develop autoantibodies, but very few go on to develop clinical manifestations related to those autoantibodies.

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1. Gottlieb AB, Evans R, Li S, Dooley LT, Guzzo CA, Baker D, Bala M, Marano CW, Menter A. [Infliximab induction therapy for patients with severe plaque-type psoriasis: a randomized, double-blind, placebo-controlled trial.](#) J Am Acad Dermatol. 2004 Oct;51(4):534-42.

TNF INHIBITORS: A REVIEW OF CLINICAL TRIALS FOR SERIOUS INFECTIONS AND MALIGNANCIES

Bongartz T, Sutton AJ, Sweeting MJ, Buchan I, Matteson EL, Montori V. **Anti-TNF Antibody Therapy in Rheumatoid Arthritis and the Risk of Serious Infections and Malignancies: Systematic Review and Meta-analysis of Rare Harmful Effects in Randomized Controlled Trials.** JAMA. 2006;295(19):2275-2285.

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There is substantial in vitro and in vivo data to support a major role for TNF in

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fighting infection and malignancy. While isolated trials of TNF inhibitors have failed to demonstrate a statistically significant increase in malignancies in treated patients compared to controls, there have been numerous post-marketing reports of opportunistic infections and of malignancies in patients treated with these agents. The authors of this study therefore searched various databases for randomized placebo-controlled trials lasting at least 12 weeks that studied the safety and efficacy of adalimumab or infliximab for the treatment of rheumatoid arthritis. Nine trials met their criteria for inclusion in this meta-analysis. All data were analyzed to find serious infections that required antimicrobial therapy or hospitalization or malignancies.

The authors point out that although malignancies were rare in the single trials, they discovered 24 malignancies in 3,493 (0.8%) patients who had received at least one dose of TNF inhibitors, compared to only two malignancies in the 1,512 control patients (0.2%). There was a dose-dependent increase in the risk of malignancies. The pooled odds ratio for developing malignancy in patients treated with TNF inhibitors was 3.3 compared to controls (95% confidence interval, 1.2-9.1).

126 patients treated with TNF inhibitors developed serious infections compared to 26 patients in the placebo groups, and the odds ratio for serious infection in rheumatoid arthritis patients treated with TNF inhibitors was 2.0 compared to controls (95% confidence interval, 1.3-3.1).

However, the authors point out a number of possible flaws in their analysis. First, when the studied events are rare, there is substantial mathematical instability, so that small changes in the number of events can result in major changes in the estimated relative risk. The authors also acknowledge that the different trials included in their meta-analysis were heterogeneous in terms of disease duration, disease activity, and other treatments used either prior to the study or concomitantly with the TNF inhibitor.

Despite the finding of increased risk of malignancy and infection, the authors point out the tremendous value that TNF inhibitors confer on patients with rheumatoid arthritis. Joint destruction is reduced, mobility increased, and quality of life improved. They also point out that TNF inhibitors may lessen cardiovascular events, which are the leading cause of death in patients with rheumatoid arthritis. It is also of interest that this meta-analysis did not show an increase in malignancies with longer study duration, and the authors suggest that TNF inhibitors may accelerate pre-existing sub-clinical malignancies rather than induce malignancies. In any case, the overall risks of therapy with TNF inhibitors must be weighed against their benefits.

TNF-INDUCED PSORIASIS: AN UNCOMMON AND UNEXPECTED SIDE EFFECT

Cohen JD, Bournerias I, Buffard V, Paufler A, Chevalier X, Bagot M, Claudepierre P. **Psoriasis Induced by Tumor Necrosis Factor- α Antagonist Therapy: A Case Series.** *Journal of Rheumatology.* 2007;34(2):380-85.

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TNF blockers have been used in hundreds of thousands of patients for the treatment of rheumatoid arthritis, Crohn's disease, ankylosing spondylitis, and other illnesses as well as psoriasis and psoriatic arthritis. Cutaneous side effects include skin infections, eczematous reactions, drug eruptions, vasculitis, cutaneous lupus, and possibly squamous cell carcinoma of the skin. The authors report six cases of new onset psoriasis among the 400 patients whom they

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treated with TNF blockers.

The six patients whom they reported had rheumatoid arthritis (2), Crohn's disease and spondyloarthropathy (3), and ankylosing spondylitis (1). Five of the patients were treated with infliximab, and in two of the patients, infliximab was discontinued and the patients were treated with etanercept. A sixth patient was treated only with etanercept and methotrexate. Concomitant medications included methotrexate in two patients and azathioprine in one. The time course to developing psoriasis after starting on the TNF blocker was quite variable: one patient developed psoriasis after 41 months following the initiation of infliximab infusions; another developed psoriasis-like skin lesions 2 months after starting.

The distribution of skin lesions was also quite varied. Pubic lesions developed in three patients, and palmoplantar lesions in another three patients. One of the patients with palmoplantar lesions developed pustules on the palms and soles. Psoriasis resolved in all patients with either topical therapy, discontinuation of the TNF blocker, or both. In four of the patients, the TNF blocker was continued, but skin lesions responded to topical therapy.

In two of the most convincing cases, psoriasis developed after infliximab and subsequently after etanercept. In one of the cases, the patient developed skin lesions ten days after her sixth infusion. The lesions persisted despite discontinuation of infliximab, but cleared with topical corticosteroids. Several months later, the patient's spondyloarthropathy flared, necessitating treatment with etanercept 25 mg twice per week. The patient developed psoriasiform skin lesions 36 hours after the first injection. The lesions again responded to treatment with topical corticosteroids.

In a second patient with Crohn's disease and spondyloarthropathy, psoriasis developed on the palms and soles and then three weeks after the third infliximab infusion, skin lesions spread to the torso but cleared when infliximab was discontinued. Several months later, the patient's arthritis flared, again necessitating treatment with etanercept 25 mg twice per week. Palm and sole psoriasis recurred after the second injection. At that time, the patient was noted to have pitted nails. Skin lesions resolved following discontinuation of etanercept and administration of topical therapy.

These six cases are typical of TNF- α antagonist-induced psoriasis. The authors refer to at least 40 additional cases and quote an online survey in which the majority of rheumatologists confirm that they have seen psoriasis or other skin reactions during TNF- α therapy. Significant factors — the absence of a personal or family history of psoriasis; the temporal association of the development of skin lesions following treatment with TNF- α blockers, especially in the two patients treated with different TNF- α blockers; and skin biopsy in one patient — all support the diagnosis of TNF- α -induced psoriasis. There have been reports of psoriasis following treatment with infliximab, etanercept, and adalimumab. The authors point out that psoriasis might have not been noticed by examining physicians before TNF- α blockers were used, but the distribution of skin lesions, in the pubic region and on the palms and soles, suggest that there are some unique features of psoriasis in patients treated with TNF- α blockers. Of note, there were no cases of erythrodermic psoriasis. The authors also point out that psoriasis occurred despite concomitant methotrexate and azathioprine in their patients.

SWITCHING: WHEN ONE TNF BLOCKER FAILS, DO YOU SWITCH TO ANOTHER? RHEUMATOID ARTHRITIS AS A MODEL

Hyrich KL, Lunt M, Watson KD, Symmons DPM, Silman AJ, for the British Society for Rheumatology Biologics Register. **Outcomes After Switching From One Anti-Tumor**

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TNF- α inhibitors had been used for the treatment of rheumatoid arthritis for years before their introduction for the treatment of psoriasis. In contrast to the data obtained in psoriasis trials, TNF blockers are similarly effective to one another in treating rheumatoid arthritis. The three drugs vary in a number of ways: infliximab is a chimeric monoclonal antibody; adalimumab is a human monoclonal antibody; and etanercept is a fusion molecule consisting of the FC portion of human IgG1 and the P75 TNF- α receptor. Like the other two drugs, etanercept binds to TNF- α ; however, it also binds to lymphotoxin, which has a number of differing biologic effects. The three drugs also have differing half-lives: etanercept with the shortest at only 4 days, while adalimumab's is 3 times longer. The formation of antibodies against the drugs may play a role in their biologic effects, and the chimeric nature of infliximab may lead to more clinically significant antibody formation.

Significant numbers of patients with rheumatoid arthritis and with psoriasis discontinue therapy with particular TNF blockers, either because of inadequate efficacy or because of the development of side effects. There are numerous reports of patients failing therapy with one TNF blocker, only to succeed with a second TNF blocker. The authors studied the likelihood of failure with a second TNF blocker after either inadequate response or side effects from a first TNF blocker in patients with rheumatoid arthritis.

The British Society for Rheumatology Biologics Register requires that all rheumatoid arthritis patients starting on TNF- α inhibitors register until 4,000 patients are recruited for each of the TNF inhibitors on the market. In the current study, only rheumatoid arthritis patients who had been followed for a minimum of 6 months were included. 6,739 patients were analyzed for this study — 3,337 (45%) on infliximab, 2,826 (42%) on etanercept, and 876 (13%) on adalimumab (reflecting the more recent approval of the latter drug). Patients were followed for 6-61 months, with a mean follow-up period of 15 months.

More than 1/3 of patients discontinued treatment with their first TNF inhibitor, with 12% stopping because of lack of efficacy and 15% because of a side effect. Of those patients who stopped, 46% switched to a second TNF inhibitor. More patients who stopped their first agent because of inadequate efficacy (60%) started a second TNF inhibitor compared to those stopping their first agent because of side effects (35%).

At the time that data for this study were analyzed, 73% of patients were still being treated with their second TNF inhibitor, with a mean length of therapy of 6 months and a maximum length of therapy of 32 months.

Sixteen percent of patients who discontinued their first agent because of inadequate efficacy also discontinued their second agent, whereas only 9% of patients who discontinued their first TNF inhibitor because of side effects discontinued the second agent for lack of efficacy.

For patients who discontinued their first TNF inhibitor because of side effects, 20% discontinued the second TNF inhibitor for side effects; whereas patients who discontinued the first TNF inhibitor because of inadequate efficacy had a discontinuation rate due to side effects of only 10% for the second TNF inhibitor.

Thus, inadequate efficacy with one agent makes it more likely the second agent will fail for lack of efficacy. Similarly, discontinuation for side effects with the first agent makes it more likely the second agent will be discontinued for side effects. Interestingly, of 71 patients who had side effects with both TNF inhibitors, only 19

experienced the same side effect with both agents.

These data are important in that they suggest that patients with rheumatoid arthritis failing one TNF blocker may respond well to a different TNF blocker. In fact, the majority of patients who switched to a second TNF blocker continued that therapy beyond 6 months. Very often, patients who discontinued the second agent do so for the same reasons that they discontinued the first.

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The Johns Hopkins University School of Medicine and The Institute for Johns Hopkins Nursing takes responsibility for the content, quality, and scientific integrity of this CME/CNE/CPE activity.

Target Audience — [back to top](#)

This activity has been developed for the Dermatologist, PharmD, Nurses, Dermasurgeon, Dermatopathologist, Pediatric Dermatologist, Immunodermatologist, Wound Care Specialist.

Learning Objectives — [back to top](#)

COMPLETE THE POST TEST

Step 1.

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Step 2.

If you have participated in a Johns Hopkins on-line course, login. Otherwise, please register.

Step 3.

Complete the post-test and course evaluation.

Step 4.

Print out your certificate.

PHYSICIAN
POST-TEST

NURSE
POST-TEST

Pharmacy credit is only available via PDF mail-in form:

PHARMACY
POST-TEST

At the conclusion of this activity, participants should be able to:

- Discuss new biologic therapies recently introduced or in development for psoriasis
- Describe the current evidence concerning the side effects of specific biologic agents
- Detail clinical outcomes occurring when switching patients from one biologic agent to another

Internet CME/CNE/CPE Policy — [back to top](#)

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- **Bernard A. Cohen, MD** has indicated a past and current financial relationship with Novartis, Pharmaceuticals, Astellas Pharma Inc., Medicis and Connetics. He served on the Speaker's Bureau for Novartis, Pharmaceuticals, Astellas Pharma Inc., and Medicis. He has also received grants for studies from Novartis, Pharmaceuticals and Astellas Pharma Inc. and received support for a fellowship program from Connetics.
- **Susan Matra Rabizadeh, MD, MBA** has disclosed no relationships with commercial supporters.
- **Mark Lebwohl, MD** has disclosed that he has received grants for clinical research and educational activities from, has served as an advisor, consultant and speaker to, and has served as an investigator for Abbott, Amgen, Astellas, Centocor, Genentech and Novartis.

Dr. Lebwohl has indicated that there will be references to unlabeled/unapproved uses of drugs or products in this presentation. Etanercept for hepatitis C is off-label; etanercept, adalimumab and infliximab are off-label for lupus.

- **Elizabeth Sloand, PhD, CRNP**, has disclosed no relationships with commercial supporters.

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