

# PHARMACEUTICAL CARE FOR DIABETIC PATIENTS

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# What should the patient know?

- How to take antidiabetics
- How to take insulin
- How to prevent complications of DM
- How to eat
- How to perform selfmonitoring

**And what should the pharmacist be able to recommend?**

# Oral antidiabetics

- do not replace insulin or diet
- the patient must know the name and dosage of his medicine – check questions, food – time – use of the drug
- the basic mechanism of action
- symptoms of lactic acidosis
- the efficacy of the administered drug
- associated problems (liver, kidney) may alter the effect of the drug
- combination with non-steroidal anti-inflammatory drugs leads to an increase in the effect of the drug
- the possibility of prolonged hypoglycaemia following sulfonylurea derivatives in elderly patients (must not omit food)

# Oral antidiabetics (PAD)

- Drugs with a hypoglycaemic effect
- used in patients with DM type 2 who can not compensate for diabetes by diet
  
- Biguanides
- Glitazones
- Sulfonylureas derivatives
- Glinids
- Incretins
- Dipeptidyl peptidase inhibitors
- Inhibitors of intestinal  $\alpha$ -glucosidases

# Biguanids

**Metformin** (Glucophage, Metformin Teva, Siofor ...)

Mechanism of action

- ▣ increases tissue sensitivity to insulin,
- ▣ slows glucose resorption from the intestine,
- ▣ reduces gluconeogenesis in the liver.

Metformin is currently PAD 1st choice.

Other benefits: Anorectal effect, reduction of CVS risk, no hypoglycemia

# Biguanids

Metformin is very often combined with other oral antidiabetic agents:

- + pioglitazone: COMPETACT tbl.
- + vildagliptin: EUCREAS tbl.
- + sitagliptin: JANUMET tbl.
- + linagliptin: JENTADUETO tbl.
- + alogliptin: VIPDOMET tbl.

# Glitazones

Reduce insulin resistance and hepatic gluconeogenesis, improve insulin secretion

Side effects: rarely hypoglycaemia, fluid retention, and swelling

Rosiglitazone (Avandia)

Pioglitazone (Actos)

# Sulfonylureas

stimulate insulin secretion and increase the susceptibility of pancreatic B cells to glucose, which is reduced in patients with type 2 DM

Indications: DM of secondary type with insulin secretion disorder

- They affect glycemia both fasting and after eating.
- They have high protein binding - interaction!



# Glinides

increase secretion of insulin

Indication: Suitable for patients who have high blood sugar (so-called prandial regulators)

They are usually given in three daily doses before a meal.

Side effects: Hypoglycaemia, nausea, vomiting

**Repaglinide** (NovoNorm)

**Nateglinid** (Starlix)

# Inhibitors of intestinal $\alpha$ -glucosidases

Intestinal  $\alpha$ -glucosidase is the enzyme responsible for digesting carbohydrates into monosaccharides (glucose).

Inhibition of intestinal glucosidase results in a slowing in the digestion of complex carbohydrates, thereby reducing glycemia.

NU: meteorism, flatulence, stools, diarrhea

**Acarbose** (Glucobay) - after p.o. is not absorbed

**Miglitol** (Diastabol)

# New Drugs in DM Therapy - Incretines

Incretines are hormones produced by GIT endocrine cells whose concentrations increase after food intake. They stimulate insulin secretion. They have a very short biological half-life because they are inactivated by **dipeptidyl peptidase 4 (DPP-4)**.

Mechanism of antidiabetic action:

- increased insulin secretion
- suppression of glucagon secretion

- Reduce appetite and body weight

# Incretines

**Exenatid** (Byetta inj.) - is an analog of incretin, reduces postprandial blood sugar and fasting glucose, is applied subcutaneously. It reduces body weight and increases the feeling of saturation.

The lizard *Heloderma suspectum* produces incretines in its saliva 4 times a year

**Liraglutid** (Victoza)

**Lixisenatid** (Lyxumia inj.)

**Semaglutid** (Ozempic inj.)

**Dulaglutid** (Trulicity inj.)



# Gliptines

Gliptins, inhibitors of DPP-4 (dipeptidyl peptidase)

dipeptidyl peptidase is an enzyme that degrades the incretines (GLP-1)

No change of body weight

VILDAGLIPTIN (Galvus tbl.)

SITAGLIPTIN (Januvia tbl.)

SAXAGLIPTIN (Onglyza tbl.)

LINAGLIPTIN (Trajenta tbl.)

ALOGLIPTIN (Vipidia tbl.)

# Gliflozines

- block the kidney protein called sodium-glucose transporter 2 (SGLT2). During kidney blood filtration, SGLT2 is responsible for the re-uptake of glucose from the urine into the blood stream. Blocking SGLT2 with gliflozins causes increased urinary glucose excretion and hence lowering blood glucose.

The mechanism of action of gliflozin is independent of the effect and level of insulin.

**Kanagliflozin**

**Empagliflozin**

**Dapagliflozin**

# Natural substances that can lower glucose levels

- Dandelion
- Blueberries
- Beans
- Calamus
- Nettle
- Laurel ("bay leaf")
- Cinnamon



# Insulin

- what insulin is, the function of insulin in the body
- basic types of insulin - depot, fast ...
- he must know exactly the name of the preparation, as well as the dose
- application sites, place rotation, varying fast onset of action in relation to the application site, alternation of injection site
- local complications
- insulin stretching and mixing, application, disinfection
- the rate of onset of insulin action, the effect of non-compliance with the time-to-time ingestion of food from insulin on actual glycemia
- storage of insulin - even on the road




# Insulin

- insulin concentration 100j. / ml
  - origin of insulin
    - humane
    - analogue

insulin lispro, insulin aspart, insulin glulisine  
Insulin detemir, insulin glargine

- Methods of application
  - Insulin pen
  - Insulin pump

# Complications of diabetes

- Acute
    - ▣ Hypoglycaemia
    - ▣ Ketoacidosis
    - ▣ Hyperglycemia
  
  - Long-term hyperglycemia leads to protein **glycation**, a change in structure and function
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- Chronic
    - ▣ Diabetic retinopathy
    - ▣ Diabetic nephropathy
    - ▣ Diabetic neuropathy
    - ▣ Diabetic macroangiopathy
    - ▣ Diabetic foot

# Chronic complications

- Neuropathy
  - ▣ control of hypertension
  - ▣ dietary intervention - protein restriction
  - ▣ regular checks
  
- retinopathy
- polyneuropathy
- dangers resulting from reduced sensitivity
- diabetic foot
- nephropathy

# Diabetic diet

- To choose carbohydrate foods rich in fiber, with a low glycemic index
- If a diabetic is not obese, he can occasionally afford sweets but not more than 20-30 g of sucrose per day
- To include foods rich in minerals, vitamins and antioxidants (vegetables, fruits, whole grains and fish)
- There is not enough scientific evidence to confirm the effectiveness of antioxidants
- Drink sufficient liquids
- ATTENTION! "Dia" foods often contain a lot of fat and energy. The designation "dia" does not mean the possibility of their unlimited consumption

# Artificial sweeteners

- Suitable non-caloric sweeteners-saccharin, cyclamate, aspartame, acesulfame K and sucralose
- They do not affect glycemia, they can be beneficial in obese people in terms of reducing energy intake in the beverage, or when cooking or baking
- Aspartame loses sweetness during baking or cooking. It is ideal to use sucralose
- Sweeteners are not recommended for pregnant women and children under 3 years of age

# *Criteria of DM compensation*

Indexes	Level of compensation		
	good	sufficient	insufficient
Fasting glycaemia (mmol/l)	4,4 - 6,7	< 7,8	> 7,8
2 hours after meals	4,4 – 8,0	< 10,0	> 10,0
Glucosurea (%)	0	0,5	> 0,5
Hb Alc (%)	< 6,5	6,5 – 8	> 8
Cholesterol (mmol/l)	< 5,0	5,0 – 6,5	> 6,5
Triglycerides (mmol/l)	< 1,7	1,7 – 2,2	> 2,2
HDL (mmol/l)	> 1,1	0,9 – 1,1	< 0,9
Body mass index (kg/m <sup>2</sup> )	males < 25 females < 24	< 27 < 26	> 27 > 26
Blood pressure	< 135/85	< 160/95	> 160/95

# Selfmonitoring

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- blood glucose measurement by the patient
- home blood pressure measurement
- control of body weight
- indicative urine tests for the presence of sugar, ketones and proteins (Diaphan strips, etc.)
- foot condition monitoring

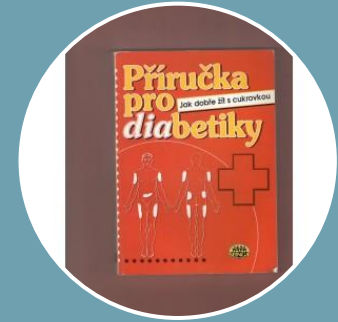
# Complex care of DM patients



Treatment



Diet



Education

