

Role of exercise in the management of diabetes

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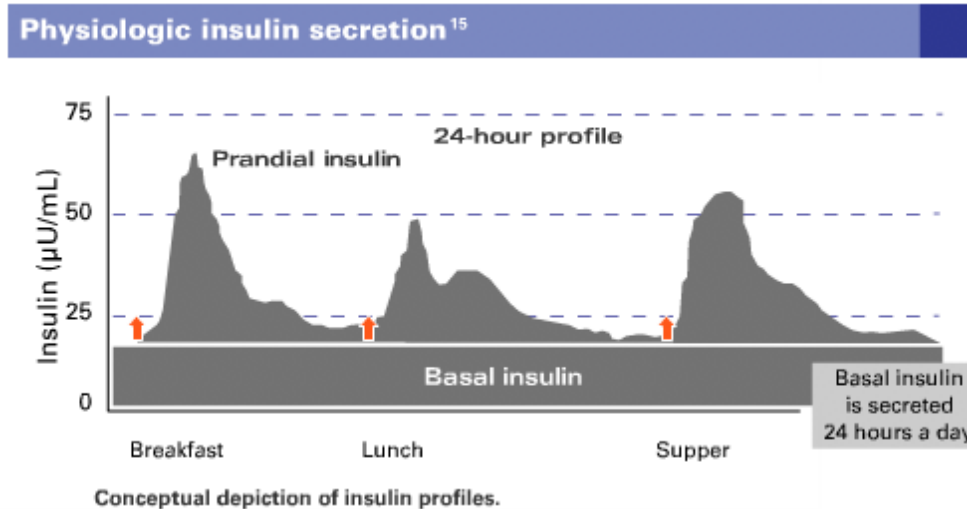
Tartu University; South Estonian Hospital;

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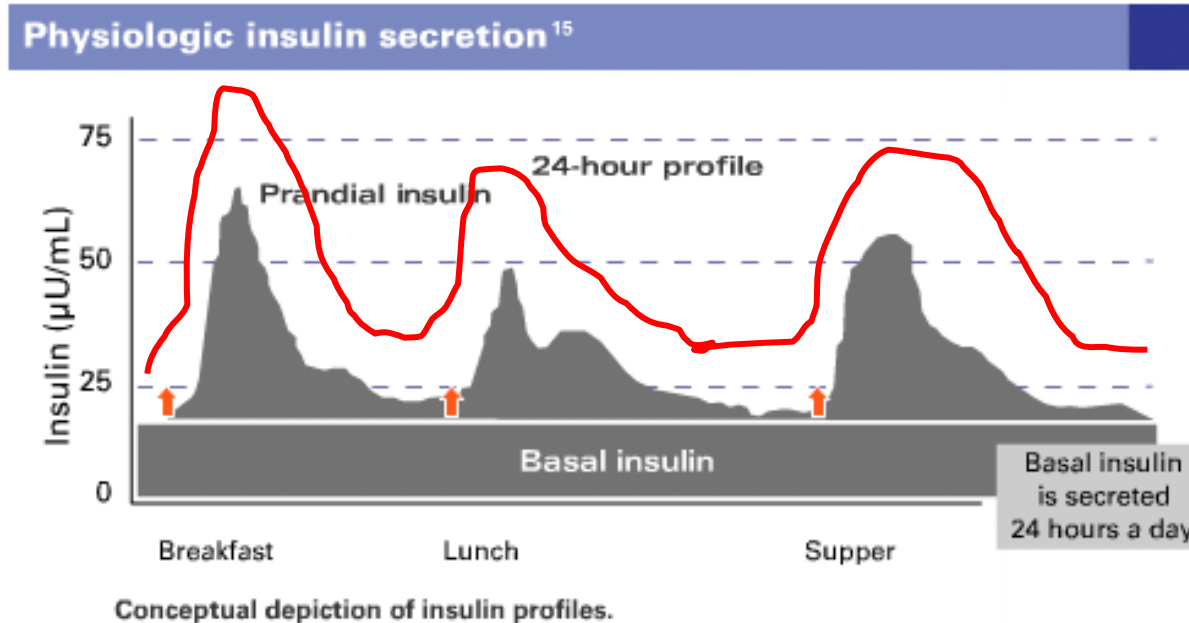
- Types of diabetes
- Exercise physiology
- Exercise in type 2 diabetes
 - how much and how often
 - safety issues
 - how to match with medication

- Diabetes: type 1 and type 2

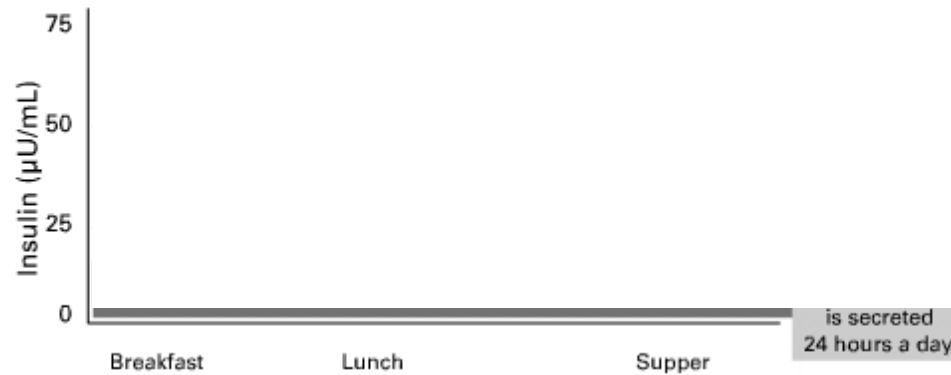
Normal secretion of insulin during 24 hours



Insulin secretion in Type 2 DM



Insulin secretion in Type 1 DM



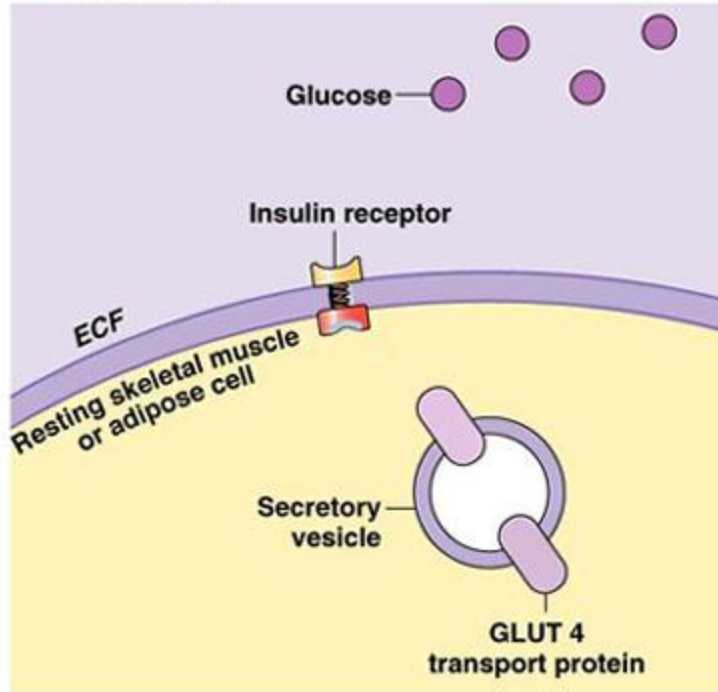
Conceptual depiction of insulin profiles.

Exercise: why effective?

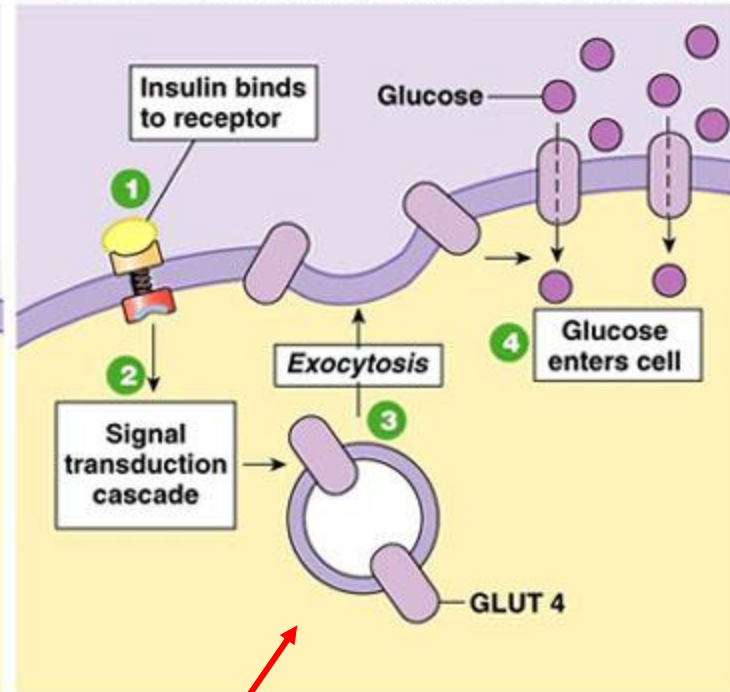
- Affects glucose transport in the muscle, glucose levels decrease.
- Improves insulin sensitivity

glucose transport and exercise

(a) In the absence of insulin, glucose cannot enter the cell.



(b) Insulin signals the cell to insert GLUT 4 transporters into the membrane, allowing glucose to enter cell.



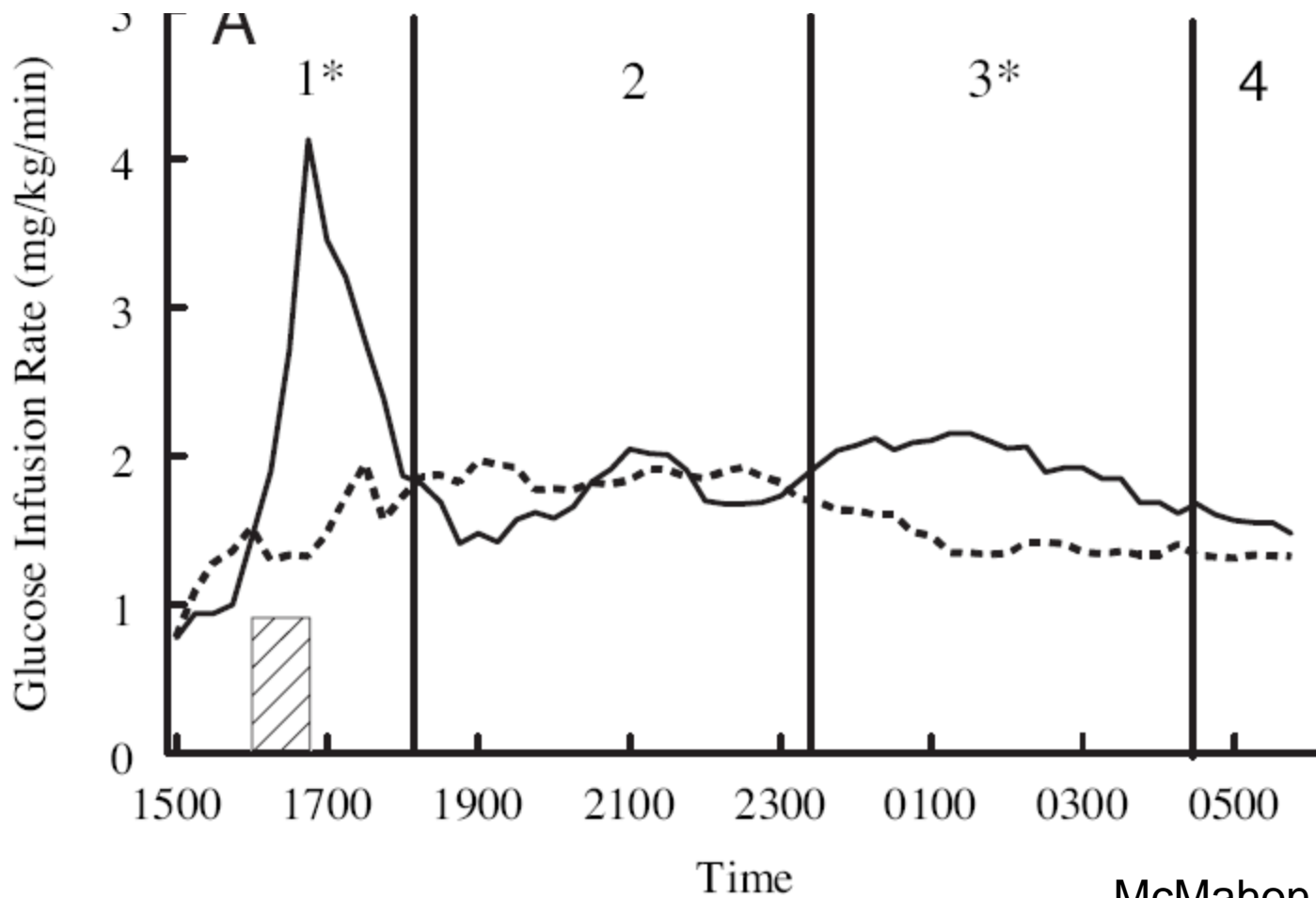
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Fig. 22-12

Exercise

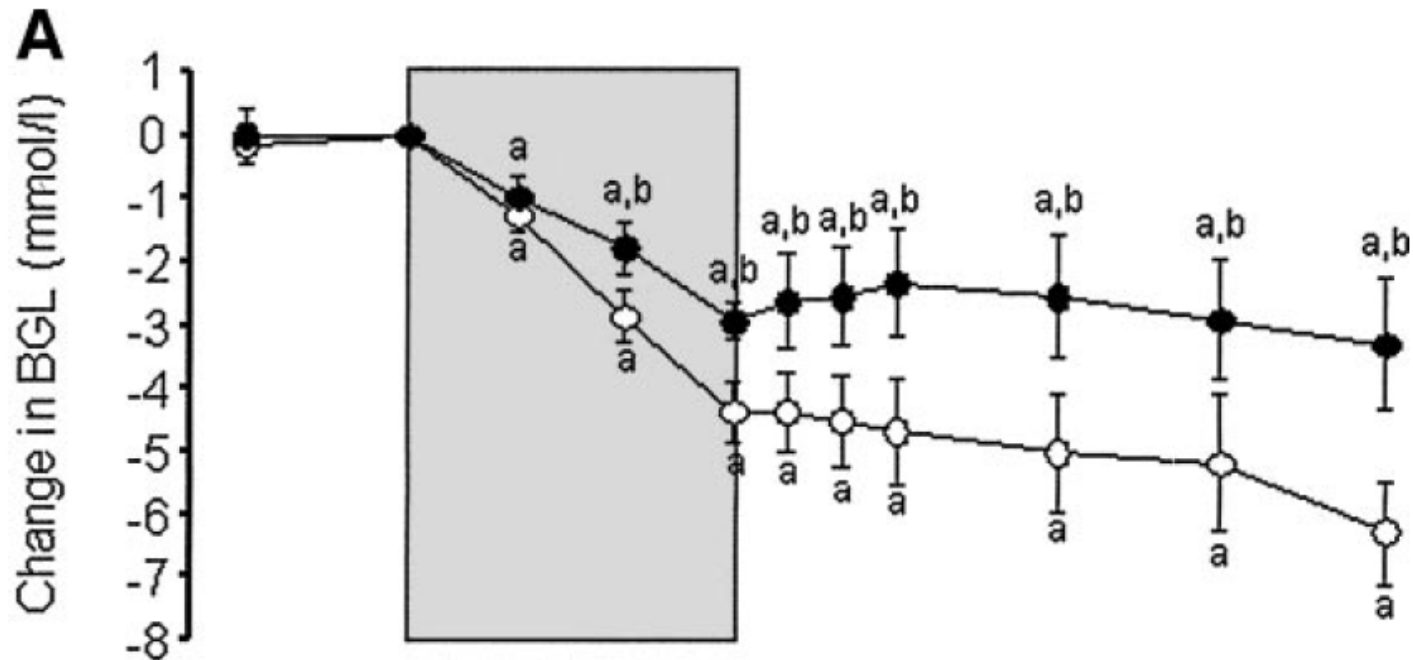
- ✓ Glucose levels fall during the exercise
- ✓ Second fall may come 6-8 hours later!

Exercise has early and late (6-8 hours) effects on blood glucose.



- ✓ Exercise has a paradoxical 'dose'- response:
more vigorous exercise decreases glucose less.

30 min of intensive exercise (black) decreases glucose less than moderate exercise (white)

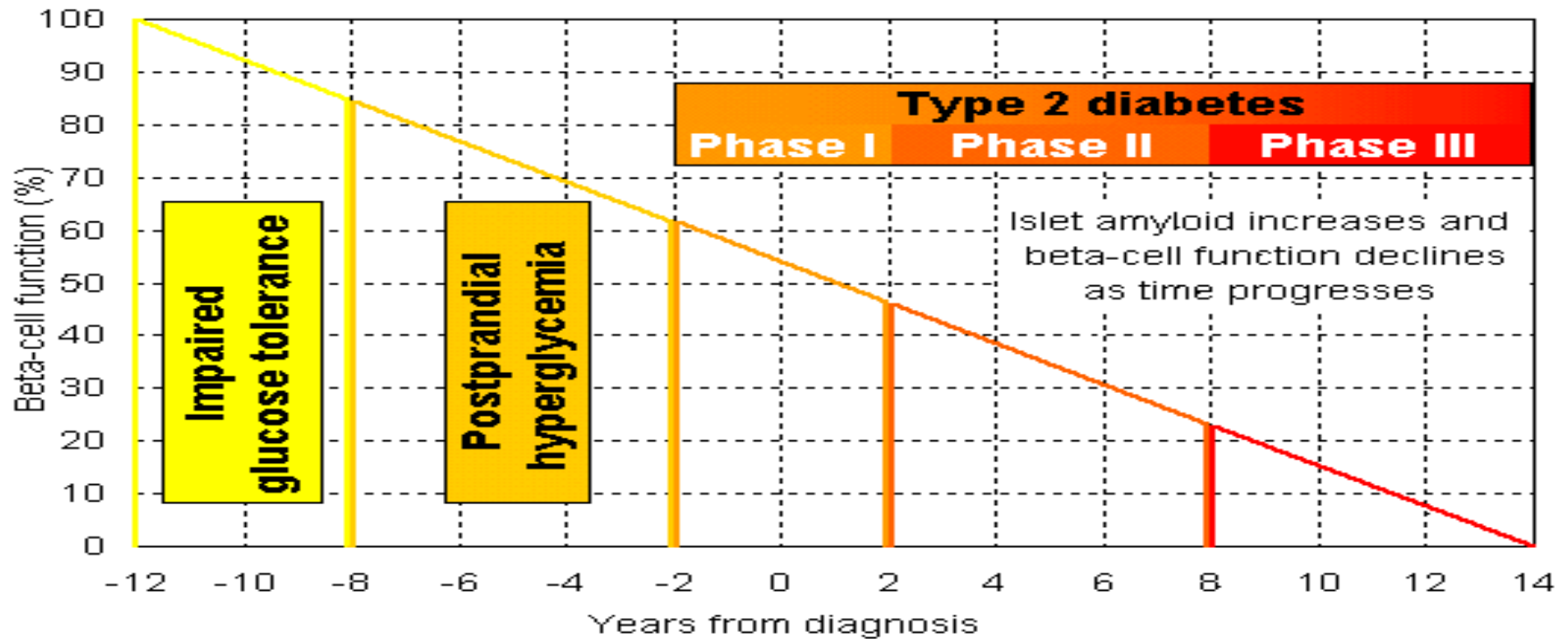


Guelfi et al. Diabetes Care 28:1289-94, 2005

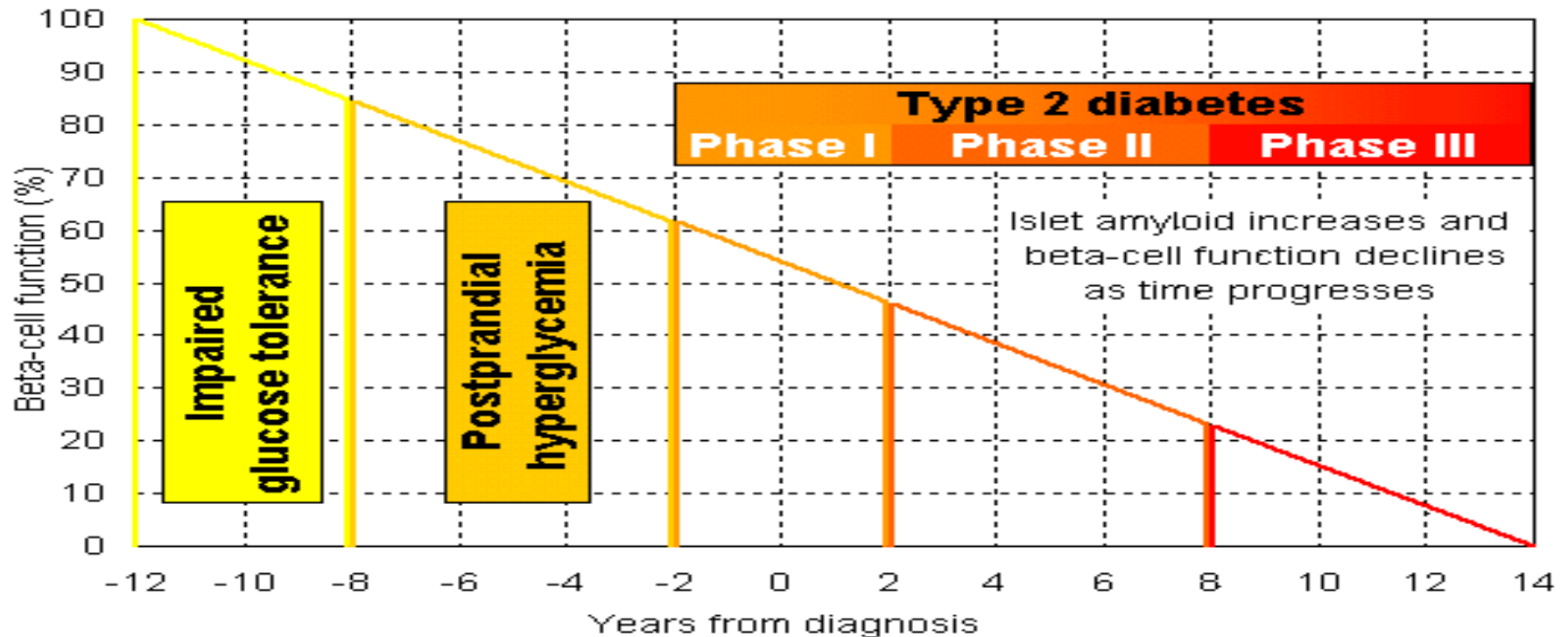
- ✓ Possible mechanisms:
 - ✓ higher counter-regulatory hormones (epinephrine, norepinephrine, growth hormone)
 - ✓ higher lactate level.

T2DM and exercise

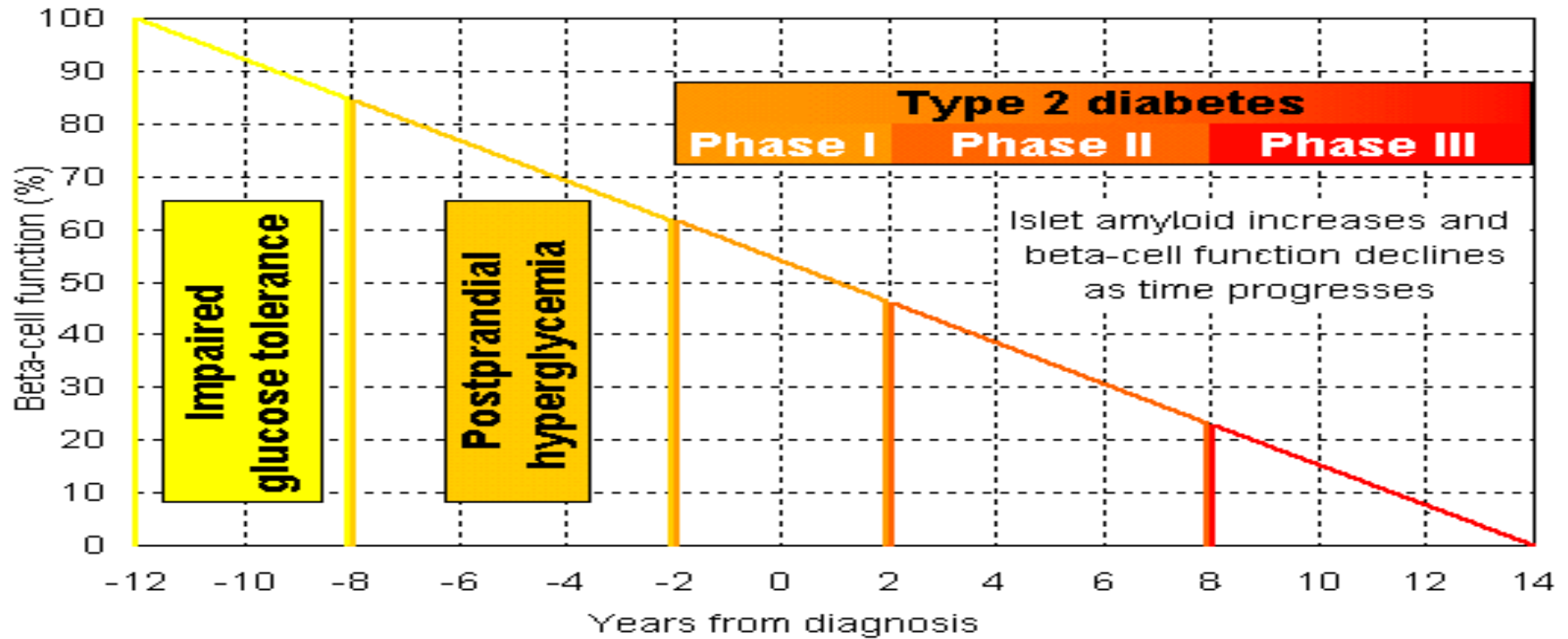
T2DM is a progressive disease



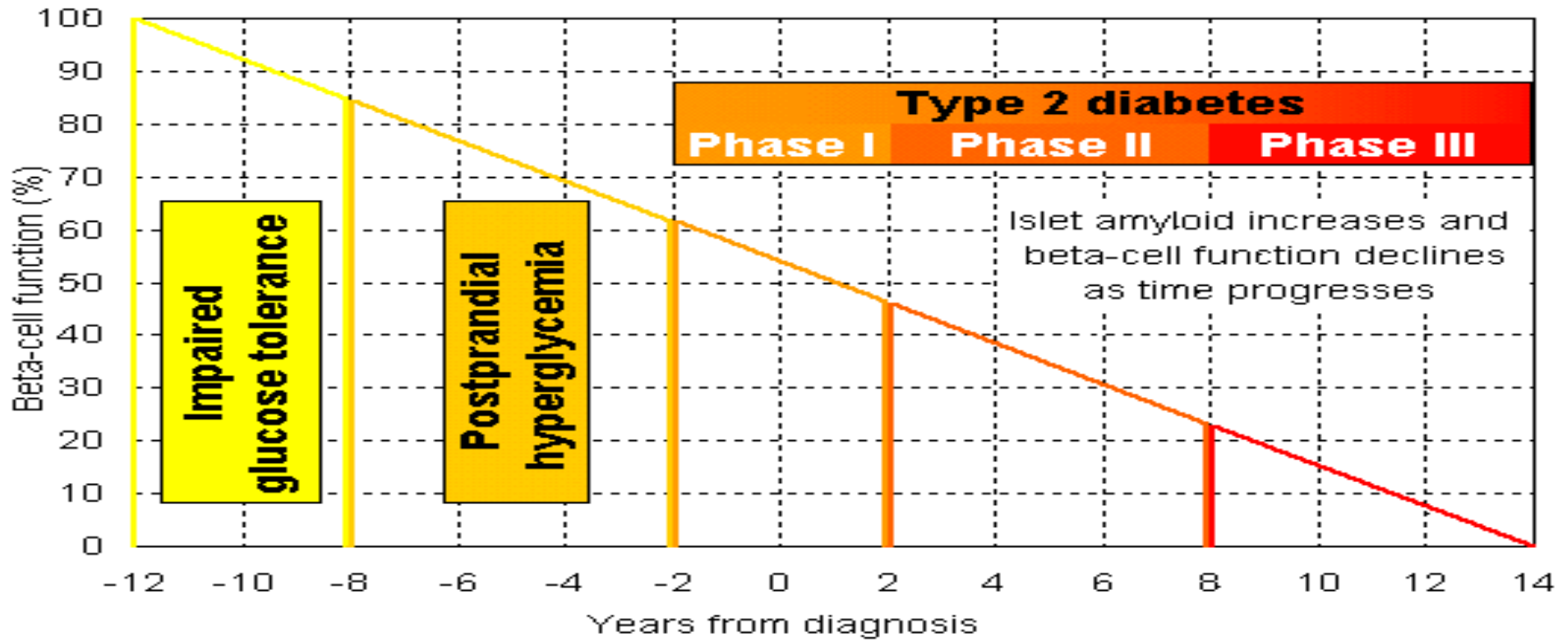
T2DM is a progressive disease



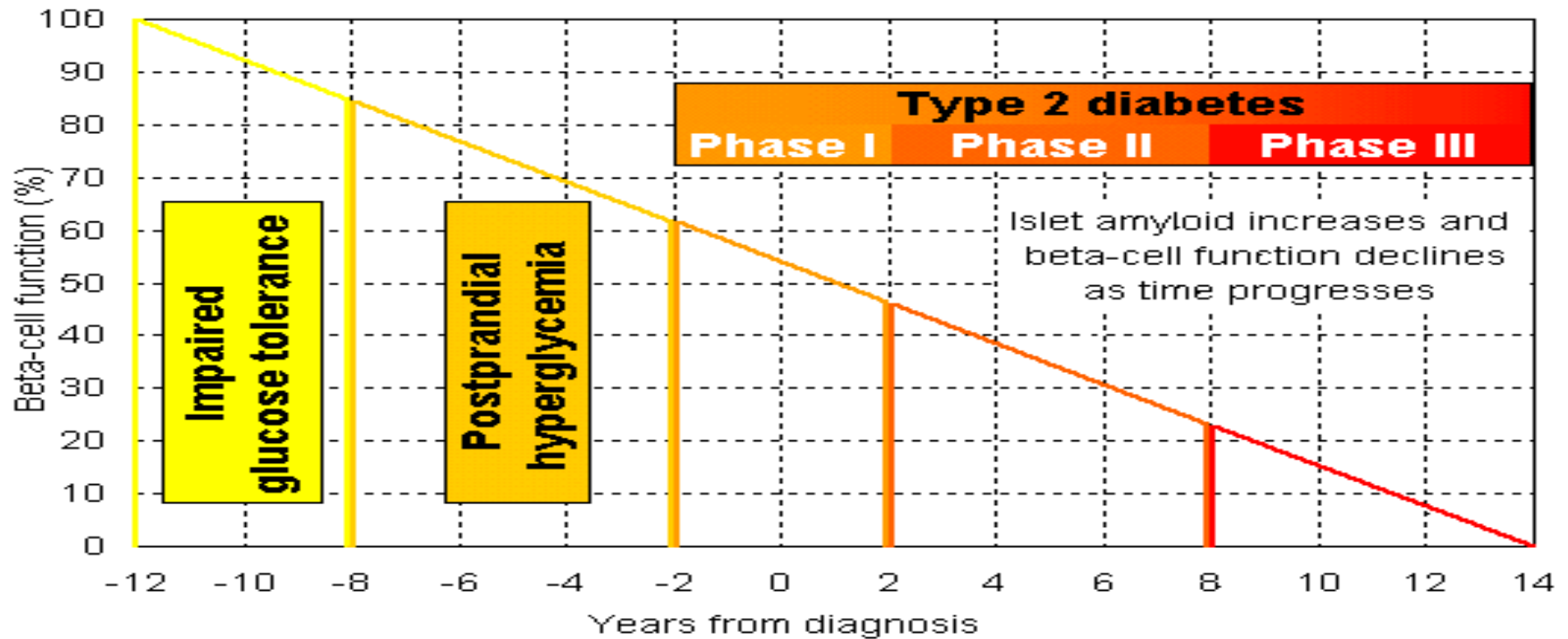
T2DM is a progressive disease



T2DM is a progressive disease



T2DM is a progressive disease



T2DM and exercise

- ✓ Exercise is a very important part of the diabetes management
- ✓ Exercise as part of lifestyle modification is the most effective way to prevent diabetes.
- ✓ Hypoglycaemia is usually not that big problem in T2DM

T2DM and exercise: why to exercise

- ✓ Improves glycaemic control
- ✓ Contributes to weight loss/ weight stability
- ✓ Better fitness --> less cv and overall mortality

T2DM and sport

General rules:

- ✓ Start slow
- ✓ Consider the medications used
- ✓ Think about possible complications of diabetes

Before recommending exercise

1. Consider the age and previous physical activity
2. Does the patient have coronary artery disease?
3. Are some types of exercise contraindicated?

2. Does the patient have coronary artery disease?

- Routine screening is not recommended
- Clinical judgement

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- Routine screening is not recommended
- Clinical judgement

What is special in diabetes and angina pectoris?

Before recommending exercise

2. Does the patient have coronary artery disease?

- **Clinical judgement**

- duration of diabetes

- other risk factors: smoking, high BP, high lipids

- diabetes complications: **macroproteinuria!**

3. Are some types of exercise contraindicated?

- uncontrolled hypertension
- severe peripheral neuropathy (previous foot ulcer?)
- unstable proliferative retinopathy

Exercise: duration and intensity (ADA)

- ✓ at least 150 min/week moderate –intensity aerobic exercise (50-70% maximum heart rate)
- ✓ or at least 90 min/week vigorous aerobic exercise (> 70% MHR)

no more than 2 consecutive days without exercise

Exercise: duration and intensity

+

resistance training 3 times per week.

- ✓ All major muscle groups
- ✓ Progressing to 3 sets of 8-10 repetitions at a weight that can not be lifted more than 8-10 times

avoiding hypoglycaemia

- ✓ Measure Glc!

 - Before, during and after exercise

- ✓ Glc before exercise < 6 - consume extra carbohydrate

Medication and hypoglycaemia risk

hypoglycaemia risk

metformin

0

pioglitazone

sitagliptin

Sulfonylurea

(gliclazide, glibenclamide,
glimepiride)

+

hypoglycaemia risk

Basal insulin (usually 1 shot in the evening) (Lantus, Levemir, NPH)	+
Premixed insulins	+++

hypoglycaemia risk

Short acting insulins

+++

(Humalog, Apidra, NovoRapid)

how to manage

2 strategies:

- ✓ add carbohydrate (usually drink)
- ✓ decrease insulin dose
- ✓ do both

how to manage (my way)

Basal insulin

add carbohydrate

Premixed insulin

change the treatment to
other scheme

Short acting insulin

decrease insulin dose 50 %
(before exercise)