

# EXPLORING INCRETIN- BASED THERAPY

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Endocrinology

The Diabetes and Endocrine Center of Mississippi

St. Dominic's Hospital

AROUND  
S  
Sugar Kush  
Hungaria  
Caraflex  
Mambo La  
Begg  
Oxa  
HYDROP  
Merle  
Red Tan  
Cherokee  
Mixed Brass  
Genovese  
Thyme + Fa  
Microgreens  
MUSHROOM  
Pink + Pearl  
Phoeris  
Blue + Green  
Chestnut  
Calden

URBAN FARM & WINE BAR



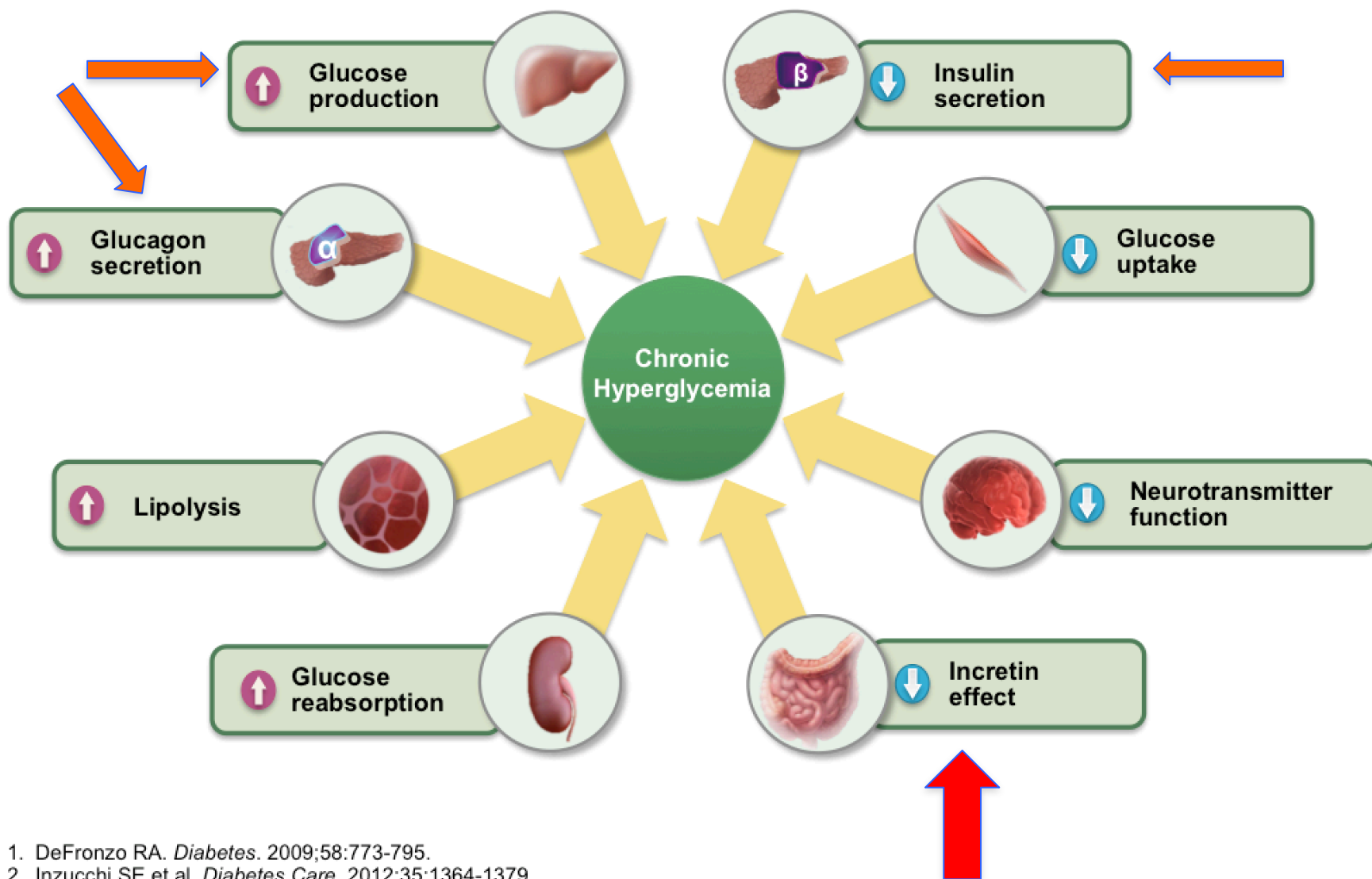
# Disclosures

■ I currently speak on behalf of:

- Abbvie
- Lilly
- NovoNordisk



# The Multifactorial Pathophysiology of Type 2 Diabetes Is a Key Factor for Optimizing Individualization of Therapy<sup>1-2</sup>



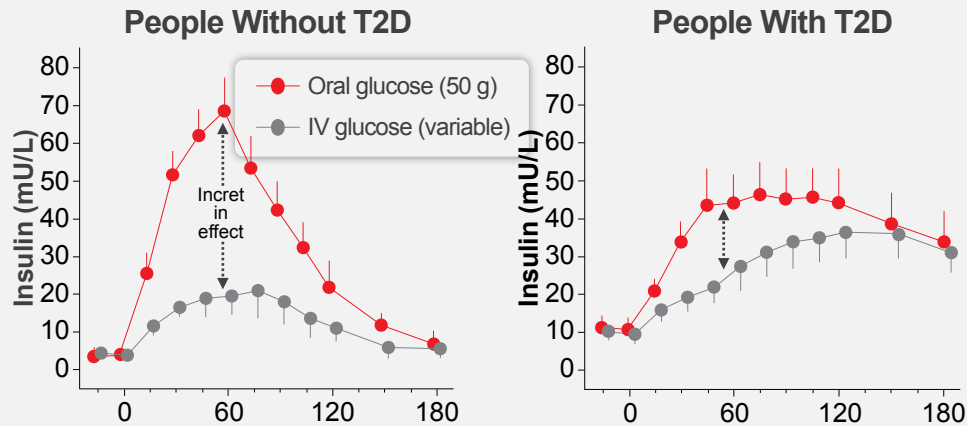
1. DeFronzo RA. *Diabetes*. 2009;58:773-795.

2. Inzucchi SE et al. *Diabetes Care*. 2012;35:1364-1379.



# GLP-1 and GIP are signals from the gut that reflect the fed state.

## The Incretin Effect of GIP and GLP-1 Is Diminished in People With T2D<sup>1</sup>



▶ Insulin secretion is enhanced after oral vs IV administration of glucose (incretin effect)

▶ Diminished incretin effect

\* $P < 0.05$  vs oral glucose.<sup>1</sup>

IV=intravenous.

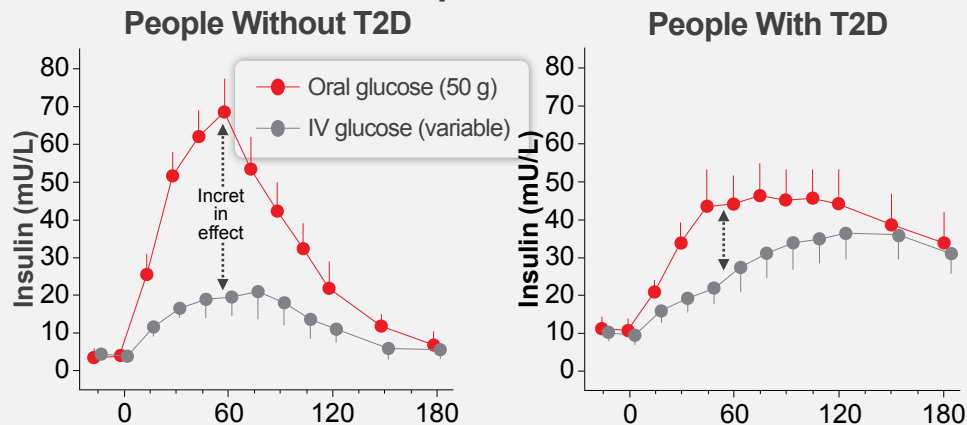
1. Nauck MA, et al. *Diabetes Obes Metab.* 2018;20(suppl 1):5-21. 2. Nauck MA, et al. *Diabetes.* 2019;68(5):897-900.



Please see Important Safety Information, including Boxed Warning about possible thyroid tumors, including thyroid cancer, throughout this deck, the Full Prescribing Information, and Medication Guide in the participant guide.

# Relative contributions of GLP-1 and GIP to the Incretin Effect.<sup>1,2</sup>

## The Incretin Effect of GIP and GLP-1 Is Diminished in People With T2D<sup>1</sup>

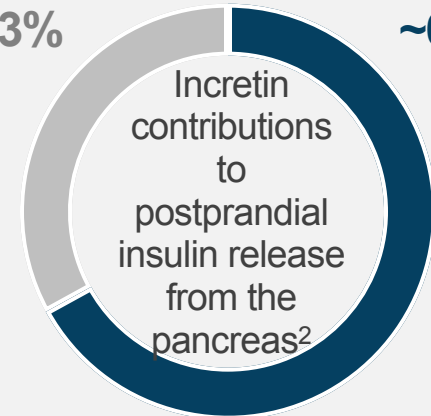


▶▶ Insulin secretion is enhanced after oral vs IV administration of glucose (incretin effect)

▶▶ Diminished incretin effect

**GLP-1**  
~33%

**GIP**  
~67%



**GIP** is responsible for nearly **two-thirds** of the incretin effect in people without T2D, contributing more to insulin secretion than GLP-1.<sup>2</sup>

\* $P < 0.05$  vs oral glucose.<sup>1</sup>

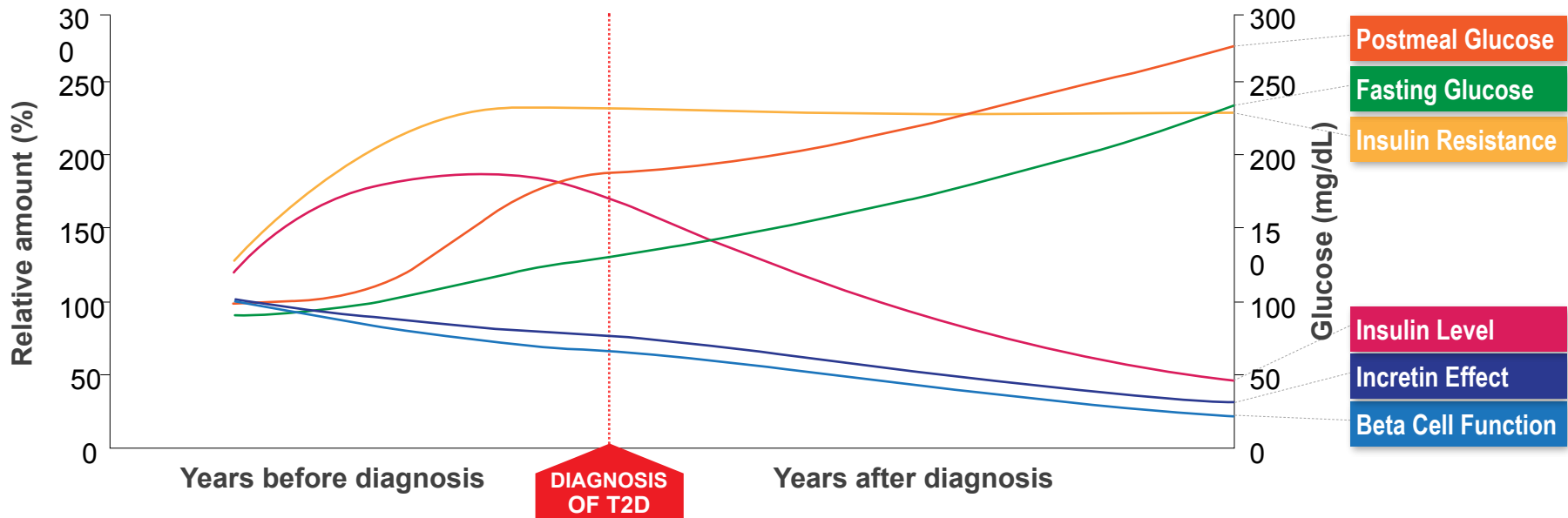
IV=intravenous.

1. Nauck MA, et al. *Diabetes Obes Metab.* 2018;20(suppl 1):5-21. 2. Nauck MA, et al. *Diabetes.* 2019;68(5):897-900.



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# T2D IS A PROGRESSIVE INSULIN SECRETORY DEFECT AGAINST THE BACKGROUND OF INSULIN RESISTANCE<sup>1-3,\*</sup>



\*Representative depiction of the natural history of T2D highlighting the role of insulin resistance, insulin deficiency, and impaired incretin effect. Both the time course and relative function are descriptive.

T2D=type 2 diabetes.

1. Kendall DM, et al. *Am J Med.* 2009;122(suppl 6A):S37-S50.

2. Esser N, et al. *Diabetologia.* 2020;63(10):2007-2021.

3. Skyler JS, et al. *Diabetes.* 2017;66(2):241-255.

Please see Important Safety Information, including Boxed Warning about possible thyroid tumors, including thyroid cancer, throughout this deck, the Full Prescribing Information, and Medication Guide in the participant guide.



# John Brown, PhD DSc, FRSC

Department of Cellular and Physiological Sciences  
University of British Columbia



# GIP

- Isolated around 1970
- “Gastric Inhibitory Polypeptide”
- Decrease in stomach acid production
  
- Later re-named, keeping GIP acronym
  
- Glucose-dependent Insulinotropic Polypeptide

# Holst and Habener



**Jans Juus Holst, MD, DMSc**

**University of Copenhagen  
Biomedical Sciences**



**Joel Francis Habener, MD**

**Professor of Medicine  
Harvard Medical School**

**Director of Molecular Endocrinology  
Massachusetts General Hospital**



# GLP-1

- Simultaneously isolated in 1986
- “Glucagon-like Peptide 1”
- Accentuation of beta cell production of insulin
- Delay in gastric emptying
- Satiety effect realized around 1996

# **John Eng, MD**

**Department of Endocrinology Veteran's Affairs  
Mount Sinai Hospital  
Bronx, NY**



# Exendin-4

- Isolated in 1990
- Similar in structure and function to GLP-1
- Present in venom of various reptiles
- Isolated from saliva of *Heloderma suspectum*



# Exendin-4



Gila monster

# Exendin-4

- *H. suspectum* - normal glucose's while fasting
- Exposure to animals increased beta cell mass
- 1999 - daily injection normalized glucose in diabetic mice
- Increased insulin production in humans
- Longer-acting than endogenous GLP-1
- 2005 - FDA approval of Exenatide

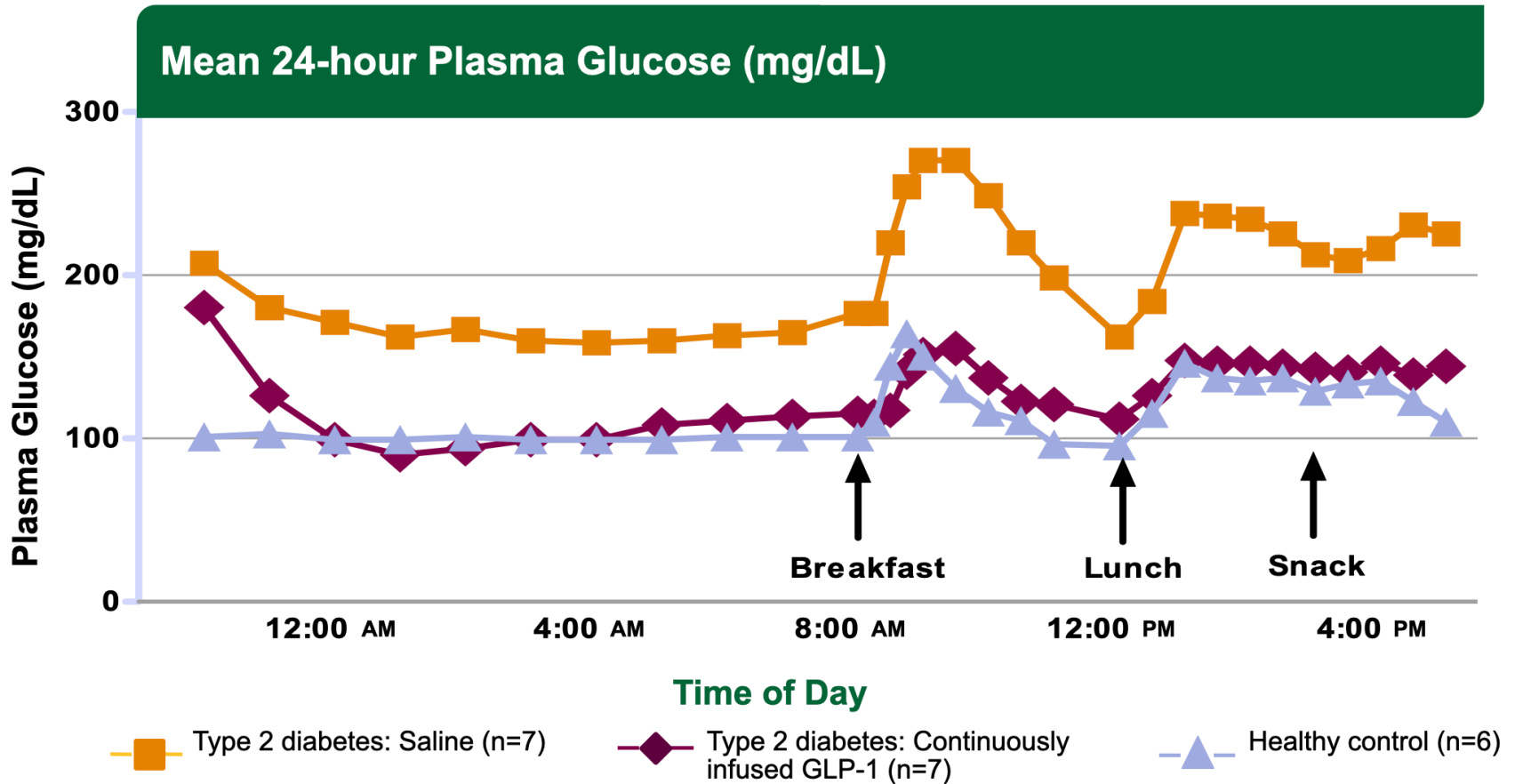
# Exenatide



- Treatment of T2DM
- BID dosing
- Very rapid-acting



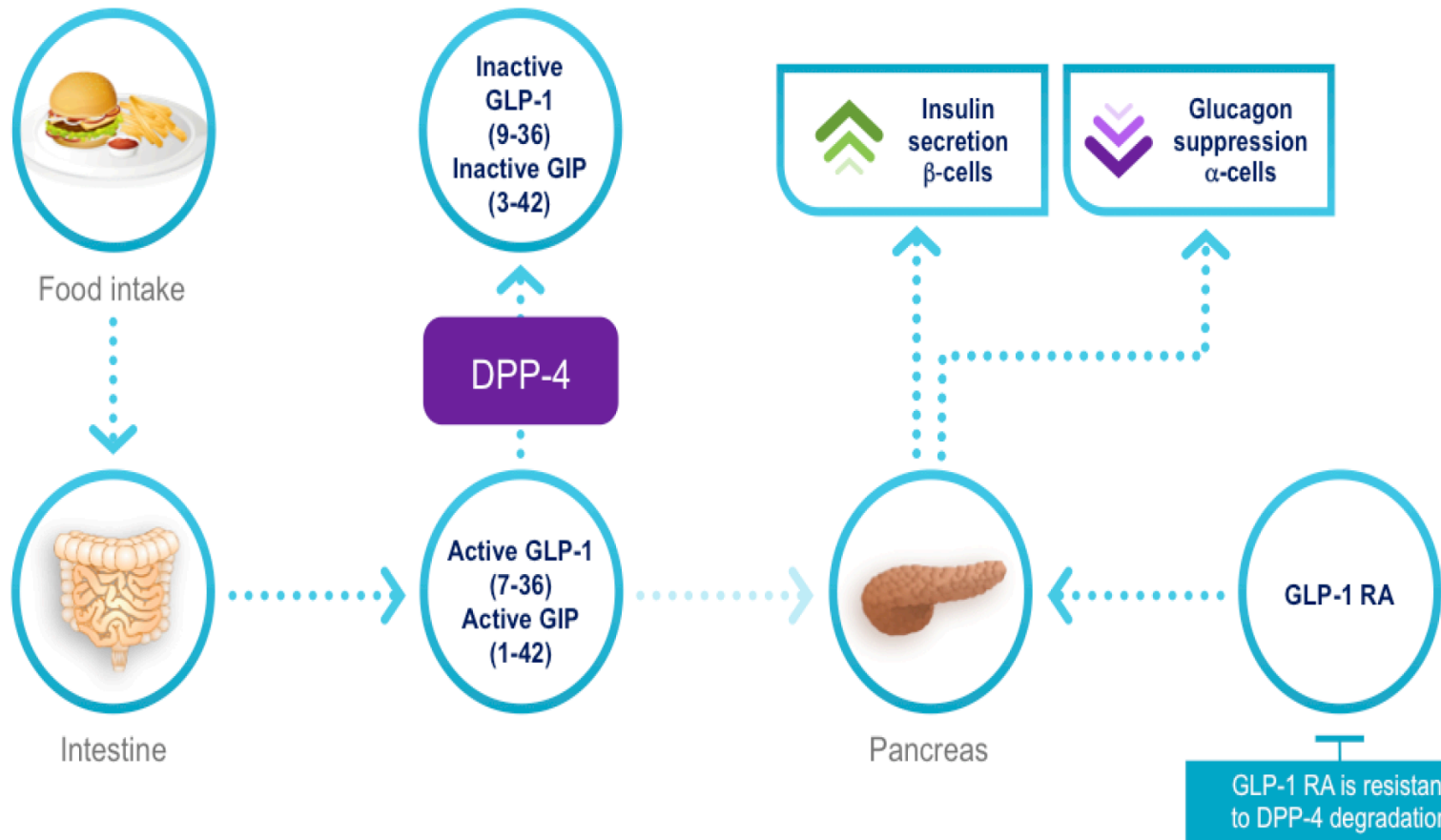
# GLP-1



GLP=glucagon-like peptide.

Adapted from Rachman J et al. *Diabetologia*. 1997;40(2):205-211.

# GLP-1



# Liraglutide

- Analog of endogenous GLP-1
- Modified to resist degradation by DPP-4
- Daily dosing (half-life 13hrs)
- 1996 - Invented (NovoNordisk)
- 2010 - Approval for adult use (T2DM)
- 2019 - Approval for pediatric use (T2DM)

# Liraglutide



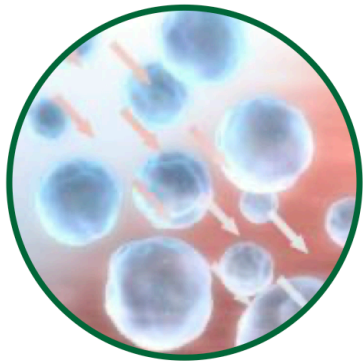
- Treatment of T2DM
- Daily dosing
- Longer-acting

# Exenatide

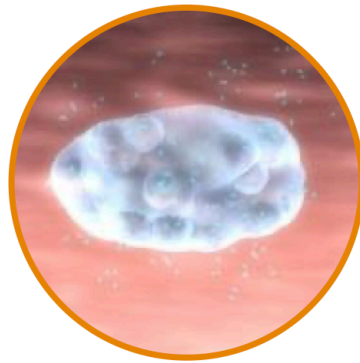
- Exenatide bound to subcutaneous microspheres
- First agent for weekly dosing
- Steady-state reached in 6-10 weeks
- 2014 - FDA approval of Bydureon (adults with T2DM)



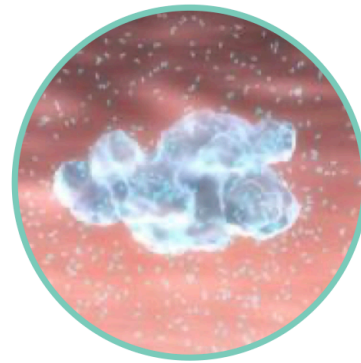
# Exenatide



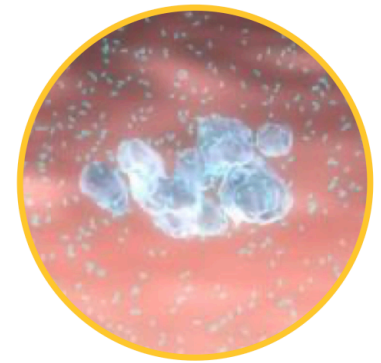
Subcutaneous injection



Microsphere aggregation



Microsphere degradation



Continued release

# Exenatide



# Exenatide



# Exenatide



# Dulaglutide

- GLP-1 analogue resistant to DPP-4 degradation
- Bound to FC portion of IgG4 molecule
- Does not cross blood-brain barrier
- Weekly dosing (half-life 5 days)
- 2014 - FDA approval of Trulicity (adults with T2DM)
- Eli Lilly



# Dulaglutide



# Semaglutide

- GLP-1 analogue resistant to DPP-4 degradation
- Bound to albumin
- Can cross blood-brain barrier
- Weekly dosing (half-life 7 days)
- 2017 - FDA approval of Ozempic (adults with T2DM)
- NovoNordisk

# Semaglutide



# Tirzepatide

- GIP analoge that agonizes both GLP-1-*R* and GIP-*R*
- Bound to albumin
- Can cross blood-brain barrier
- Weekly dosing (half-life 5 days)
- 2022 - FDA approval of Mounjaro (adults with T2DM)
- Eli Lilly

# Terzepatide





# Treatment of Diabetes Mellitus

## GOALS OF TREATMENT:

– Diabetic Goals:	<u>ADA</u>	<u>ACE</u>
■ A1c:	< 7%	< 6.5%
■ Preprandial:	70-130	< 110
■ Postprandial:	< 180	< 140

## How aggressive should we be?

- Age
- Risk of hypoglycemia
- Pre-existing cardiovascular disease burden
- Does the drug impact CV risk ?

# Diabetes Mellitus and CVD

**Macrovascular Outcomes:** There have been no clinical studies establishing conclusive evidence of macrovascular risk reduction with **xxx** or any other antidiabetic drug.

# American Diabetes Association/EASD general therapy recommendations in type 2 diabetes<sup>1</sup>

## Monotherapy

Efficacy  
Hypo risk  
Weight  
Side effects  
Costs

## Metformin

high  
low risk  
neutral / loss  
GI / lactic acidosis  
low

## Dual therapy\*

Efficacy  
Hypo risk  
Weight  
Side effects  
Costs

†HbA<sub>1c</sub> target not achieved after ~3 months of monotherapy, proceed to 2-drug combination (order not meant to denote any specific preference—choice dependent on a variety of patient and disease specific factors):

Metformin +	Metformin +	Metformin +	Metformin +	Metformin +	Metformin +
Sulfonylurea	Thiazolidinedione	DPP-4 inhibitor	SGLT2 inhibitor	GLP-1 receptor agonist	Insulin (basal)
high efficacy moderate risk weight gain hypoglycemia low costs	high efficacy low risk weight gain edema, HF, fxs low costs	intermediate efficacy low risk neutral weight rare hypoglycemia high costs	intermediate efficacy low risk weight loss GU, dehydration high costs	high efficacy low risk weight loss hypoglycemia high costs	highest efficacy high risk weight gain hypoglycemia variable costs

\*Consider initial therapy at this stage when HbA<sub>1c</sub> is ≥9% (≥75 mmol/mol).

## Triple therapy

†HbA<sub>1c</sub> target not achieved after ~3 months of dual therapy and patient (1) on oral combination, move to injectables (2) on GLP-1-RA add basal insulin, or (3) on optimally titrated basal insulin, add GLP-1-RA or mealtime insulin. In refractory patients consider adding TZD or SGLT2-i.

Metformin +	Metformin +	Metformin +	Metformin +	Metformin +	Metformin +
Sulfonylurea + TZD or DPP-4-i or SGLT2-i or GLP-1-RA or Insulin <sup>§</sup>	Thiazolidinedione + SU or DPP-4-i or SGLT2-i or GLP-1-RA or Insulin <sup>§</sup>	DPP-4 inhibitor + SU or TZD or SGLT2-i or Insulin <sup>§</sup>	SGLT2 inhibitor + SU or TZD or DPP-4-i or Insulin <sup>§</sup>	GLP-1 receptor agonist + SU or TZD or Insulin <sup>§</sup>	Insulin (basal) + TZD or DPP-4-i or SGLT2-i or GLP-1-RA

## Combination injectable therapy<sup>†</sup>

†Consider initial therapy at this stage when blood glucose is ≥300-350 mg/dL (≥16.7-19.4 mmol/L) and/or HbA<sub>1c</sub> ≥10-12% (≥86-108 mmol/mol), especially if patient is symptomatic or if catabolic features (weight loss, ketosis) are present, in which case basal insulin + mealtime insulin is the preferred initial regimen.

Metformin +

Basal insulin +	Mealtime insulin	or	GLP-1-RA
-----------------	------------------	----	----------

Trulicity<sup>®</sup> has not been studied in combination with basal insulin.

<sup>§</sup>Usually a basal insulin (eg, NPH, glargine, detemir, degludec).

HbA<sub>1c</sub>=glycated hemoglobin; DPP-4-i=dipeptidyl peptidase-4 inhibitor; EASD=European Association for the Study of Diabetes; fxs=fractures; GU=genitourinary infections; HF=heart failure; SU=sulfonylurea; TD=thiazolidinedione.

1. Inzucchi SE, et al. *Diabetes Care*. 2015;38(1):140-149.

# Glycemic Control Algorithm



## INDIVIDUALIZE GOALS

**A1C ≤ 6.5%** For patients without concurrent serious illness and at low hypoglycemic risk

**A1C > 6.5%** For patients with concurrent serious illness and at risk for hypoglycemia

## LIFESTYLE THERAPY (Including Medically Assisted Weight Loss)

Entry A1C < 7.5%

Entry A1C ≥ 7.5%

Entry A1C > 9.0%

### MONOTHERAPY\*

- ✓ Metformin
- ✓ GLP-1 RA
- ✓ SGLT-2i
- ✓ DPP-4i
- ⚠ TZD
- ✓ AGi
- ⚠ SU/GLN

If not at goal in 3 months proceed to Dual Therapy

### DUAL THERAPY\*

- ✓ GLP-1 RA
  - ✓ SGLT-2i
  - ✓ DPP-4i
  - ⚠ TZD
  - ⚠ Basal Insulin
  - ✓ Colesevelam
  - ✓ Bromocriptine QR
  - ✓ AGi
  - ⚠ SU/GLN
- MET**  
or other 1st-line agent
- +

If not at goal in 3 months proceed to Triple Therapy

### TRIPLE THERAPY\*

- ✓ GLP-1 RA
  - ✓ SGLT-2i
  - ⚠ TZD
  - ⚠ Basal insulin
  - ✓ DPP-4i
  - ✓ Colesevelam
  - ✓ Bromocriptine QR
  - ✓ AGi
  - ⚠ SU/GLN
- MET**  
or other 1st-line agent + 2nd-line agent
- +

If not at goal in 3 months proceed to or intensify insulin therapy

### SYMPTOMS

NO YES

DUAL Therapy

OR

TRIPLE Therapy

INSULIN ± Other Agents

**ADD OR INTENSIFY INSULIN**  
Refer to Insulin Algorithm

### LEGEND

- ✓ Few adverse events and/or possible benefits
- ⚠ Use with caution

\* Order of medications represents a suggested hierarchy of usage; length of line reflects strength of recommendation

## PROGRESSION OF DISEASE

# Incretin Receptor Agonists

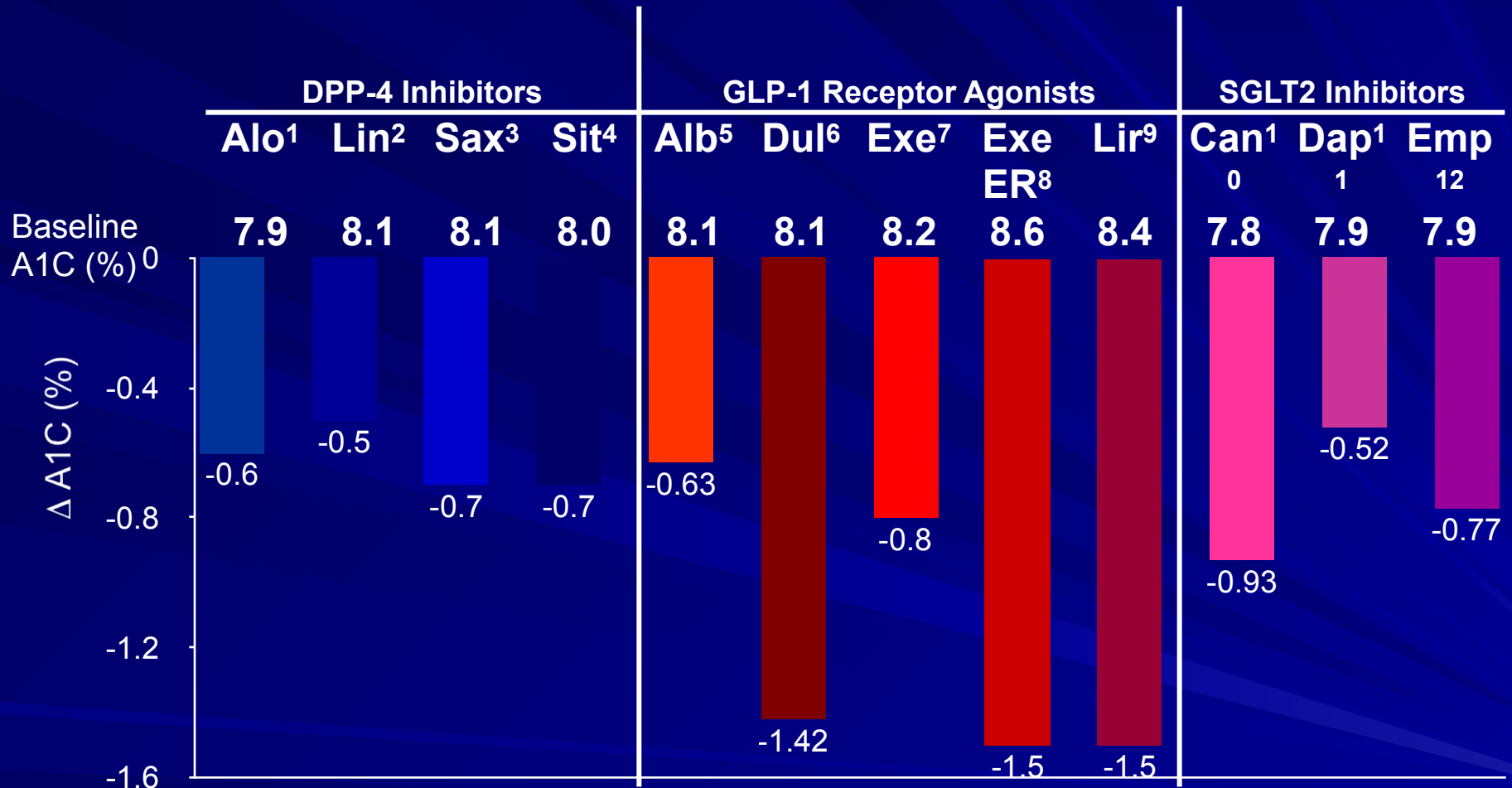




# Safety Considerations with GLP-1 RA's

<b>GI adverse events</b>	<ul style="list-style-type: none"><li>• Common</li><li>• Usually dose dependent and transient</li><li>• Usually reduced with dose titration</li></ul>
<b>Pancreatitis</b>	<ul style="list-style-type: none"><li>• Pancreatitis has been reported with postmarketing use of some of incretin agents, although no causal relationship has been established</li><li>• Extensive review by FDA of studies involving &gt;80,000 patients has not uncovered reliable evidence of increased pancreatic risk with incretins vs other agents</li><li>• Labeling for all incretins states these agents should be immediately discontinued if pancreatitis is suspected</li><li>• Labeling for GLP-1 receptor agonists suggests consideration of other therapies for patients with a history of pancreatitis</li></ul>
<b>Pancreatic cancer</b>	<ul style="list-style-type: none"><li>• Extensive review by FDA of studies involving &gt;80,000 patients has not uncovered reliable evidence of increased pancreatic risk with incretins vs other agents</li><li>• Further assessments required from long duration-controlled studies or epidemiological databases</li></ul>
<b>Medullary thyroid cancer</b>	<ul style="list-style-type: none"><li>• Animal data showed an increased incidence of C-cell tumors with liraglutide and exenatide ER treatment, but confirmatory population studies are lacking</li><li>• Labeling for liraglutide and exenatide ER:<ul style="list-style-type: none"><li>• Patients should be counseled regarding medullary thyroid carcinoma and the signs/symptoms of thyroid tumors</li><li>• Contraindicated in patients with personal/family history of MTC or multiple endocrine neoplasia syndrome type 2</li></ul></li></ul>
<b>Renal impairment</b>	<ul style="list-style-type: none"><li>• Renal Impairment has been reported postmarketing, usually in association with nausea, vomiting, diarrhea, or dehydration. Use caution when initiating or escalating doses in patients with renal impairment. Exenatide is contraindicated in patients with severe renal insufficiency or ESRD</li></ul>

# Glucose Reduction



1. Nauck MA, et al. *Int J Clin Pract.* 2009;63:46-55. 2. Taskinen MR, et al. *Diabetes Obes Metab.* 2011;13:65-74. 3. DeFronzo RA, et al. *Diabetes Care.* 2009;32:1649-1655. 4. Charbonnel B, et al. *Diabetes Care.* 2006;29:2638-2643. 5. Ahrén B, et al. *Diabetes Care.* 2014;37:2141-2148. 6. Dungan KM, et al. *Lancet.* 2014;384:1349-1357. 7. DeFronzo RA et al. *Diabetes Care.* 2005;28:1092-1100. 8. Bergenstal RM, et al. *Lancet.* 2010;376:431-439. 9. Pratley RE, et al. *Lancet.* 2010;375:1447-1456. 10. Cefalu WT, et al. *Lancet.* 2013;382:941-950. 11. Nauck MA, et al. *Diabetes Care.* 2011;34:2015-2022. 12. Haring HU, et al. *Diabetes Care.* 2014;37:1650-1659.

# EMPA-REG

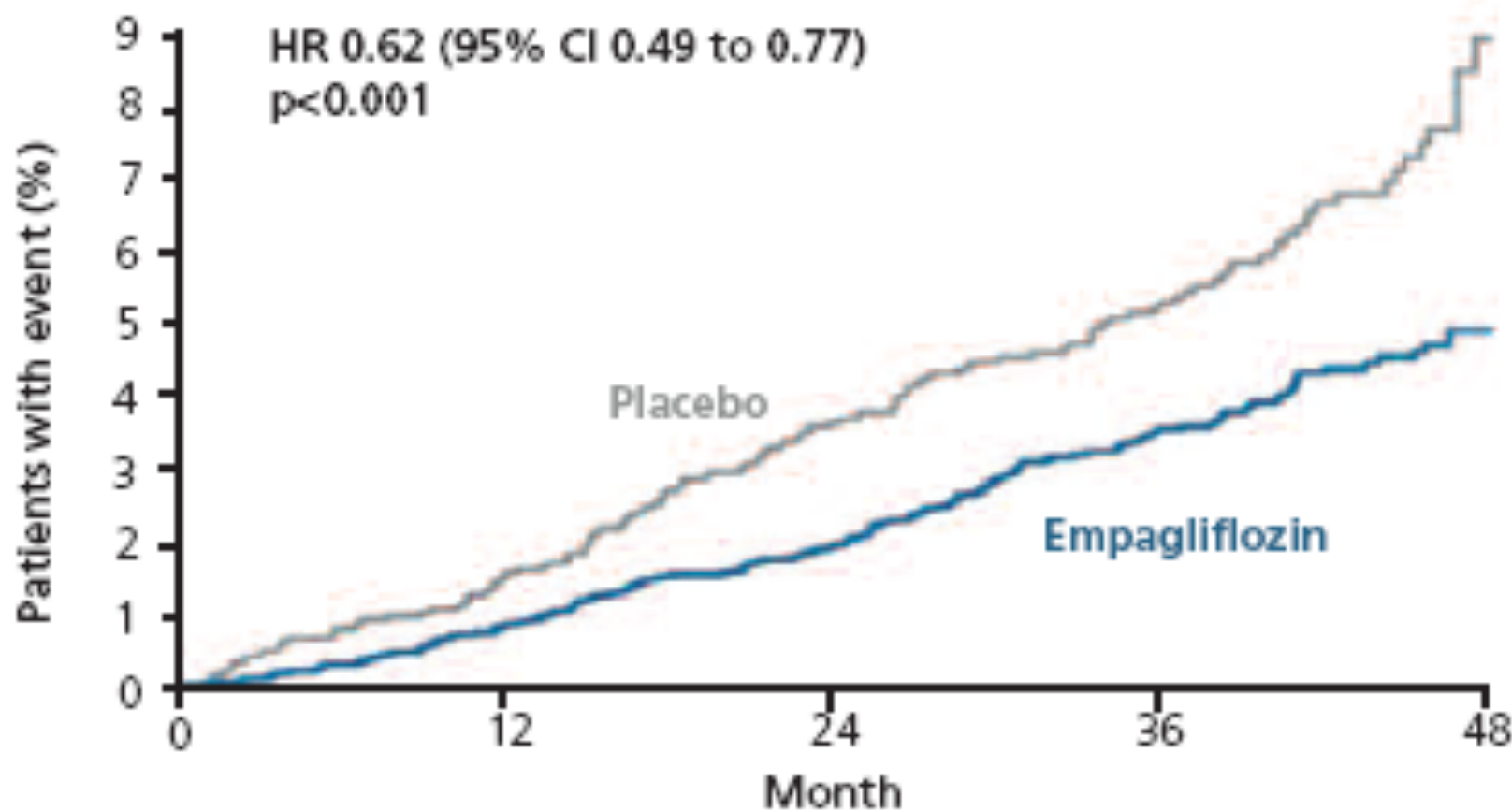
*The* NEW ENGLAND JOURNAL *of* MEDICINE

ORIGINAL ARTICLE

## Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes

Bernard Zinman, M.D., Christoph Wanner, M.D., John M. Lachin, Sc.D.,  
David Fitchett, M.D., Erich Bluhmki, Ph.D., Stefan Hantel, Ph.D.,  
Michaela Mattheus, Dipl. Biomath., Theresa Devins, Dr.P.H.,  
Odd Erik Johansen, M.D., Ph.D., Hans J. Woerle, M.D., Uli C. Broedl, M.D.,  
and Silvio E. Inzucchi, M.D., for the EMPA-REG OUTCOME Investigators

**Figure 1.** The cumulative incidence of death from cardiovascular causes in the empagliflozin group versus placebo group in the EMPA-REG OUTCOME



Hazard ratios (HR) are based on Cox regression analysis. Reproduced with permission from ref 2.

## INDICATIONS AND LIMITATIONS OF USE

JARDIANCE is indicated to reduce the risk of cardiovascular (CV) death in adults with type 2 diabetes mellitus and established CV disease.



# LEADER Trial

ORIGINAL ARTICLE

## Liraglutide and Cardiovascular Outcomes in Type 2 Diabetes

Steven P. Marso, M.D., Gilbert H. Daniels, M.D., Kirstine Brown-Frandsen, M.D.,  
Peter Kristensen, M.D., E.M.B.A., Johannes F.E. Mann, M.D.,  
Michael A. Nauck, M.D., Steven E. Nissen, M.D., Stuart Pocock, Ph.D.,  
Neil R. Poulter, F.Med.Sci., Lasse S. Ravn, M.D., Ph.D.,  
William M. Steinberg, M.D., Mette Stockner, M.D., Bernard Zinman, M.D.,  
Richard M. Bergenstal, M.D., and John B. Buse, M.D., Ph.D., for the LEADER  
Steering Committee on behalf of the LEADER Trial Investigators\*

ABSTRACT

# LEADER Trial

**Figure 1.** Cumulative incidence of death from cardiovascular causes in the liraglutide group versus placebo group in the LEADER study



Hazard ratios [HR (95%CI)] based on Cox regression analysis  
Adapted from reference 6

‘Victoza<sup>®</sup> is indicated:

- as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus.
- **as an adjunct to standard treatment of cardiovascular risk factors to reduce the risk of major adverse cardiovascular events (cardiovascular death, non-fatal myocardial infarction, or non-fatal stroke) in adults with type 2 diabetes mellitus and high cardiovascular risk.’**

# SUSTAIN-6

*The* NEW ENGLAND JOURNAL of MEDICINE

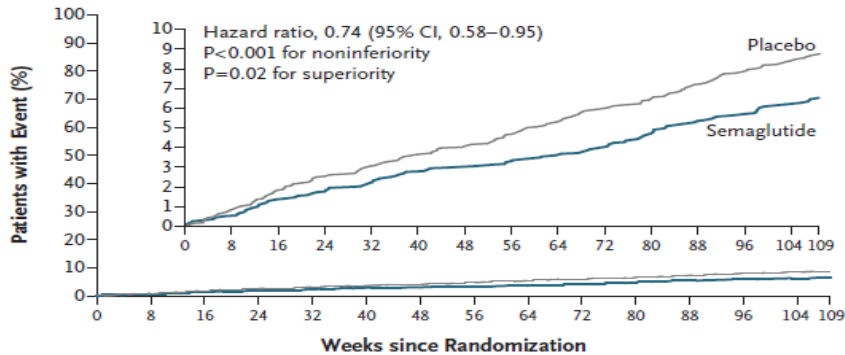
ORIGINAL ARTICLE

## Semaglutide and Cardiovascular Outcomes in Patients with Type 2 Diabetes

Steven P. Marso, M.D., Stephen C. Bain, M.D., Agostino Consoli, M.D.,  
Freddy G. Eliaschewitz, M.D., Esteban Jódar, M.D., Lawrence A. Leiter, M.D.,  
Ildiko Lingvay, M.D., M.P.H., M.S.C.S., Julio Rosenstock, M.D.,  
Jochen Seufert, M.D., Ph.D., Mark L. Warren, M.D., Vincent Woo, M.D.,  
Oluf Hansen, M.Sc., Anders G. Holst, M.D., Ph.D., Jonas Pettersson, M.D., Ph.D.,  
and Tina Vilsbøll, M.D., D.M.Sc., for the SUSTAIN-6 Investigators\*

# SUSTAIN-6

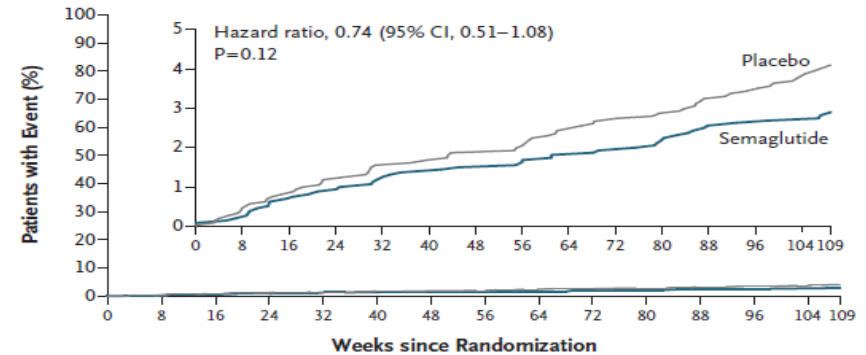
## A Primary Outcome



### No. at Risk

Placebo	1649	1616	1586	1567	1534	1508	1479
Semaglutide	1648	1619	1601	1584	1568	1543	1524

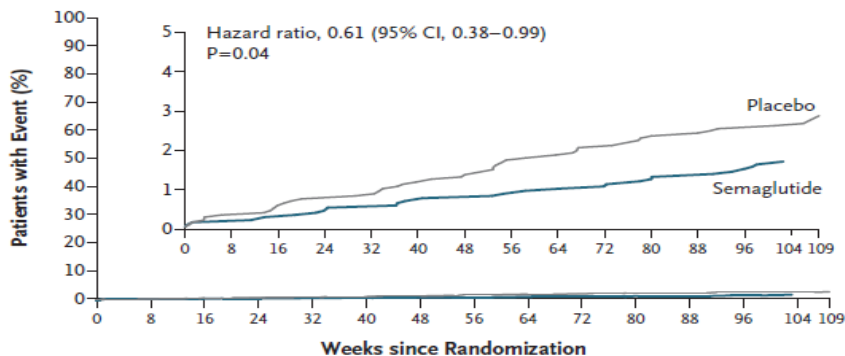
## B Nonfatal Myocardial Infarction



### No. at Risk

Placebo	1649	1624	1598	1587	1562	1542	1516
Semaglutide	1648	1623	1609	1595	1582	1560	1543

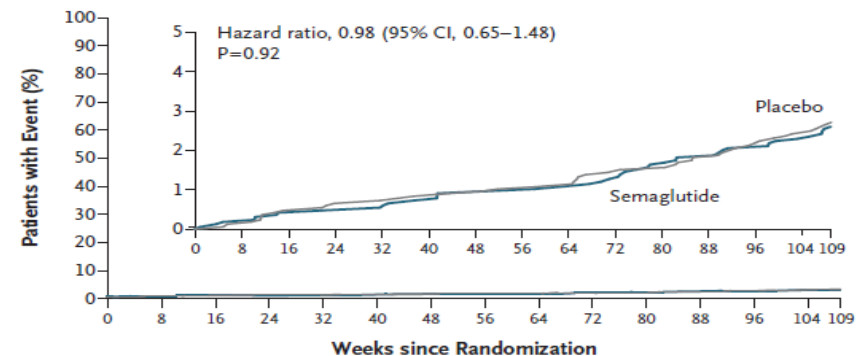
## C Nonfatal Stroke



### No. at Risk

Placebo	1649	1629	1611	1597	1571	1548	1528
Semaglutide	1648	1630	1619	1606	1593	1572	1558

## D Death from Cardiovascular Causes



### No. at Risk

Placebo	1649	1637	1623	1617	1600	1584	1566
Semaglutide	1648	1634	1627	1617	1607	1589	1579

**Figure 1. Cardiovascular Outcomes.**

Shown are Kaplan–Meier plots of the primary outcome (a composite of cardiovascular death, nonfatal myocardial infarction, or nonfatal stroke) (Panel A), nonfatal myocardial infarction (Panel B), nonfatal stroke (Panel C), and death from cardiovascular causes (Panel D). The trial included a planned observation period of 109 weeks for all patients (a 104-week treatment period with a 5-week follow-up period). In Panel C, there were no events in the semaglutide group after week 104. Insets show the same data on an expanded y axis.



- to reduce the risk of major adverse cardiovascular events in adults with type 2 diabetes mellitus and established cardiovascular disease (1).

# REWIND



**REWIND<sup>®</sup>**

*Trulicity CV Outcomes Trial*

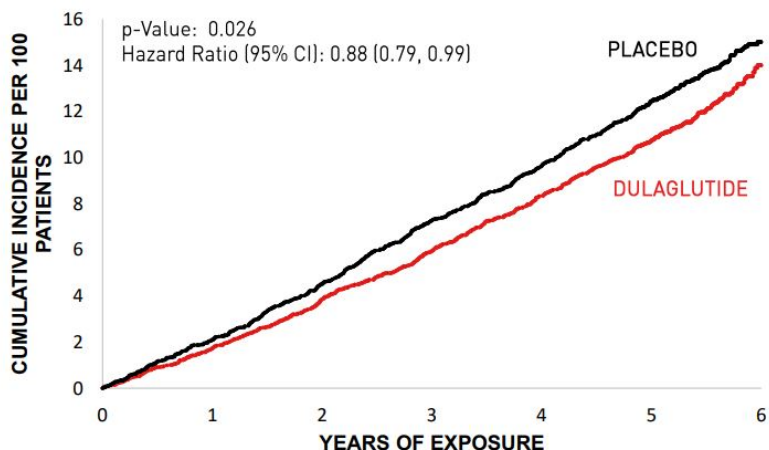
# REWIND

## TRULICITY CV OUTCOME TRIAL



### PRIMARY MACE 3 RESULT

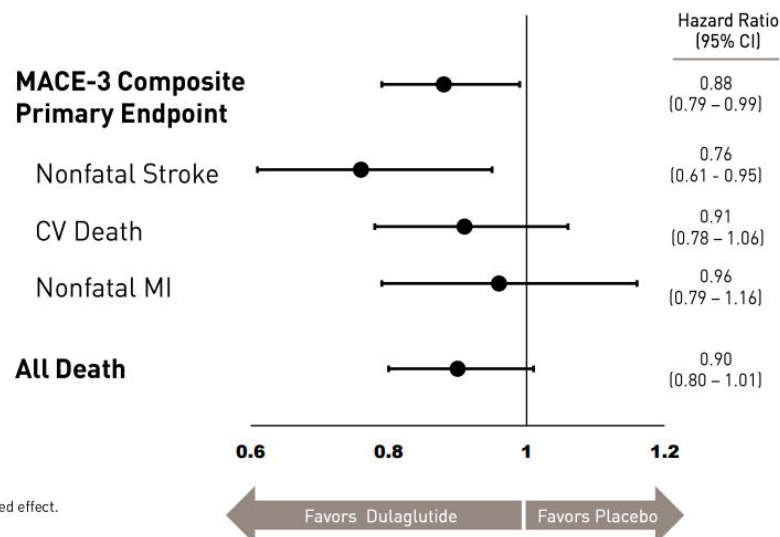
- Dulaglutide significantly reduced the risk of Major Adverse Cardiovascular Events (MACE 3: CV death, non-fatal MI or non-fatal stroke) by 12% vs. placebo



Note: Hazard Ratio and its CI and p-value obtained from Cox Proportional Hazards Regression Model with treatment as a fixed effect.  
Gerstein et al. Lancet 2019.

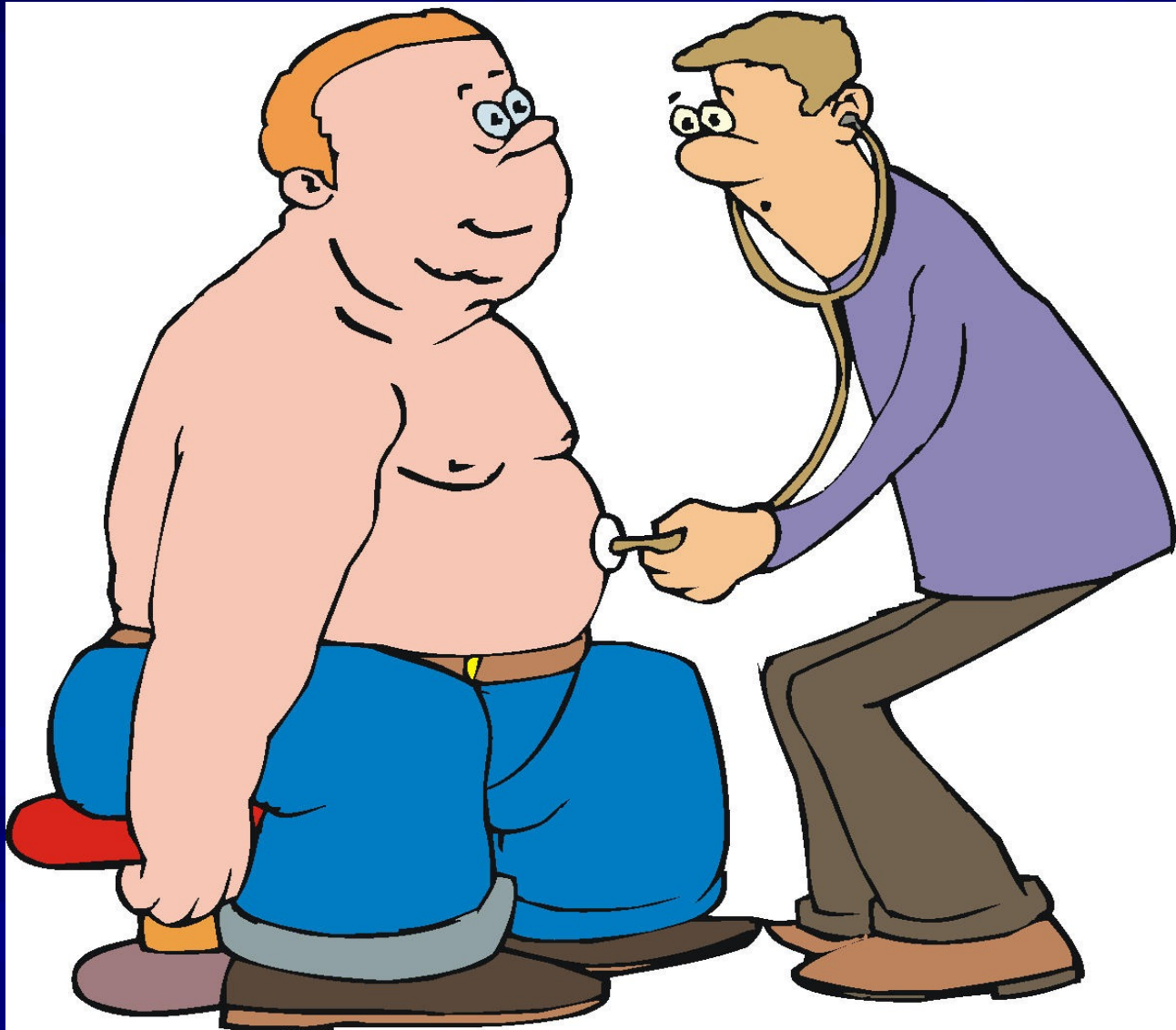
### CV OUTCOMES

- Consistent effect across three components of MACE, greatest difference observed in Nonfatal Stroke



- To reduce the risk of major adverse cardiovascular events in adults with type 2 diabetes mellitus who have established cardiovascular disease or multiple cardiovascular risk factors.

# Incretins for Weight Loss ?





# How did we get here?



# How did we get here?



From your Watch later playlist



Semaglutide, Kardashians, and Female Body Image :

PowerfulJRE · 2M views · 7 months ago

# How did we get here?

The image shows a screenshot of the TikTok app interface. On the left is the search results page for the hashtag #ozempic, with the #ozempic hashtag highlighted in a red box. On the right is the search results page for the user @ozempic, showing a grid of videos.

**TikTok Search Results for #ozempic (Left Panel):**

- #ozempic2023: 11 posts
- #ozempicbelgium: 105 posts
- #ozempic: 275.8K posts (highlighted)
- #ozempicprescription: 130 posts
- #ozempicweightlossinjections: 305 posts
- #ozempicresults: 89 posts
- #ozempictransformation: 49 posts
- #ozempicinjections: 128 posts
- #ozempicproblems: 65 posts
- #ozempicmadrid: 10 posts
- #ozempicmedicine: 8 posts
- #ozempicgermany: 73 posts
- #ozempiclatvija: 6 posts

**TikTok Search Results for @ozempic (Right Panel):**

Search results for the user @ozempic, showing a grid of videos:


- Video 1 (5-2):** A man in a gym setting. Text overlay: "Oh, ok", "All right, she is crushing it! Maintaining muscle mass while on Ozempic Education Incoming". Caption: "You will lose all your muscle mass....." by dr.tommym... (2.5M views).
- Video 2 (7-1):** A man speaking into a microphone. Text overlay: "OZEMPIC BUTT". Caption: "@Mike Israel on Ozempic" by doctormike (4.5M views).
- Video 3 (1-28):** A woman. Text overlay: "OZEMPIC WITHDRAWAL Will you gain double the weight back?". Caption: "After stopping, ozempic you gain double the way back?" by dr.tommym... (14.5M views).
- Video 4 (5-13):** Two women in silver dresses. Text overlay: "Ozempic", "Hiking 20 miles a week". Caption: "Ozempic" by dr.karanr (23.3M views).
- Video 5 (7-20):** A woman in a "KEEP BLAZING STAY AMAZING" t-shirt. Text overlay: "I wonder what I look like after taking Ozempic for 1 year". Caption: "Oh i like it, i think ill stay here #fypp" by chanelica.r (1.1M views).
- Video 6 (9-13):** A man. Text overlay: "WORST FOODS ON OZEMPIC". Caption: "The WORST foods for you on Ozempic:" by realdrbae (2.8M views).




# How did we get here?



# How did we get here?

 New York Post ⋮ ✕



**Ozempic patients are getting filler to fix their saggy skin: Ki...**

[Visit](#)

Images may be subject to copyright. [Learn More](#)



How did we get here?

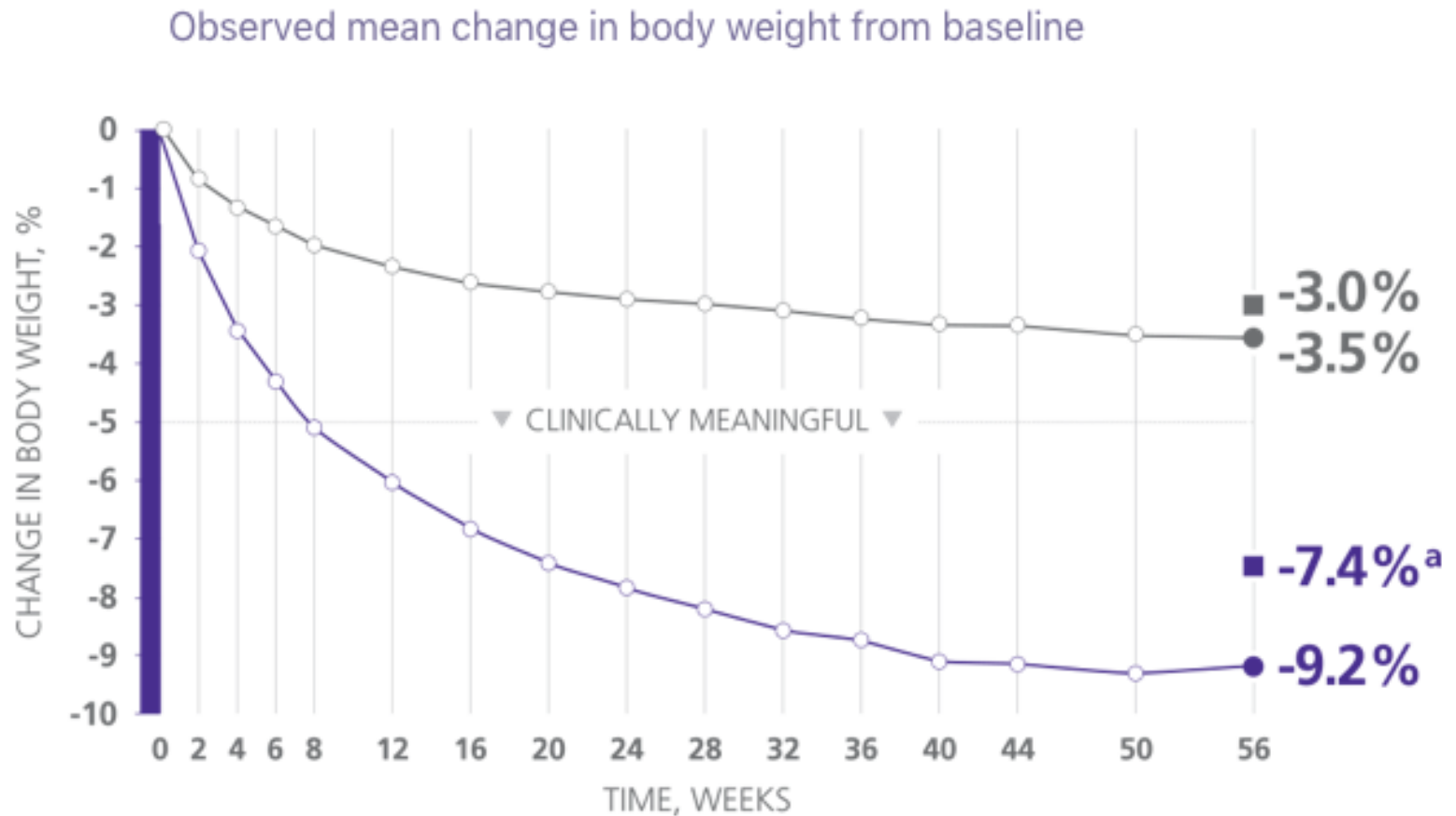
# OZEMPIC FACE????



# Incretins for Weight Loss

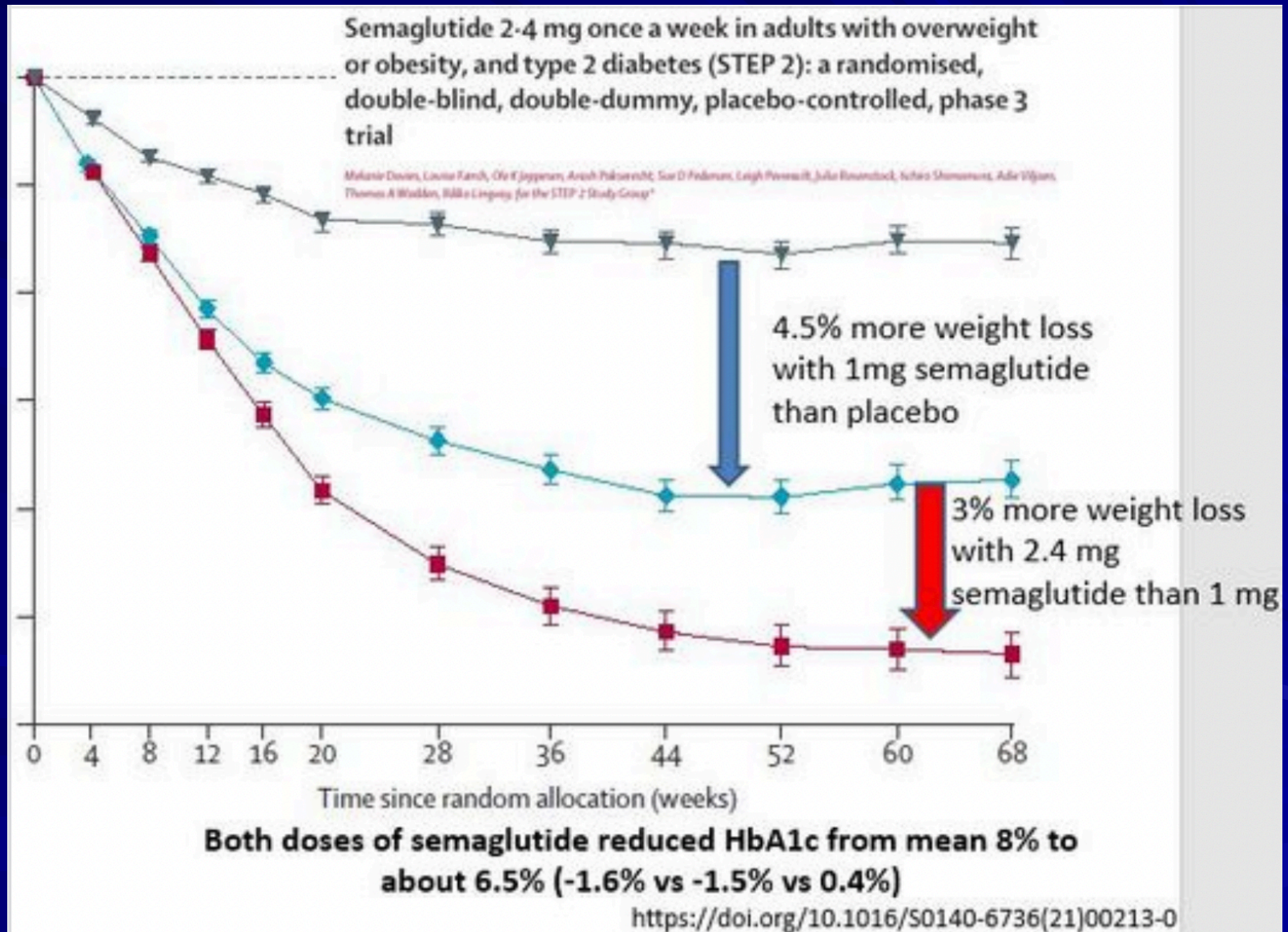
- Saxenda (liraglutide)
- Wegovy (semaglutide)
- Zepbound (tirzepatide)

# Saxenda (liraglutide)



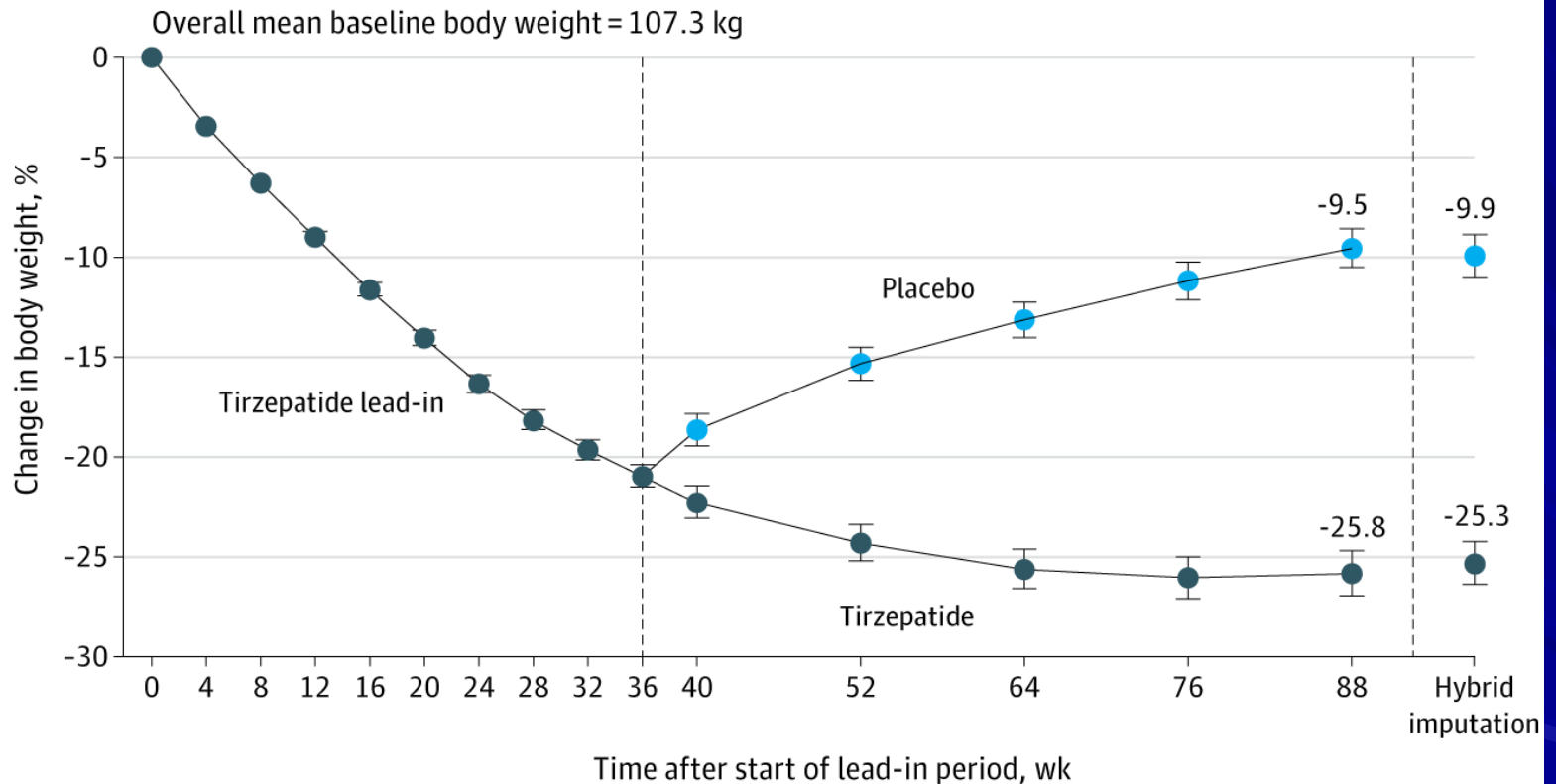


# Wegovy (semaglutide)



# Zepbound (terzepatide)

**A** Percent change in body weight (week 0-88)



No. at risk

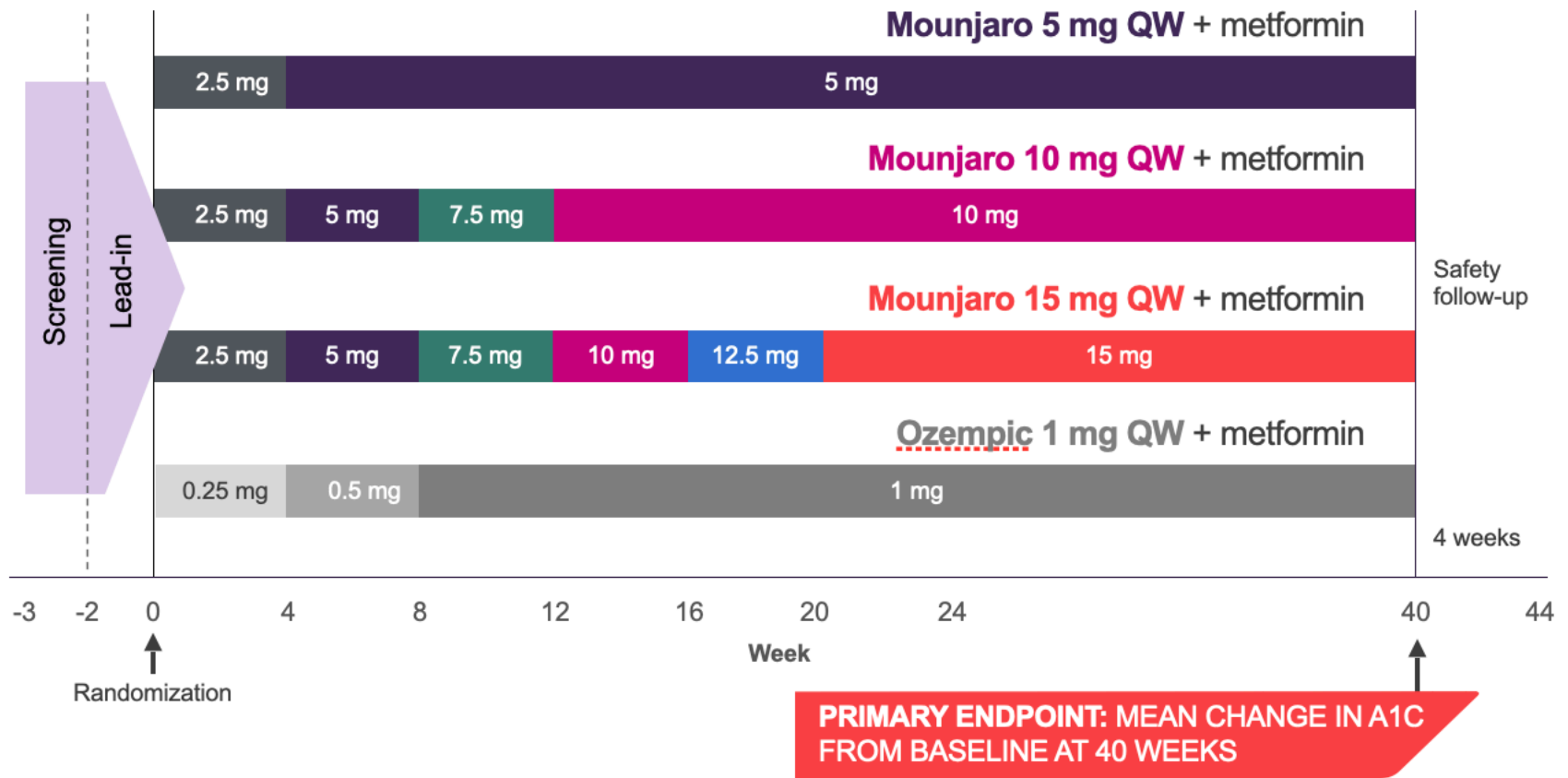
Tirzepatide lead-in 670 666 669 668 667 667 669 663 659 670

Tirzepatide 335 333 328 317 310 310 335

Placebo 335 330 317 303 292 289 335



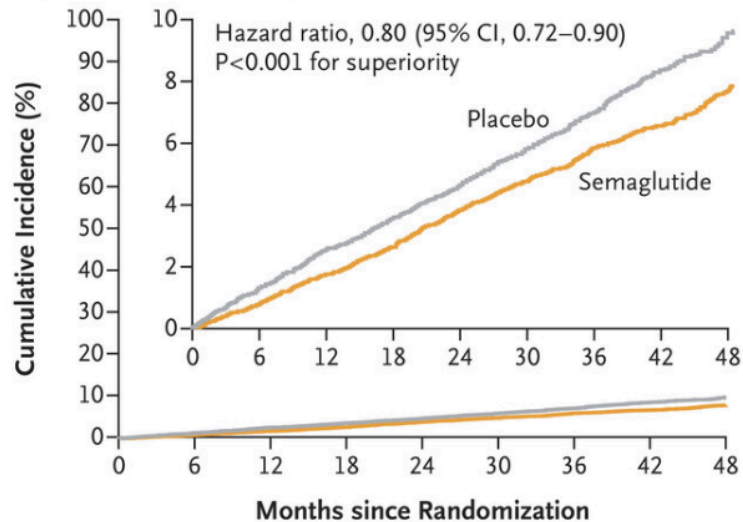
# MOUNJARO 5 MG, 10 MG, AND 15 MG VS OZEMPIC 1 MG AS THE ONLY ADD-ON TO METFORMIN<sup>1,2</sup>





**But there is more !**

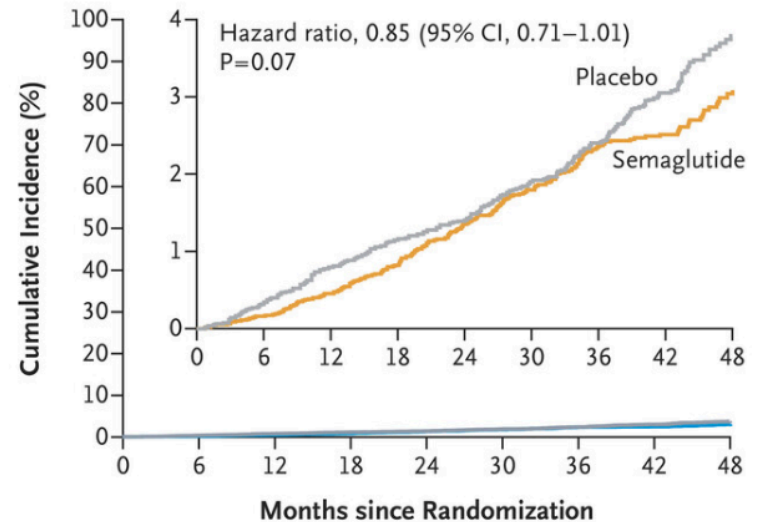
### A Primary Cardiovascular Composite End Point



#### No. at Risk

Placebo	8801	8652	8487	8326	8164	7101	5660	4015	1672
Semaglutide	8803	8695	8561	8427	8254	7229	5777	4126	1734

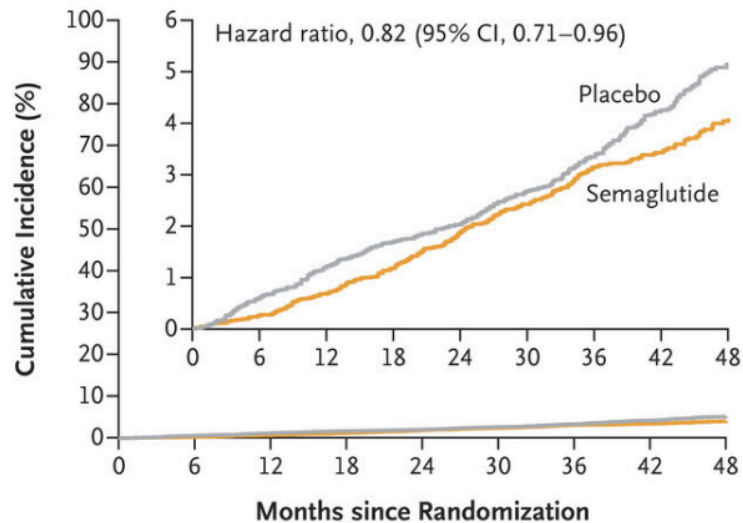
### B Death from Cardiovascular Causes



#### No. at Risk

Placebo	8801	8733	8634	8528	8430	7395	5938	4250	1793
Semaglutide	8803	8748	8673	8584	8465	7452	5988	4315	1832

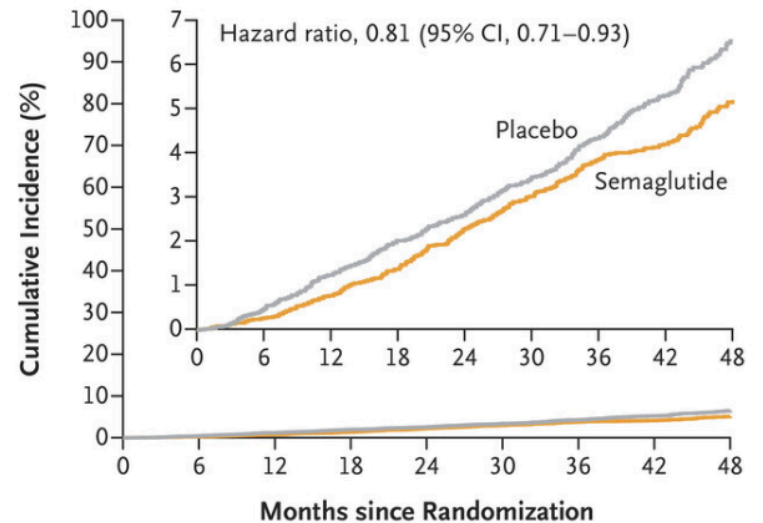
### C Heart Failure Composite End Point



#### No. at Risk

Placebo	8801	8711	8601	8485	8381	7341	5885	4198	1766
Semaglutide	8803	8740	8654	8557	8425	7409	5944	4277	1816

### D Death from Any Cause



#### No. at Risk

Placebo	8801	8733	8634	8528	8430	7395	5938	4250	1793
Semaglutide	8803	8748	8673	8584	8465	7452	5988	4315	1832

# **FDA approves Wegovy for CVD reduction in non-diabetic patients**

FDA NEWS RELEASE

## **FDA Approves First Treatment to Reduce Risk of Serious Heart Problems Specifically in Adults with Obesity or Overweight**

March, 2024





ORIGINAL ARTICLE



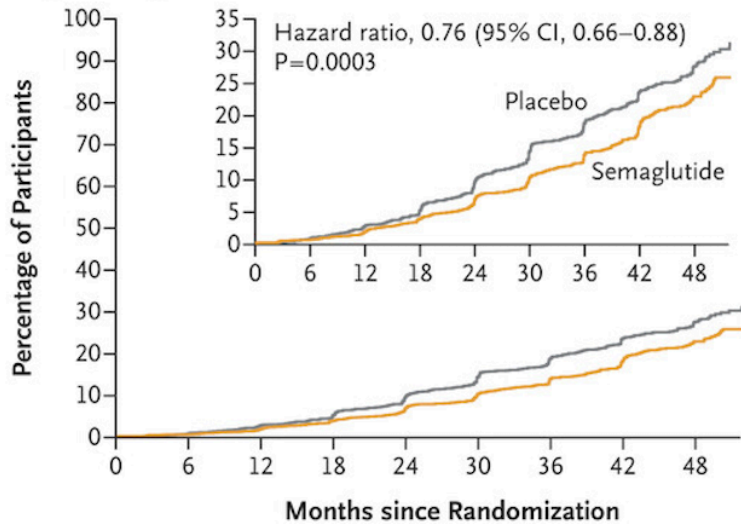
# Effects of Semaglutide on Chronic Kidney Disease in Patients with Type 2 Diabetes

**Authors:** Vlado Perkovic, M.B., B.S., Ph.D., Katherine R. Tuttle, M.D. , Peter Rossing, M.D., D.M.Sc. , Kenneth W. Mahaffey, M.D., Johannes F.E. Mann, M.D., George Bakris, M.D. , Florian M.M. Baeres, M.D., Thomas Idorn, M.D., Ph.D., Heidrun Bosch-Traberg, M.D., Nanna Leonora Lausvig, M.Sc., and Richard Pratley, M.D., for the FLOW Trial Committees and Investigators\* [Author Info & Affiliations](#)

Published May 24, 2024 | N Engl J Med 2024;391:109-121 | DOI: 10.1056/NEJMoa2403347 | **VOL. 391 NO. 2**

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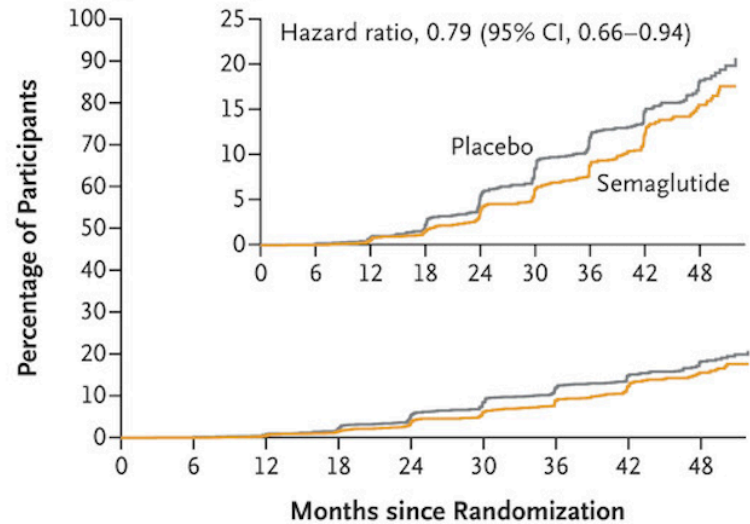
**A** First Major Kidney Disease Event



**No. at Risk**

Placebo	1766	1736	1682	1605	1516	1408	1048	660	354
Semaglutide	1767	1738	1693	1640	1572	1489	1131	742	392

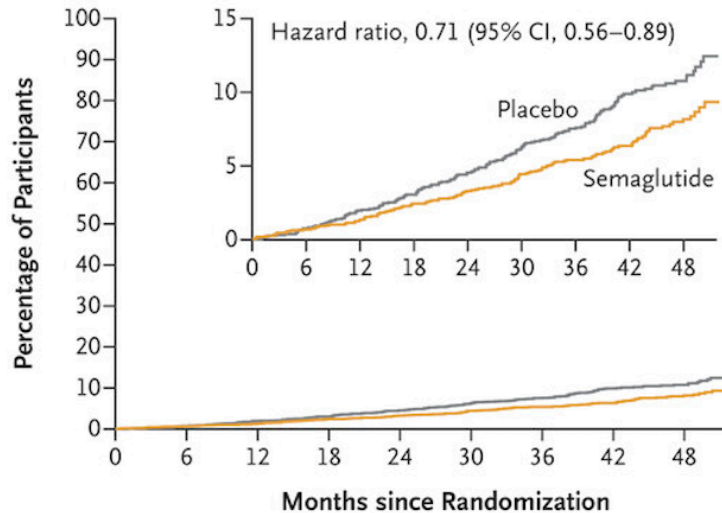
**B** First Kidney-Specific Component Event



**No. at Risk**

Placebo	1766	1736	1682	1605	1516	1408	1048	660	354
Semaglutide	1767	1738	1693	1640	1572	1489	1131	742	392

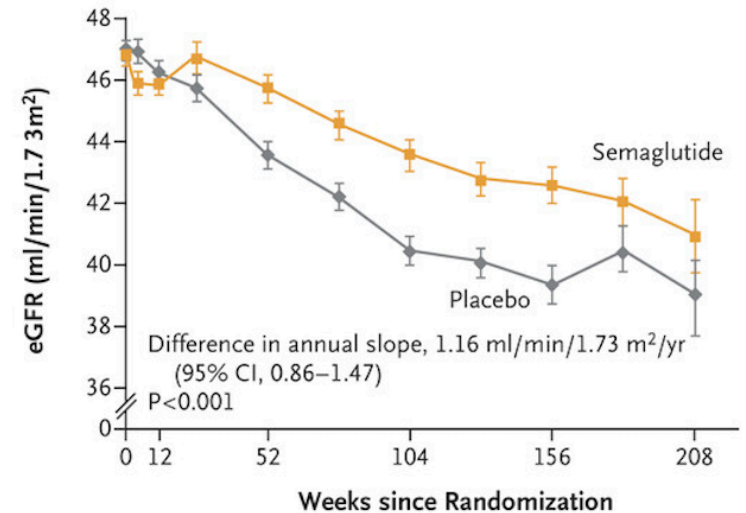
### C Death from Cardiovascular Causes



#### No. at Risk

Placebo	1766	1737	1697	1641	1601	1544	1185	772	437
Semaglutide	1767	1739	1703	1665	1627	1583	1234	838	460

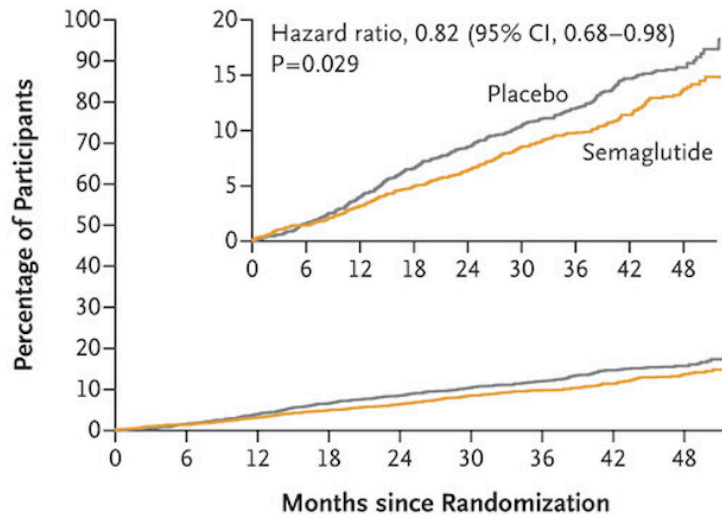
### D Total eGFR Slope



#### No. at Risk

Placebo	1766	1663	1573	1609	1490	1441	1284	876	609	199
Semaglutide	1766	1665	1590	1606	1521	1468	1345	952	651	218

### E First Major Cardiovascular Event

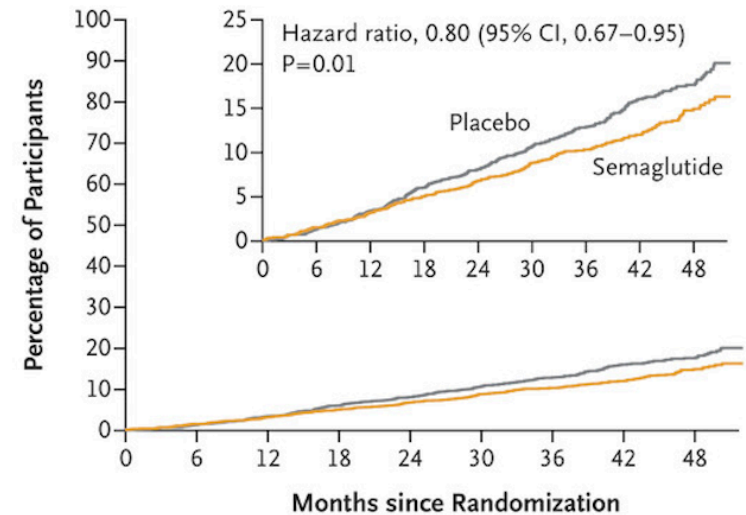


#### No. at Risk

Placebo	1766	1721	1663	1583	1535	1478	1133	731	418
Semaglutide	1767	1725	1672	1622	1575	1515	1176	793	430

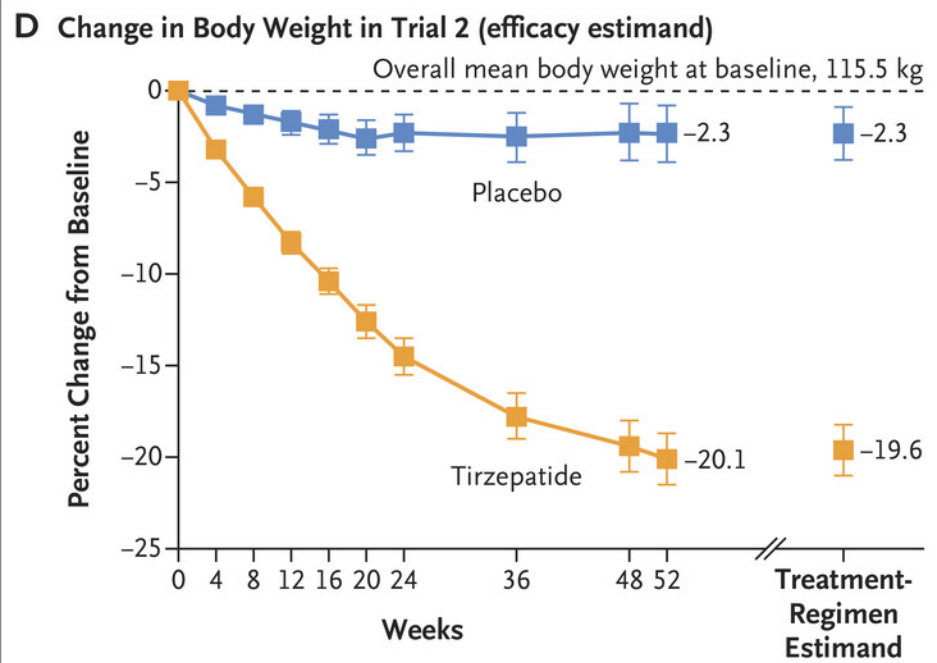
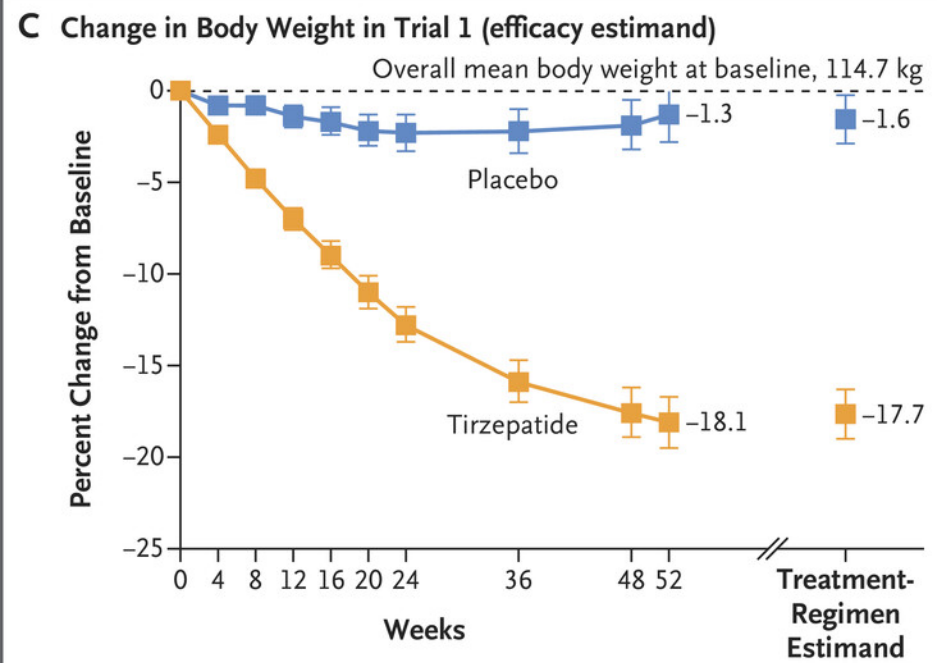
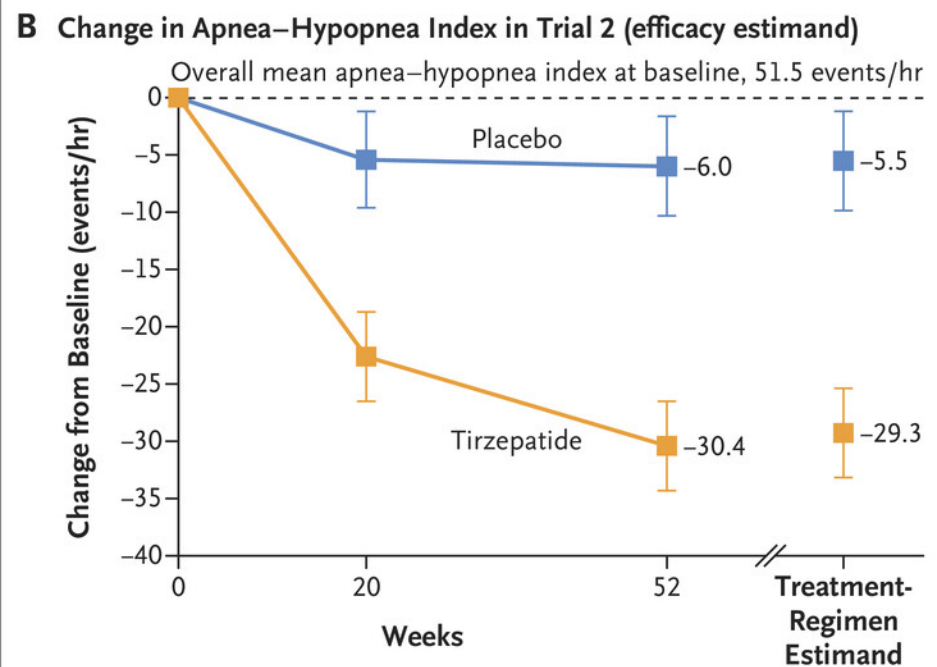
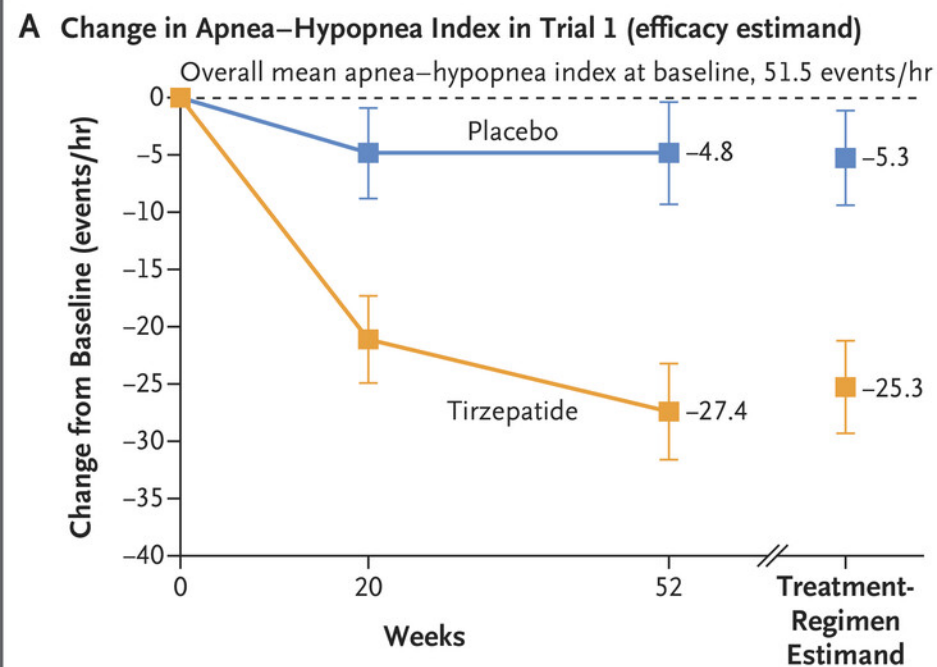
No change to the usual dose

### F Death from Any Cause



#### No. at Risk

Placebo	1766	1737	1697	1641	1601	1544	1185	772	437
Semaglutide	1767	1739	1703	1665	1627	1583	1234	838	460



# **FDA approves Zepbound for treatment of OSA**

**FDA NEWS RELEASE**

## **FDA Approves First Medication for Obstructive Sleep Apnea**

**December, 2024**

## In summary....

### **Incretin-based therapy has evidence to improve:**

- Diabetic control
- Weight / obesity
- CVD risk
- Risk of renal events / progression of CKD
- Obstructive Sleep Apnea



## Additionally ....

### Incretin-based therapy has evidence to improve:

- A-fib burden
- Cancer risk
- NASH / NAFLD
- CHF
- Pre-diabetes
- PCOS
- Addiction
  - Alcohol use disorder
  - Opiate addiction
  - Smoking
  - Binge-eating

# Ongoing incretin-based research:

- Alzheimer's Dementia
- Parkinson's Disease



ORIGINAL ARTICLE



# Trial of Lixisenatide in Early Parkinson's Disease

**Authors:** Wassilios G. Meissner, M.D., Ph.D., Philippe Remy, M.D., Ph.D., Caroline Giordana, M.D., David Maltête, M.D., Pascal Derkinderen, M.D., Ph.D., Jean-Luc Houéto, M.D., Mathieu Anheim, M.D., Ph.D., [+37](#), for the LIXIPARK Study Group\* [Author Info & Affiliations](#)

Published April 3, 2024 | N Engl J Med 2024;390:1176-1185 | DOI: 10.1056/NEJMoa2312323 | [VOL. 390 NO. 13](#)

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- DBRPCT, Phase 2
- Diagnosis of Parkinson's Disease (<3 years)
- Stable med regimen, NO motor complications
- Lixisenatide vs. placebo
- Primary outcome: Progression of MC @ 12 mo....  
*Movement Disorder Society–Unified Parkinson's Disease Rating Scale (MDS-UPDRS) part III (range, 0 to 132, with higher scores indicating greater motor disability)*

Placebo: 3.04 (progression)

Lixisenatide: -0.04 (improvement)

# QUESTIONS



[benseale@yahoo.com](mailto:benseale@yahoo.com)