

Metastatic Lung Cancer Targeted Therapy Update

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Agenda

- Increasing Targets in NSCLC
- mEGFR and OSI resistance
 - MET inhibition (Chrysalis 2, Insight 2)
 - Chemo+ (AGAIN, Keynote 789)
- Antibody Drug Conjugates (ADC)
 - Her2 mutation (Destiny)
 - TROP2 (Tropion-Lung02)
- Novel Inhibitors (YK-029A, APG-2449, SI B-001)
- BRAF 4600E (Pharos)
- KRAS G12C + Chemo (Scarlet)

Lung Cancer Targets

- EGFR* exon 19 deletion or exon 21 L858R mutation positive**
- EGFR* S768I, L861Q, and/or G719X mutation positive**
- EGFR* exon 20 insertion mutation positive**
- KRAS* G12C mutation positive**
- ALK* rearrangement positive**
- ROS1* rearrangement positive**
- BRAF* V600E mutation positive**
- NTRK1/2/3* gene fusion positive**
- MET* ex14 skipping mutation positive**
- RET* rearrangement positive**
- ERBB2 (HER2)* mutation positive**
- PD-L1 ≥1% and negative for actionable molecular biomarkers above**
- PD-L1 <1% and negative for actionable molecular biomarkers above**

MOLECULAR AND BIOMARKER-DIRECTED THERAPY FOR ADVANCED OR METASTATIC DISEASE^{a,b}

EGFR Exon 19 Deletion or Exon 21 L858R

- First-line therapy
 - ▶ Afatinib¹
 - ▶ Erlotinib²
 - ▶ Dacomitinib³
 - ▶ Gefitinib^{4,5}
 - ▶ Osimertinib⁶
 - ▶ Erlotinib + ramucirumab⁷
 - ▶ Erlotinib + bevacizumab^c (nonsquamous)⁸
- Subsequent therapy
 - ▶ Osimertinib⁹

EGFR S768I, L861Q, and/or G719X

- First-line therapy
 - ▶ Afatinib^{1,10}
 - ▶ Erlotinib²
 - ▶ Dacomitinib³
 - ▶ Gefitinib^{4,5}
 - ▶ Osimertinib^{6,11}
- Subsequent therapy
 - ▶ Osimertinib⁹

EGFR Exon 20 Insertion Mutation

- Subsequent therapy
 - ▶ Amivantamab-vmjw¹²
 - ▶ Mobocertinib¹³

KRAS G12C Mutation

- Subsequent therapy
 - ▶ Sotorasib¹⁴
 - ▶ Adagrasib¹⁵

ALK Rearrangement

- First-line therapy
 - ▶ Alectinib^{16,17}
 - ▶ Brigatinib¹⁸
 - ▶ Ceritinib¹⁹
 - ▶ Crizotinib^{16,20}
 - ▶ Lorlatinib²¹
- Subsequent therapy
 - ▶ Alectinib^{22,23}
 - ▶ Brigatinib²⁴
 - ▶ Ceritinib²⁵
 - ▶ Lorlatinib²⁶

ROS1 Rearrangement

- First-line therapy
 - ▶ Ceritinib^{27,28}
 - ▶ Crizotinib²⁹
 - ▶ Entrectinib³⁰
- Subsequent therapy
 - ▶ Lorlatinib³¹
 - ▶ Entrectinib³⁰

BRAF V600E Mutation

- First-line therapy
 - ▶ Dabrafenib/trametinib³²
 - ▶ Dabrafenib³²
 - ▶ Vemurafenib
- Subsequent therapy
 - ▶ Dabrafenib/trametinib^{33,34}

NTRK1/2/3 Gene Fusion

- First-line/Subsequent therapy
 - ▶ Larotrectinib³⁵
 - ▶ Entrectinib³⁶

MET Exon 14 Skipping Mutation

- First-line therapy/Subsequent therapy
 - ▶ Capmatinib³⁷
 - ▶ Crizotinib³⁸
 - ▶ Tepotinib³⁹

RET Rearrangement

- First-line therapy/Subsequent therapy
 - ▶ Selpercatinib⁴⁰
 - ▶ Pralsetinib⁴¹
 - ▶ Cabozantinib^{42,43}

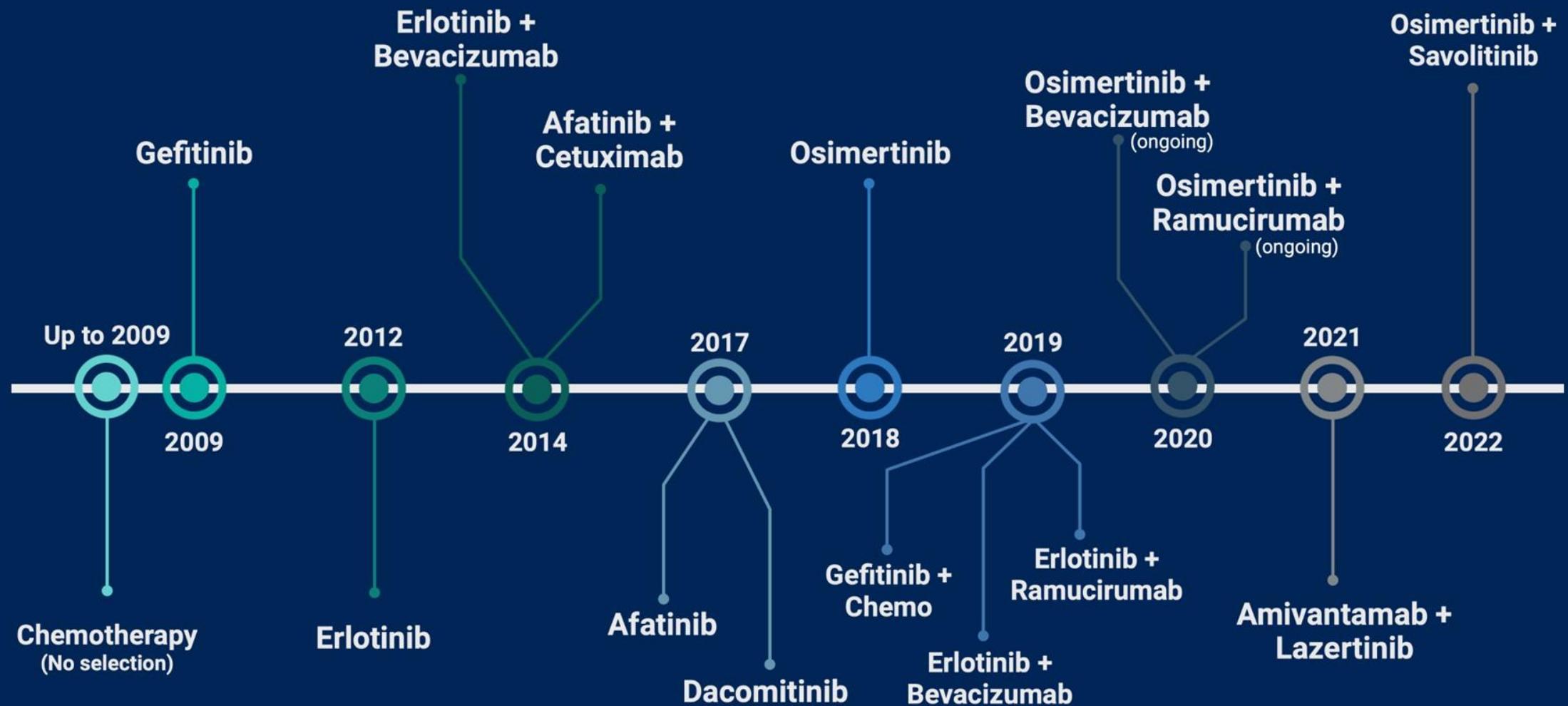
ERBB2 (HER2) Mutation

- Subsequent therapy
 - ▶ Fam-trastuzumab deruxtecan-nxki⁴⁴
 - ▶ Ado-trastuzumab emtansine⁴⁵

PD-L1 ≥50% First-line Therapy

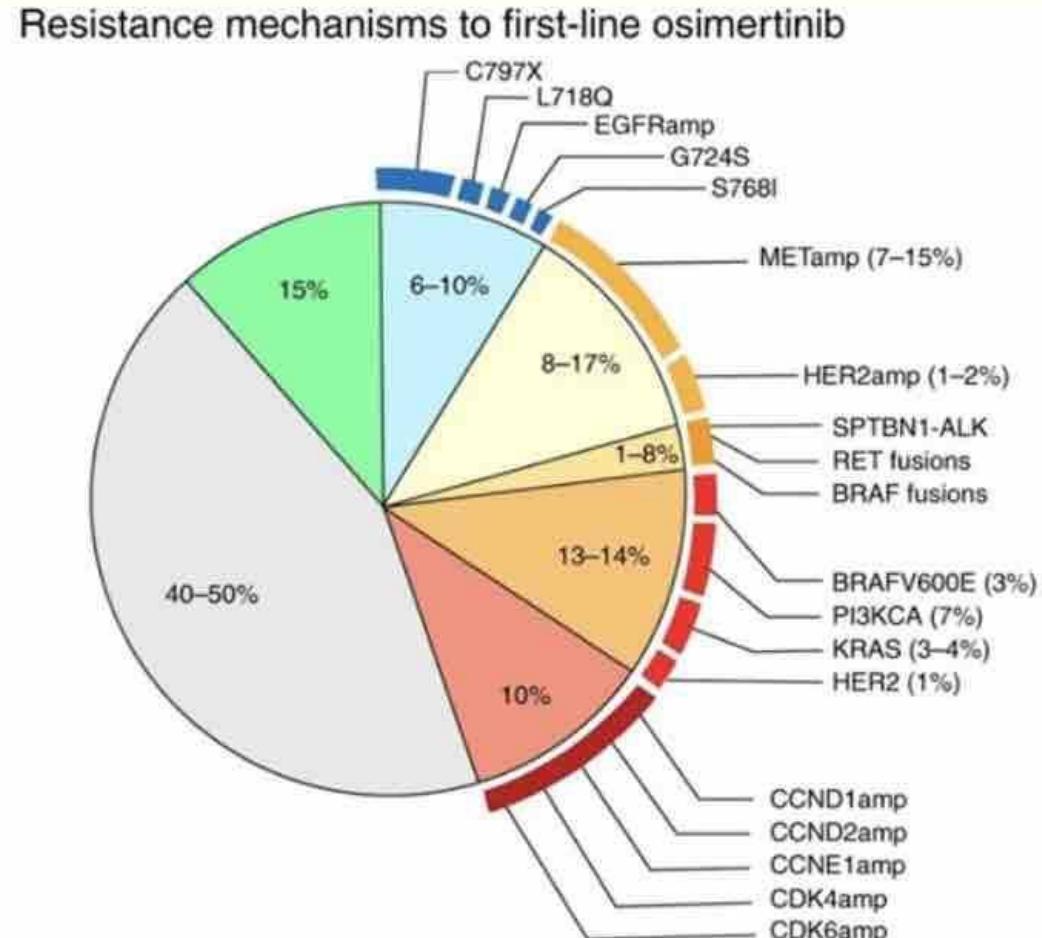
PD-L1 ≥1-49% First-line Therapy

EGFR Mutations *Evolution of Treatment* in advanced NSCLC



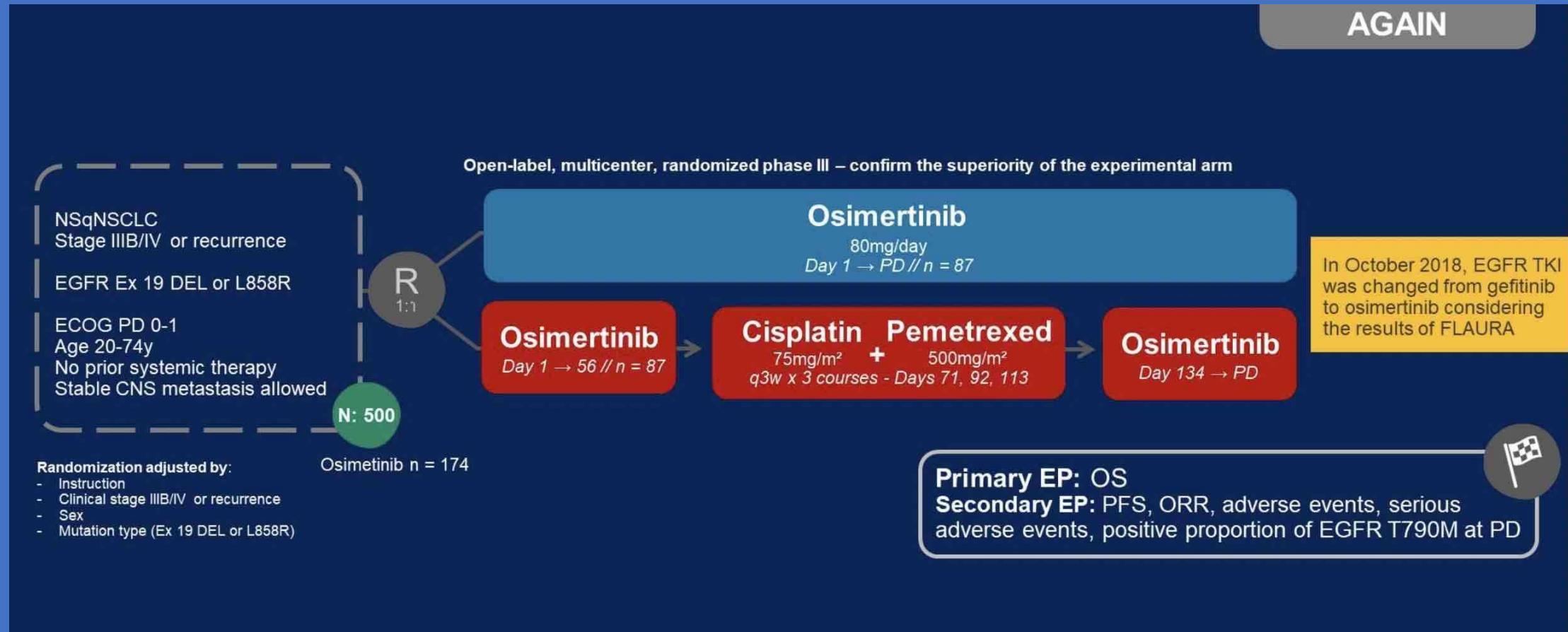
Resistance to Osimertinib in mEGFR NSCLC

Schoenfeld Clin Cancer Res 2020, 26, 2654

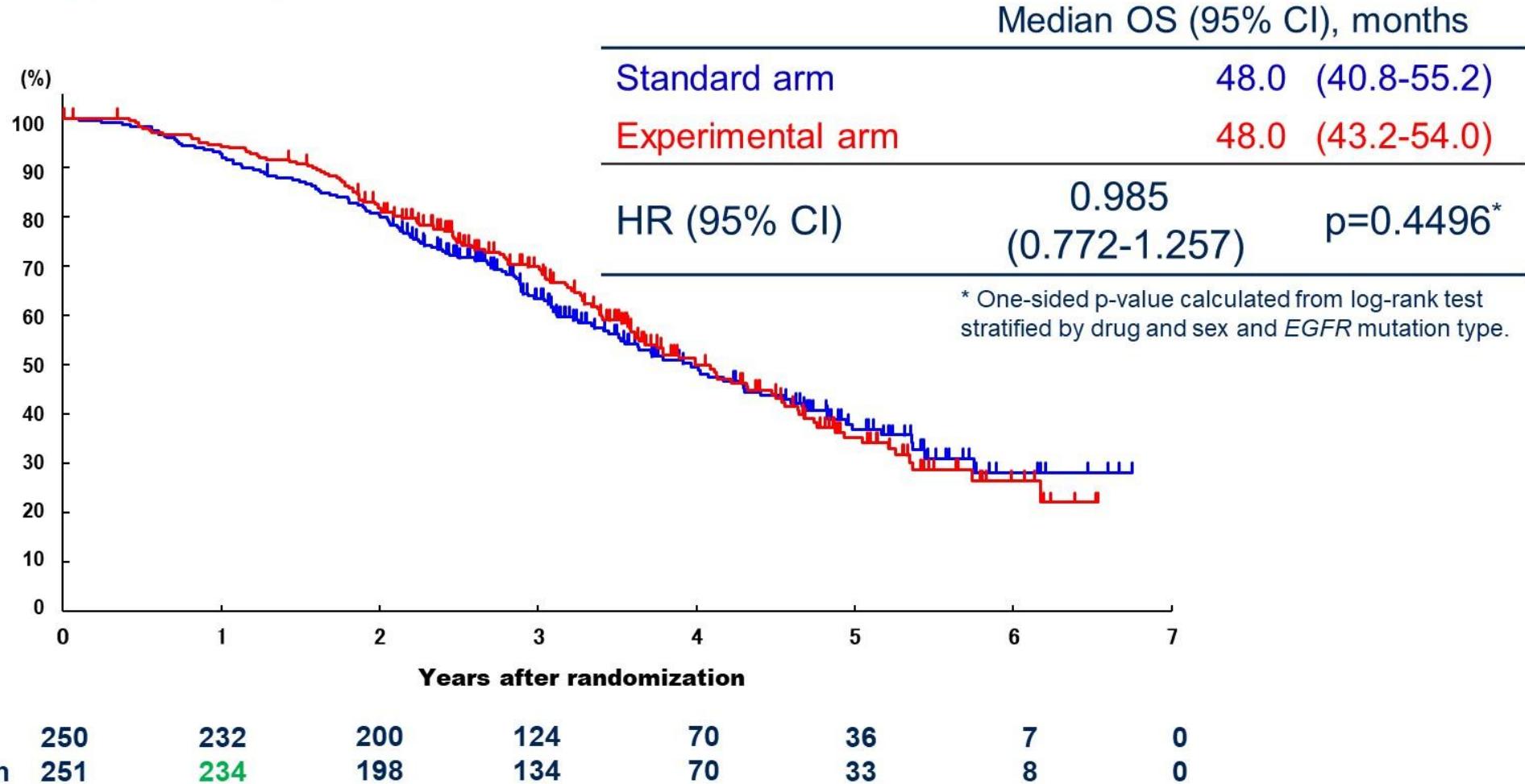


AGAIN Study combining chemo and Osi

JCOG1404/WJOG8214L



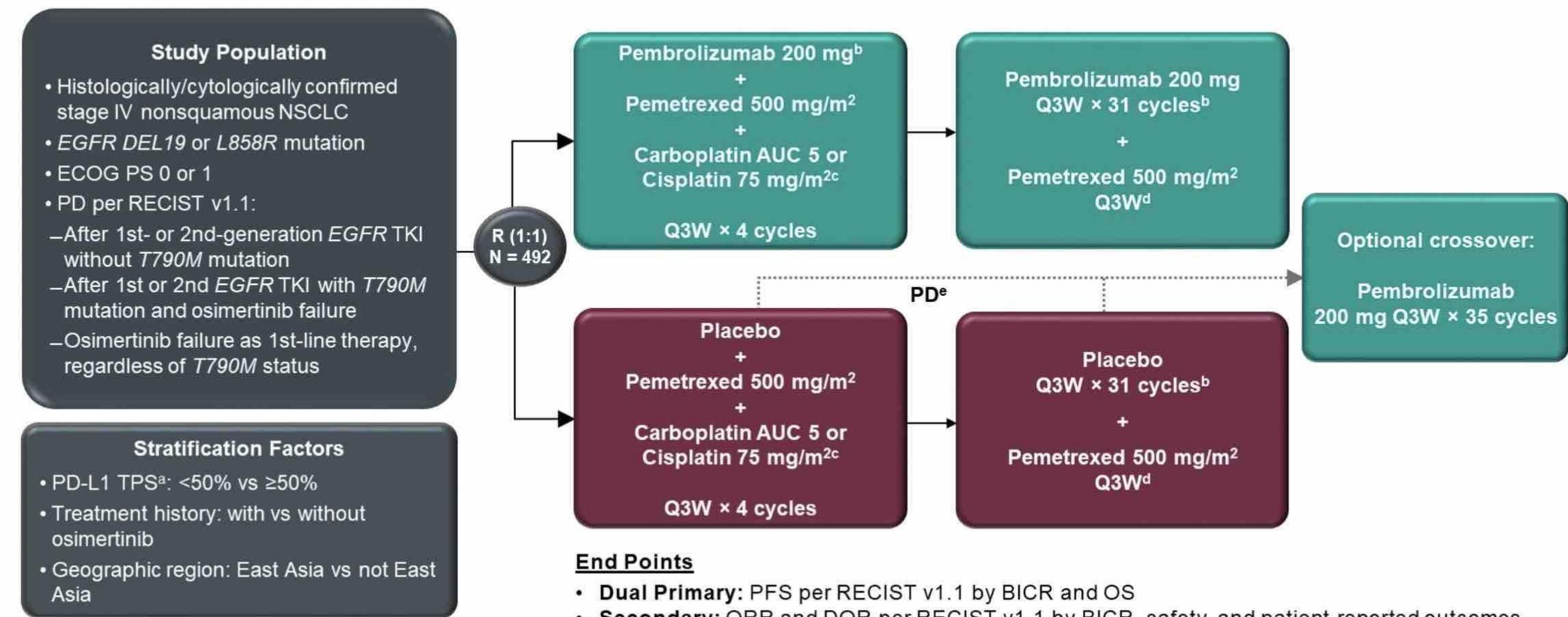
Primary endpoint: Overall survival (ITT)



Overcoming EGFR TKI Resistance

Chemo+/-IO in TKI refractory mEGFR NSCLC

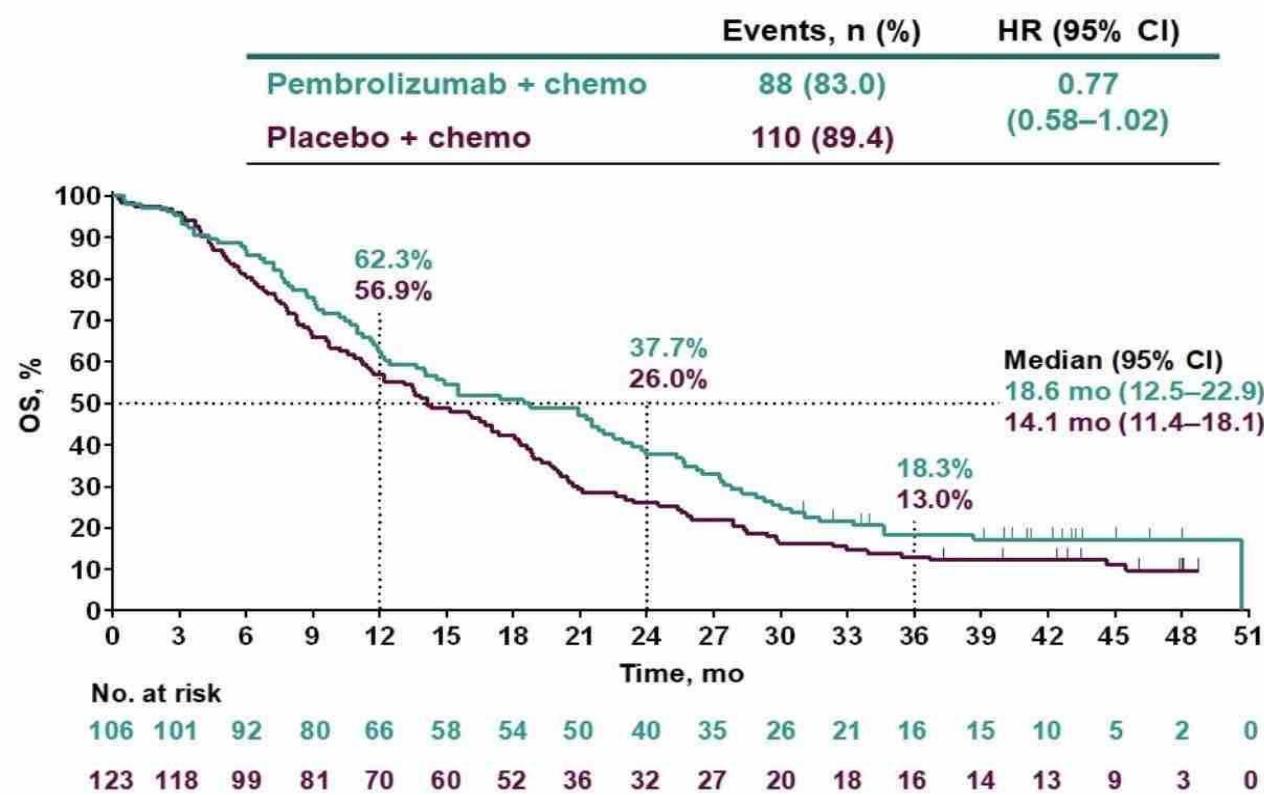
KEYNOTE-789: Phase 3 Randomized Study (NCT03515837)



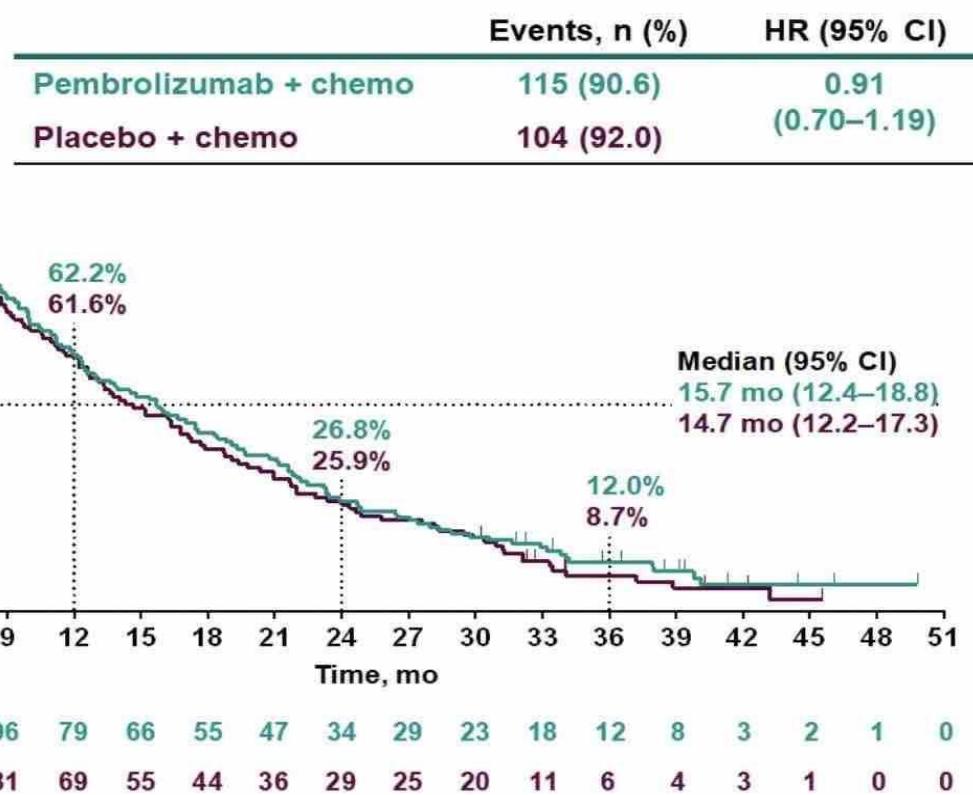
Chemo+/-IO in TKI refractory mEGFR NSCLC, KN 789

Overall Survival in PD-L1 TPS $\geq 1\%$ and $<1\%$ at FA

PD-L1 TPS $\geq 1\%$

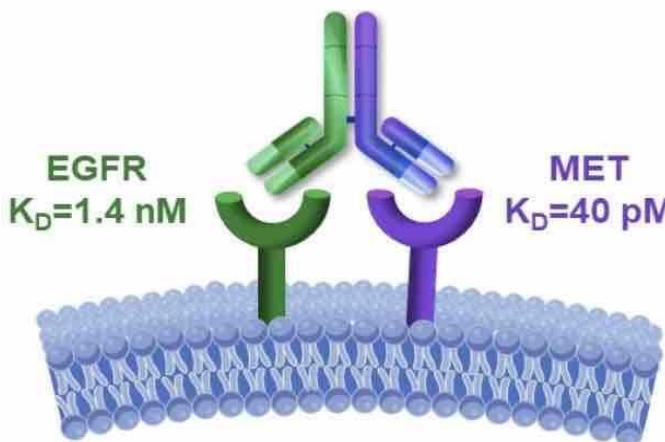
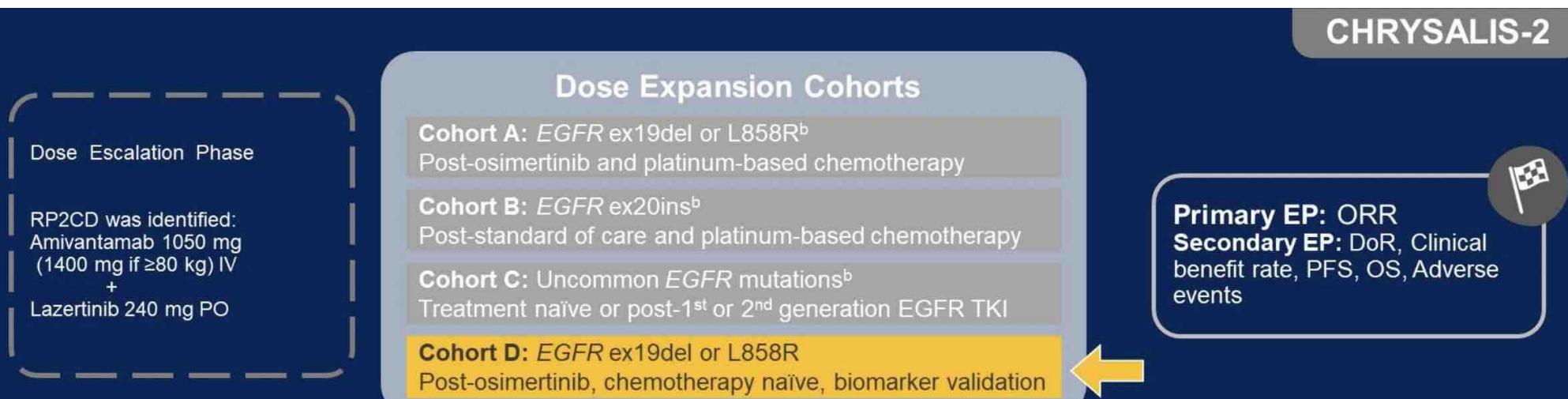


PD-L1 TPS <1%

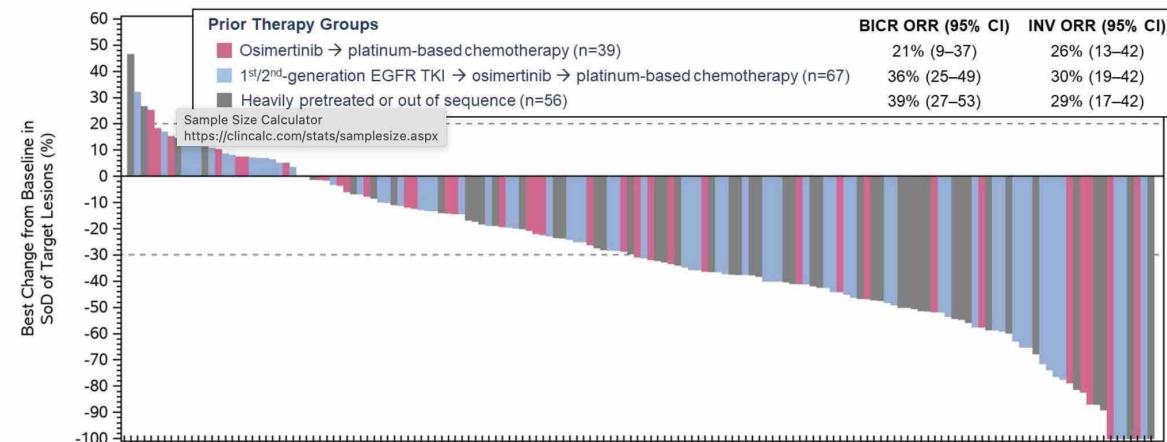


Chrysalis 2 (Phase 1B), Amivantamab (BITE) and Lazertinib (3rd gen. EGFR TKI) post Osimertinib in mEGFR NSCLC

ASCO 2022, C. Shu, #9006



Best Antitumor Response and ORR by Prior Therapy Group



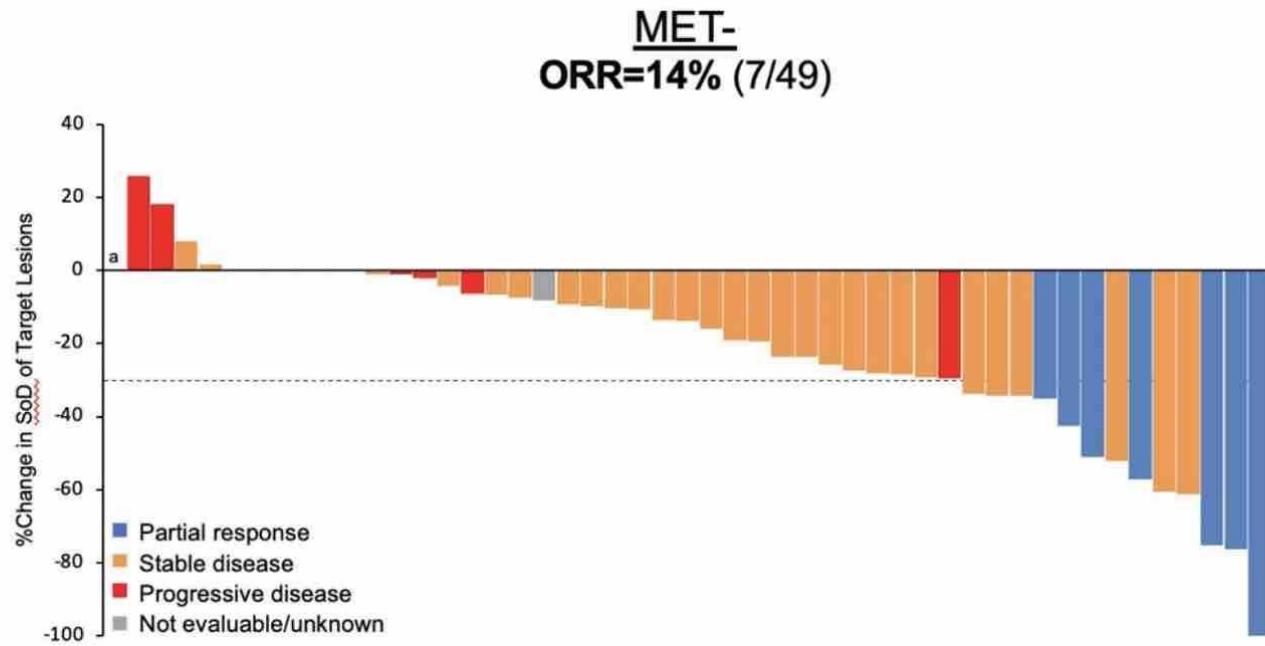
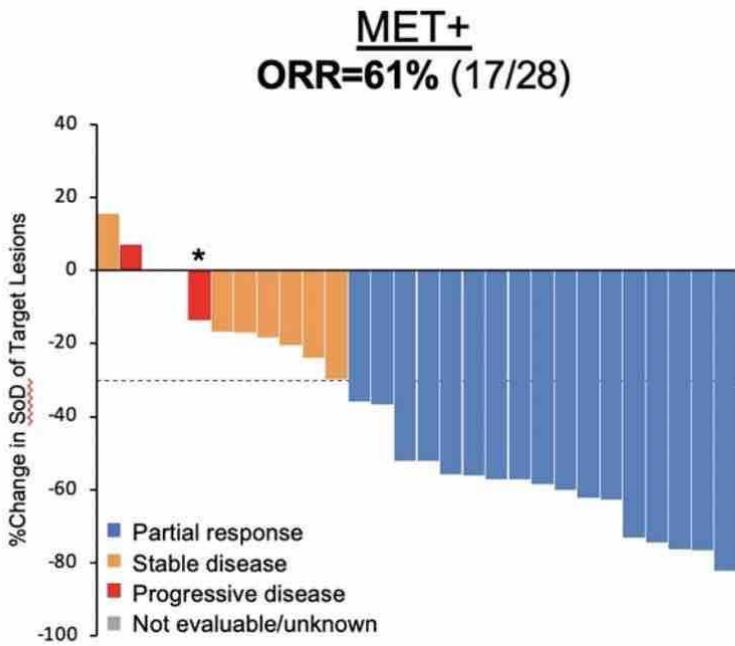
- 10 efficacy-evaluable patients did not have any evaluable post-baseline target lesion measurements

MET IHC Expression 3+ a predictive biomarker?

B. Besse, ASCO 2023

CHRYSALIS-2

MET+ by IHC Enriched Response to Amivantamab Plus Lazertinib



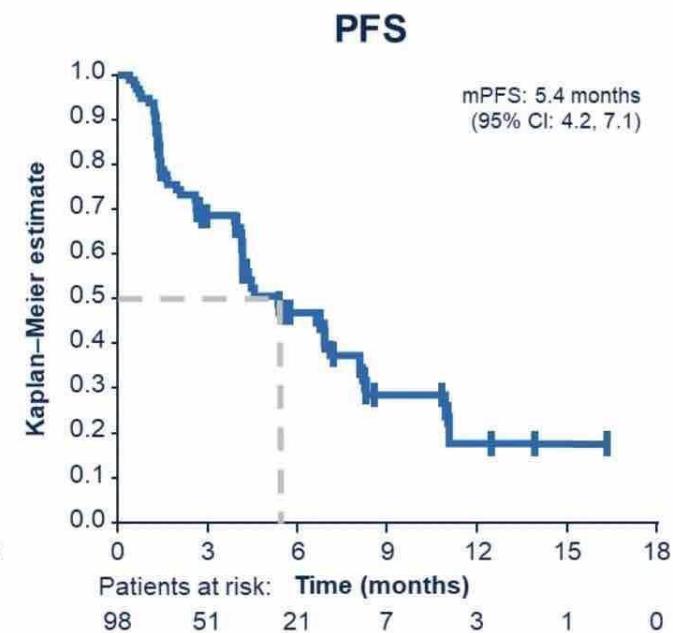
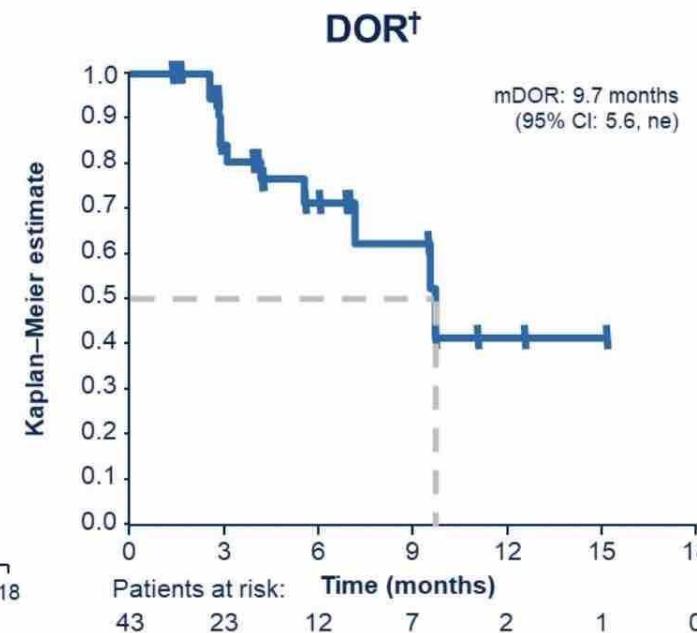
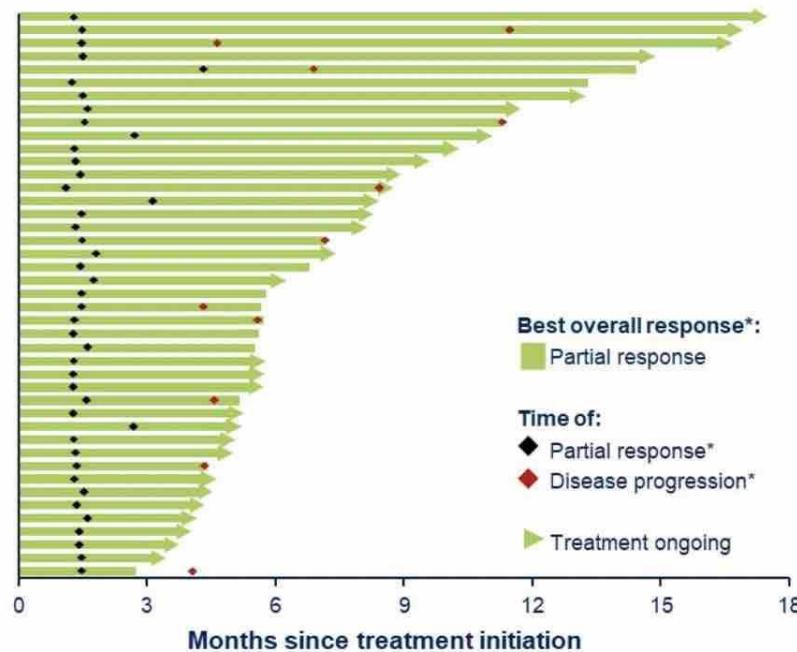
- A total of 28 of 77 (36%) patients^b had MET 3+ staining on ≥25% of tumor cells (MET+)
- MET amplification was detected by NGS of ctDNA in 1 patient (see asterisk)

INSIGHT 2

Tepotinib and OSI for FISH amplified MET mEGFR D. Tan, ASCO 2023

INSIGHT 2: Efficacy TBx FISH⁺

- Responses mostly occurred within 6 weeks, median DOR was 9.7 months (95% CI: 5.6, ne) and median PFS was 5.4 months (95% CI: 4.2, 7.1)
- Treatment was ongoing in 42 patients





EGFR Exon 20 Insertion



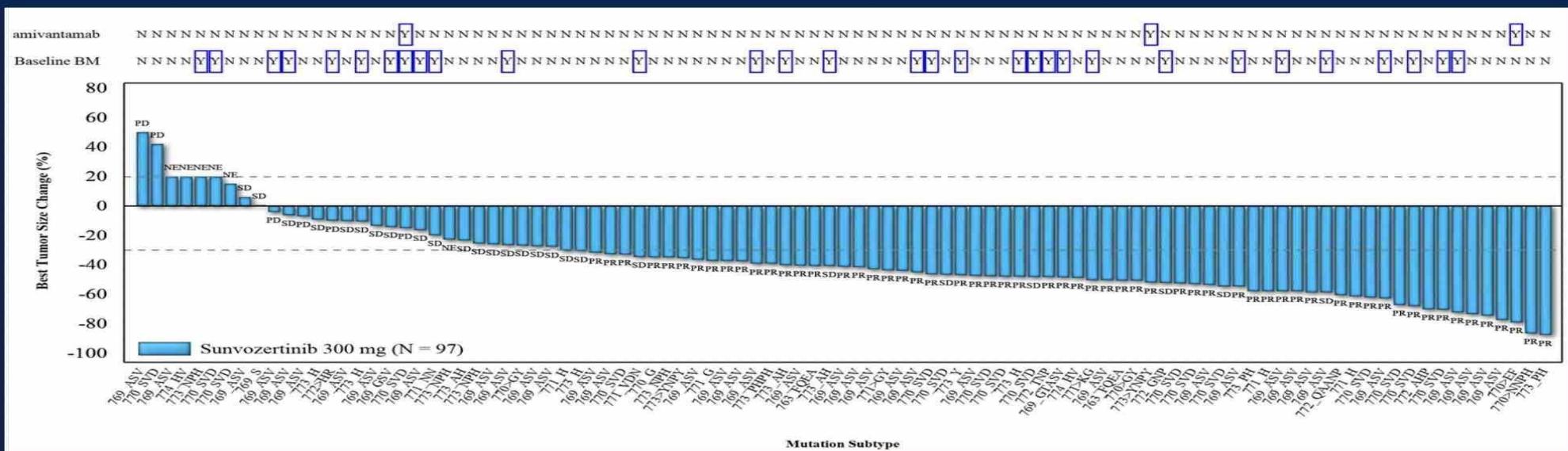
New players

Sunvocertinib (WUKONG Study)
and YK-029A

Sunvozertinib for the Treatment of NSCLC with *EGFR* Exon20 Insertion Mutations: the First Pivotal Study Results

Mengzhao Wang¹, Yun Fan², Meili Sun³, Yongsheng Wang⁴, Yanqiu Zhao⁵, Bo Jin⁶, Ying Hu⁷, Zhigang Han⁸, Xia Song⁹, Anwen Liu¹⁰, Kejing Tang¹¹, Cuimin Ding¹², Li Liang¹³, Lin Wu¹⁴, Junzhen Gao¹⁵, Jianghong Wang¹⁶, Ying Cheng¹⁷, Jianying Zhou¹⁸, Yong He¹⁹, Li Zheng²⁰

Target Tumor Size Change per IRC Assessment



- Tumor shrinkage was observed in > 90% of subjects with sunvozertinib treatment.
 - Tumor response was observed in patients with baseline brain metastasis or post amivantamab treatment.

BM, brain metastasis

Efficacy

Safety

	Mobocertinib 1 (N=114)	Amivantamab ² (N=81)	Sunvozertinib (DZD9008) (N=97) WUKONG6 ³
Investigator assessed			
ORR, %	35%	36%	46.4%
Disease control rate, %	78%	73%	
Duration of response, mos	11.2 mo	-	
IRC assessed (95% CI)			
ORR, % (95% CI)	28% (20-37%)	40% (29-51%)	60.8% (50.4-70.6%)
Disease control rate, %	78%	74%	87.6%
Duration of response, months	17.5 mo	11.1 mo	64.4% responding at median fup of 5.6 mo.
PFS, months	7.3 mo	8.3 mo	-
Brain Mets, ORR (N=)	-	-	44% (N=25) ⁴

EGFR Exon 20 Tx	Trial	Diarrhea	Rash	Other Major Notable
Amivantamab	CHRY SALIS ²	12% (2% G3+)	86% (4% G3+)	Infusion-related reaction 66% (8% G3+), Paronychia lipase, amylase, other GI, lipase, amylase elevation
Mobocertinib	EXCLAIM ¹	93% (16% G3+)	45% (0% G3+)	CPK Elevation (57.7%, 17.3%)
Sunvozertinib	WUKONG6 ⁴	67.3% (7.7% G3+)	53.8% (1% G3+)	G3+

Other EGFR Exon 20 ins TKI with Putative CNS Penetration in Development

- TAS6417 (CLN-081)
- Blu-451
- Oric-114
- Furmonertinib

*WUKONG 1,2,6 pooled at 300 mg dose⁵

1. Zhou C. et al. JAMA Oncol. 2021 Oct 14;e214761. 2. Park K, et al. J Clin Oncol. 2021;39:3391-3404. 3. M. Wang et al ASCO 2023. ABS7 9002. 4. L. Bazhenova et al NACLC 2022.

New Exon 20 ins Inhibitors

	Mobocertinib	Amivantamab	Sunvozertinib DZD9008	Zipalertinib CLN081/TAS6417	YK-029A
	FDA accelerated approval 2021	FDA accelerated approval 2021	FDA BTD	FDA BTD	
ORR	28% (post-chemo)	40% (post-chemo)	Phase 3 PAPLLON 1L phase 3 trial ongoing	1L phase 3 trial ongoing	1L phase 3 trial ongoing (vs. chemo)
PFS (months)	7.3	8.3	NR	12	9.3
DoR (months)	17.5	11.1	NR	NR	7.5
CNS activities	No	No	Not known	Not known	Not known
Common Toxicities All grade (G3+)	Diarrhea, 91% (21%) Rash, 45% (0%)	Diarrhea 11% (2%) Rash 86% (4%)	Diarrhea, 59% (6.5%) Rash 39% (1%)	Diarrhea, 30% (3%) Rash, 80% (1%)	Diarrhea 46% (14.6%) Rash 32%(0%) Mucositis (4.9%)
	QTc prolongation (Black Box)	Infusion reaction (66%)	CPK elevation 31%		
Dose discontinuation	17%	10%	NR	5%	4.9%
Dose reduction	25%	13%	NR	13%	22%

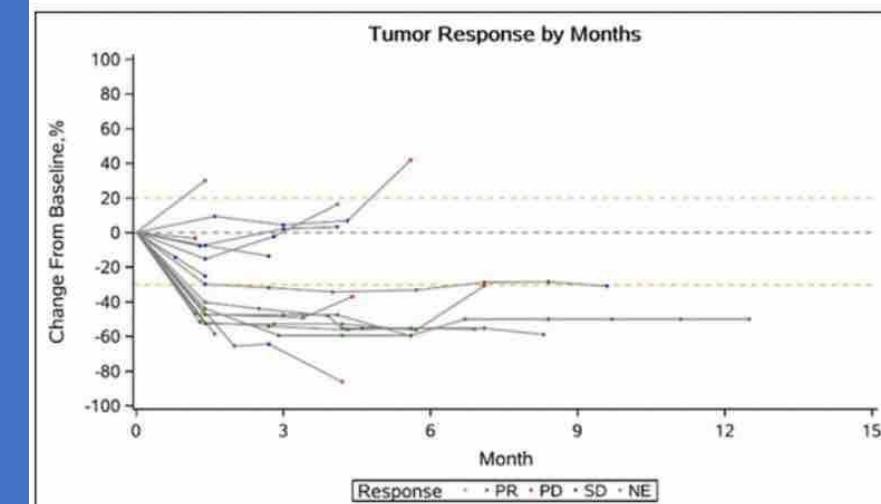
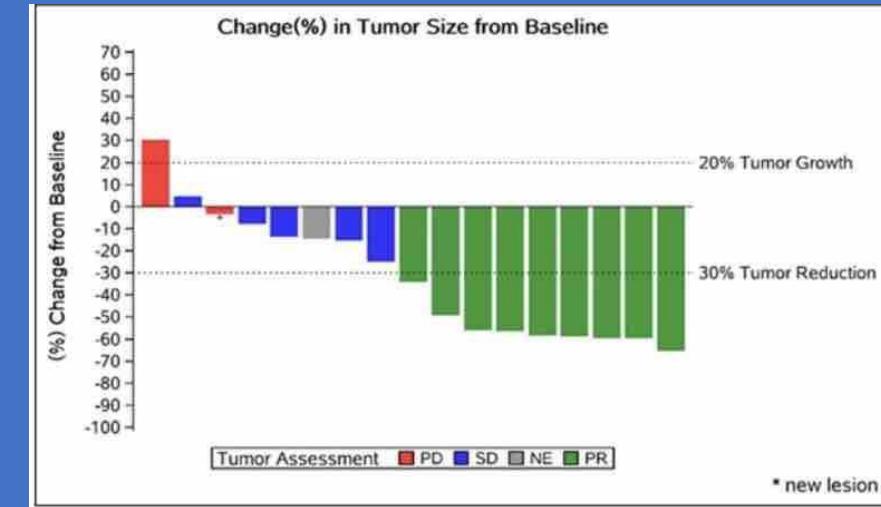
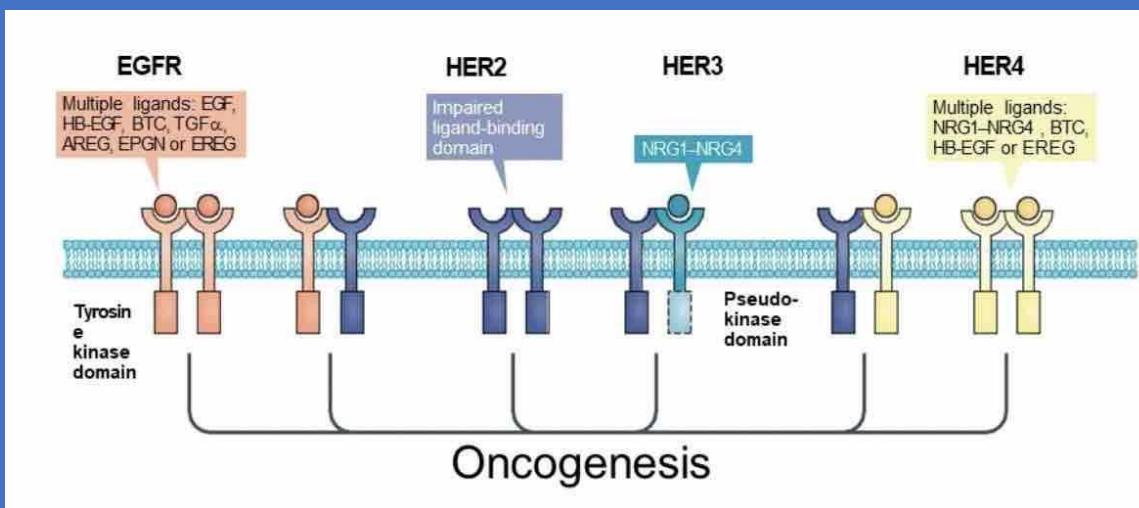
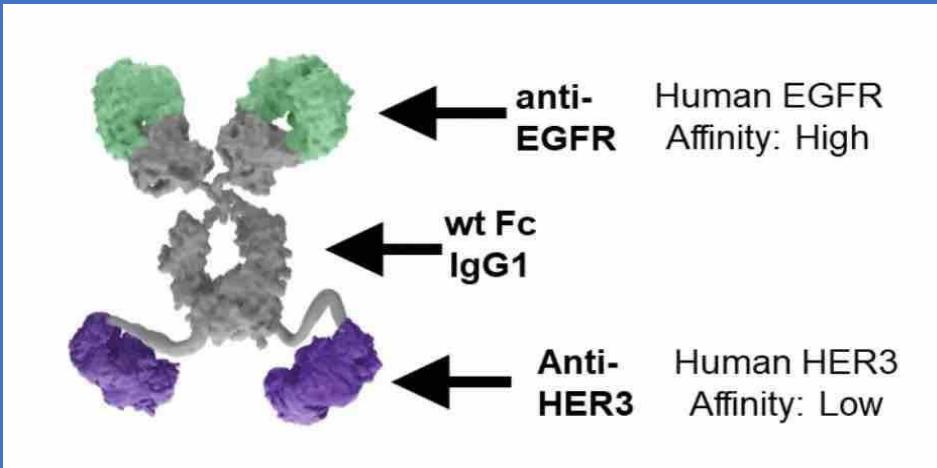
Blu-451, ORIC-114, BAYER7088, PLB004, furmonertinib, and many others in clinical development

Zhou C et al JAMA Oncol 2021, Park K et al JCO 2021, Bazhenova LA et al NALC 2022, Yu H et al ASCO 2022, Wang et al ASCO 2023, Xu et al ASCO 2023, Duan J et al ASCO 2023

Targeting EGFR Wild Type

SI-B001: A new BITE EGFR/HER3 AB in wt EGFR/ALK

ASCO 2023, Zhao , #2025



Targeting ALK

New ALK inhibitors

	Ceritinib	Alectinib	Brigatinib	Ensartinib	Lorlatinib (3G)	APG-2449
ORR	72%	81-91%	74%	74%	77%	78% (Treatment-Naïve)
PFS (months)	16.6	25.7-34.1	24.0	25.8	NR (f/u 37m)	NR
CNS ORR	73%	81-94%	78%	64%	83%	Promising
Common Toxicities	Nausea 66-83%	Nausea 10-21% ALT/AST 12-28%	Nausea 40-55% ALT/AST 15%	Nausea 22% ALT/AST 48%	Nausea 15% ALT/AST 17%	Nausea 27% (0.7%)
All grade (G3+)	ALT/AST 20-45%	Constipation 24- 33%		Rash 68% Elevated creatinine 14%	Edema 55% Hyperlipidemia 70% Cognitive 21%	ALT/AST 40% (3%) Elevated Creatine (46%)
Dose discontinuation	5% (80% dose interruption)	11-13%	8-13%	9%	7%	NR

NVL-655 and other ALK inhibitors in clinical development

FAK inhibitor defactinib (VS6063), BI 853520, GSK2256098 in clinical development with combination strategies.

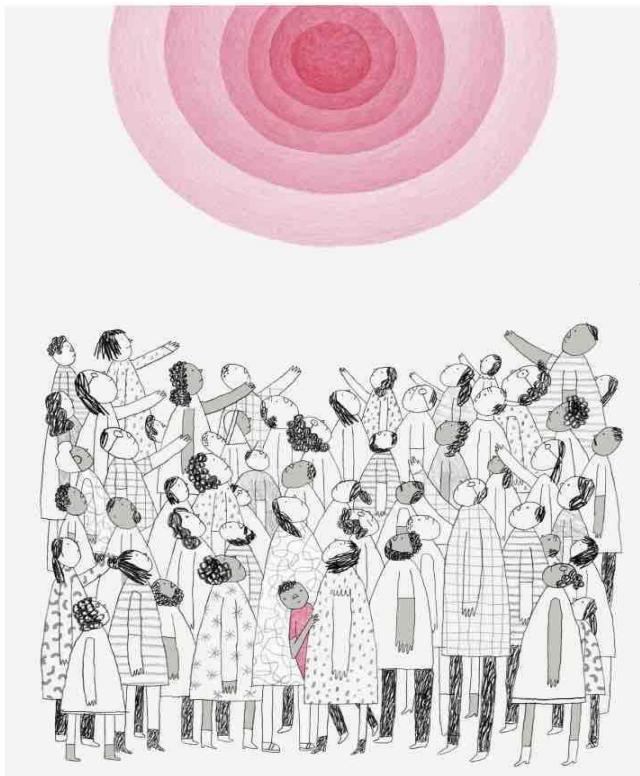
Soria JC et al Lancet 2017, Hida T et al Lancet 2017, Peters S. et al NEJM 2017, Mok T et al Ann Oncol 2020, Zhou et al Lancet Respir Med. 2019, Camidge DR, et al. J Thorac Oncol, Camidge DR, et al. J Clin Oncol. 2020, Horn L, et al. JAMA Oncol. 2021, Shaw AT, et al. NEJM 2020, Solomon BJ, et al. Lancet Resp Med. 2022, Ou SH et al unpublished data

Antibody Drug Conjugates (ADC) in Lung Cancer

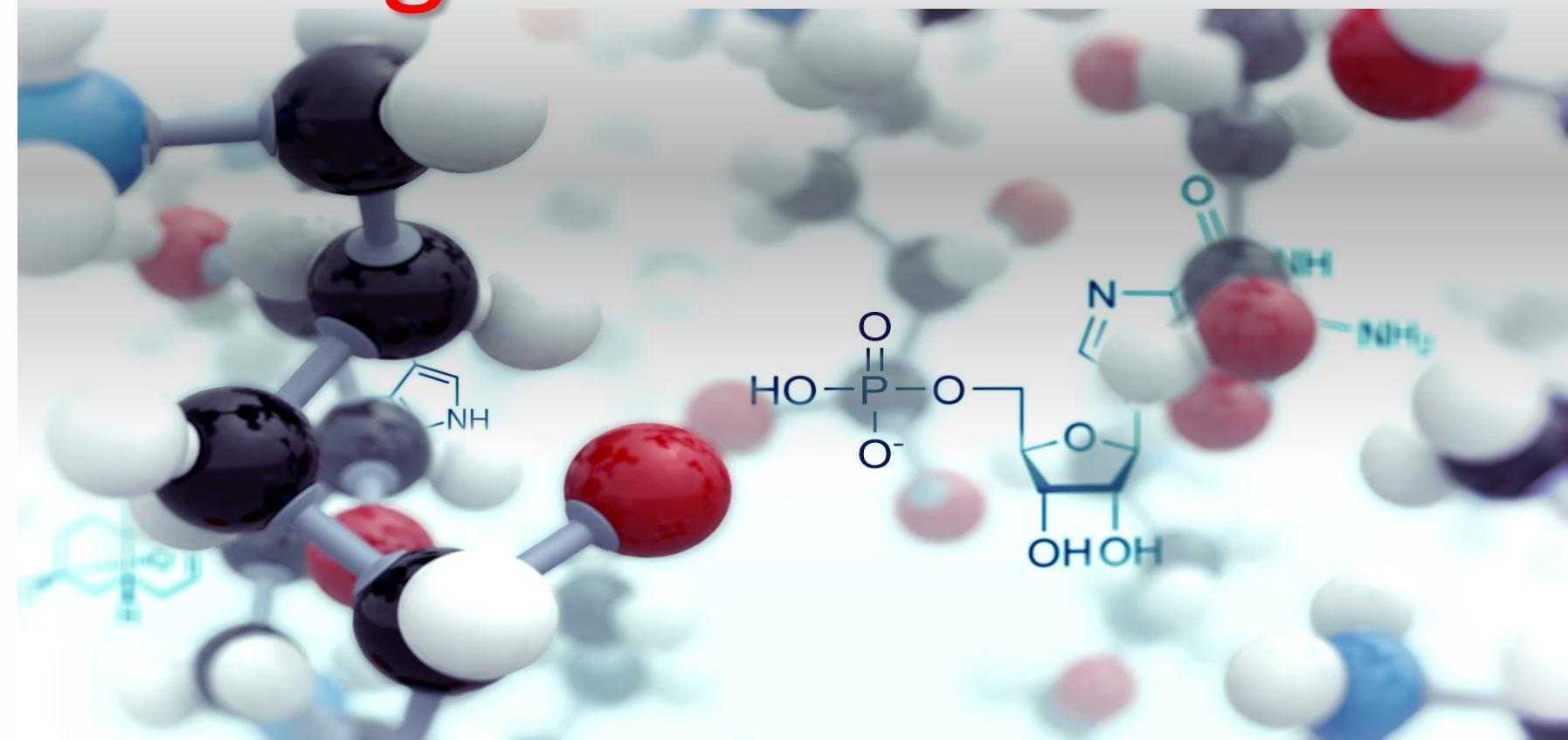
OPINION
GUEST ESSAY

Is a Revolution in Cancer Treatment
Within Reach?

June 16, 2023



Brian Rea



Antibody-Drug Conjugates: New kids on the block

Important Properties of the ADC Components and Target Antigen

Antigen

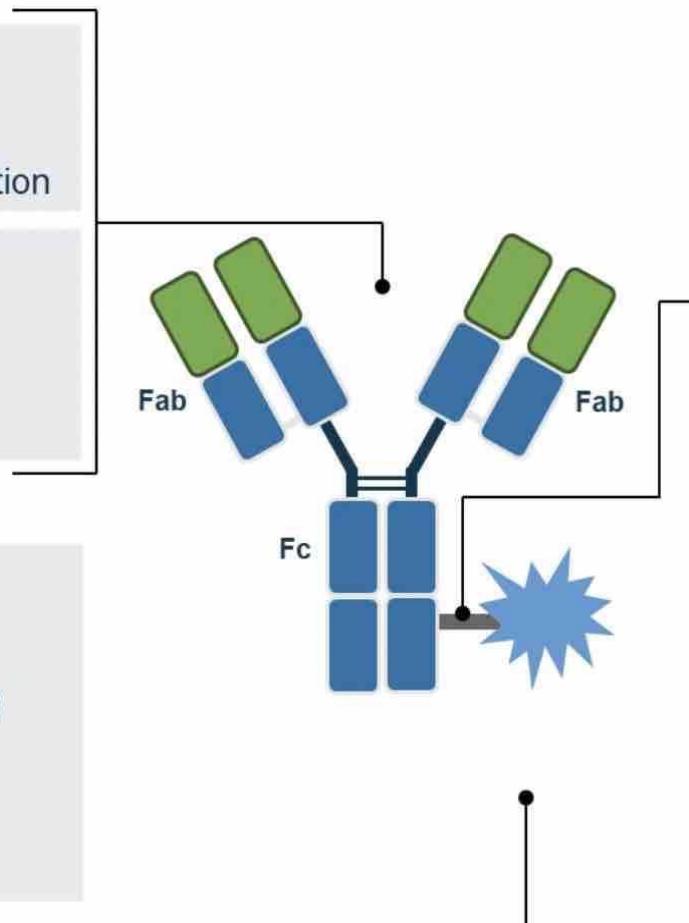
- High homogeneous expression on tumor
- Low or no expression on healthy tissues
- High affinity and avidity for antibody recognition

Antibody

- High affinity and avidity for tumor antigen
- Chimeric or humanized to decrease immunogenicity
- Long half-life and high molecular weight

Cytotoxic Payload

- Highly potent agents:
 - Calicheamicin
 - Maytansine derivative (DM1 or DM4)
 - Auristatin (MMAE or MMAF)
 - SN-38
 - DXd topoisomerase I inhibitor
- Optimal DAR (range: 2 to 8)



Linker

- Stable in circulation
- Efficient release of payload at target site
- Prevents premature release of payload at nontarget tissue
- Efficient linker technology (**cleavable vs noncleavable**)
- Site of conjugation
- DAR affects drug distribution and pharmacokinetics

Cleavable Linkers

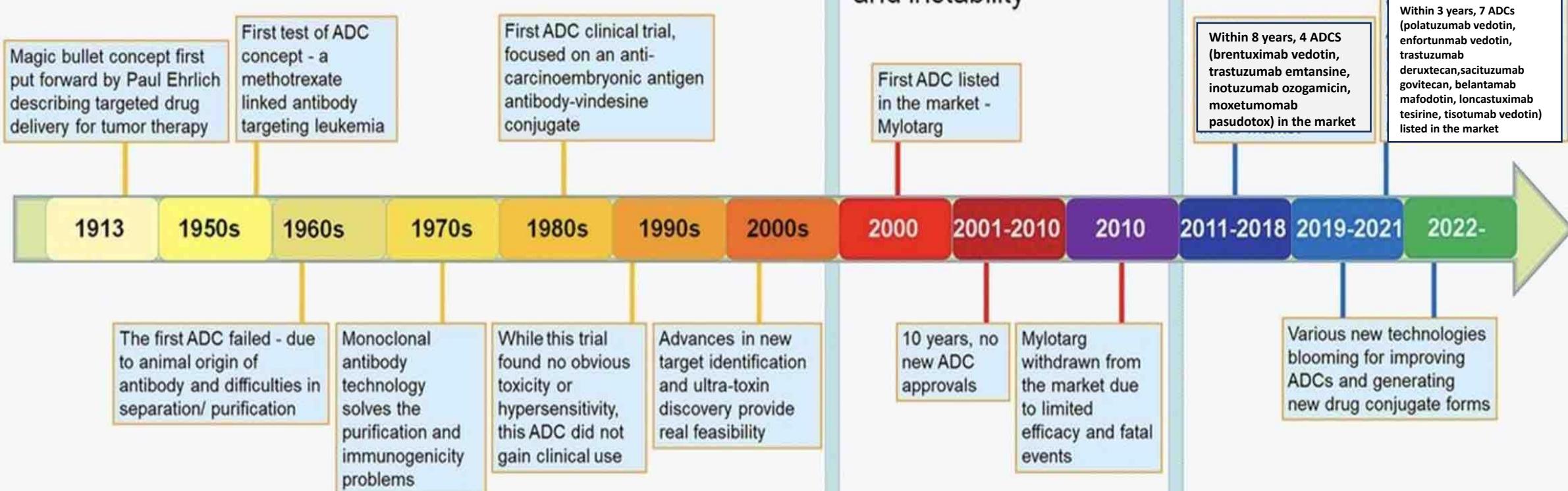
Depend on physiological conditions: pH, proteolysis, or high intracellular glutathione

Noncleavable Linkers

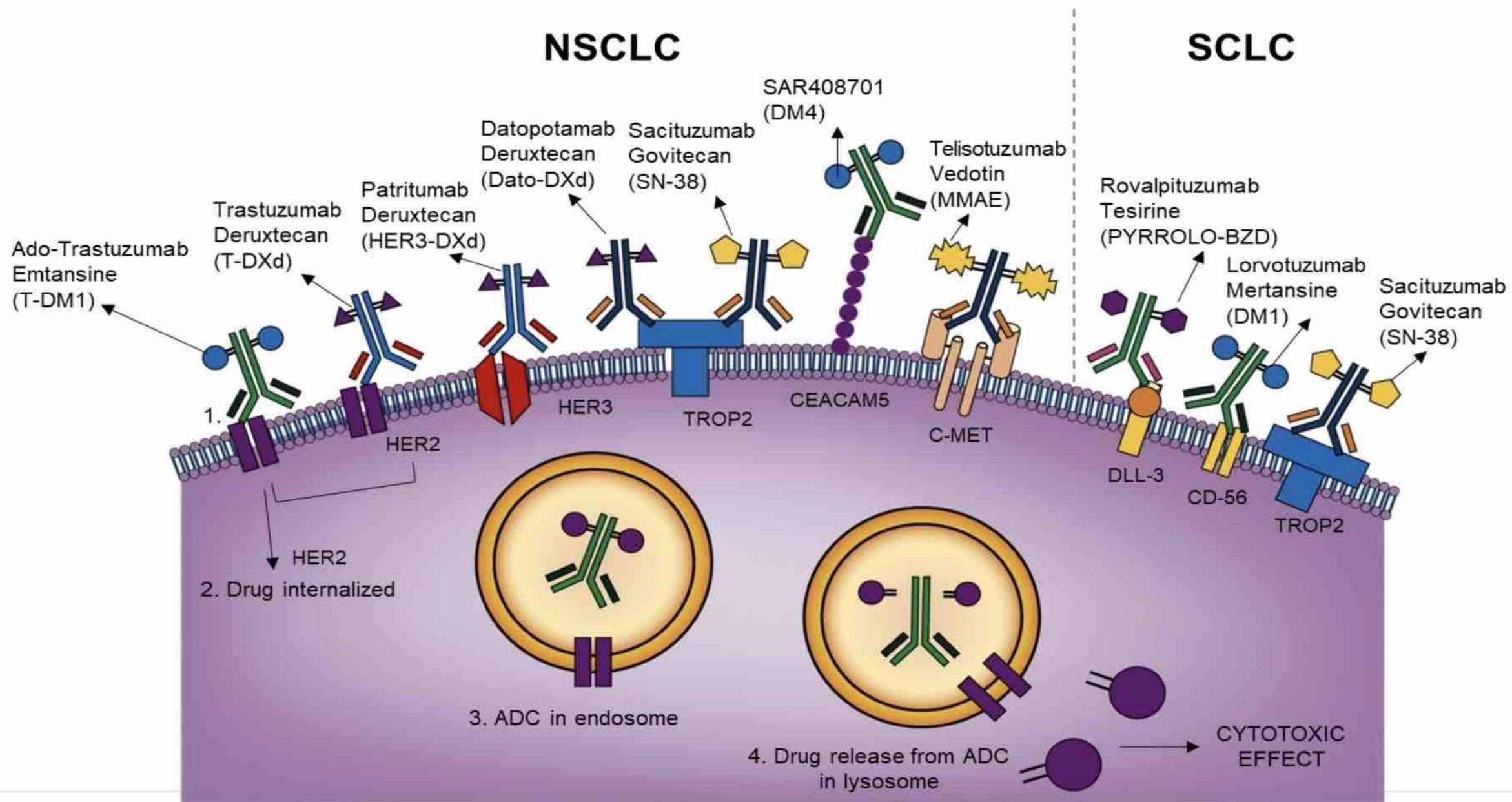
Depend on lysosomal degradation

History, progress and research stages of drug conjugates

Stage 1: About 90 years spent to realize the concept



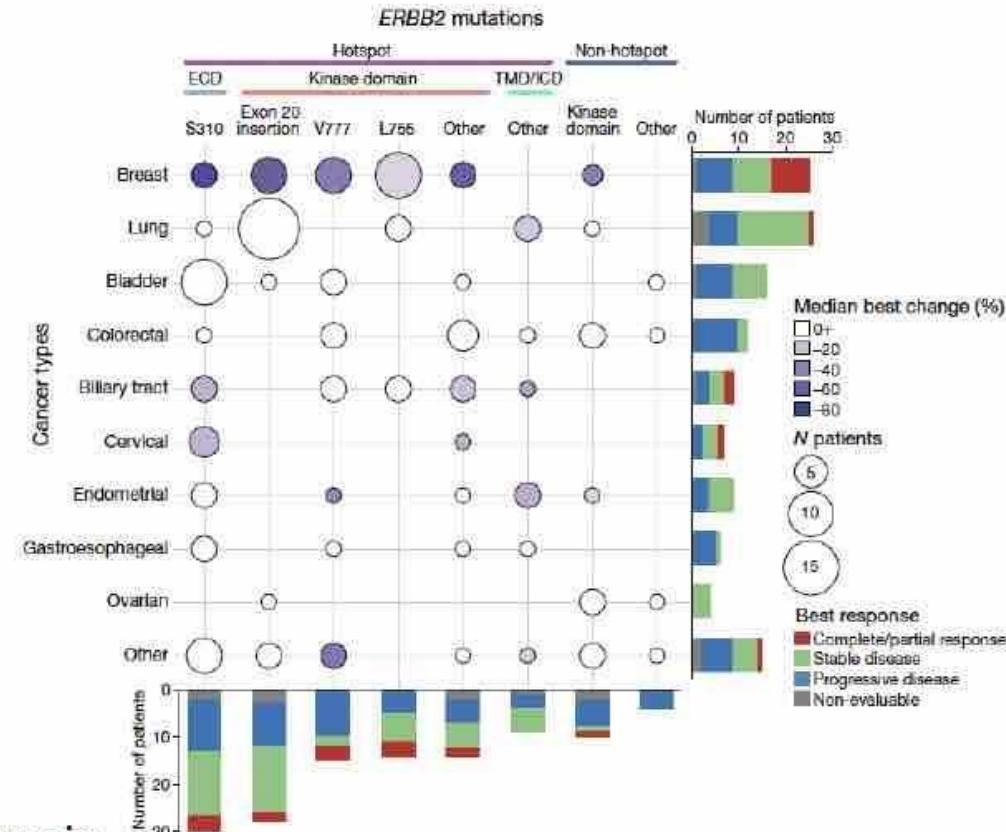
Desai, Lung Cancer, 2022



What Is “HER2+” Lung Cancer

HER2 in NSCLC	Frequency
Protein overexpression	59%
Overexpression (IHC 2+ and 3+)	15-30%
Overexpression (IHC 3+ only)	2-6%
Amplification (FISH) GCN to CEP 17 ≥ 2	2-6%
Mutations	1-5%

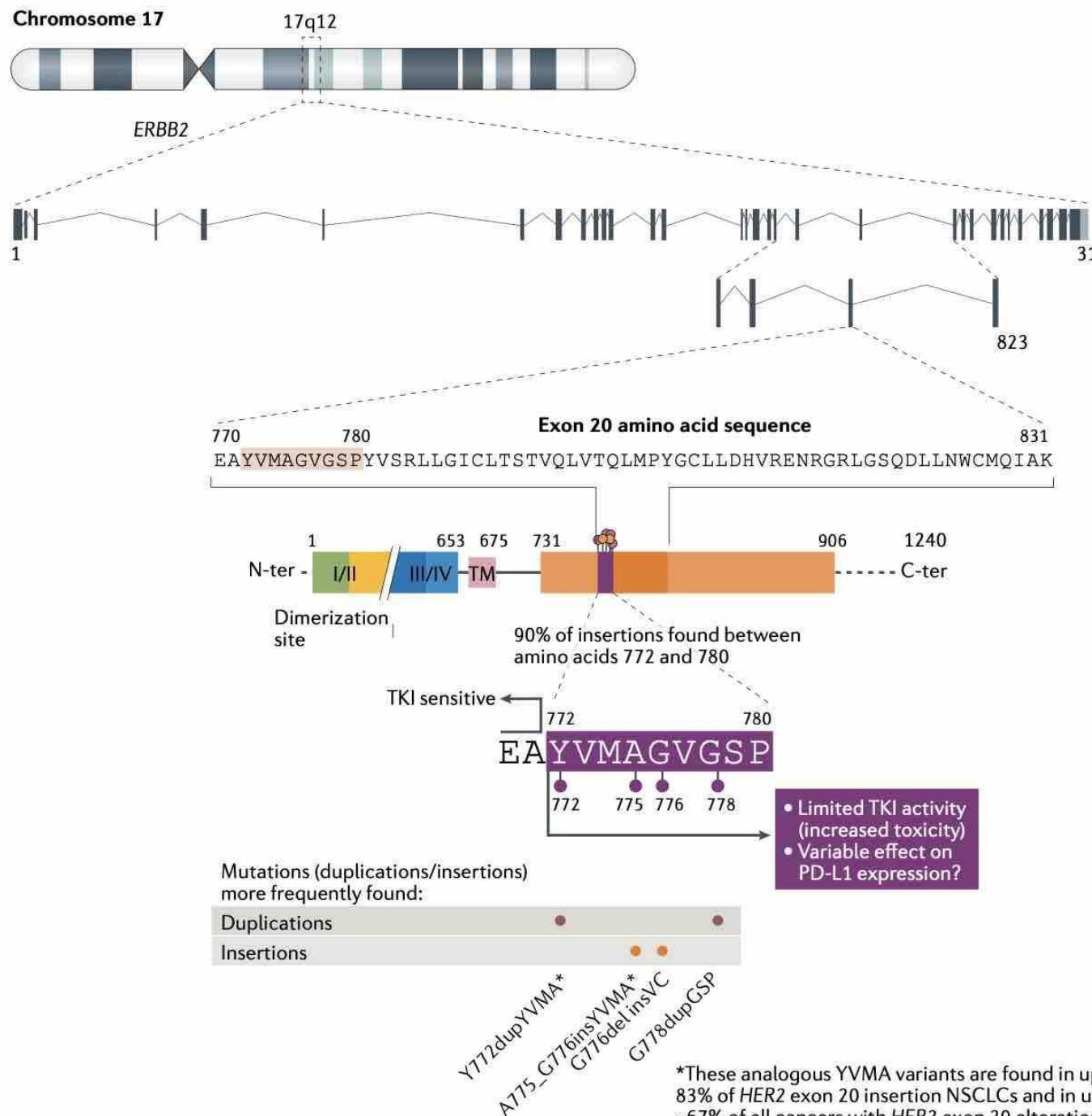
- Most common HER 2 mutations in lung cancer are in tyrosine kinase domain
 - exon 20 insertions
- Less common are in
 - Furin-like domain (S310F)
 - Transmembrane domain (V659E)
- Contrary to breast and gastric cancer, overexpression does not always co-occur with amplification



slide credit: Dr. Bazhenova

HER2 Ex20Ins

A Friedlaender, Nat Rev 1/2022

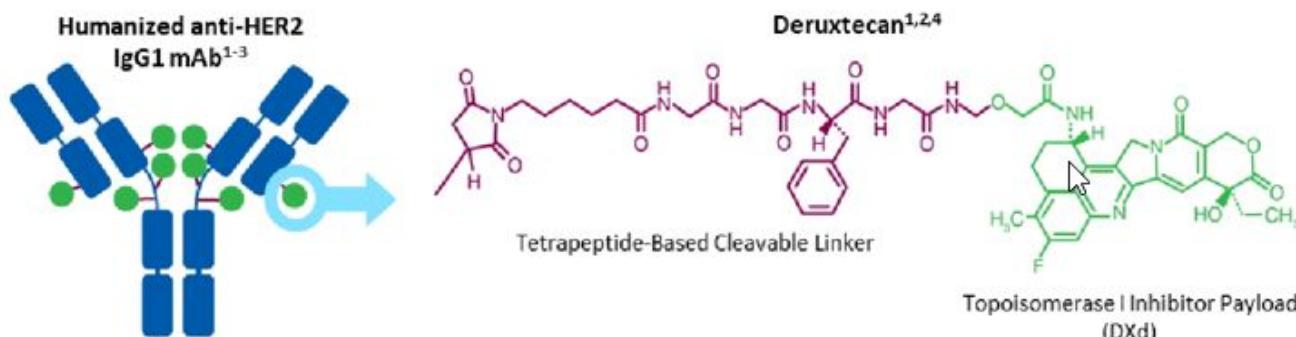


HER 2 Mutation Target in Lung Cancer

Trastuzumab Deruxtecan (T-DXd)

T-DXd is an ADC with 3 components:

- A humanized anti-HER2 IgG1 mAb with the same amino acid sequence as trastuzumab
- A topoisomerase I inhibitor payload, an exatecan derivative
- A tetrapeptide-based cleavable linker



Key Design Attributes:

Antibody Drug Conjugate (ADC)

Payload mechanism of action:

topoisomerase I inhibitor ^{1,2}

High potency of payload ^{1,2}

High drug-to-antibody ratio, ≈ 81,²

Payload with short systemic half-life ^{1,2}

Stable linker-payload ^{1,2}

Tumor-selective cleavable linker ^{1,2}

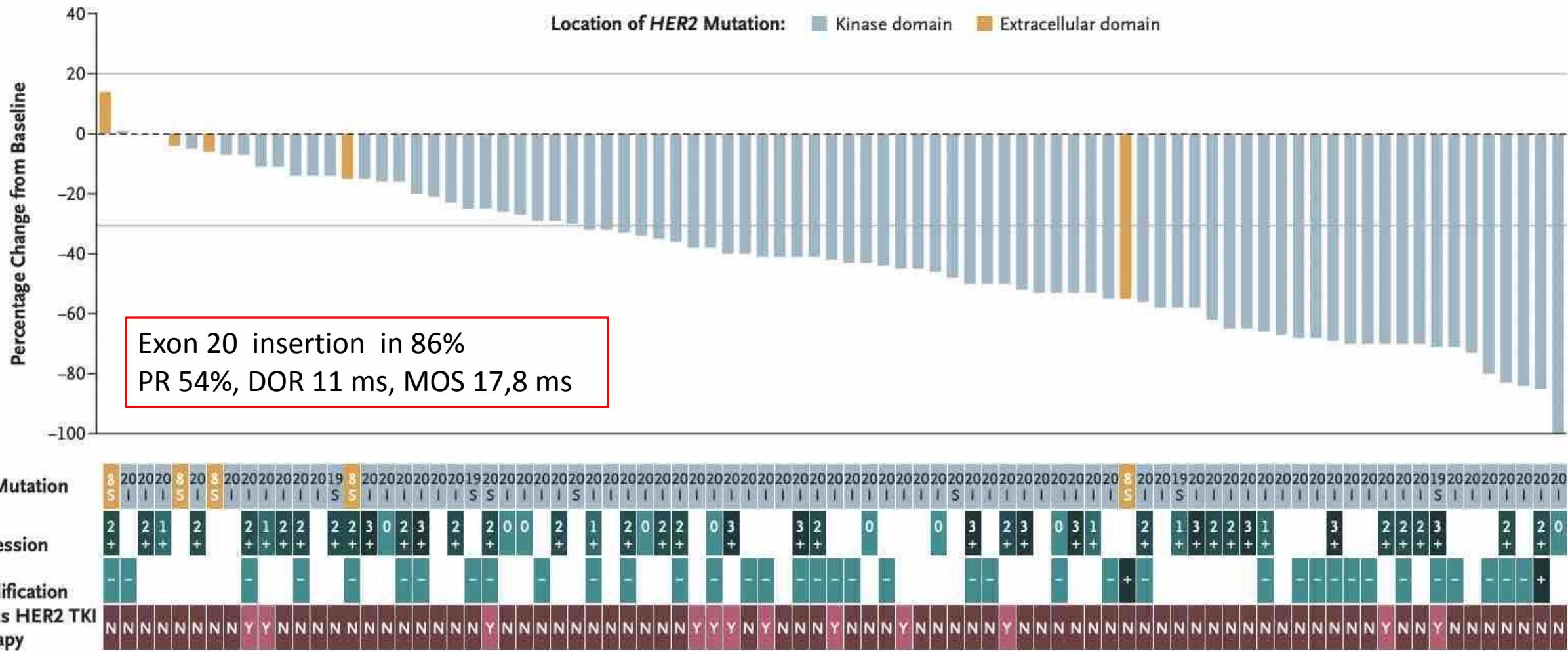
Membrane-permeable payload ^{1,4}

1. Nakada T et al. *Chem Pharm Bull(Tokyo)*. 2019;67(3):173-185.
2. Ogitani Y et al. *Clin Cancer Res*. 2016;22(20):5097-5108.
3. Trail PA et al. *Pharmacol Ther*. 2018;181:126-142.
4. Ogitani Y et al. *Cancer Sci*. 2016;107(7):1039-1046.

Trastuzumab Deruxtecan in mutated HER2

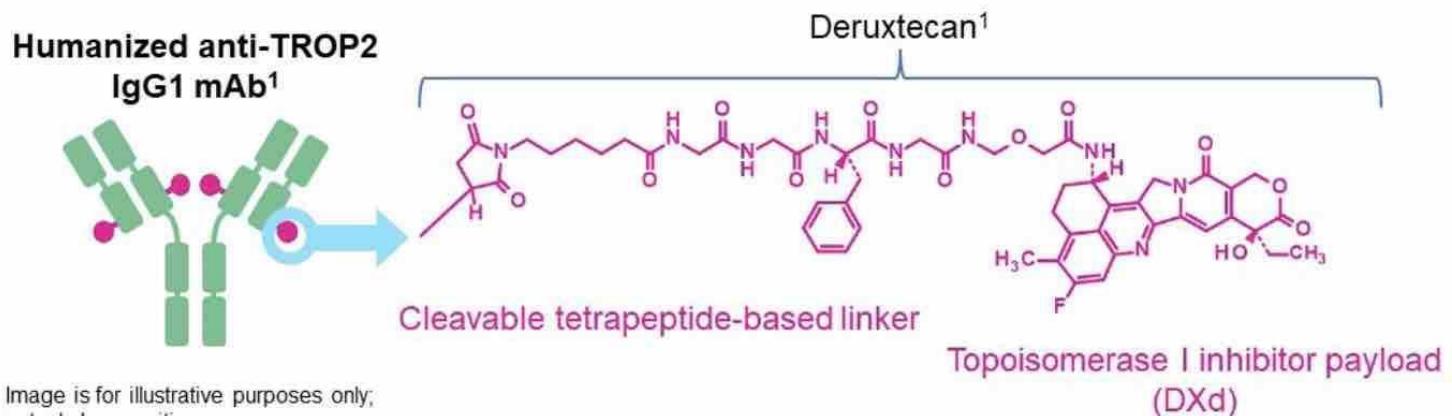
Destiny Trial, Li BT, NEJM, 2021

A Best Percentage Change in Sum of Largest Tumor Diameter



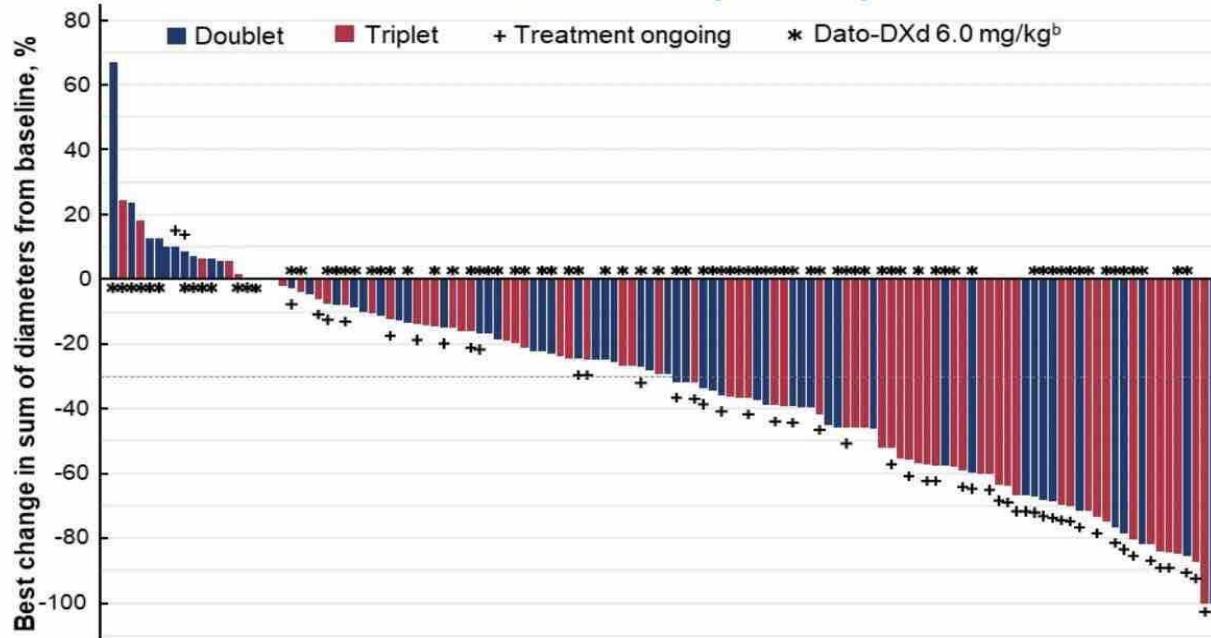
TROPION-Lung02: Datopotamab Deruxtecan (Dato-DXd) Plus Pembrolizumab With or Without Platinum Chemotherapy in Advanced Non-Small Cell Lung Cancer

Yasushi Goto, MD, PhD,¹ Wu Chou Su, MD,² Benjamin Levy, MD,³ Olivier Rixe, MD, PhD,^{4,5} Tsung Ying Yang, MD, PhD,⁶ Anthony Tolcher, MD,⁷ Yanyan Lou, MD, PhD,⁸ Yoshitaka Zenke, MD, PhD,⁹ Panayiotis Savvides, MD,¹⁰ Enriqueta Felip, MD, PhD,¹¹ Manuel Domine, MD, PhD,¹² Konstantinos Leventakos, MD, PhD,¹³ Mariano Provencio Pulla, MD, PhD,¹⁴ Atsushi Horiike, MD, PhD,¹⁵ Edward Pan, MD,⁵ Daisy Lin, PhD,⁵ Jessie Gu, PhD, MS,⁵ Priyanka Basak, MD, MBE,⁵ Michael Chisamore, PhD,¹⁶ Luis Paz-Ares, MD, PhD¹⁷

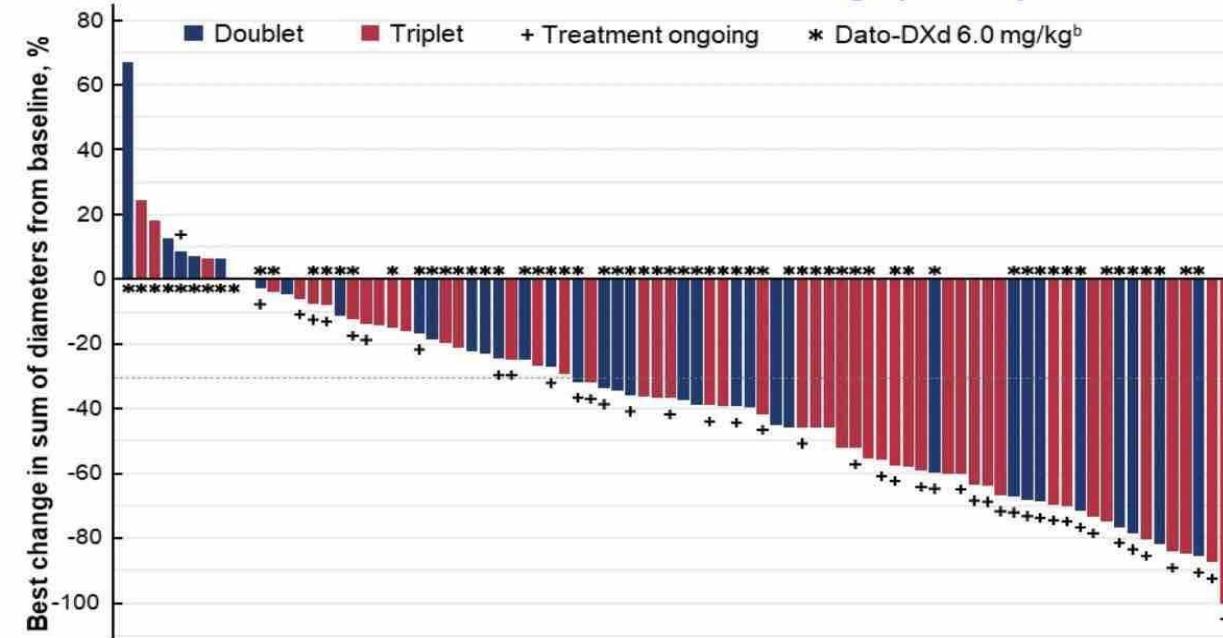


Tropion Lung 02: Anti Trop2 AB + I/O +/- Chemo

All patients (n=124)^a



Patients in the 1L setting (n=84)^a



AESI, n (%)^{a,b}

**Doublet
(n=64)**

**Triplet
(n=72)**

All grades

Grade ≥ 3

All grades

Grade ≥ 3

Oral mucositis/stomatitis

37 (58)

5 (8)

31 (43)

4 (6)

ILD/pneumonitis adjudicated as drug related^c

11 (17)

2 (3)

16 (22)

2 (3)

Ocular surface toxicity^d

10 (16)

1 (2)

17 (24)

2 (3)

IRR^e

15 (23)

0

10 (14)

0

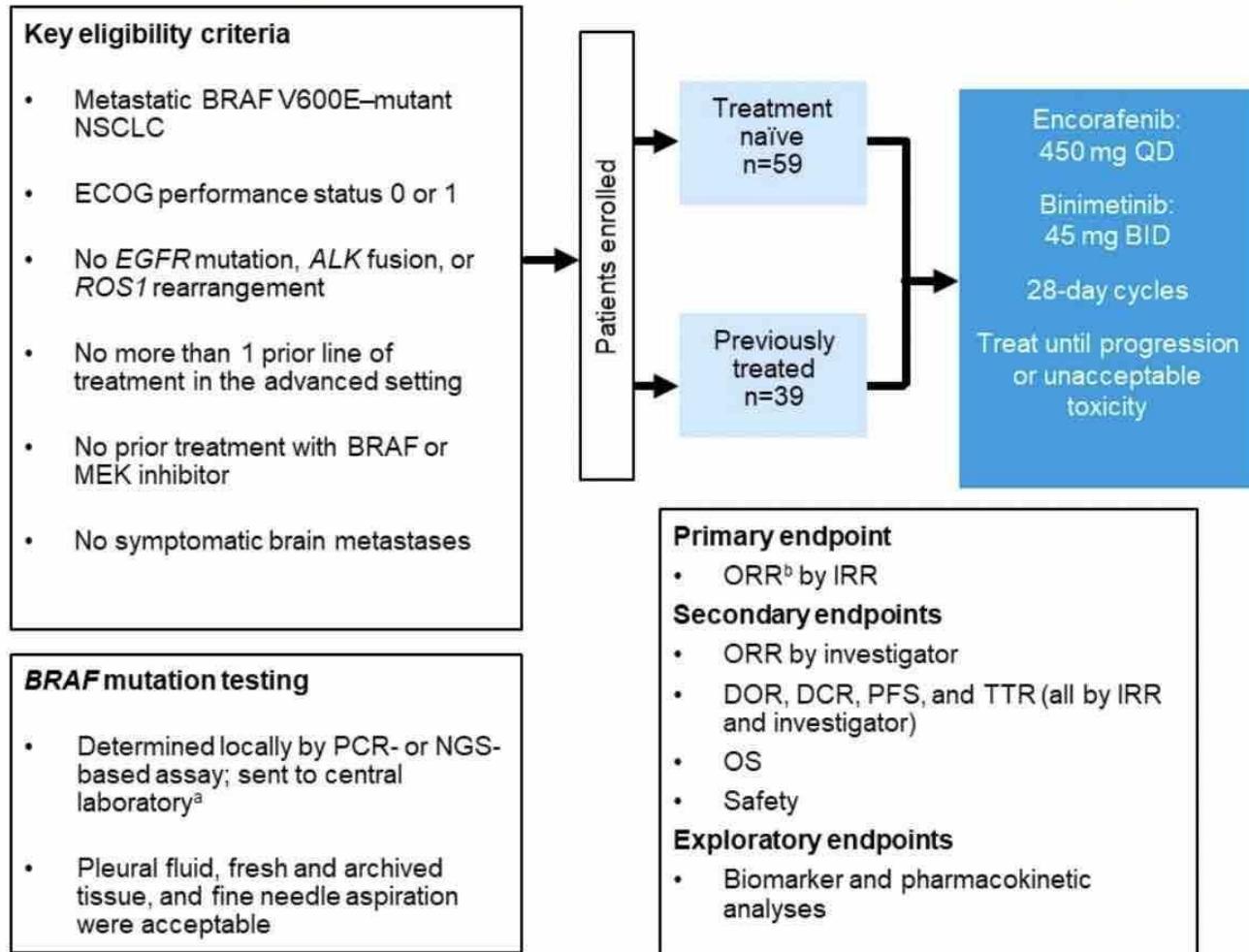
TROP 2 Trials in 1st Line

TROPION-Lung02	IB	Dato-DXd + pembro + pembro + platinum	1L/2L	NCT04526691
TROPION-Lung04	IB	Dato-DXd + durva + durva + platinum	1L/2L	NCT04612751
TROPION-Lung07	III	Dato-DXd + pembro + platinum Dato-DXd + pembro Pembro + pemetrexed + platinum	1L PDL1 < 50%	NCT05555732
TROPION-Lung08	III	Dato-DXd + pembro Pembro	1L PDL1 ≥ 50%	NCT05215340
AVANZAR	III	Dato-DXd + durva + carboplatin Pembro + histology-specific platinum doublet	1L	NCT05687266
EVOKE-03	III	Sacituzumab + pembro Pembro	1L PDL1 ≥ 50%	NCT05609968
EVOKE-02	II	Sacituzumab + pembro Sacituzumab + pembro + platinum	1L	NCT05186974

Encorafenib and Binitemib in mBRAF V600E NSCLC

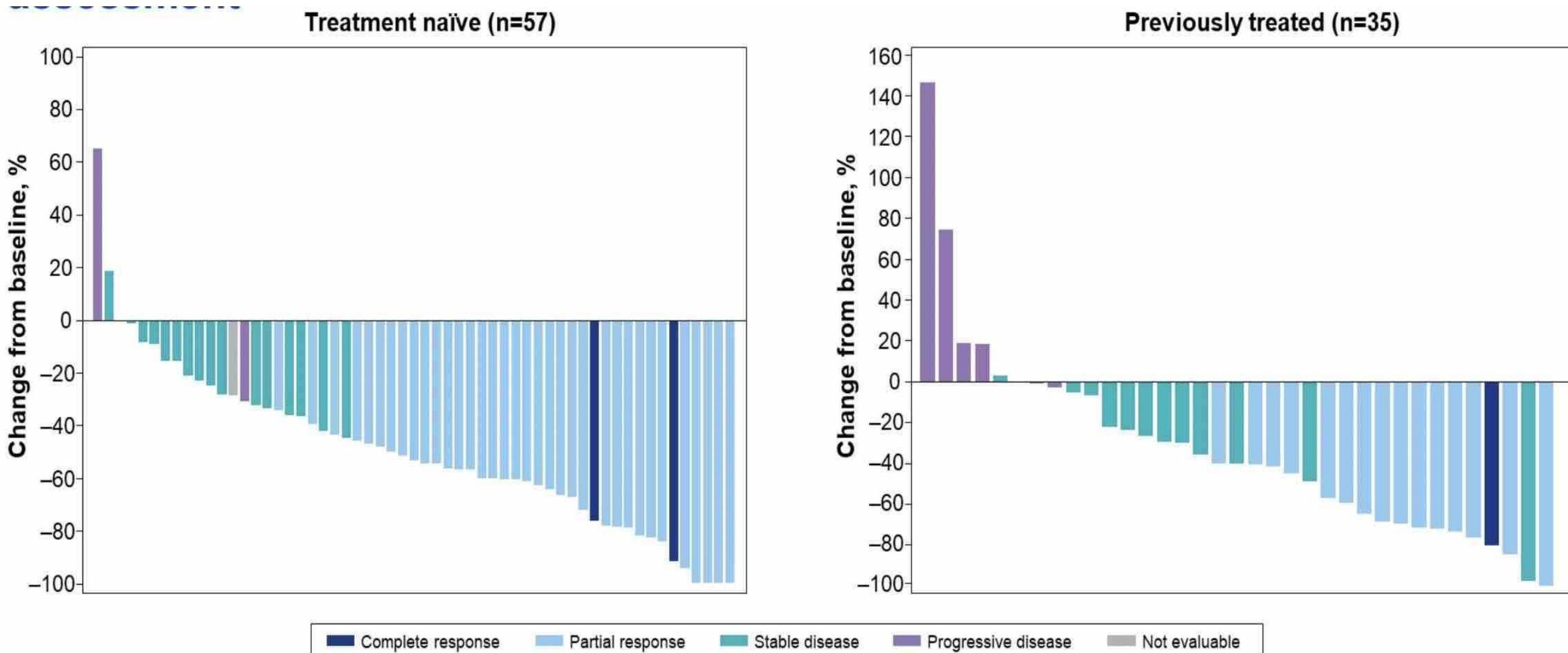
PHAROS, ASCO 2023, G Riely, #9018

- The combination of encorafenib (BRAF inhibitor) plus binimetiinib (MEK inhibitor) has demonstrated clinical efficacy with an acceptable safety profile in patients with metastatic BRAF V600E/K-mutant melanoma¹
- For patients with metastatic BRAF V600E-mutant NSCLC the combination of dabrafenib and trametinib was approved by the US FDA and is a current standard of care ²
 - This approval was based on the results of a single-arm, phase 2 study that showed meaningful antitumor activity and a manageable safety profile^{3,4}
 - In treatment-naïve and previously treated patients, the ORR by IRR was 64% and 63%, respectively
 - The median DOR by IRR was 15.2 months and 9.0 months, respectively
- Given the observed efficacy and safety profile of encorafenib plus binimetiinib in patients with BRAF V600E/K-mutant metastatic melanoma, this combination therapy was assessed in patients with metastatic BRAF V600E-mutant NSCLC

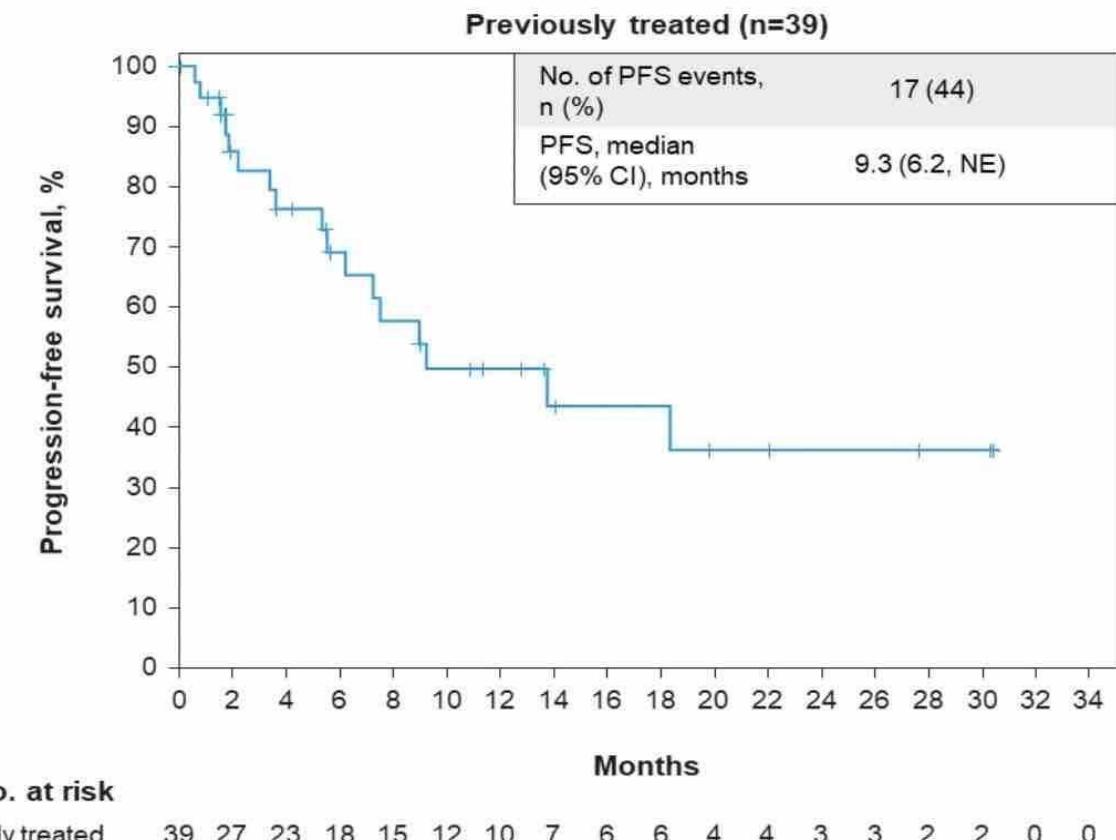
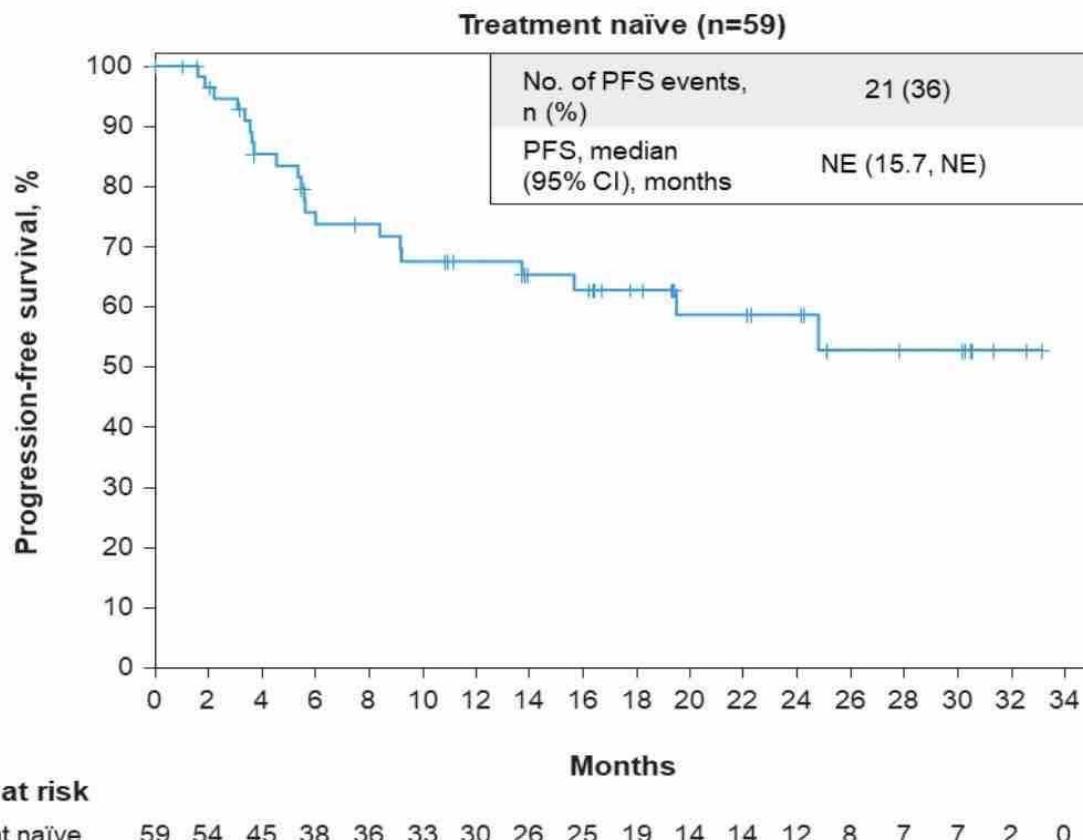


Encorafenib and Binitemib in mBRAF V600E NSCLC

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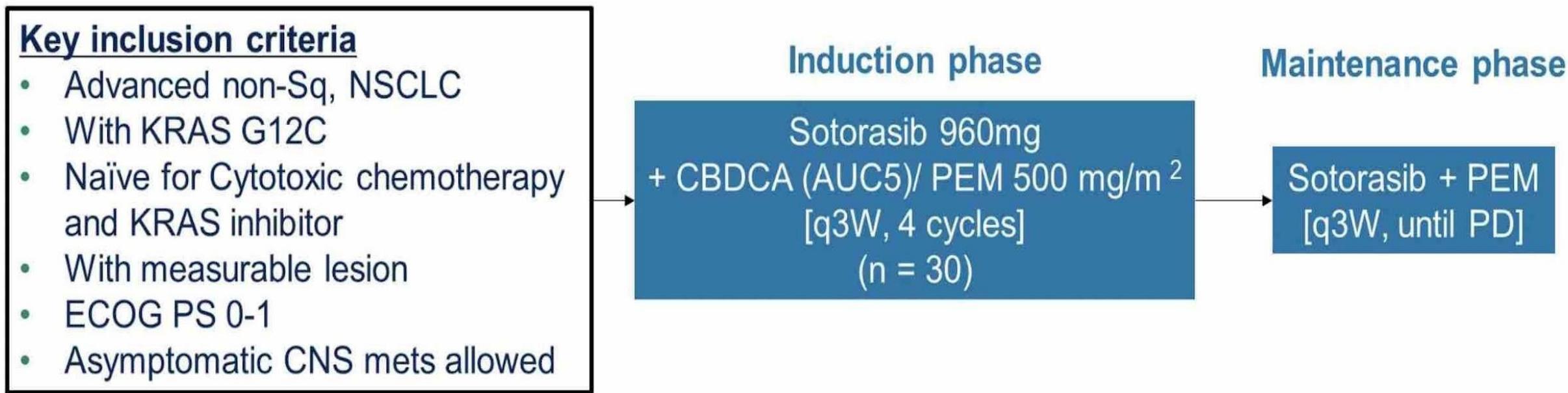
Encorafenib and Binitemib in mBRAF V600E NSCLC PHAROS, ASCO 2023, G Riely, #9018



- The median duration of follow-up for PFS by IRR was 18.2 months (95% CI, 16.4, 22.3 months) in treatment-naïve patients and 12.8 months (95% CI, 9.0, 19.8 months) in previously treated patients

KRAS G12C Inhibitor (Sotorasib) + Chemotherapy

SCARLET: study schema

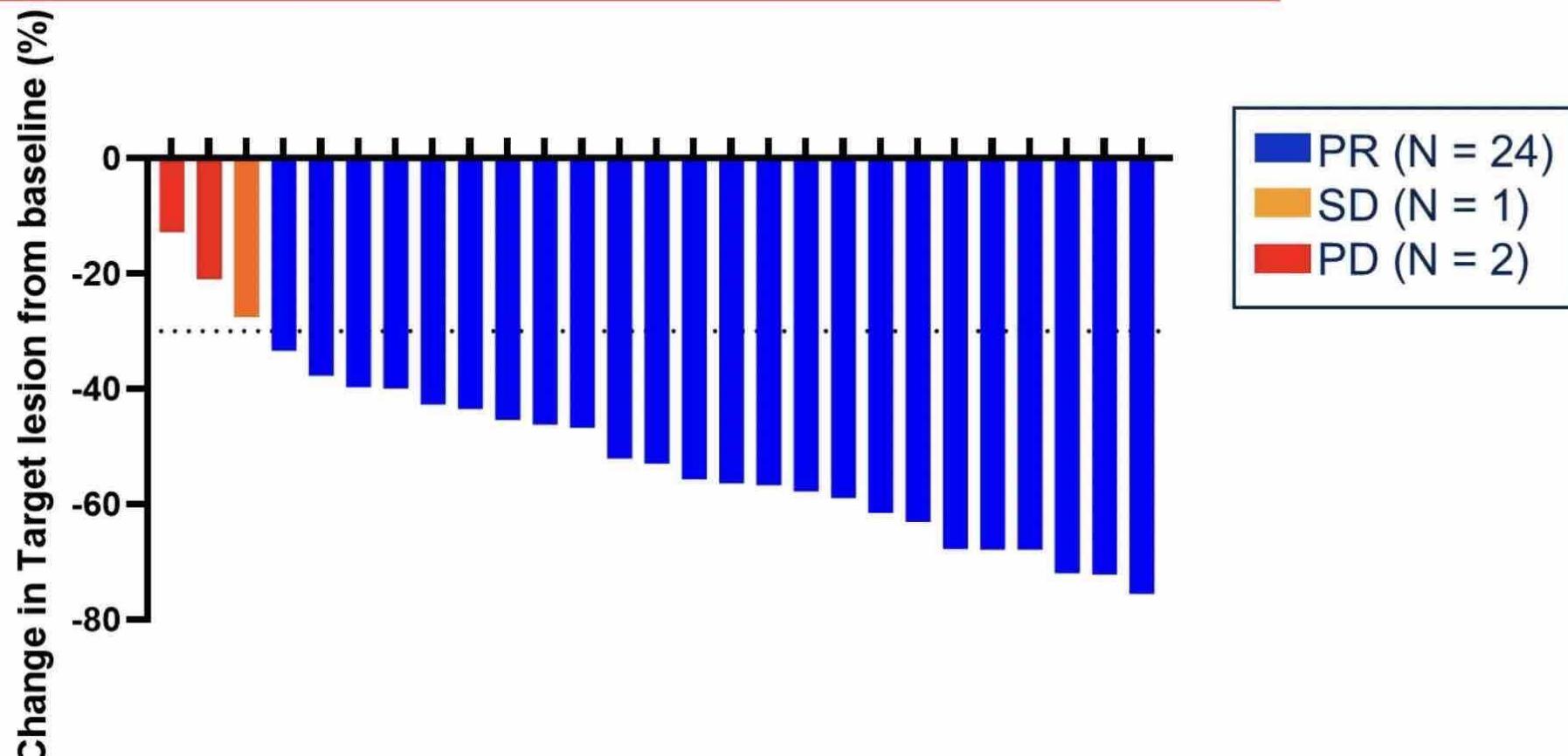


- Primary endpoint; ORR by blinded independent central review (BICR)
- Secondary endpoints; DCR, PFS, DOR, OS and AEs
- Translational research; NGS analysis (tissue and plasma [at baseline, 3 wks, and PD])

Scarlet: KRAS G12C + Chemotherapy

Primary endpoint: ORR by BICR

ORR 88.9% (80%CI 76.9-95.8%, 95%CI 70.8-97.6%)



MY TAKE HOME FROM ASCO 2023

- Increasing molecular targets in NSCLCs
- mEGFR TKI resistance mechanisms better understood
- Chemo/TKI not synergistic in mEGFR NSCLC
- Chemo/IO not effective in overcoming resistance
- More targeted therapies available and coming soon
- EGFR Exon 20, Her 2 mutation, EGFR WT, BRAF, KRAS G12C
- ADCs: a "Revolution Within Reach"?

