Inibidores de complemento para HPN: quanto mais próximo melhor?

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Declaração de Conflito de Interesse

De acordo com a Norma 1595/2000 do Conselho Federal de Medicina e com a RDC 96/2008 da ANVISA, declaro que:

- Pesquisa Clínica como investigador: Roche, Novartis, BioCryst, AstraZeneca
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- Atividades de Consultoria Roche, Alexion, Janssen, Pfizer, BioCryst, AstraZeneca
- Speaker Novartis, Pfizer, Alexion, AstraZeneca, Amgen, BMS

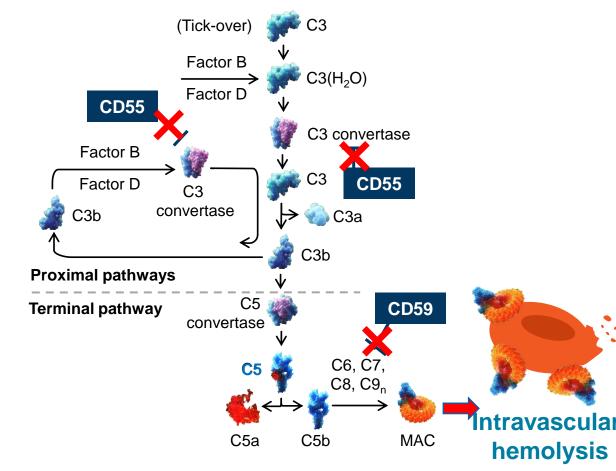
Declaro não ter ações, opções, patentes ou royalties das empresas supracitadas.

Meus pré-requisitos para participar destas atividades são o intercâmbio científico, a autonomia do pensamento científico, a independência de opinião e a liberdade de expressão, aspectos estes respeitados pela Novartis.

Esta apresentação reflete a minha opinião pessoal e não a do meu empregador ou universidade; é para efeitos de discussão científica independente Por favor, consulte a informação de prescrição nas bulas aprovadas no Brasil.

Complement Pathway

Alternative pathway

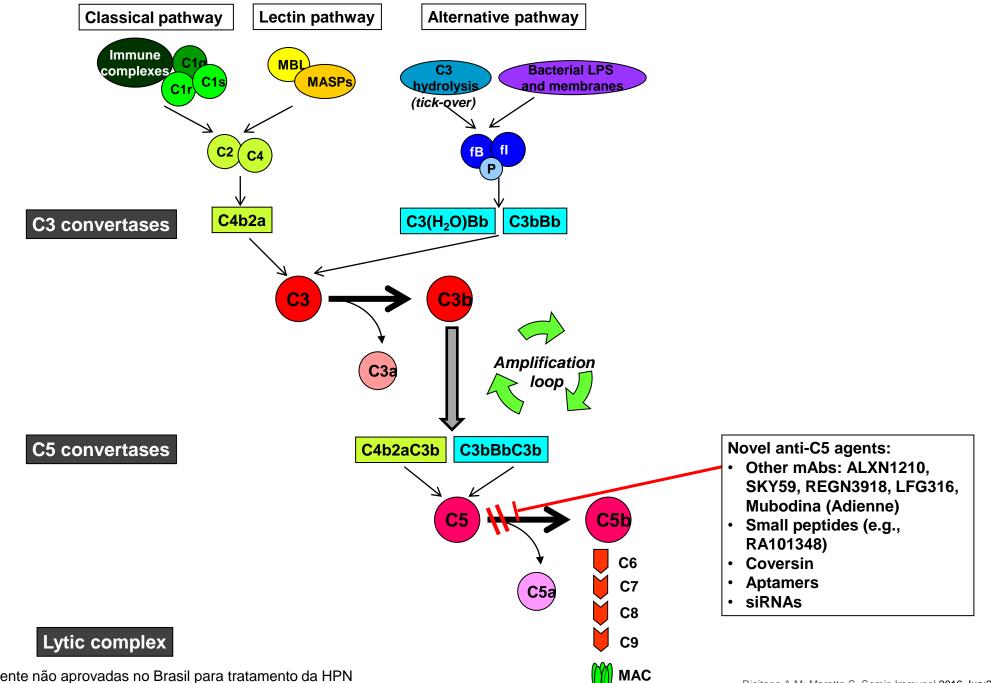


- PNH is a rare, chronic hematological disorder characterized by complement-mediated intravascular haemolysis, thrombophilia and bone marrow failure
 - Caused by a somatic mutation in the *PIGA* gene, resulting in a lack of the GPI-anchored complement-regulating proteins CD55 and CD59, leading to intravascular haemolysis

C, complement component; EVH, extravascular hemolysis; IVH, intravascular hemolysis; MAC, membrane attack complex

3 1. Risitano AM *et al. Blood* 2009;113:4094–100; 2. Hill A *et al. Haematologica* 2010;95:567–73; 3. Debureaux PE *et al. Bone Marrow Transplant* 2021;56:2600–2;

4. Risitano AM et al. Front Immunol 2019;10:1157



Cenário no Brasil

2019 - Protocolos Clínicos e Diretrizes Terapêuticas (PCTD)

Critérios de Inclusão

- Clone > 10%, com atividade hemolítica DHL \ge 1,5
- Histórico de evento tromboembólico
- Anemia crônica Hb \leq 7,0 g/dL ou \leq 10 g/dL com sintomas
- Hipertensão arterial pulmonar por eco PSAP > 35
- História de insuficiência renal clearance \leq 60 ml/min
- Gestação

Cenário no Brasil

2019 - Protocolos Clínicos e Diretrizes Terapêuticas (PCTD)

Critérios de Exclusão

- HPN subclínica
- Concomitância com síndrome de falência medular grave ativa
- neutrófilos < 500 / μ L, plaquetas < 20.000 / μ L, reticulócitos < 25.000 / μ L
- Clone < 10%, sem atividade hemolítica DHL \geq 1,5

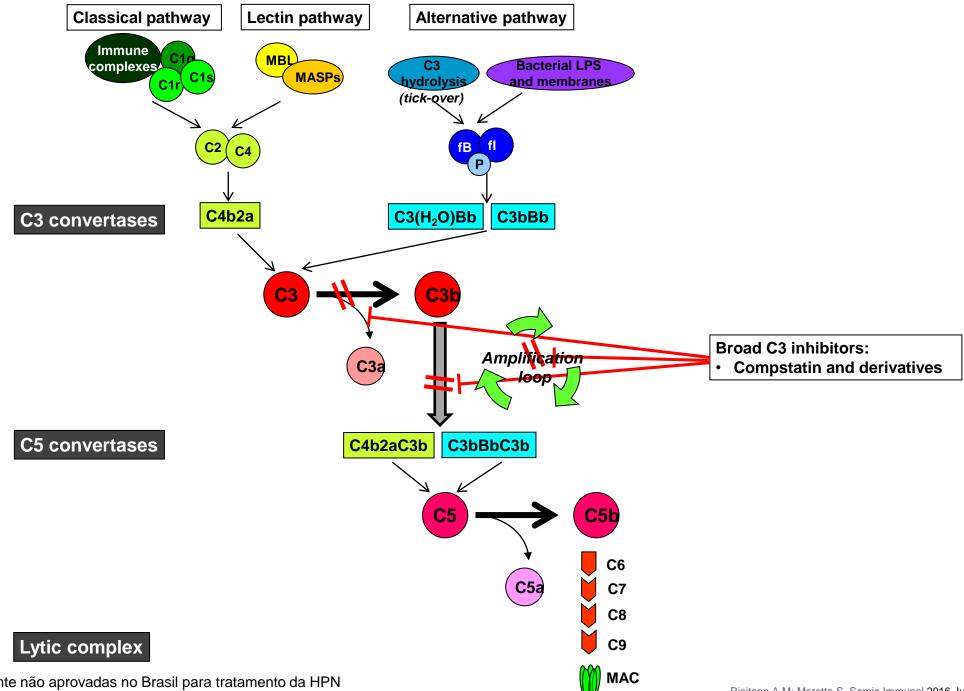
High Unmet Medical Need Despite

Multicenter, real-life, retrospective study of 160 patients with PNH treated with eculizumab¹

	Response category	Response criteria	Main goal of new therapy
21.3%	Complete response 11% BTH, 17% EVH	Hb ≥ 12 g/dL, transfusion independent	Decrease hospital visits
40.2%	Good response 8% BTH, 43% EVH	Hb 10 – 12 g/dL, transfusion independent	Normalization of Hb
26.8%	Partial response 21% BTH, 55% EVH	Hb 8 – 10 g/dL, occasional transfusions	Transfusion independency
11.8%	Minor response 27% BTH, 66% EVH	Hb < 8 g/dL, regular transfusions	Transfusion independency, limit hemachromatosis

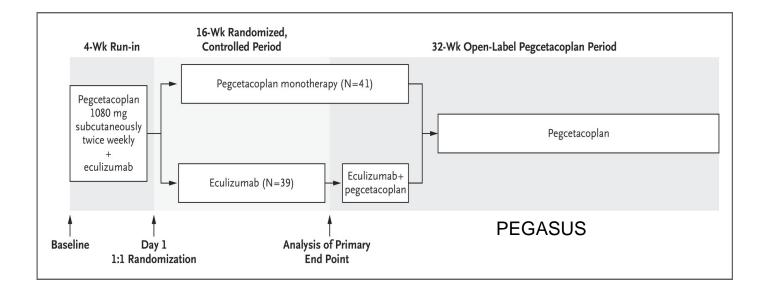
Hb, hemoglobin; RBCT, red blood cell transfusion; SoC, standard of care; BTH, breakthrough hemolysis; EVH, extravascular hemolysis

7



Pegcetacoplan

- Pegcetacoplan is a targeted C3 inhibitor.
- Pegcetacoplan targets the proximal complement pathway, binding to C3 and inhibiting its activation¹
- Pegcetacoplan is administered SC twice weekly^{1–4}



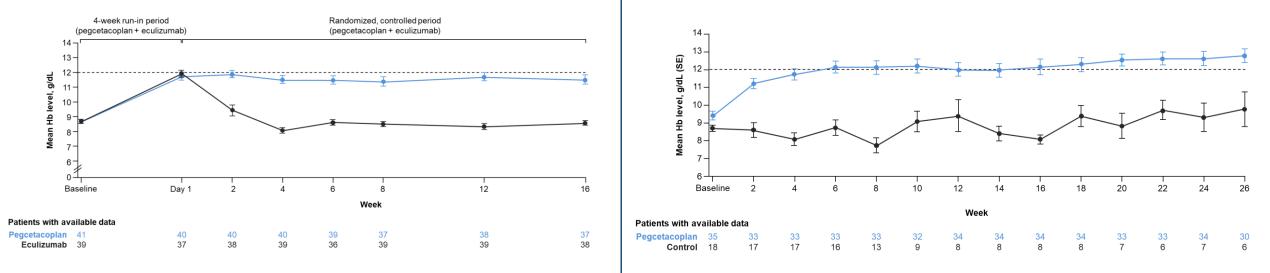
1. De Castro C *et al. Am J Hematol* 2020;95:1334–43; 2. Hillmen P *et al. N Engl J Med* 2021;384:1028–37; 3. Apellis Pharmaceuticals, Inc. EMPAVELI (pegcetacoplan) Prescribing Information. 2021. Available at: <u>https://www.accessdata.fda.gov/drugsatfda_docs/label/2021/215014s000lbl.pdf</u> (accessed March 2022); 4. Swedish Orphan Biovitrum AB (publ). ASPAVELI Summary of Product Characteristics. 2021. Available at: <u>https://www.ema.europa.eu/en/documents/product-information/aspaveli-epar-product-information_en.pdf</u> (accessed March 2022);

Pegcetacoplan

Pegcetacoplan (Phase III; PEGASUS)¹ (80 patients who were anemic despite receiving eculizumab)

Difference at Week 16 = +3.84 g/dL (95% CI 2.33, 5.34; *P*<0.001) between patients receiving pegcetacoplan and eculizumab* **Pegcetacoplan (Phase III; PRINCE)**² (53 complement inhibitor-naïve patients)

Difference at Week 26 = +2.7 g/dL (95% CI 1.0, 4.4; *P*=0.019) between patients receiving pegcetacoplan and supportive care only[†]

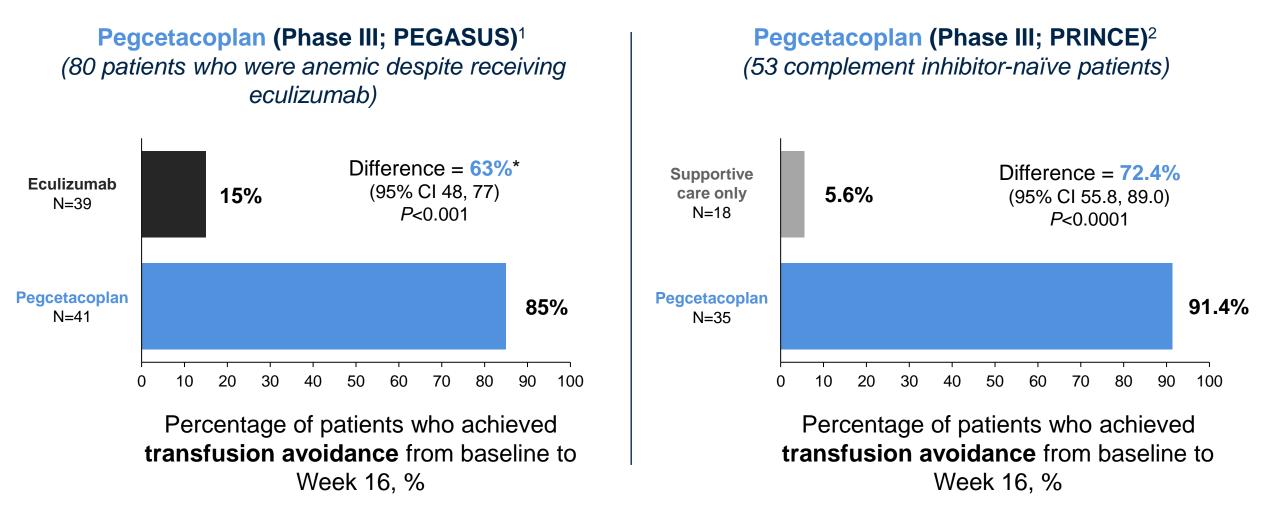


*Graph includes all available data for all patients, regardless of transfusion events. Week 8 data includes three patients in the pegcetacoplan group who had discontinued the trial and one patient with missing data; [†]Control group patients received supportive care (eg RBCTs, corticosteroids and supplements [iron, folate, vitamin B12])

CI, confidence interval; RBCT, red blood cell transfusion; SE, standard error

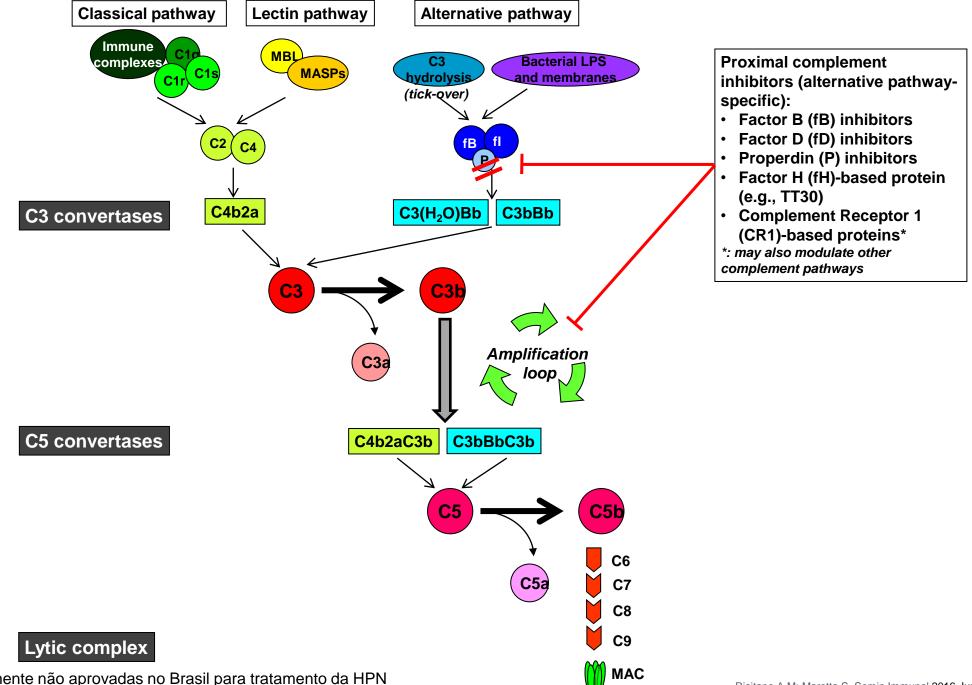
1. Hillmen P et al. N Engl J Med 2021;384:1028–37; 2. Wong RS et al. Blood Adv 2023 doi: https://doi.org/10.1182/bloodadvances.2022009129

Pegcetacoplan



*Pegcetacoplan was non-inferior to eculizumab. To control for a type 1 error, the proportion of patients who did not require a transfusion during the randomized controlled period were tested for non-inferiority if superiority was declared for the primary endpoint

1. Hillmen P et al. N Engl J Med 2021;384:1028-37; 2. Wong RS et al. Blood Adv 2023 doi: https://doi.org/10.1182/bloodadvances.2022009129

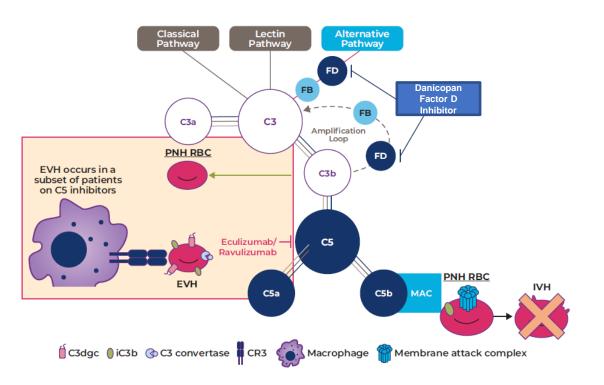


Danicopan*

Introduction

- Danicopan (ALXN2040) is an investigational, first-in-class, oral factor D inhibitor targeting complement AP activity
 - The AP, unlike the classical and lectin pathways, turns over continuously at a low level in the blood via C3 hydrolysis¹
- Danicopan demonstrated predictable pharmacokinetics and a favorable benefit-risk profile in phase 2 trials in patients with PNH^{2,3}

IVH and EVH Associated Complement System in PNH



*Terapia atualmente não aprovada no Brasil para tratamento da HPN

1. Wiles JA, et al. Curr Med Chem. 2020. 2 Kulasekararaj AG, et al. Blood. 2021. 3. Risitano AM, et al. Haematologica 2021.

AP, alternative pathway; cs-EVH, clinically significant EVH; EVH, extravascular hemolysis; FB, factor B; FD, factor D; IVH, intravascular hemolysis; MAC, membrane attack complex; PNH, paroxysmal nocturnal hemoglobinuria; RBC, red blood cell.

Methods

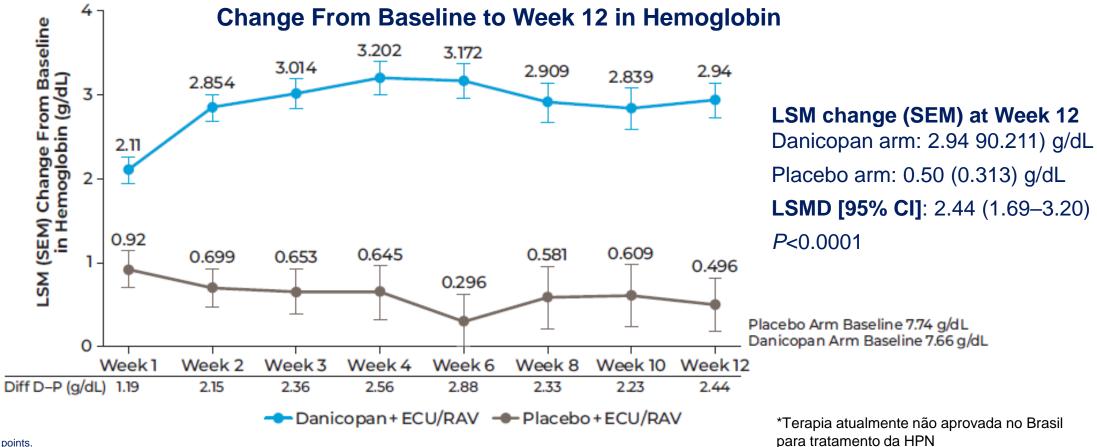
Study Design	 Ongoing, phase 3, randomized, double-blind, placebo- controlled clinical trial 	Dosing	 Initial danicopan dose of 150 mg TID Escalation to 200 mg TID permitted based on clinical response at the investigator's discretion
	 Primary endpoint: Change in Hgb from baseline at week 12 Key secondary endpoints at week 12: Proportion of participants with Hgb increase of ≥2 g/dL without transfusion Proportion of participants with transfusion avoidance Change from baseline in FACIT-F score and ARC Safety: TEAEs and laboratory abnormalities 	Key Inclusion Criteria	 Age ≥18 years with PNH and cs-EVH, despite receiving stable eculizumab or ravulizumab treatment for ≥6 months
Endpoints		Data Analysis	 Statistical significance: 2-sided 0.018 for primary endpoint 2-sided 0.042 for key secondary endpoints Safety analysis performed using data from all participants who took ≥1 dose of the study drug Data analyzed descriptively



ARC, absolute reticulocyte count; ECU, eculizumab; FACIT-F, Functional Assessment of Chronic Illness Therapy–Fatigue; Hgb, hemoglobin; RAV, ravulizumab; TEAE, treatment-emergent adverse event; TID, thrice daily. Kulasekararaj AG *et al.* Poster 756 presented at ASH 2020

Methods

 Danicopan* as an add-on treatment to eculizumab or ravulizumab resulted in a statistically significant increase in Hb from baseline to week 12 vs placebo as add-on to eculizumab or ravulizumab

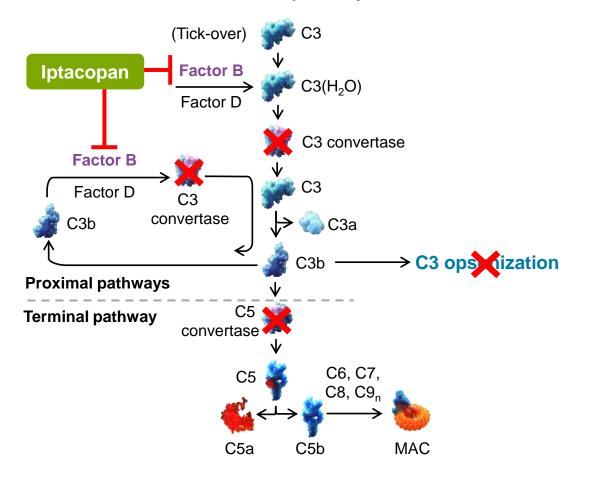


P<0.0001 for all data points.

D, danicopan; Diff, difference; ECU, eculizumab; Hgb, hemoglobin; LSM, least squares mean; P, placebo; RAV, ravulizumab; SE, standard error.

Iptacopan* First-in-class, oral, selective factor B¹

Alternative pathway



Iptacopan binds to the active site of factor B, inhibiting the activity of C3 convertase¹

Iptacopan



Iptacopan controlled intra- and extravascular hemolysis in 10 patients with a suboptimal response to eculizumab, leading to transfusion independence and an improved quality of life²

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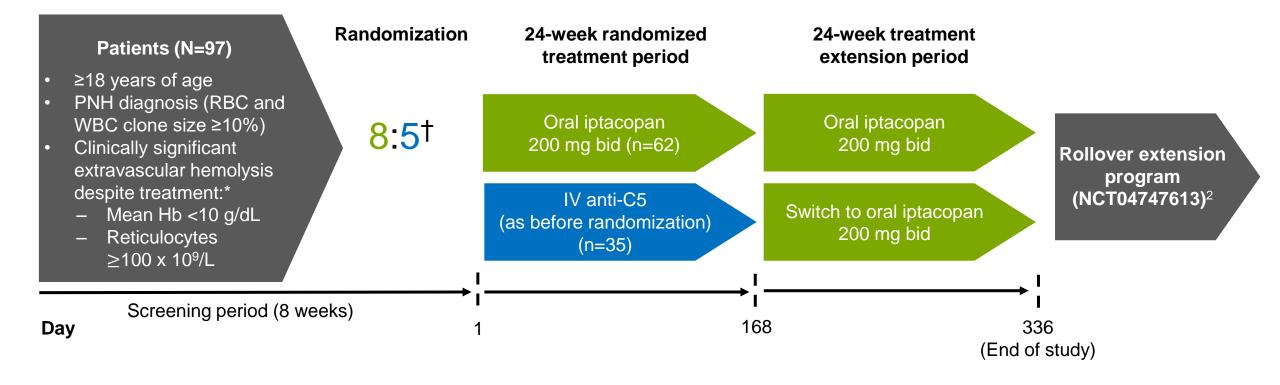
 Addition of iptacopan, an oral factor B inhibitor, to eculizumab in patients with paroxysmal nocturnal haemoglobinuria and active haemolysis: an open-label, single-arm, phase 2, proof-of-concept trial

 Prof Antonio M Risitano, MD & Import Alexander Röth, MD - Juliette Soret, MD - Camilla Frieri, MD - Flore Sicre de Fontbrune, MD - Luana Marano, MD + Ferras Alashkar, MD - Lina Benajiba, MD - Serena Marotta, MD - Izabela Rozenberg, PhD - Julie Milojevic, PhD - Peter End, PhD - Prasanna K Nidamarthy, MSc - Guido Junge, MD - Prof Régis Peffault de Latour, MD - Show less

 Published: March 22, 2021 + DOI: https://doi.org/10.1016/S2352-3026(21)00028-4 + Import

Material from The Lancet Haematology is used with permission 1. Schubart A et al. Proc Natl Acad Sci USA 2019;116:7926–31; 2. Risitano AM et al. Lancet Haematol 2021;8:e344–54

APPLY-PNH is an open-label, randomized, multicenter, Phase III trial investigating iptacopan monotherapy in PNH patients with residual anemia despite anti-C5 therapy (NCT04558918)¹



*With a stable regimen of eculizumab or ravulizumab for at least 6 months preceding randomization; †Stratified by prior anti-C5 treatment and RBC transfusions in the preceding 6 months

bid, twice daily; Hb, hemoglobin; IV, intravenous; RBC, red blood cell; WBC, white blood cell

1. ClinicalTrials.gov. NCT04558918. Available at: https://clinicaltrials.gov/ct2/show/NCT04558918 (accessed April 2023);

2. ClinicalTrials.gov. NCT04747613. Available at: https://clinicaltrials.gov/ct2/show/NCT04747613 (accessed April 2023) N Engl J Med . 2024 Mar 14;390(11):994-1008

APPLY-PNH is a superiority trial with two primary endpoints

Primary

- Hematological response defined as an increase from baseline in Hb of ≥2 g/dL* in the absence of RBC transfusions[†]
- Hematological response defined as Hb ≥12 g/dL* in the absence of RBC transfusions[†]

Secondary

- Transfusion avoidance[†]
- Change from baseline:^{*}
 - Hb levels[‡]
 - FACIT-Fatigue scores
 - Absolute reticulocyte count
 - LDH levels
- Occurrences of clinical breakthrough hemolysis and MAVEs§
- Safety§
- A multiple testing procedure adjusting for multiplicity was used to determine superiority^{1,2}

The overall study Type I error rate was controlled at the one-sided 2.5% level. All presented P values are two-sided and unadjusted

FACIT, Functional Assessment of Chronic Illness Therapy; LDH, lactate dehydrogenase; MAVE, major adverse vascular event

1. Bretz F et al. Stat Med 2009;28:586–604; 2. Bretz F et al. Stat Med 2011;30:1489–501

N Engl J Med . 2024 Mar 14;390(11):994-1008

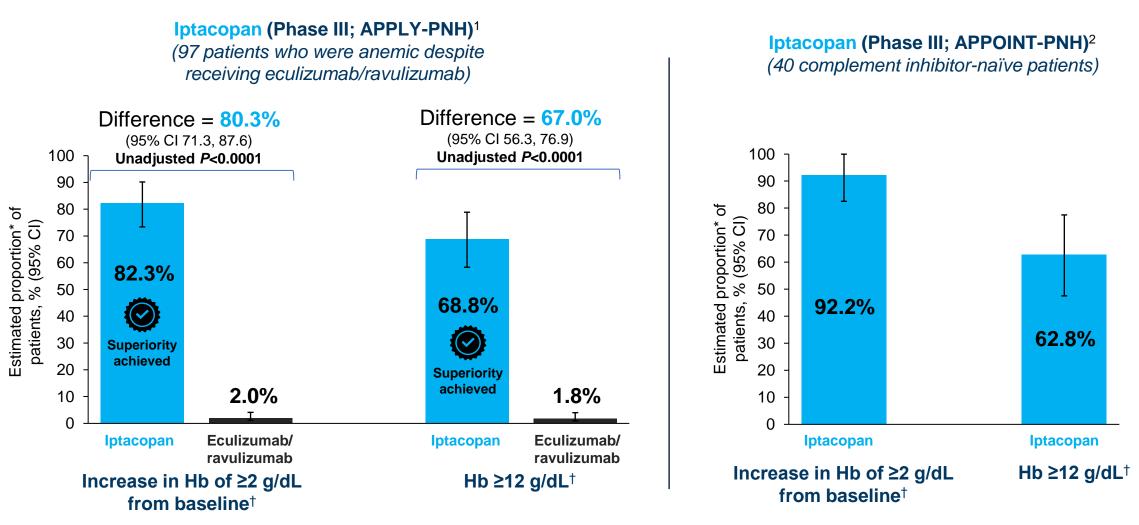
^{*}Assessed between Days 126 and 168; [†]Between Days 14 and 168 and neither meeting the criteria for administration of an RBC transfusion nor receiving an RBC transfusion between Days 14 and 168; [‡]Excluding values within 30 days of RBC transfusion; [§]Throughout the study

Demographics and disease characteristics at baseline were generally balanced between arms

	lptacopan* 200 mg bid N=62	Anti-C5 N=35	Overall N=97
Mean age, years (SD)	51.7 (16.9)	49.8 (16.7)	51.0 (16.8)
Female, n (%)	43 (69.4)	24 (68.6)	67 (69.1)
Time since diagnosis, years (SD)	11.9 (9.8)	13.6 (10.9)	12.5 (10.2)
Anti-C5 therapy Eculizumab,* n (%) Ravulizumab,* n (%) Mean duration, years (SD)	40 (64.5) 22 (35.5) 3.8 (3.5)	23 (65.7) 12 (34.3) 4.2 (3.9)	63 (64.9) 34 (35.1) 4.0 (3.6)
Received RBC transfusions,* n (%)	35 (56.5)	21 (60.0)	56 (57.7)
Mean baseline Hb, g/dL (SD) [range]	8.9 (0.7) [6.8–10.0]	8.9 (0.9) [6.2–9.9]	8.9 (0.8) [6.2–10.0]
Mean baseline LDH, U/L (SD) [range]	269.1 (70.1) [150–539]	272.7 (84.8) [133–562]	270.4 (75.3) [133–562]
Baseline LDH >1.5 x ULN, n (%)	4 (6.5)	3 (8.6)	7 (7.2)
Mean baseline absolute reticulocyte count, 10 ⁹ /L (SD) [range]	193.2 (83.6) [51–563]	190.6 (80.9) [90–412]	192.3 (82.3) [51–563]

In Phase III trials, inhibition of factor B with oral iptacopan* monotherapy led to clinically meaningful Hb improvements in the absence of RBCTs





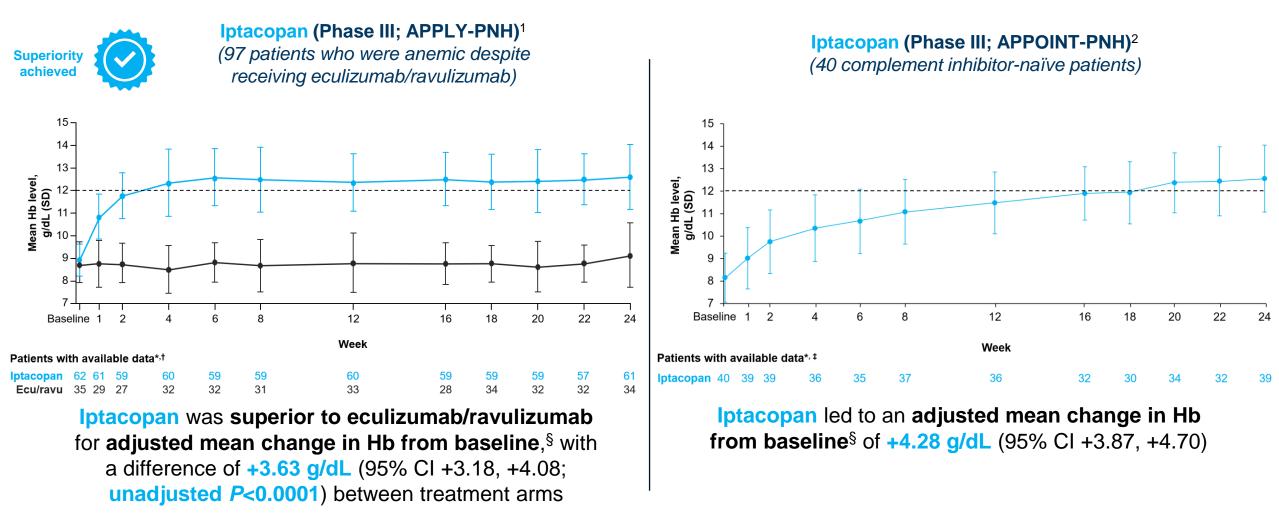
*Terapia atualmente não aprovada no Brasil para tratamento da HPN

*Estimated proportions were calculated to reflect the population average probability of a patient meeting the endpoint criteria; [†]Assessed between Days 126 and 168 in the absence of (or meeting the criteria for) RBCTs between Days 14 and 168

1. Peffault de Latour R *et al. Blood* 2022;140(Suppl 2):LBA-2; 2. Risitano AM et al. European Society for Blood and Marrow Transplantation (EBMT). Paris, France, 23–26 April 2023; abstract OS12-06

b NOVARTIS

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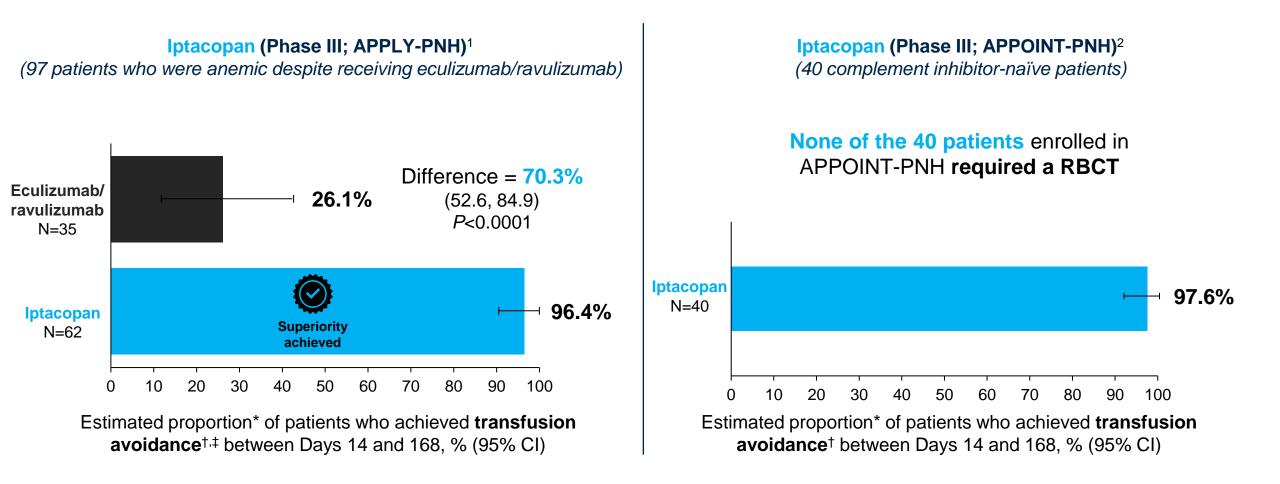
*Includes post-transfusion data; †2/62 patients in the iptacopan arm and 21/35 patients in the eculizumab/ravulizumab arm had RBCTs between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 1 and 13 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 14 and 168; ‡RBCTs were received by 5/40 patients between Days 14 and 18 between Days 14 and 168; SAssessed between Days 126 and 168 in the absence of (or meeting the criteria for) RBCTs between Days 14 and 168. Ecu, eculizumab; ravu, ravulizumab; SD, standard deviation 1. Peffault de Latour R et al. Blood 2022;140(Suppl 2):LBA-2; 2. Risitano AM et al. European Society for Blood and Marrow Transplantation (EBMT). Paris, France, 23–26 April 2023; abstract OS12-06



The factor B inhibitor iptacopan* led to transfusion independence in nearly all patients treated in Phase III trials



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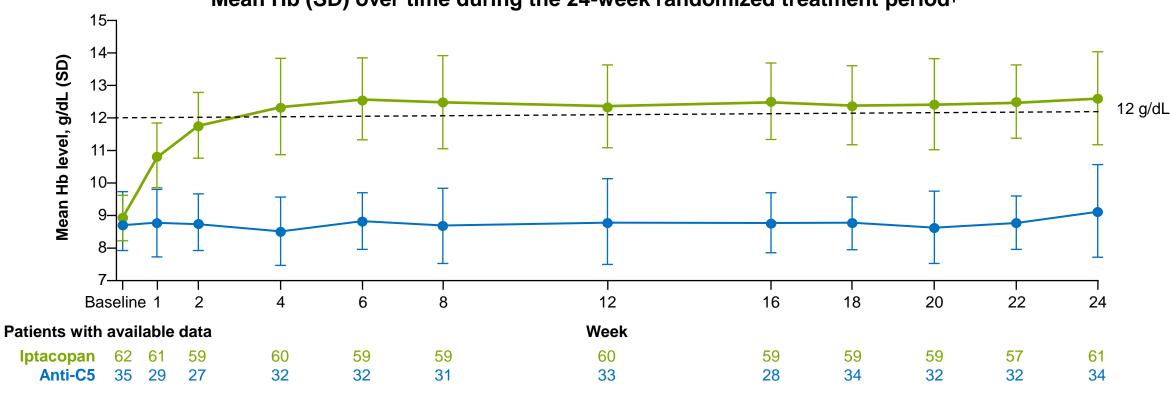


*Terapia atualmente não aprovada no Brasil para tratamento da HPN

*Estimated proportions were calculated to reflect the population average probability of a patient meeting the endpoint criteria; [†]Defined as the proportion of patients who remained free from (and did not meet the criteria for) transfusions between Days 14 and 168; [‡]The prespecified methodology for handling of missing data may have underestimated transfusion avoidance in the eculizumab/ravulizumab arm, so a *post hoc* sensitivity analysis was conducted using a different approach. In this analysis, estimated proportions (95% CI) were 96.7% (91.3, 100.0) versus 38.9% (23.1, 55.8) for iptacopan and eculizumab/ravulizumab, respectively (*P*<0.0001) 1. Peffault de Latour R *et al. Blood* 2022;140(Suppl 2):LBA-2; 2. Risitano AM *et al.* European Society for Blood and Marrow Transplantation (EBMT). Paris, France, 23–26 April 2023; abstract OS12-06

Iptacopan* monotherapy was superior to anti-C5 at increasing Hb level from baseline

Adjusted mean Hb change from baseline* (95% CI) was +3.59 (3.32, 3.86) g/dL for iptacopan vs -0.04 (-0.42, 0.35) g/dL for anti-C5, with a difference of +3.63 (3.18, 4.08) g/dL (*P*<0.0001[†])



Mean Hb (SD) over time during the 24-week randomized treatment period[‡]

*Terapia atualmente não aprovada no Brasil para tratamento da HPN

N Engl J Med . 2024 Mar 14;390(11):994-1008

*Between Days 126 and 168 (excluding values within 30 days of RBC transfusion); [†]A repeated measures model, adjusting for covariates including baseline Hb, was used for comparisons between the treatment arms. *P* value is two-sided and unadjusted; [‡]Includes post-transfusion data. 2/62 patients in the iptacopan arm and 21/35 patients in the anti-C5 arm had RBC transfusions between Days 14 and 168. BL, baseline; Wk, week

Iptacopan* monotherapy was superior to anti-C5 at reducing patient-reported fatigue from baseline

Adjusted mean change from baseline* in FACIT-Fatigue score (95% CI) was +8.59 (6.72, 10.47) for iptacopan vs +0.31 (-2.20, 2.81) for anti-C5, with a difference of +8.29 (5.28, 11.29) (P<0.0001⁺) Mean FACIT-Fatigue score (SD) during the 24-week randomized treatment period Mean score in healthy general US population¹ Mean FACIT-Fatigue score (SD) 50-45-40-35-30-25-20-15-**Baseline 1** 2 12 18 20 22 24 6 Patients with available data Week **Iptacopan** 62 57 58 59 60 57 61 56 60 32 **Anti-C5** 33 27 28 29 29 28 28 30

*Terapia atualmente não aprovada no Brasil para tratamento da HPN

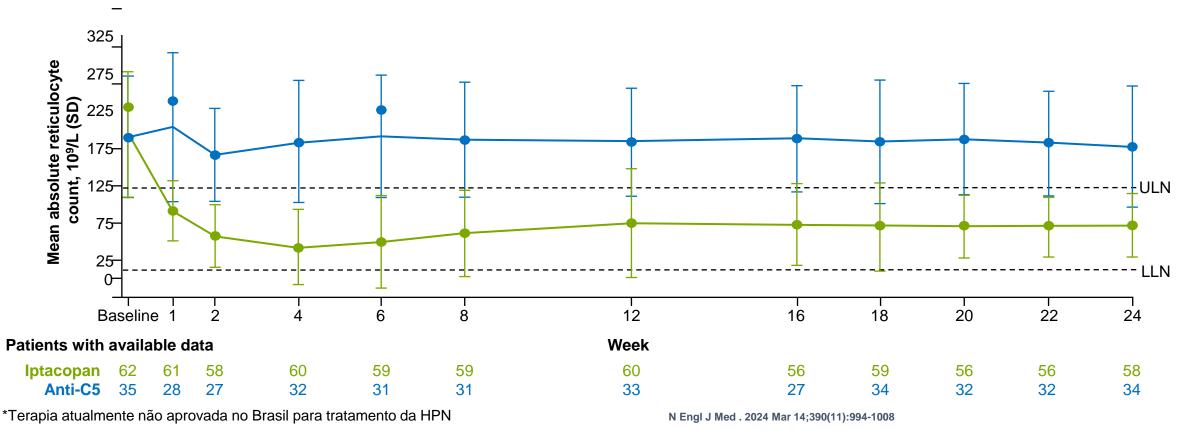
N Engl J Med . 2024 Mar 14;390(11):994-1008

*Between Days 126 and 168; [†]A repeated measures model, adjusting for covariates including baseline FACIT-Fatigue score, was used for comparisons between the treatment arms. *P* value is two-sided and unadjusted 1. Cella D *et al. Cancer* 2002;94:528–38

Iptacopan* monotherapy was superior to anti-C5 at reducing absolute reticulocyte count from baseline

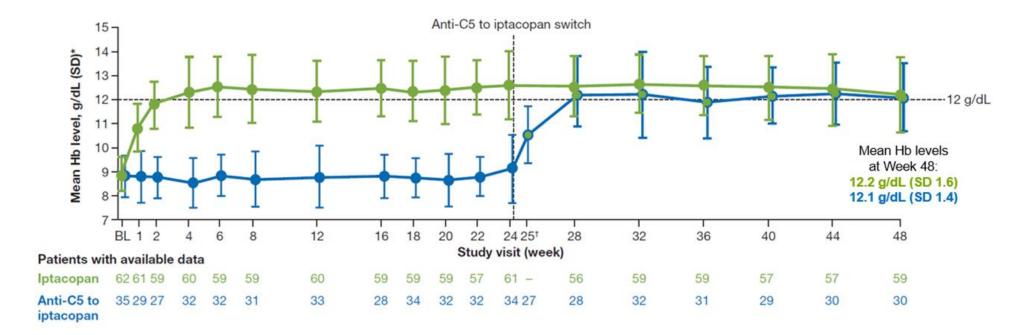
Adjusted mean change from baseline* in absolute reticulocyte count (95% CI) was $-115.89 (-126.49, -105.30) \times 10^{9}$ /L for iptacopan vs +0.37 (-13.03, 13.77) x 10⁹/L for anti-C5, with a difference of $-116.26 (-132.17, -100.36) \times 10^{9}$ /L (*P*<0.0001[†])

Mean absolute reticulocyte count (SD) during the 24-week randomized treatment period



*Between Days 126 and 168; [†]A repeated measures model, adjusting for covariates including baseline absolute reticulocyte count, was used for comparisons between the treatment arms. *P* value is two-sided and unadjusted. LLN, lower limit of normal

Cross over to iptacopan from C5i



Mean Hb level over time during the entire 48-week treatment period of APPLY-PNH

There was no significant difference between iptacopan monotherapy and anti-C5 for the annualized rate of MAVEs

	Arm	n/N*	Adjusted annual rate, % (95% Cl)	Rate ratio (95% CI) [†]	P value [†]
Rate of MAVEs	Iptacopan	1/62	0.03 (0.00, 0.25)	Not optimoble	0.3173
Rale OF MAVES	Anti-C5	0/35	0	Not estimable	

 Serious TEAE of transient ischemic attack, considered by the investigator to be unrelated to iptacopan

The patient had a concomitant serious TEAE of sick sinus syndrome and is continuing to receive iptacopan treatment

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Iptacopan* monotherapy was well tolerated and had a favorable safety profile

Most common TEAEs (≥4 patients in either arm)*

n (%)	lptacopan 200 mg bid N=62	Anti-C5 N=35
Any TEAE	51 (82.3)	28 (80.0)
Mild / Moderate / Severe, %	32.3 / 45.2 / 4.8	37.1 / 34.3 / 8.6
Headache	10 (16.1)	1 (2.9)
Diarrhea	9 (14.5)	2 (5.7)
Nasopharyngitis	7 (11.3)	2 (5.7)
Nausea	6 (9.7)	1 (2.9)
COVID-19	5 (8.1)	9 (25.7)
Urinary tract infection	5 (8.1)	1 (2.9)
Arthralgia	5 (8.1)	1 (2.9)
Abdominal pain	4 (6.5)	1 (2.9)
Increased blood LDH	4 (6.5)	3 (8.6)
Dizziness	4 (6.5)	0
Breakthrough hemolysis	2 (3.2)	6 (17.1)

*Organized by descending frequency in the iptacopan arm N Engl J Med . 2024 Mar 14;390(11):994-1008

Serious TEAEs: 9.7% vs **14.3%**

Hemolysis serious TEAEs:

•Anti-C5: breakthrough hemolysis (n=1) and extravascular hemolysis (n=1)

•lptacopan: none

No serious infections caused by *Neisseria meningitidis, Streptococcus pneumoniae* or *Haemophilus influenzae*

No patients discontinued study treatment, except one because of pregnancy (iptacopan)

No deaths

Conclusions

- Proximal Complement Inhibitors are finally here.
- Oral iptacopan monotherapy led to a significant majority of patients achieving clinically meaningful Hb increases and Hb ≥12 g/dL, associated with a higher rate of transfusion independence and reduced patient-reported fatigue, compared with anti-C5
- Iptacopan monotherapy achieved resolution of extravascular hemolysis and maintenance of intravascular hemolysis control
- The therapy was well tolerated, with a favorable safety profile and no serious breakthrough hemolysis
- Iptacopan monotherapy may represent a practice-changing, oral, outpatient treatment, which may become a preferred treatment option for patients with hemolytic PNH who have an inadequate response to IV anti-C5 therapy

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