



Diagnose Lab. pd Metabolisme- KHO dan DM

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Met. KHO

- ☀ Pemeriksaan Urin
- ☀ Glukosa darah
- ☀ HbA1c / Hb A1 total
- ☀ Fructosamin
- ☀ Insulin
- ☀ C-peptide
- ☀ Badan keton
- ☀ Analisa gas darah dll



PEMERIKSAAN URIN

1. Pemeriksaan Reduksi

a. tes Benedict

b. tes Fehling

2. GOD paper

a. Clinistix - red

b. Tes-tape - yellow

c. Diastix - brown

Pemeriksaan Urin

- ☀ Urinalisa

- ☀ a. protein ; albumin

- ☀ mikroalbuminuria < 60 mg/dl

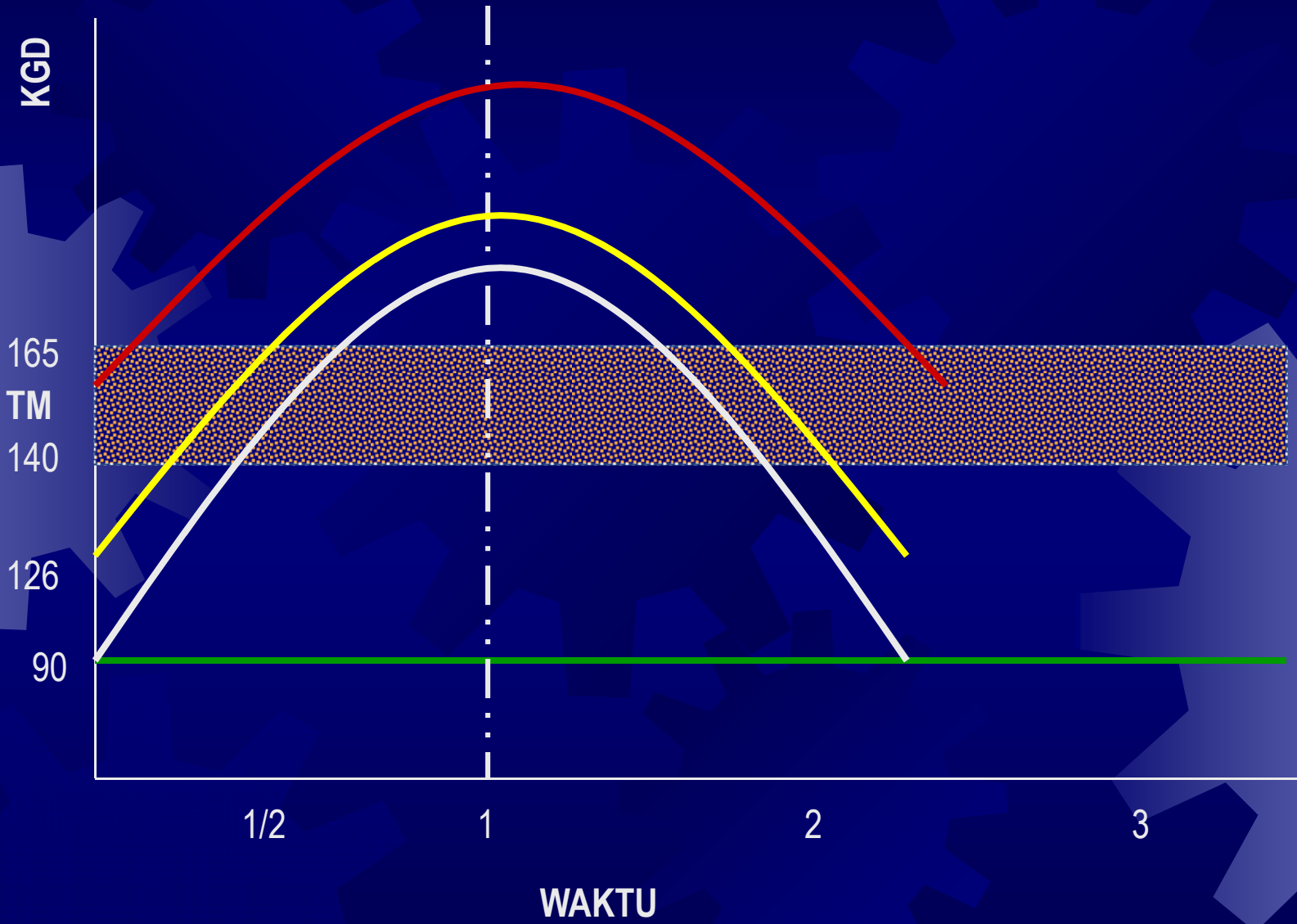
- ☀ b. keton bodies

- ☀ c. pH urin dll

Interpretasi Pemeriksaan urine

- ★ Tes- tes Reduksi selain glukose .
Semua zat mempunyai gugus reduksi
false positive
- ★ Glukosuria bila kadar glukosa darah $>$
T_m ginjal
Mikroalbumin , $<$ 60 mg% sulit ok urin
ditampung 24 jam, sekarang
alb/creatin rindex (n : $<$ 3 a/c index)

GLUKOSURIA



Glukosa darah

- ✦ Oxydation reduction methods
- ✦ Enzymmatik methods
- ✦ Plasma, serum, whole blood (conv.1.15)
- ✦ Capiller, vena, arteri

Pemeriksaan glukose darah

- ★ 1. oxidation-reduction methods
 - ★ a. Alkaline cupric reduction
 - ★ -Folin Wu- Benedict
 - ★ - Shaffer Hartmann- Samogyi
 - ★ - Nelson Somogyi
 - ★ b. Alkaline ferric reduction
 - ★ -Hagedoem-Jensen

Pemeriksaan glukosa darah

- ✱ 2. Enzymatic methods
 - ✱ a. Glucose Oxidase
 - ✱ Colorimetric
 - ✱ Kinetic
 - ✱ b. Hexokinase

Normal

Impaired

DM

GDP < 110 mg%	110-125 mg%	> 125 mg %
2h GD < 145 mg%	140-200 mg%	>200mg
Ad-rendum		Symptom po Sitive > 200 mg/ dl

Interpretasi pem.glukosa darah

- ✦ Hyperglycemia bila GDP > 125 mg/dl
- ✦ Normoglycemia 90 – 110mg/dl
- ✦ Hypoglycemia < 60 mg/dl

GDP WHO sebelum 1997 DM > 140 mg/d

- ✦ Paris Prospective Study, American
Collect for Endocrinology GD 2 H PP > 140 mg/dl

Hb A1 C atau Hb A1 total

- ☀ Terkontrol /tak terkontrol

- ☀ HbA1c HbA1 total

- ☀ HbA1 a, HbA1b, HbA1c

- ☀ < 8% < 9%

- ☀ HbA1c seumur eritrosit

- ☀ rigid/ tidak fleksibel

- ☀ ggn mikrosirkulasi



Fructosamin

- ✦ Terikat pada protein
- ✦ Masa paruh 3 bulan monitor jangka menengah 1-3 minggu
- ✦ Pemeriksaan sulit

Insulin

- ✦ Dibtk di sel beta pulau Langerhan pancrease
- ✦ Preproinsulin → proinsulin → insulin dan c-peptida → sel target otot, hati, otak, syaraf, sel adiposa
- ✦ metode pemeriksaan
RIA, Elisa, EIA

C-peptida

- ✦ 1 mol. C-peptide = 1 mol.insulin
- ✦ masa paruh lebih lama
- ✦ Dilakukan utk mengetahui def. Insulin
- ✦ Tidak terpengaruh dengan insulin exogen

Badan keton dan Analisa Gas Darah

- ✦ Met. catabolisme lemak dominan
- ✦ Pada urin
- ✦ Pada darah (Dune - Shipney)
- ✦ AGD (Analisa Gas Darah) Acidosis metabolik .
- ✦ Pernapasan Kussmaull

DM


- ☀ DM tipe 1
- ☀ Genetik
- ☀ Sejak anak
- ☀ Sering keto asidosis
- ☀ Insulin rendah $\rightarrow 0$
- ☀ C.peptida rendah $\rightarrow 0$
- ☀ DM tipe 2
- ☀ Predisposisi
- ☀ > 30 tahun
- ☀ Hyperinsulinism
- ☀ Respon obat hypoglicemik oral

DM type 2

- ✦ Epidemiologi

meningkat pd popul. pacific. developing countries, afrika dan spanish america, pend aborigin, asia

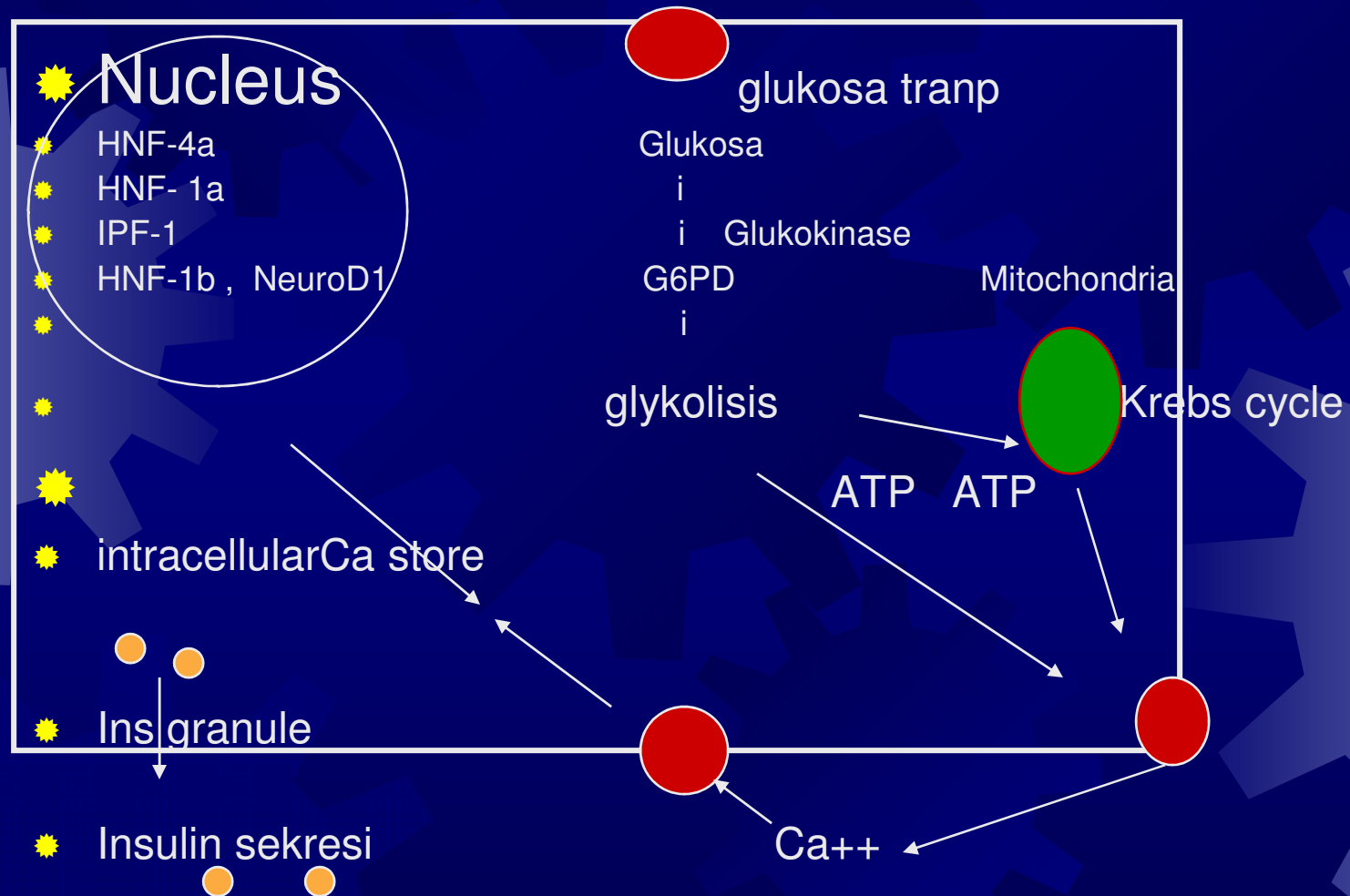
- ✦ 2010 – 2025 → 150 – 250 juta

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- ✦ Genetik
 - ✦ Sex, Umur dan etnik
 - ✦ Behavior dan lifestyle
 - ✦ Met.determination , intermediate risk category of type DM

Genetik

- ★ Monogenik / poligenik
- ★ **Ass. Insulin resisten**
- ★ Mutasi gen insulin receptor
- ★ Type A insulin resisten, Leprechaunism, Rabson-Mendelhall sind.
- ★ Liproatrophy DM
- ★ Mutasi PPAR γ gen
- ★ **Ass. Defek insulin sekresi**
- ★ Mutasi gen insulin/proinsulin,
- ★ Mutasi gen mitochondria,
- ★ Maturity Onset Diab.of the Young (MODY)
- ★ MODY 1 (HNF-4a), 2 (Glucokinase, 3 (HNF-1a), 4(IPF-1),
- ★ 5 (HNF-1 b) , 6 (NeuroD1/ beta2)

Model sel beta pankreas



Demografi

- ✦ Sex wanita > laki laki
- ✦ Umur >, DM >
- ✦ etnik/ ras



Behavior dan lifestyle

- ✦ Obesitas
- ✦ Phisikal aktivitas
- ✦ Diet
- ✦ Stress
- ✦ Westernisasi, urbanisasi, modrenisasi



Met determinasi dan intermediate katagori DM

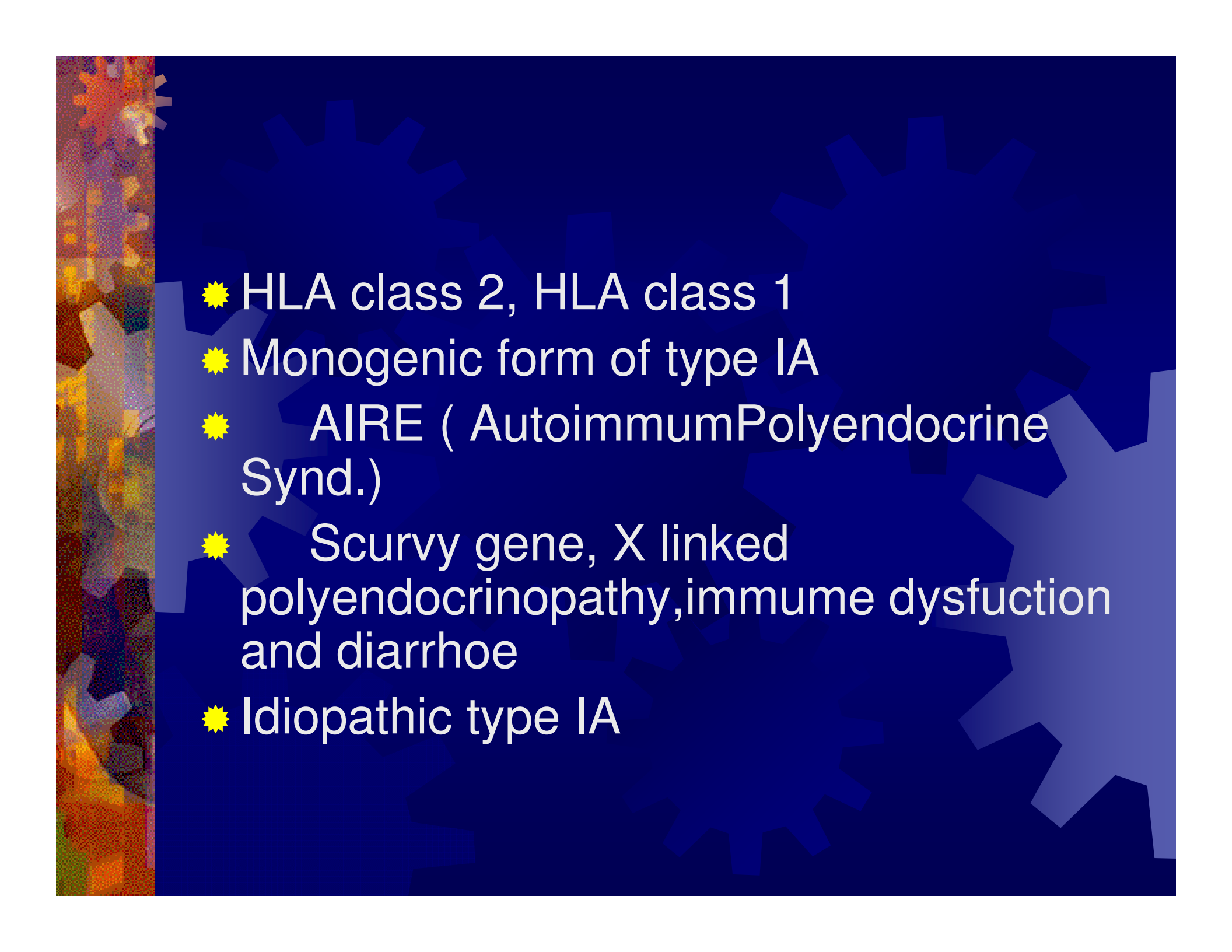
- ✦ Impaired Glucose Tolerance
- ✦ Insulin resisten
- ✦ Kehamilan – related varitas, gestasi, intra uterin malnutrition, overnutrition

Managemen DM type 2

- ✦ Problem
- ✦ Screening dan diagnosa
- ✦ Guideline
- ✦ Intervensi lifestyle
- ✦ Farmakopi
- ✦ Pencegahan
- ✦ prognosa

DM tipe 1

- ✦ DM type IA (Immune mediated)
- ✦ Anti-islet autoantibody (RIA)
- ✦ Risk factors DM, obesitas, HLA
- ✦ Cpeptide, HbA1c,
- ✦ DM Type IB (with severe insulin deficiency)

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- ★ HLA class 2, HLA class 1
 - ★ Monogenic form of type IA
 - ★ AIRE (AutoimmumPolyendocrine Synd.)
 - ★ Scurvy gene, X linked polyendocrinopathy, immune dysfunction and diarrhoe
 - ★ Idiopathic type IA

Komplikasi

★ Akut

★ coma

★ hiperglikemia

★ hipoglikemia

★ dehidrasi

★ ketoacidosis

Kronik

neuropathy

retinopathy

nepropathy

ganggren



TERIMA KASIH



Gangguan Metabolisme Lemak

Iman Sukiman

Meth Lemak

- ✦ Profil Lemak
 - ✦ Total Cholesterol
 - ✦ Trigliserida
 - ✦ HDL
 - ✦ LDL

Total Cholesterol

- ✦ Makin tua kadar chol makin tinggi
- ✦ Bad chol dan good chol
- ✦ Total chol meningkat ~ MCI, Stroke dan peny. perifer-al-vaskular

✦ Rekomendasi	hati-hati	resiko
✦ < 200 mg%	200 – 220	> 220

Trigliserida

- ✦ Normo hati-hati resiko
- ✦ < 200mg% 200- 300 mg% > 300
- ✦ Hypertriglyceridemia ~ LDL small particle >
- ✦ Meningkatkan pada Chylomicron dan VLDL

HDL

- ★ Secara ultra centrifuge HDL- 1

- ★ HDL - 2

- ★ HDL - 3

- ★ Good chol.

- ★ Normo hati-hati risiko

- ★ Lk > 55 < 45 < 35 mg/dl

- ★ Pr > 45 < 35

LDL

- ✦ Rumus Friedewarl – $Tg < 400\text{mg}\%$

- ✦ Enzymatik

- ✦ Normo

hatihati

resiko

- ✦ < 150

150 – 190

$> 190 \text{ mg}\%$

- ✦ LDL receptor

Ultra centrifuge / elektroporesis

- ✦ Chylomicron
- ✦ VLDL, I - VLDL
- ✦ HDL 1, 2 dan 3
- ✦ LDL : dense particle LDL
- ✦ low particle LDL



Lain-lain

- ✦ Total lipid
- ✦ phospholipid
- ✦ Apoprotein B
- ✦ Apoprotein A
- ✦ Apoprotein E
- ✦ Lipoprotein a

Hiperlipidemia Familiar

Type	Predom > lipoprotein	Predom. > lipid	contoh
I	Chylomicron	Trigliserida	LPL def.
IIa	LDL	Cholesterol	Fa hyp-chol
IIb	VLDL/LDL	TRI./Chol	Fa com hyp
III	Beta VLDL	Tri/Chol	Tipe3 hyp
IV	VLDL	Tri	Fa hyp tri
V	Chylo./ VLDL	Tri/ chol	Apo CII def