

South Beach
Symposium
medical + aesthetic dermatology

CELEBRATING 20 YEARS
OF PREMIER MEDICAL & AESTHETIC
DERMATOLOGY EDUCATION

REIMAGINING
MEDICAL AND
AESTHETIC
DERMATOLOGY



New Targets for Treatment of Psoriasis

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On the horizon...

EMERGING THERAPIES

PSORIASIS

TOPICAL TREATMENT IS THE FOUNDATION OF DERMATOLOGIC THERAPY

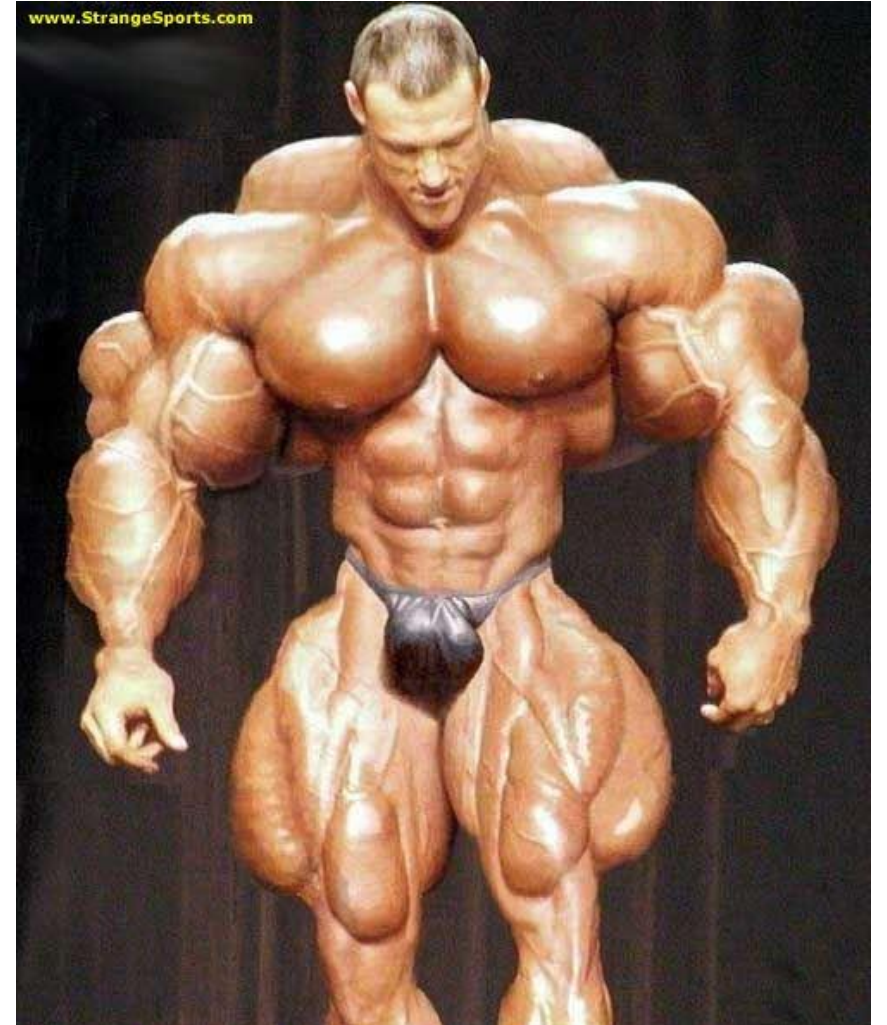


WHAT DO I DO?

BIOLOGICS **TOPICALS**
SYSTEMIC **TOPICALS**
LIGHT **TOPICALS**

TOPICALS

I DON'T WANT TO BE ON
STEROIDS



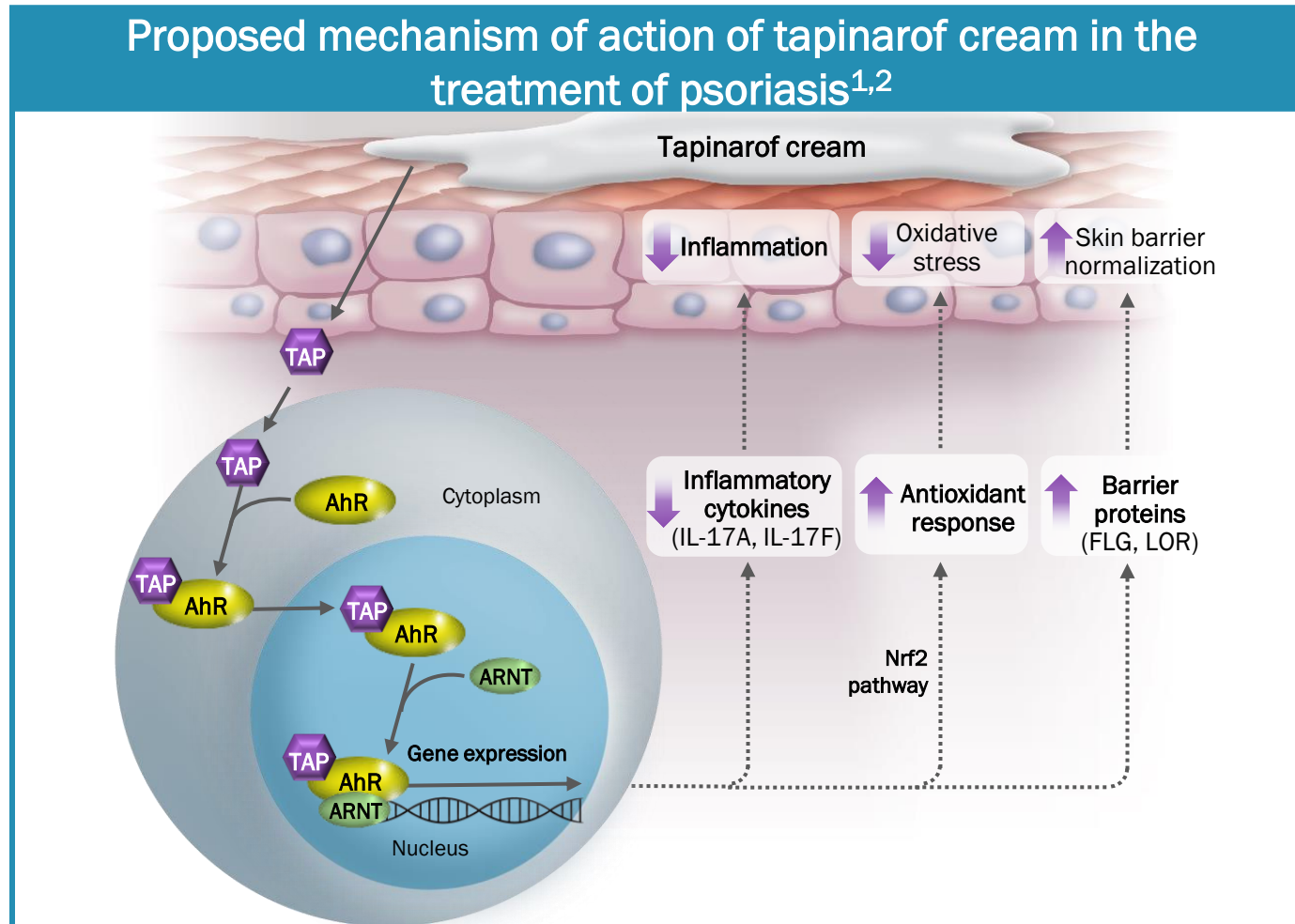
UNNMET

NEED

NEW CHEMICAL ENTITIES



Tapinarof is a First-in-Class, Topical Therapeutic Aryl Hydrocarbon Receptor Modulating Agent (TAMA)

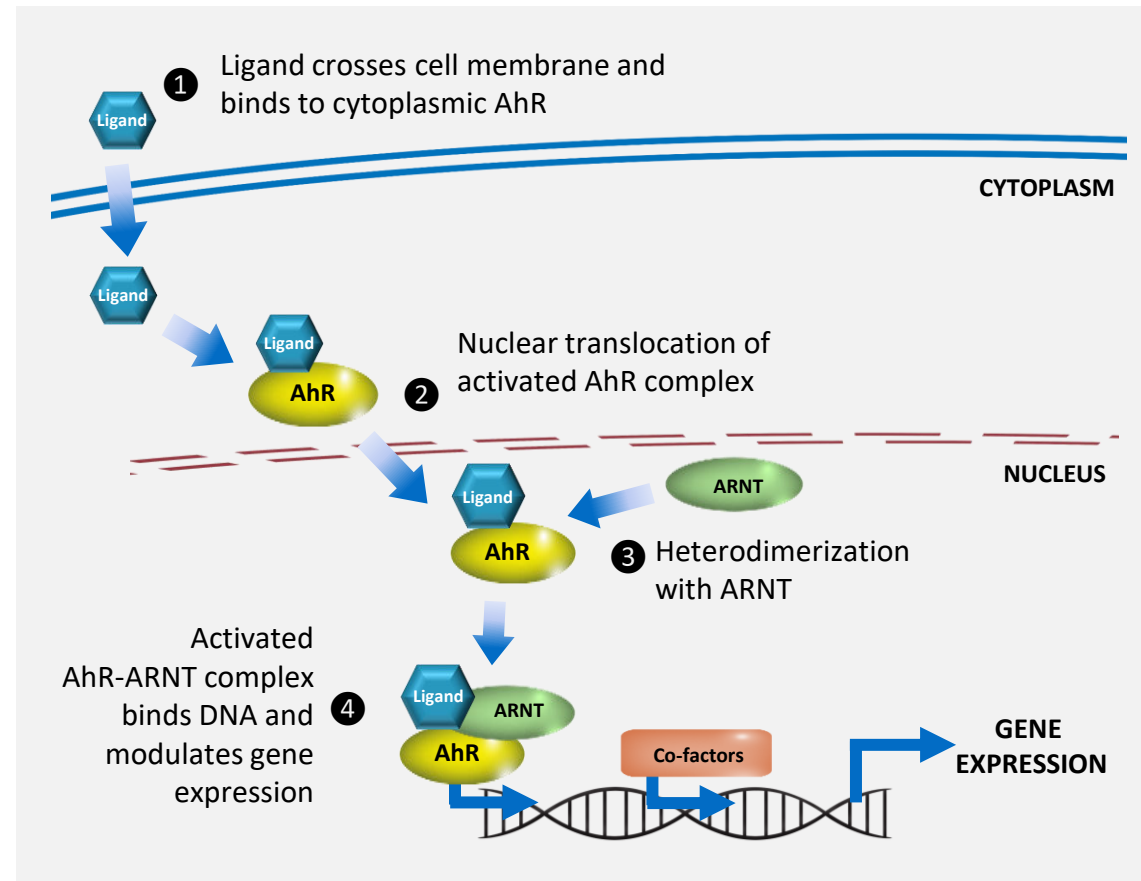


AhR, aryl hydrocarbon receptor; ARNT, aryl hydrocarbon receptor nuclear translocator; FLG, filaggrin; IL, interleukin; LOR, loricrin; Nrf2, nuclear factor erythroid 2-related factor 2; TAP, tapinarof.
1. Smith SH, et al. *J Inv Dermatol.* 2017;137:2110-2119; 2. Furue M, et al. *J Dermatological Sci.* 2015;80:83-88.

Tapinarof: Therapeutic AhR Modulating Agent (TAMA)

- Tapinarof is a topical, small molecule TAMA that directly binds to and activates AhR transcription factor¹
- AhR activation via tapinarof *in vitro* and animal models leads to:
 - Reduction of Th17 cytokine expression¹
 - Reduction of Th2 cytokine expression^{1,2}
 - Decreased oxidative stress¹
 - Increased skin barrier proteins¹

AhR pathway³

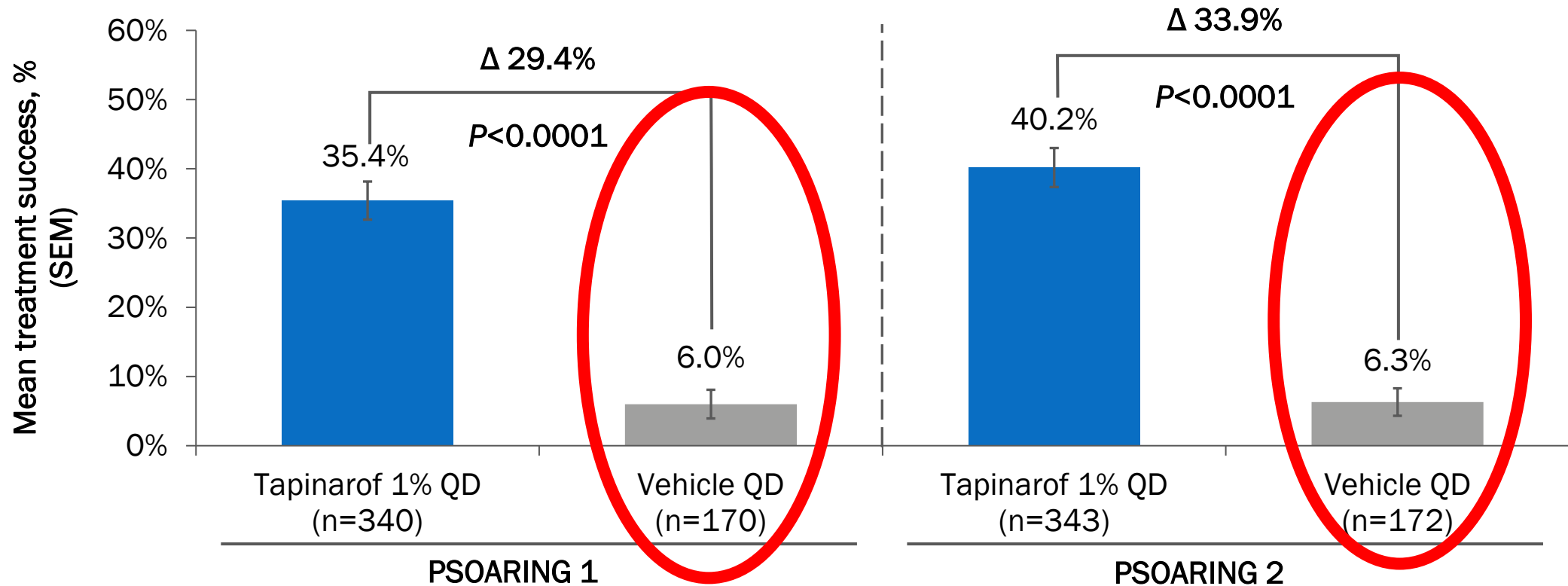


Tapinarof Cream 1% QD for the Treatment of Plaque Psoriasis: Efficacy and Safety in Two Pivotal Phase 3 Trials

Mark Lebwohl,¹ Linda Stein Gold,² Bruce Strober,³ Kim Papp,⁴ April Armstrong,⁵ Jerry Bagel,⁶
Leon Kircik,^{1,7} Benjamin Ehst,⁸ H Chih-ho Hong,⁹ Jennifer Soung,¹⁰ Jeff Fromowitz,¹¹ Scott Guenther,¹²
Stephen C Piscitelli,¹³ David S Rubenstein,¹³ Philip M Brown,¹³ Anna M Tallman,¹³ Robert Bissonnette¹⁴

¹Icahn School of Medicine, Mount Sinai, New York, NY, USA; ²Henry Ford Health System, Detroit, MI, USA; ³Yale University, New Haven and Central Connecticut Dermatology Research, Cromwell, CT, USA; ⁴Probity Medical Research, Waterloo, ON, Canada; ⁵Keck School of Medicine University of Southern California, Los Angeles, CA, USA; ⁶Psoriasis Treatment Center of Central New Jersey, NJ, USA; ⁷Skin Sciences, PLLC, Louisville, KY, USA; ⁸Oregon Medical Research Center, Portland, OR, USA; ⁹University of British Columbia and Probity Medical Research, Surrey, BC, Canada; ¹⁰Southern California Dermatology, Santa Ana, CA, USA; ¹¹Dermatology of Boca, Boca Raton, FL, USA; ¹²The Indiana Clinical Trials Center, PC, Plainfield, IN, USA; ¹³Dermavant Sciences, Inc., Durham, NC, USA; ¹⁴Innovaderm Research Inc., Montreal, QC, Canada

Tapinarof 1% QD: Primary Endpoint of PGA Response at Week 12 was Achieved in Both Studies



PGA response rate* was highly statistically significant in the tapinarof cream 1% QD group versus vehicle in both PSOARING 1 and 2: 35.4% vs 6.0% ($P < 0.0001$) and 40.2% vs 6.3% ($P < 0.0001$), respectively

*PGA of 0 or 1 and ≥ 2 -grade improvement at Week 12.
ITT population. P value based upon Cochran-Mantel-Haenszel analysis stratified by baseline PGA score.
ITT, intent-to-treat; PGA, Physician Global Assessment; QD, once daily; SEM, standard error of mean

Tapinarof 1% QD Clinical Response of Patient with Plaque Psoriasis who Achieved Primary and Secondary Efficacy Endpoints at Week 12



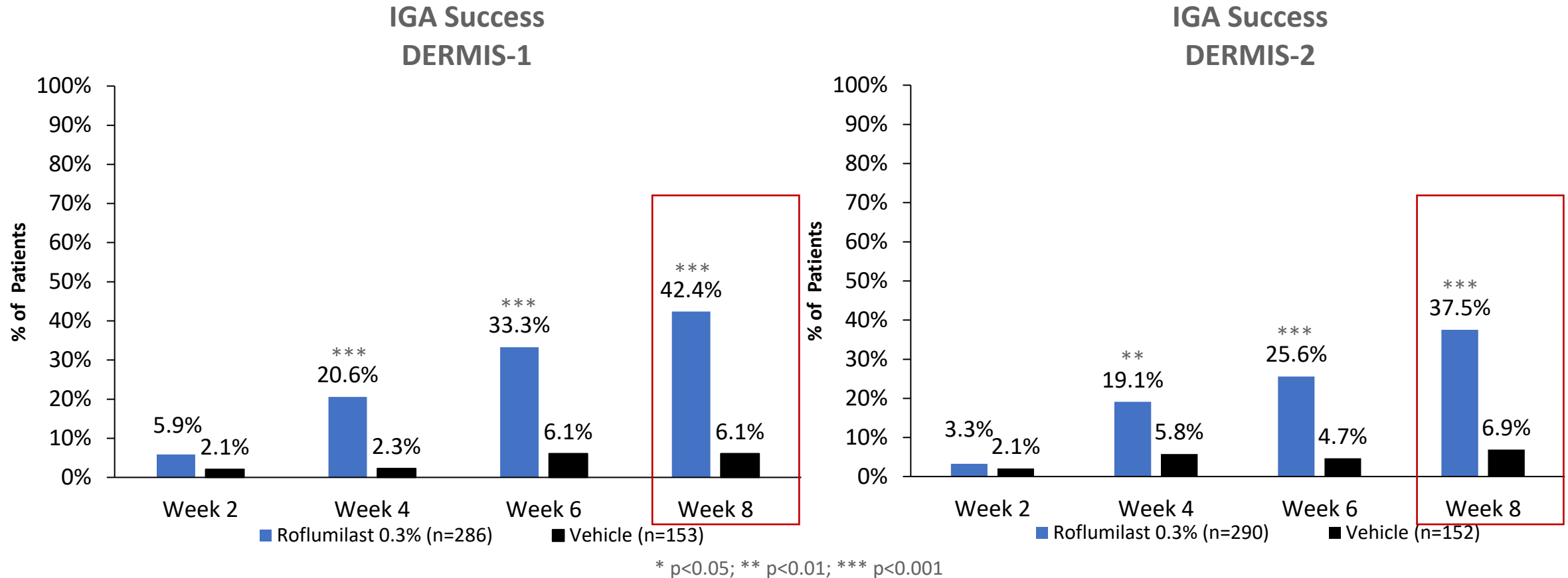
PGA and PASI are global efficacy assessments. Example of one representative target lesion of a patient treated with tapinarof 1% QD; individual results may vary. Photographs demonstrate improvement in PGA and PASI at Week 4 and 12. PASI, Psoriasis Area and Severity Index; PGA, Physician Global Assessment; QD, once daily.

Roflumilast Cream, a Once-Daily, Potent Phosphodiesterase-4 Inhibitor, in Chronic Plaque Psoriasis Patients: Efficacy and Safety From DERMIS-1 and DERMIS-2 Phase 3 Trials

- Mark Lebwohl,¹ Leon H. Kirck,² Angela Moore,³ Linda Stein Gold,⁴ Zoe D. Draelos,⁵ Melinda J. Gooderham,⁶ Kim A. Papp,⁷ Jerry Bagel,⁸ Neal Bhatia,⁹ James Del Rosso,¹⁰ Laura K. Ferris,¹¹ Lawrence J. Green,¹² Adelaide A. Hebert,¹³ Terry Jones,¹⁴ Steven E. Kempers,¹⁵ David M. Pariser,¹⁶ Paul S. Yamauchi,¹⁷ Matthew Zirwas,¹⁸ Patrick Burnett,¹⁹ Robert C. Higham,¹⁹ Lynn Navale,¹⁹ David R. Berk¹⁹
- ¹Icahn School of Medicine at Mount Sinai, New York, NY, USA; ²Icahn School of Medicine at Mount Sinai, New York, NY, Indiana Medical Center, Indianapolis, IN, Physicians Skin Care, PLLC, Louisville, KY, and Skin Sciences, PLLC, Louisville, KY, USA; ³Arlington Research Center, Arlington, TX, USA, Baylor University Medical Center, Dallas, TX, USA; ⁴Henry Ford Medical Center, Detroit, MI, USA; ⁵Dermatology Consulting Services, High Point, NC, USA; ⁶SkiN Centre for Dermatology, Probiity Medical Research and Queen's University, Peterborough, ON, Canada; ⁷Probiity Medical Research and K Papp Clinical Research, Waterloo, ON, Canada; ⁸Psoriasis Treatment Center of Central New Jersey, Windsor, NJ, USA; ⁹Therapeutics Clinical Research, San Diego, CA, USA; ¹⁰JDR Dermatology Research Center, LLC, Las Vegas, NV, USA; ¹¹University of Pittsburgh, Department of Dermatology, Pittsburgh, PA, USA; ¹²George Washington University School of Medicine, Rockville, MD, USA; ¹³UT Health McGovern Medical School, Houston, TX, USA; ¹⁴U.S. Dermatology Partners Bryan, Bryan, TX, USA; ¹⁵Minnesota Clinical Study Center, Fridley, MN, USA; ¹⁶Eastern Virginia Medical School and Virginia Clinical Research, Inc., Norfolk, VA, USA; ¹⁷David Geffen School of Medicine at UCLA, Los Angeles, and Dermatology Institute & Skin Care Center, Inc., Santa Monica, CA, USA; ¹⁸Dermatologists of the Central States, Probiity Medical Research, and Ohio University, Bexley, OH, USA; ¹⁹Arcutis Biotherapeutics, Inc., Westlake Village, CA, USA
- Disclosures: Mark Lebwohl, Leon H. Kirck, Angela Moore, Linda Stein Gold, Zoe D. Draelos, Melinda J. Gooderham, Kim A. Papp, Jerry Bagel, Neal Bhatia, James Del Rosso, Laura K. Ferris, Lawrence J. Green, Adelaide A. Hebert, Terry Jones, Steven E. Kempers, David M. Pariser, Paul S. Yamauchi, and Matthew Zirwas are investigators and/or consultants for Arcutis Biotherapeutics, Inc. and received grants/research funding and/or honoraria; Robert C. Higham, Lynn Navale, and David R. Berk are employees of Arcutis Biotherapeutics, Inc. Additional disclosures provided on request.
- This work was supported by Arcutis Biotherapeutics, Inc.
- Writing support was provided by Christina McManus, PhD, Alligent Biopharm Consulting LLC, and funded by Arcutis Biotherapeutics, Inc.

Robust Efficacy on IGA Success in Both Phase 3 Studies

IGA Success = Clear or Almost Clear with at least a 2-grade improvement from baseline



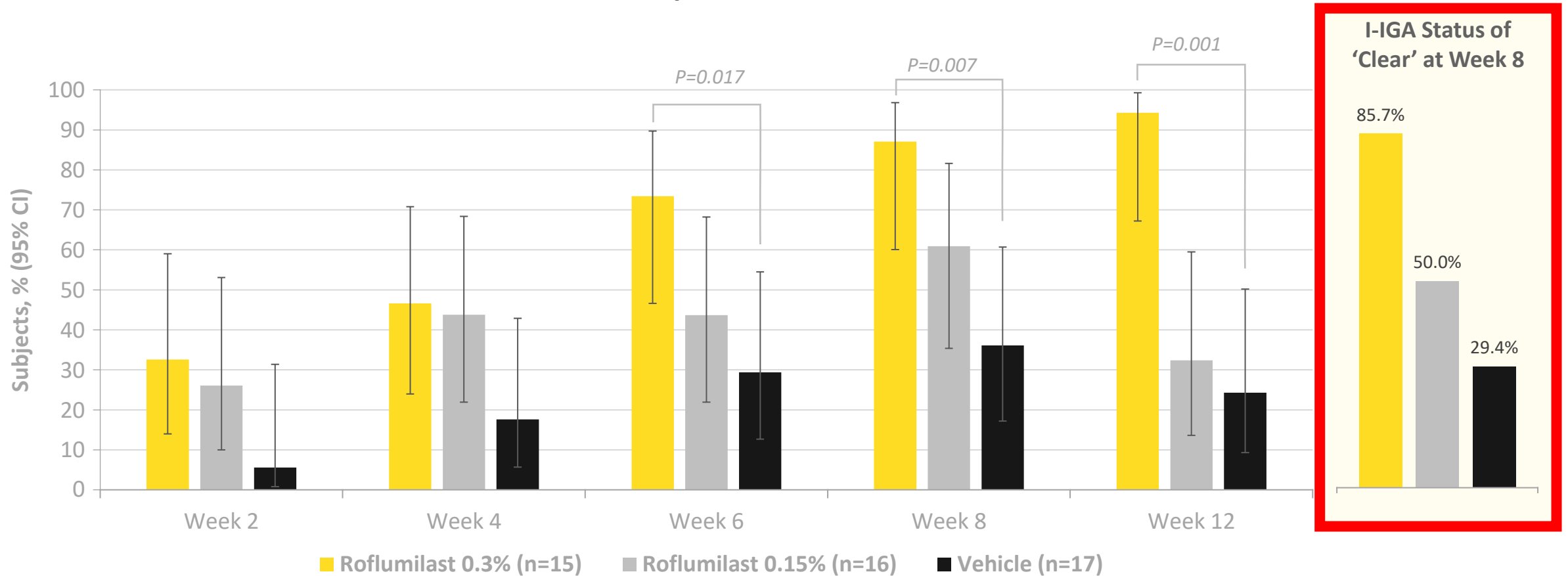
The primary endpoint was achieved in both DERMIS-1 and DERMIS-2

Intent-to-treat population; missing scores imputed using multiple imputations

IGA: Investigator's Global Assessment

Most Subjects With Intertriginous Plaques Treated With Roflumilast Cream Achieved I-IGA Success by Week 6 With Continued Improvement Through Week 12

Subjects With Intertriginous Plaques Achieving I-IGA of 'Clear' or 'Almost Clear' Plus 2-Grade Improvement From Baseline



Patient Examples Illustrating Efficacy of Roflumilast Cream 0.3% From DERMIS-1 & DERMIS-2

Baseline

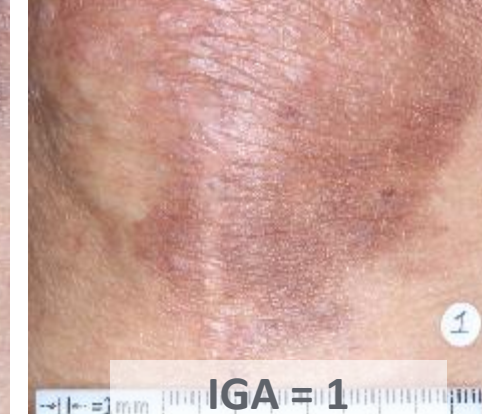
Week 2

Week 4

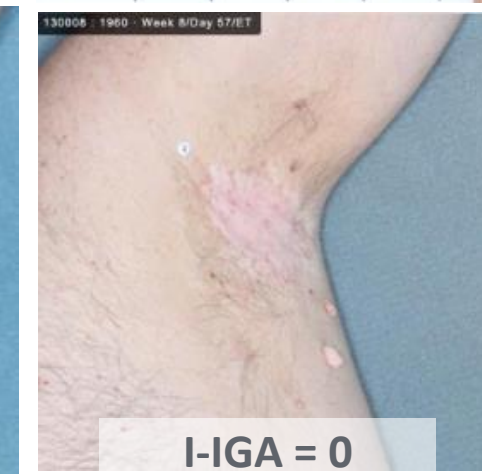
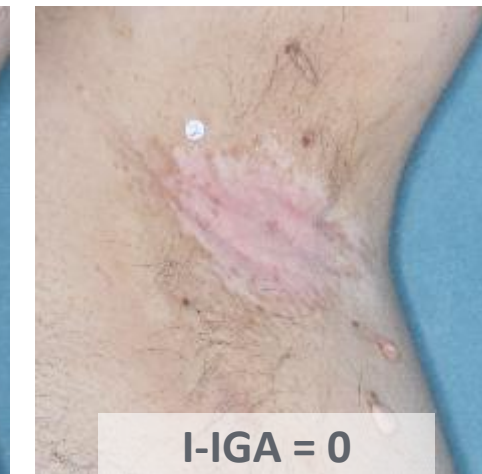
Week 6

Week 8

Knee



Axillae



IGA: Investigator's Global Assessment; I-IGA: intertriginous-IGA

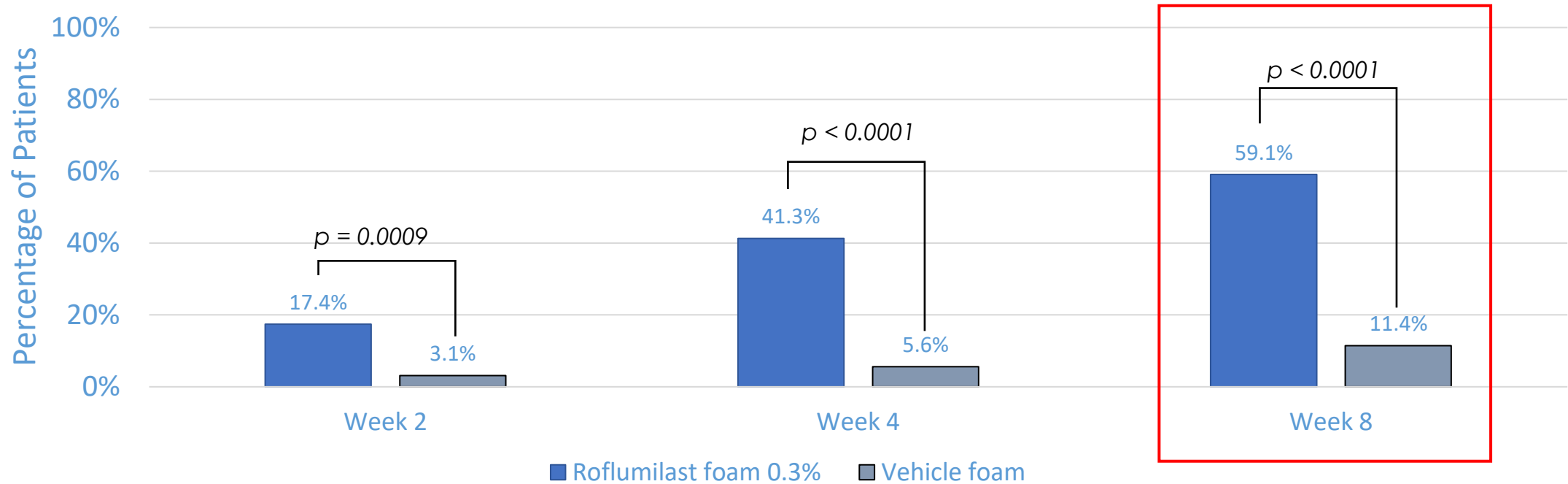
Once-daily Roflumilast Foam 0.3% for Scalp and Body Psoriasis: A Randomized, Double-blind, Vehicle-controlled Phase 2b Study

- Leon H Kircil¹, Angela Moore², Neal Bhatia³, Alim R Devani⁴, Zoe D Draelos⁵, Janet DuBois⁶, Melinda J Gooderham⁷, Steven E Kempers⁸, Edward Lain⁹, Mark Lee¹⁰, Dedee F Murrell¹¹, Kim A Papp¹², David M Pariser¹³, Rodney Sinclair¹⁴, Matthew Zirwas¹⁵, Patrick Burnett¹⁶, Robert C Higham¹⁶, Lynn Navale¹⁶, David R Berk¹⁶

- ¹Icahn School of Medicine at Mount Sinai, NY, Indiana Medical Center, Indianapolis, IN, Physicians Skin Care, PLLC, Louisville, KY, and Skin Sciences, PLLC, Louisville, KY, USA; ²Arlington Research Center, Arlington, TX, USA, and Baylor University Medical Center, Dallas, TX; ³Therapeutics Clinical Research, San Diego, CA, USA; ⁴Dermatology Research Institute, Skin Health & Wellness Centre and Probity Medical Research, Calgary, AB, Canada; ⁵Dermatology Consulting Services, High Point, NC, USA; ⁶DermResearch, Inc., Austin, TX, USA; ⁷SkiN Centre for Dermatology, Probity Medical Research and Queen's University, Peterborough, ON, Canada; ⁸Minnesota Clinical Study Center, Fridley, MN, USA; ⁹Sanova Dermatology, Austin, TX, USA; ¹⁰Progressive Clinical Research, San Antonio, TX, USA; ¹¹UNSW, Sydney, Australia; ¹²Probity Medical Research and K Papp Clinical Research, Waterloo, ON, Canada; ¹³Eastern Virginia Medical School and Virginia Clinical Research, Inc., Norfolk, VA, USA; ¹⁴Sinclair Dermatology, East Melbourne, Australia; ¹⁵Dermatologists of the Central States, Probity Medical Research, and Ohio University, Bexley, OH, USA; ¹⁶Arcutis Biotherapeutics, Inc., Westlake Village, CA, USA

Roflumilast Foam Significantly Increased the Percentage of Patients with S-IGA Success at Week 8 (Primary Endpoint)

Approx 60% of Patients Achieved S-IGA Success at Week 8
Significant Efficacy was Demonstrated as Early as Week 2



34.3% of patients on roflumilast achieved S-IGA = 0 (clear) versus 3.4% on vehicle

IGA Success = Clear or Almost Clear with at least a 2-grade improvement from baseline

Intent-to-treat population

S-IGA: Scalp-Investigator's Global Assessment

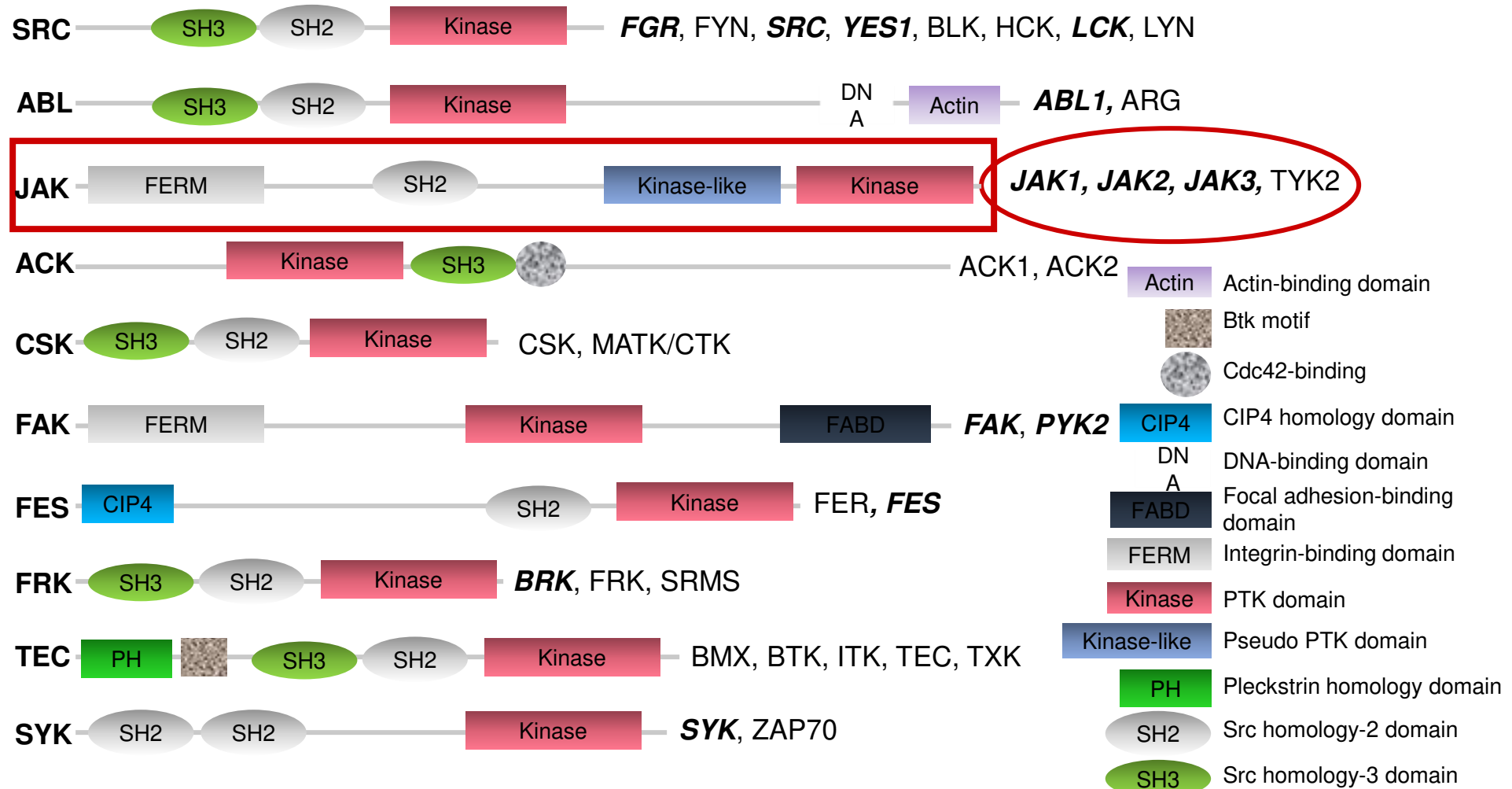
**GAME CHANGER IN PSORIASIS
AND
ATOPIC DERMATITIS TREATMENT**

NEW CHEMICAL ENTITIES



JAK/STAT Signaling Pathways

Janus Kinases (JAKs): Members of Nonreceptor Tyrosine Kinases



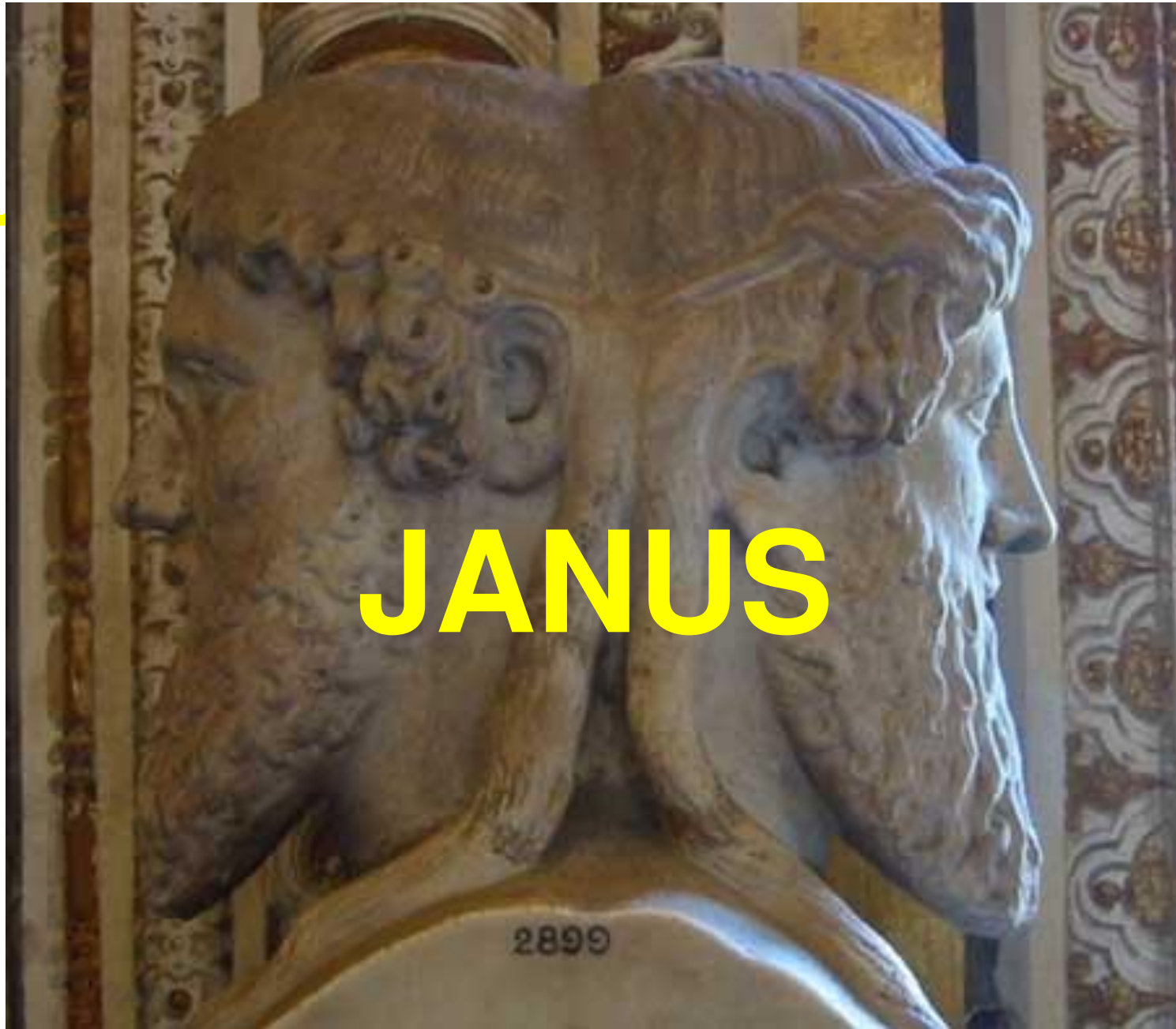
Blume-Jensen and Hunter. *Nature*
2001;411(6835):355-65.

JAK Structure^{1,2}



Of the 518 kinases identified in the human genome, only 5 have a pseudokinase and kinase domain present in the same protein, namely, the 4 members of the JAK family and GCN2, a serine threonine kinase

1. Pesu et al. *Immunol Rev* 2008;223:132-42.
2. Haan et al. In: *Jak-Stat Signaling: From Basics to Disease*, 2012.



JANUS

How are the TYK2 and
JAK 1/2/3 kinases
different from each
other?

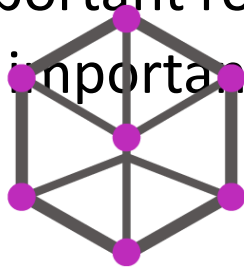
THIS IS MY BROTHER DARRYL,
AND MY OTHER BROTHER DARRYL



NEWHART

TYK2 and JAK1/2/3 kinases are each *structurally* and *functionally* different^{25,26,28,29}

- TYK2 and JAK1/2/3 proteins belong to the same kinase family and are structurally distinct from each other^{26,29}
- TYK2 and JAK1/2/3 proteins form different dimers to mediate different sets of cytokine signals that can influence immune and/or systemic responses^{25,26,28,29}
 - TYK2 plays an important role in immune-specific responses^{25,28}
 - JAK1/2/3 play an important role in immune and broad systemic responses²⁸









Structural differences



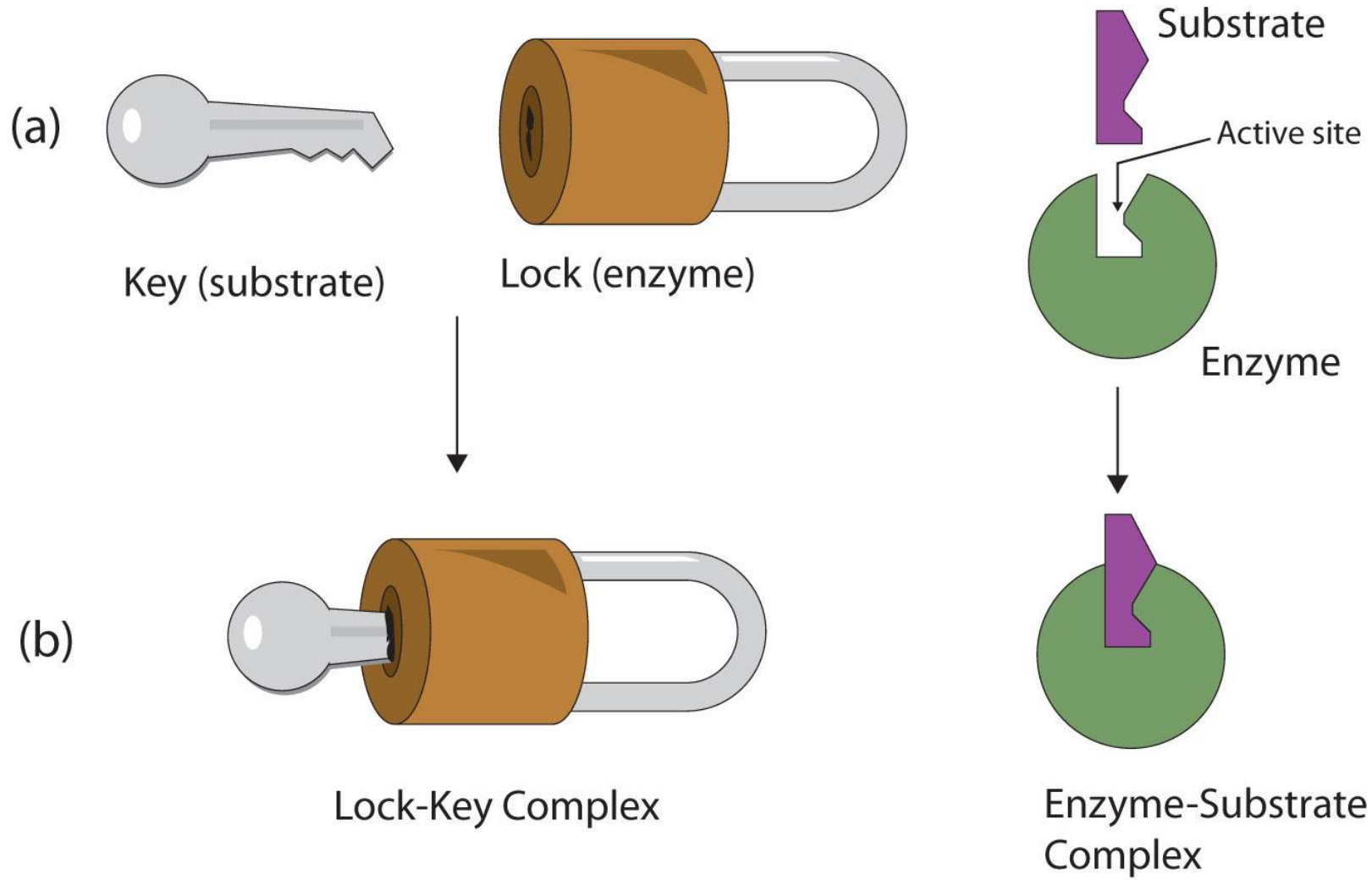
Functional differences

Systems affected by different cytokines mediated through TYK2 and JAK1/2/3

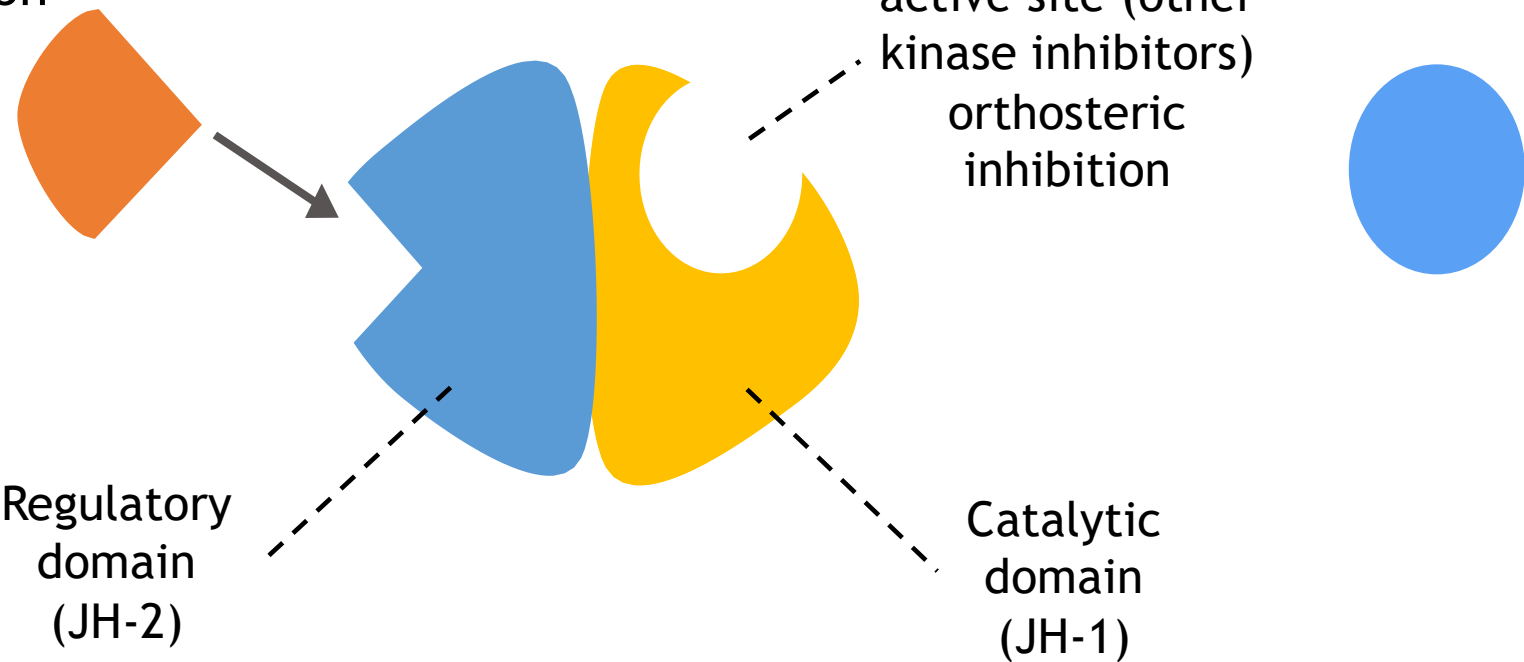
Systems affected by select pairings	JAK1 	JAK2 	JAK3 	TYK2 
 Immune system ^{25,28,33}	✓	✓	✓	✓
 Blood cell development ^{28,33}		✓		
 Metabolic activity ^{32,33,44}	✓	✓	✓	
 Bone development and lipid metabolism ^{33,35,38}	✓	✓		

Please note that this list of systems affected by the different TYK2 and JAK1/2/3 pairings is not exhaustive.
 JAK=Janus kinase; TYK2=tyrosine kinase 2.

HIGH SCHOOL CHEMISTRY



Allosteric inhibition

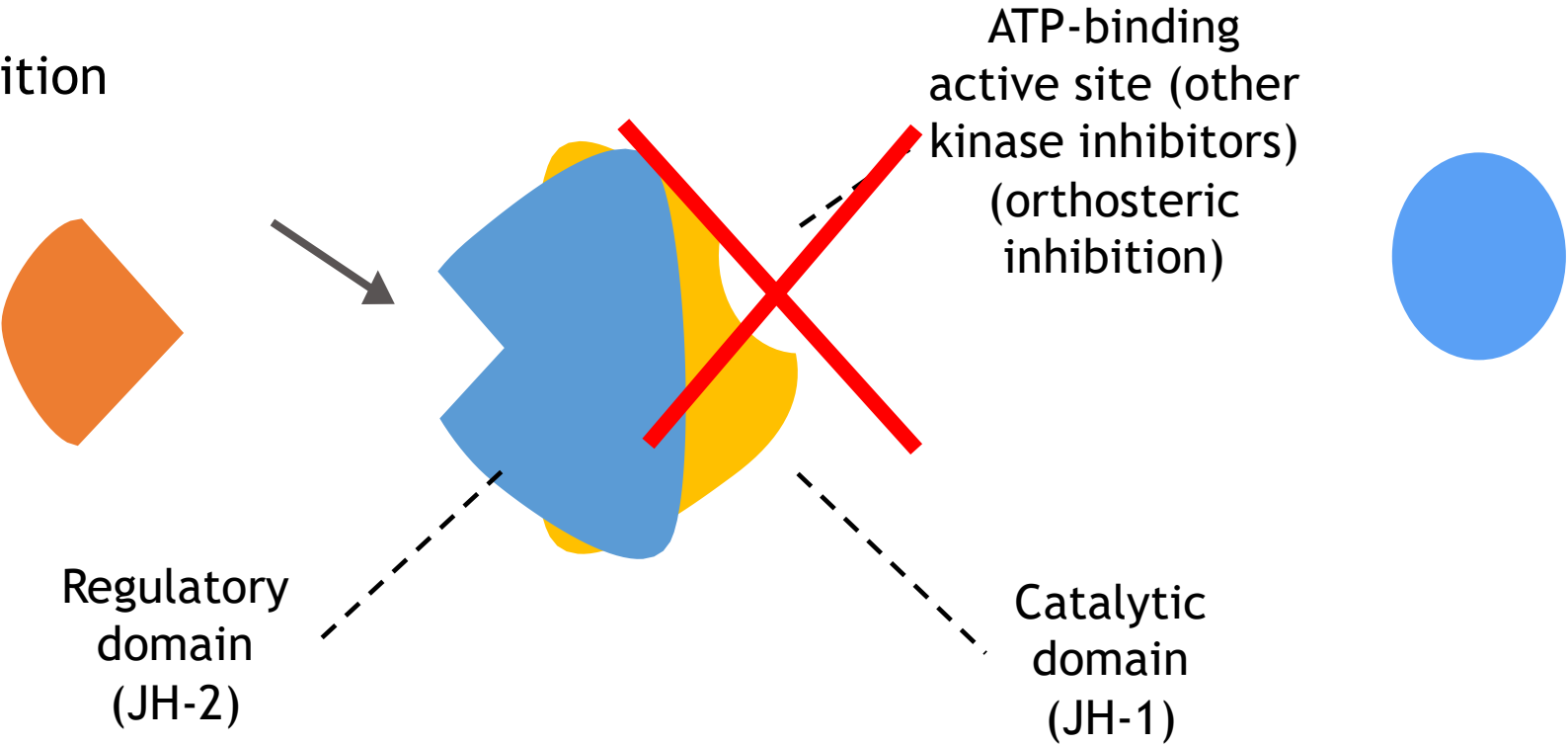


Regulatory domain (JH-2)

ATP-binding active site (other kinase inhibitors) orthosteric inhibition

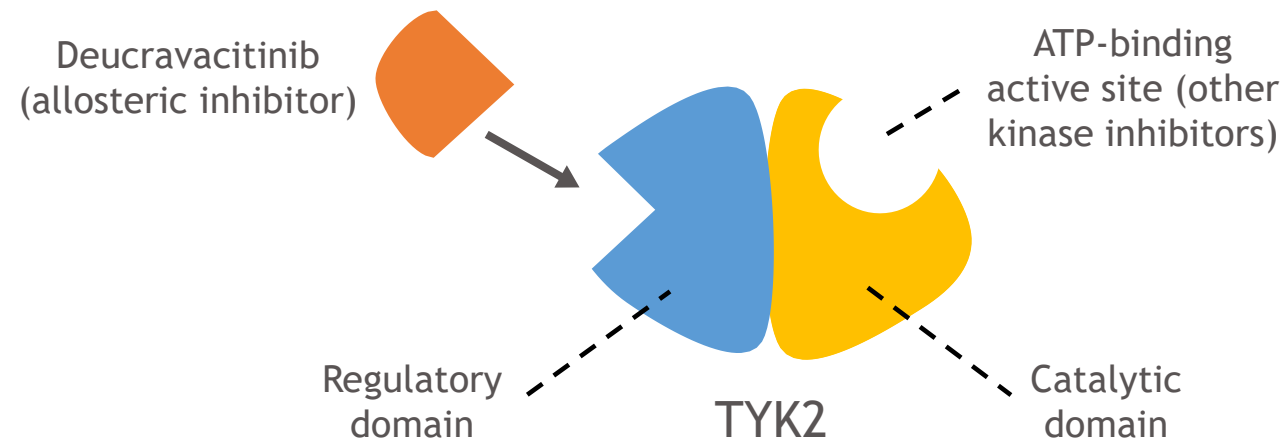
Catalytic domain (JH-1)

Allosteric inhibition



Introduction

- Deucravacitinib
 - Novel, oral, selective tyrosine kinase 2 (TYK2) inhibitor with a unique mechanism of action distinct from Janus kinase (JAK) 1, 2, 3 inhibitors¹
 - Binds to the TYK2 regulatory domain with high selectivity and inhibits TYK2 via an allosteric mechanism¹
 - ≥ 100 -fold greater selectivity for TYK2 vs JAK1/3 and ≥ 2000 -fold greater selectivity for TYK2 vs JAK2^{1,2}
 - Inhibits TYK2-mediated signaling by cytokines involved in psoriasis pathogenesis (eg, IL-23, IL-12, and Type 1 interferon)¹
 - Previously demonstrated efficacy and tolerability in Phase 2 trials in moderate to severe plaque psoriasis³ and active psoriatic arthritis⁴



Laboratory abnormalities observed with individual JAK family inhibitors^{1,2*}

No head-to-head trials were conducted

	Tofacitinib ²	Baricitinib ²	Filgotinib ²	Upadacitinib ²
Selectivity	JAK1, JAK3	JAK1, JAK2	JAK1	JAK1
Lymphocyte number	↓*	No change**	No change**	↓ [†]
NK cell number	↓*	↓ [‡]	No change	↓ [§]
Neutrophil number	↓*	↓*	↓	↓ [†]
Hemoglobin level	↑ [¶]	↓*	↑	↓ [†]
Platelet count	↓ [‡]	No change	↓	NA
Liver transaminase level	↑*	↑*	No change	↑ [†]
Creatine phosphokinase level	↑*	↑*	NA	↑ [†]
HDL level	↑*	↑*	↑	↑ [†]
LDL level	↑*	↑*	No change	↑ [†]
Creatinine level	↑*	↑*	↑	↑ [§]

BMS-986165 ¹
TYK2
No change
No change
No change
No change
No change
No change
No change
↔ [‡]
No change
No change
No change

*Shown are the general trends reported in the development programs of each compound across different indications and doses.¹ [†]Initial rise followed by a decrease. [‡]Cases of lymphocyte and neutrophil elevations from baseline (most of which had a Common Terminology Criteria for Adverse Events grade of 1 or 2) were observed in 12/44 (27%) patients who received placebo, and 57/221 (26%) patients treated with BMS-986165, with no clear dose dependence; these were associated with increased physical activity, resolved spontaneously, and did not result in trial drug discontinuation. *Noted in both USPI and SmPC. **Decreases noted in both USPI and SmPC. [†]Noted in USPI (SmPC not available). [‡]Not noted in either USPI or SmPC. [§]Not noted in USPI (SmPC not available). [¶]According to the SmPC, hemoglobin levels are decreased with tofacitinib. While the USPI does not specifically state that tofacitinib use is associated with changes in hemoglobin, it does provide guidance for drops in hemoglobin. ^{||}Increases noted in both USPI and SmPC.

HDL=high-density lipoprotein; JAK=Janus kinase; LDL=low-density lipoprotein; NA=not applicable; NK=natural killer; TYK=tyrosine kinase.

1. Papp K et al. *N Engl J Med.* 2018;379:1313-1321. 2. Winthrop KL. *Nat Rev Rheumatol.* 2017;13:234-243.

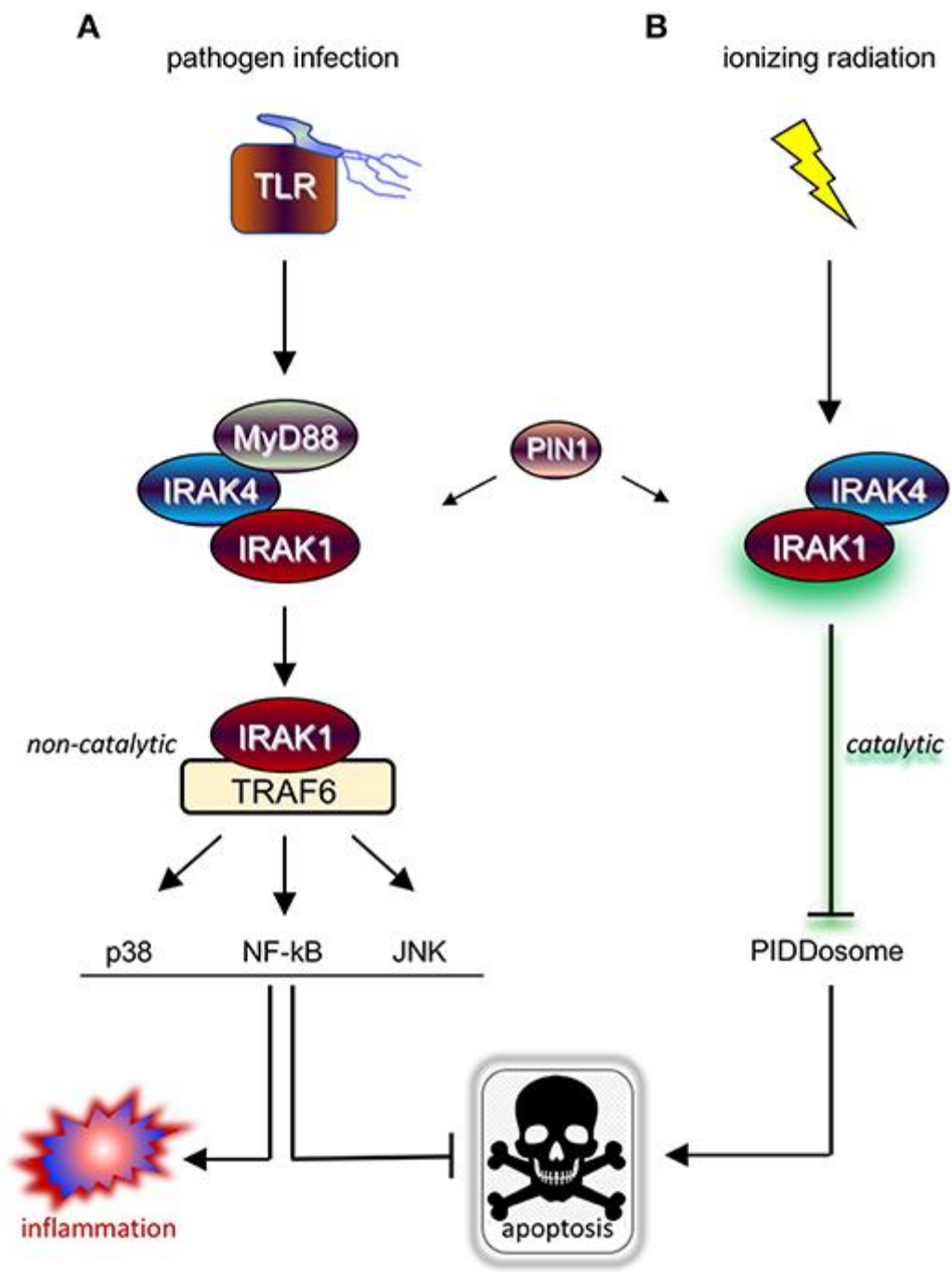
COUSINS

MY NAME
IS NOT
JAK

JAK

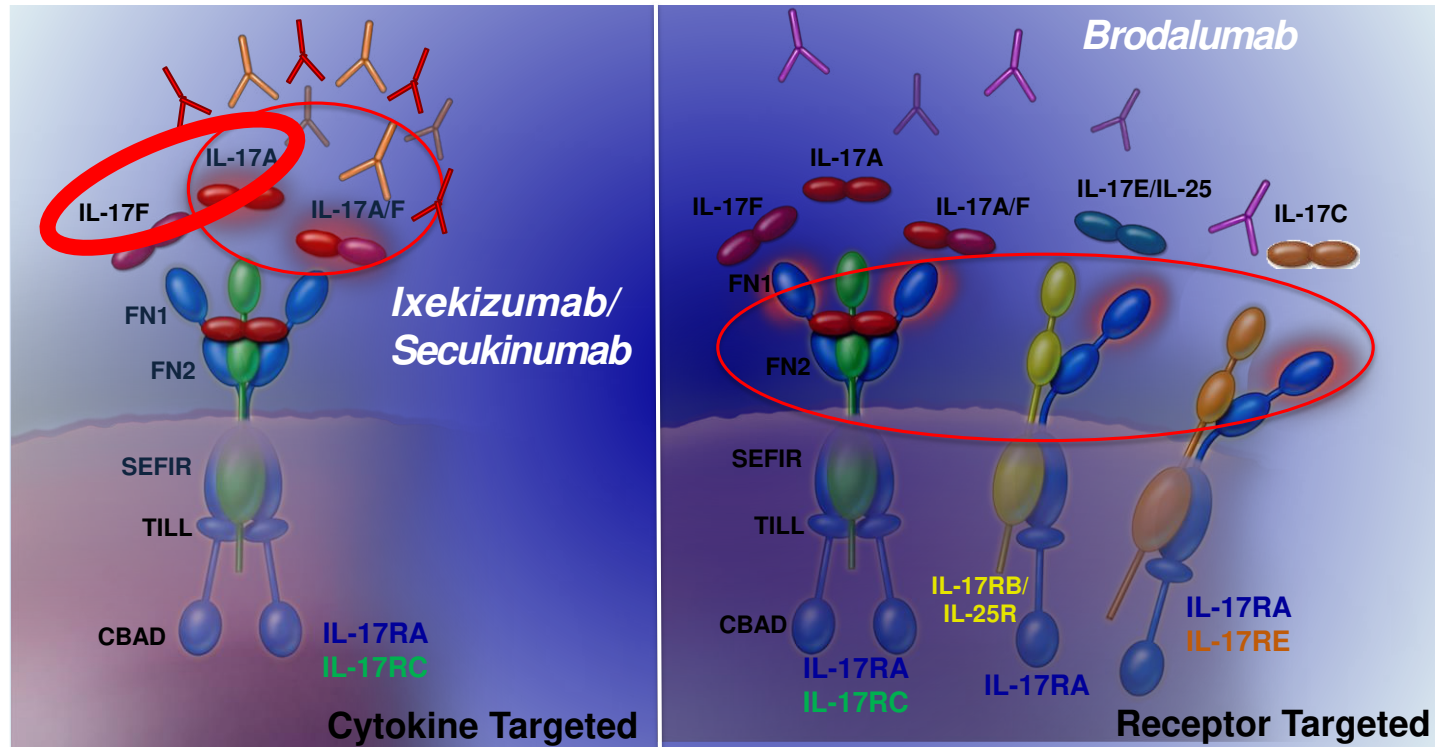
TYK





- IRAK4 is the most proximal kinase in the Toll-like receptor (TLR)/IL-1R signaling cascade. Activation of the cascade triggers assembly of the myddosome complex and the downstream production of proinflammatory cytokines. Human and rodent genetics support the role of IRAK4 in the immune response.
- Over a dozen pharmaceutical companies have reported the discovery of IRAK4 inhibitors. Many of the reported compounds are potent enzyme inhibitors. IRAK4 inhibitors have been found to be active in a broad range of cellular and *in vivo* models.
- The work disclosed in patent applications over the last several years has led to multiple IRAK4 inhibitors being advanced to the clinic. Pfizer has enrolled patients in a phase II trial for RA.
- Emerging data suggests IRAK4 inhibition may offer a therapeutic benefit in the treatment of cancer. Aurigene and Curis have reported the start of a clinical trial evaluating IRAK4 inhibition for non-Hodgkin lymphoma.

BIMEKIZUMAB



1. Gaffen. *Nat Rev Immunol* 2009;9(8):556-67 (Updated 9: p 747).

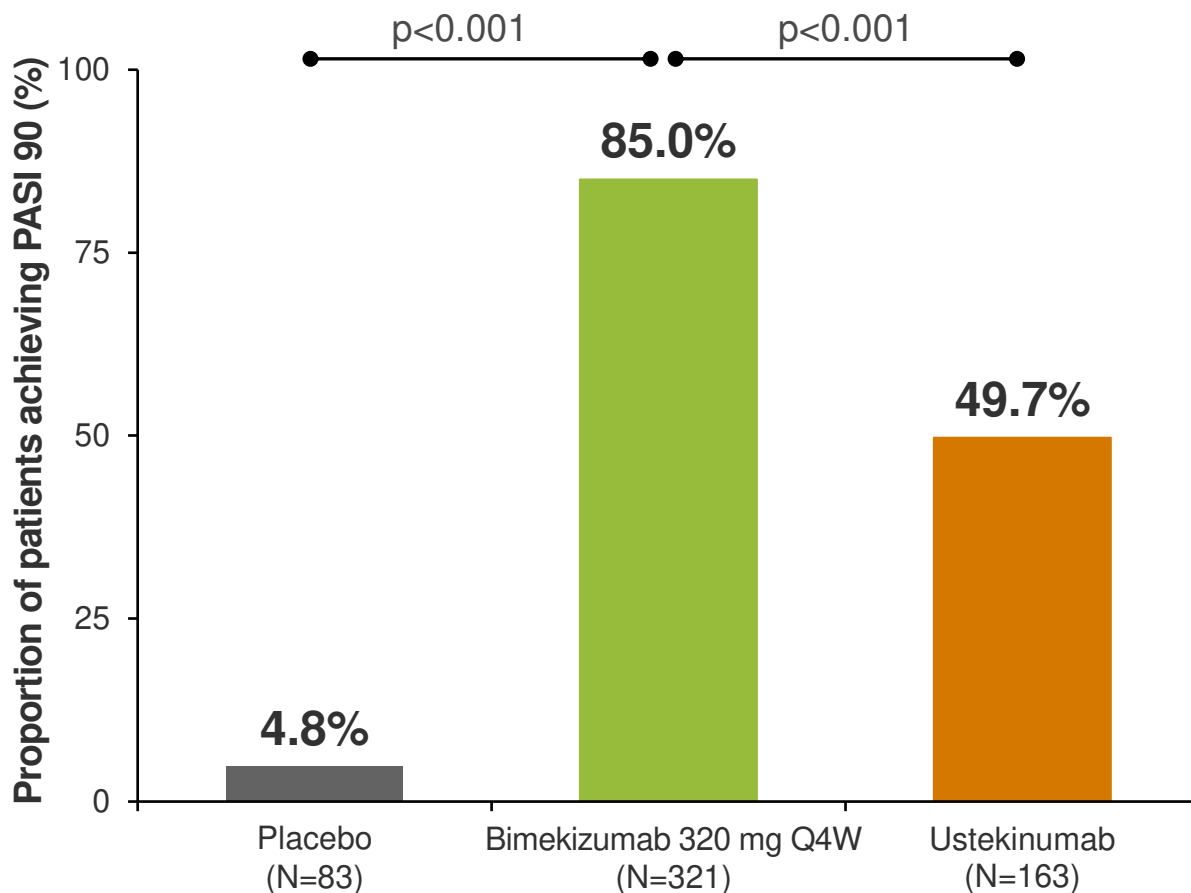
2. Chang et al. *Immunity* 2011;35(4):611-21.

BE VIVID PASI 90 and IGA 0/1 at Week 16 (ITT, NRI)

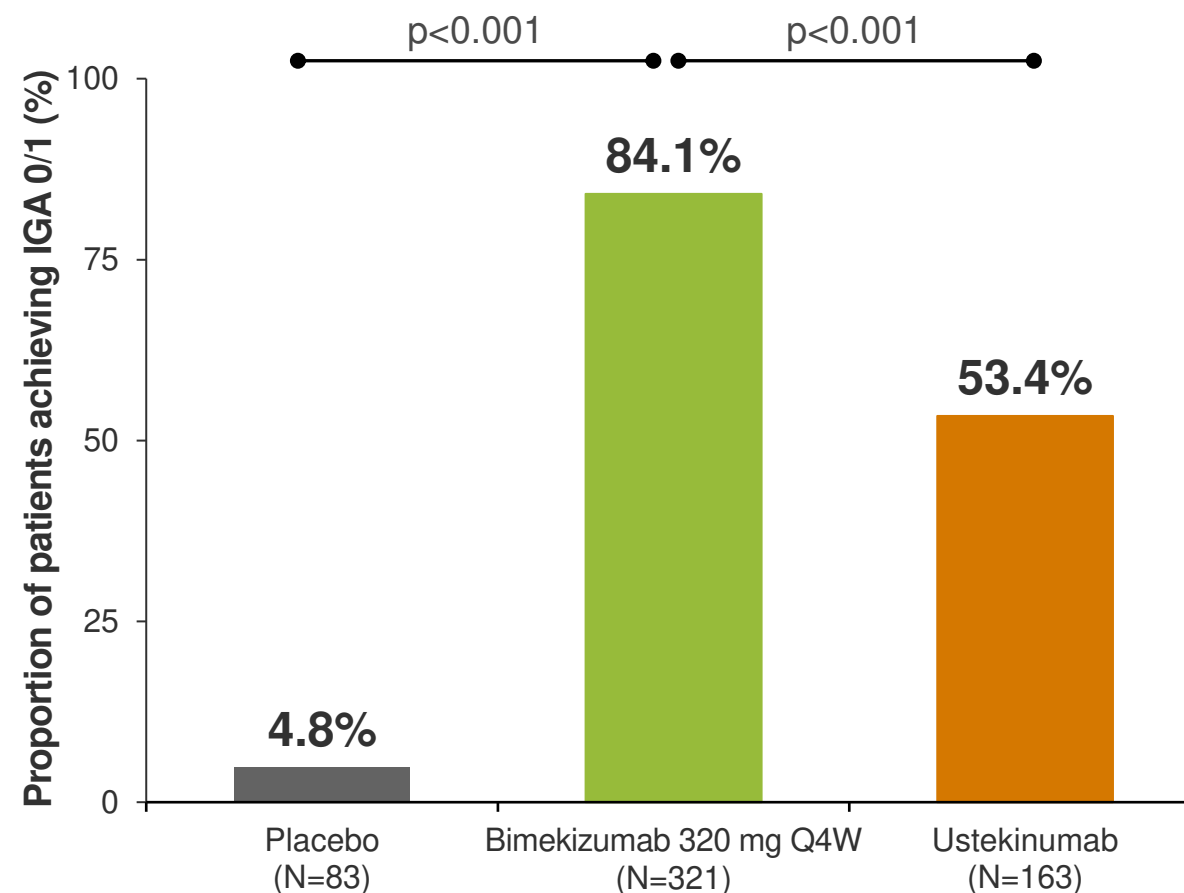
Co-primary endpoints: superiority with bimekizumab versus placebo

Key secondary endpoints: superiority with bimekizumab versus ustekinumab

Week 16 PASI 90

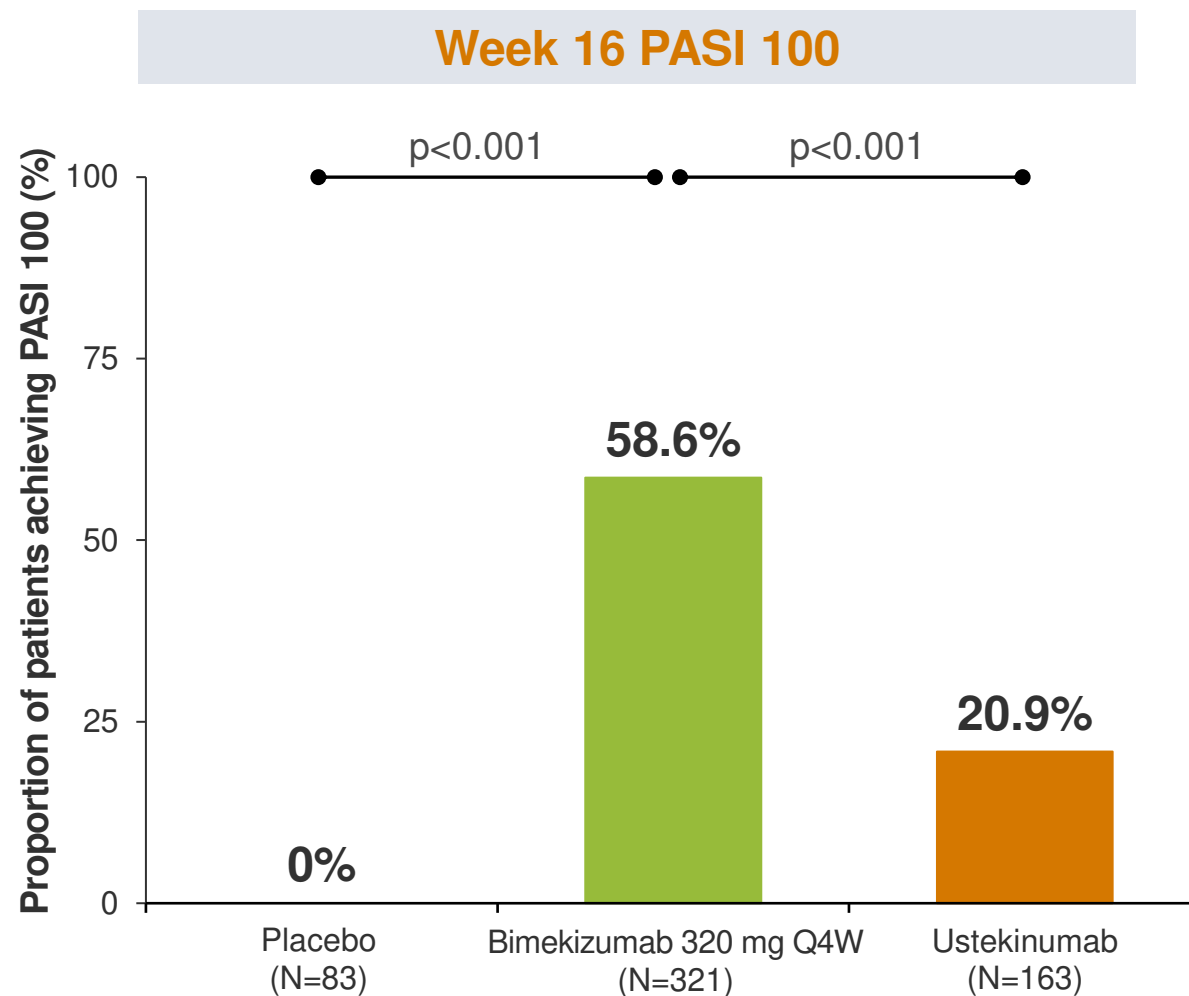
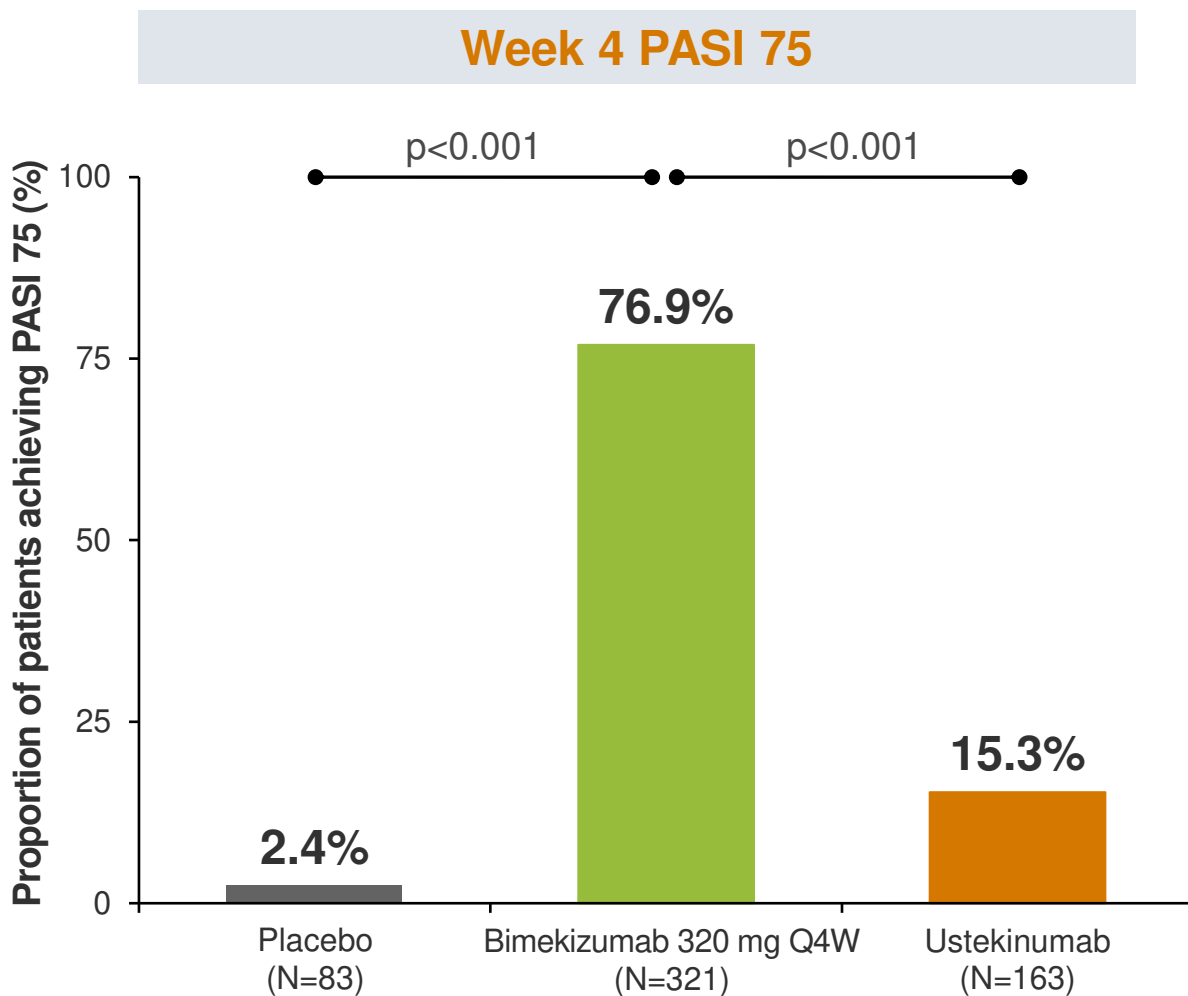


Week 16 IGA 0/1



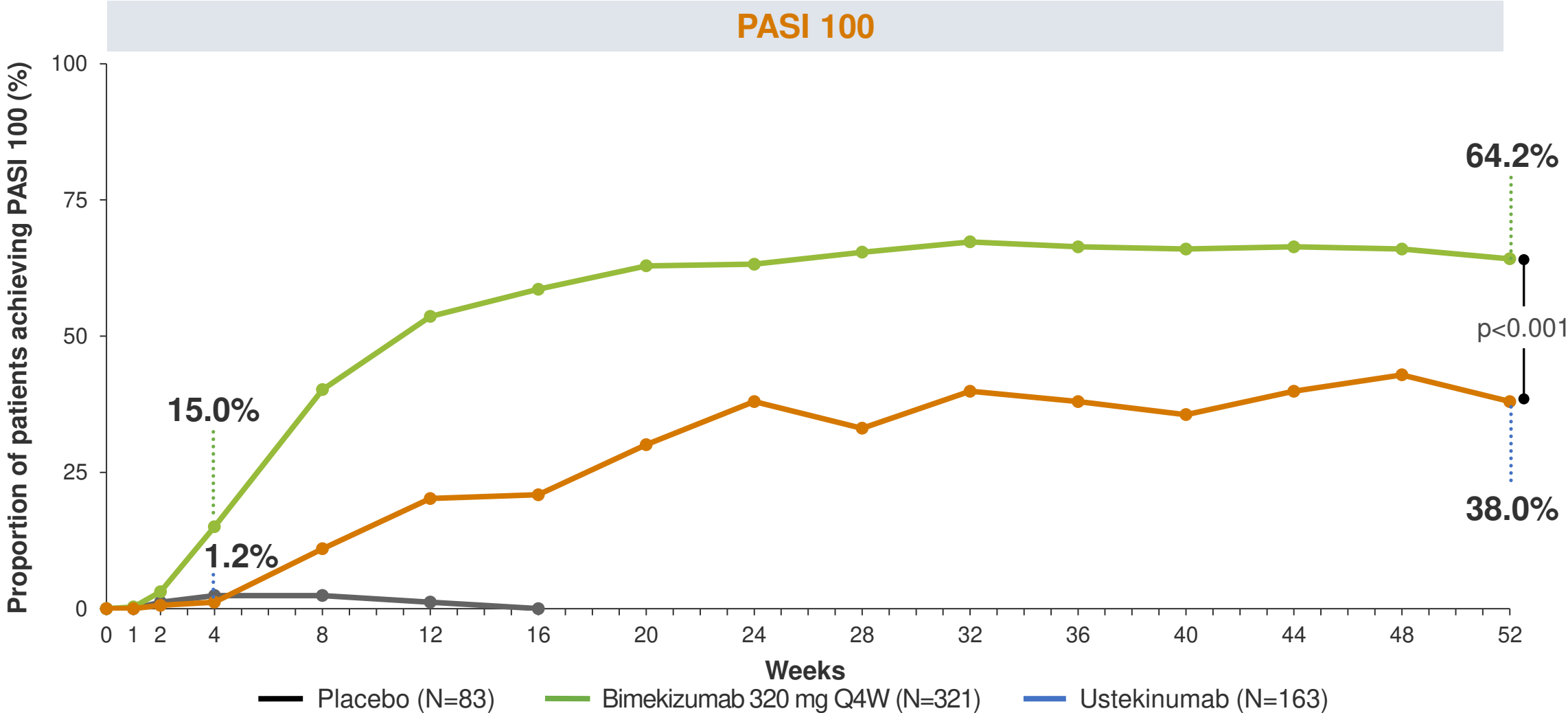
p values for the comparison of treatment groups were based on the Cochran–Mantel–Haenszel test from the general association. Proportions were calculated using non-responder imputation (NRI). IGA 0/1: score of 0 (clear) or 1 (almost clear) with ≥ 2 -category improvement relative to Baseline in Investigator's Global Assessment, scored on a 5-point scale; ITT: intent-to-treat; PASI 90: $\geq 90\%$ improvement from Baseline in Psoriasis Area and Severity Index; Q4W: every four weeks.

BE VIVID PASI 75 at Week 4 and PASI 100 at Week 16 (ITT, NRI)



For PASI 75 at Week 4, the p value for the comparison of treatment groups was based on the Cochran–Mantel–Haenszel test from the general association; for PASI 100 at Week 16, the p value for a general association was based on a stratified Cochran–Mantel–Haenszel test where region and prior biologic exposure were used as stratification variables, is considered nominal, and was not controlled for multiplicity. Proportions were calculated using non-responder imputation (NRI). ITT: intent-to-treat; PASI 75/100: $\geq 75/100\%$ improvement from Baseline in Psoriasis Area and Severity Index; Q4W: every four weeks.

BE VIVID PASI 100 over 52 weeks (ITT, NRI)



The p value for a general association was based on a stratified Cochran–Mantel–Haenszel test where region and prior biologic exposure were used as stratification variables, is considered nominal, and was not controlled for multiplicity. Proportions were calculated using non-responder imputation (NRI). At Week 16, patients receiving placebo were switched to bimekizumab 320 mg Q4W.

ITT: intent-to-treat; PASI 100: 100% improvement in psoriasis area severity index (PASI) score; Q4W: every four weeks.

TEAEs of Interest (Short- and Longer-Term)

	Initial treatment period (Week 0–16)				Short-term (Week 0–16)	Longer-term
	n (%)				EAIR per 100 PY (95% CI)	
	BKZ 320 mg Q4W ^a N=989	ADA ^b N=159	UST ^c N=163	PBO ^d N=169	BKZ 320 mg Q4W ^a N=989	All BKZ ^e N=1789
Exposure	306.0 PY	48.8 PY	51.1 PY	51.6 PY	306.0 PY	1830.4 PY
Serious infections	3 (0.3)	0	1 (1.2)	0	1.0 (0.2, 2.9)	1.4 (0.9, 2.0)
Inflammatory bowel disease	1 (0.1)	0	0	0	0.3 (0.0, 1.8)	0.1 (0.0, 0.3)
Candida infections	30 (9.1)	0	0	0	30.6 (24.6, 37.6)	18.7 (16.7, 21.0)
Oral candidiasis	25 (7.6)	0	0	0	25.3 (19.9, 31.8)	16.4 (14.5, 18.5)
Adjudicated MACE	1 (0.1)	0	0	0	0.3 (0.0, 1.8)	0.7 (0.3, 1.1)
Malignancies (inc. NMSC)	4 (0.4)	1 (0.6)	0	1 (0.6)	1.3 (0.4, 3.4)	0.8 (0.5, 1.4)
Adjudicated SIB ^f	0	0	0	0	0	0.1 (0.0, 0.3)
Serious hypersensitivity reactions ^g	0	0	0	0	0	0.2 (0.0, 0.5)
Injection site reactions	27 (2.7)	3 (1.9)	2 (1.2)	2 (1.2)	9.0 (5.9, 13.1)	3.1 (2.4, 4.1)
Hepatic events	19 (1.9)	9 (5.7)	0	2 (1.2)	6.3 (3.8, 9.8)	5.6 (4.6, 6.8)

GL-N-BK-PSO-2000082

• EAIRs are patient incidence of new cases per 100 PY. ^aBKZ initial treatment period data are included from three pivotal phase 3 studies; ^bADA initial treatment period data are from BE SURE; ^cUST initial treatment period data are from BE VIVID; ^dPBO initial treatment period data are from BE VIVID and BE READY; ^eBKZ longer-term data are pooled from four phase 3 trials and four phase 2 trials; ^fIncludes one event adjudicated by the external Neuropsychiatric Committee (active suicidal ideation with some intent to act) in a patient with pre-existing psychiatric conditions; ^gIncludes one fatal event of circulatory failure (adjudicated MACE), one event of atopic dermatitis-like disseminated eczema and one case of anaphylactic shock due to insect sting, all considered unrelated to study treatment. ADA: adalimumab; BKZ: bimekizumab; CI: confidence interval; EAIR: exposure-adjusted incidence rate; MACE: major adverse cardiovascular event; NMSC: non-melanomic skin cancers; PBO: placebo; PY: patient-years; Q4W: every 4 weeks; SIB: suicidal ideation and behaviour; UST: ustekinumab.

Thank You For Your Attention!



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