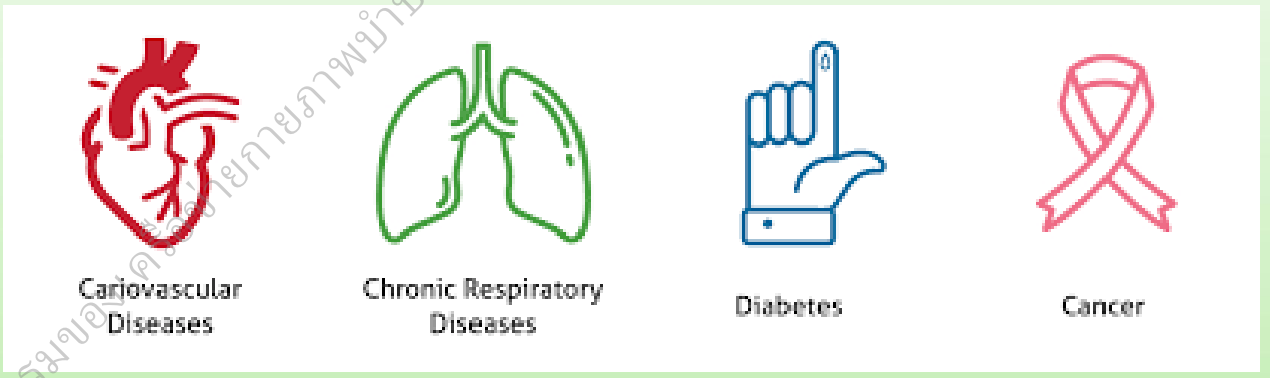
ผลของบุหรี่ไฟฟ้าต่อระบบหายใจ หัวใจ และหลอดเลือด และกลุ่มโรคไม่ติดต่อเรื้อรัง



ผศ.ดร.กภ. นันทินี นวลนิ่ม

คณะกายภาพบำบัด มหาวิทยาลัยมหิดล

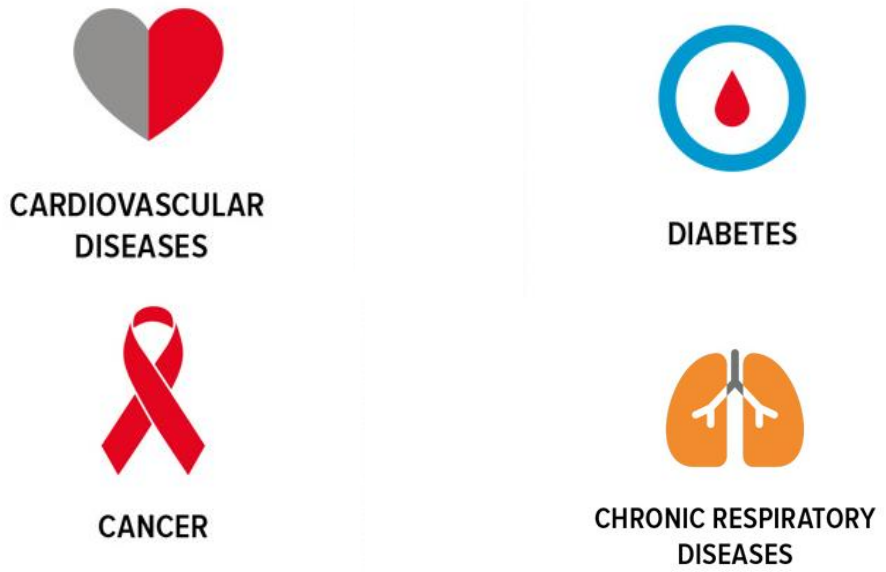
เอกสารประกอบการอบรมของคณะกายภาพบำบัดเพื่อสังคมสัมพันธ์

3 GOOD HEALTH AND WELL-BEING

#ความรู้ทำให้ ทุกอย่างเป็นไปได้

Non-communicable Disease (NCDs)

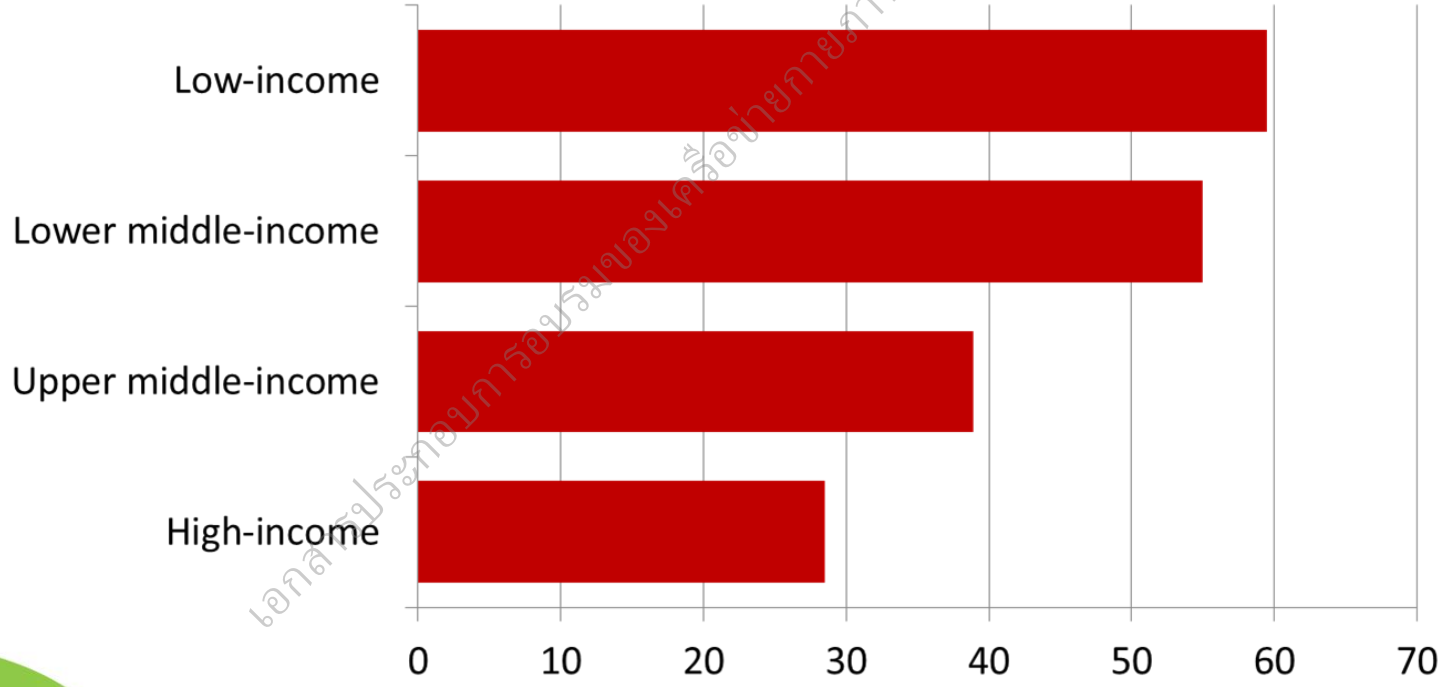
- **Definition** - a medical condition or disease that is non-infectious and non-transmissible among people
- also known as "chronic diseases" or "lifestyle diseases"
- NCDs – diseases of long duration and generally slow progression
- The **4 main NCDs**
  - Cardiovascular diseases
  - Diabetes
  - Cancer
  - Chronic respiratory diseases



เอกสารประกอบการอบรมของเครือข่ายภาพยำบัดเพื่อสังคมไทยปลอดบุหรี่

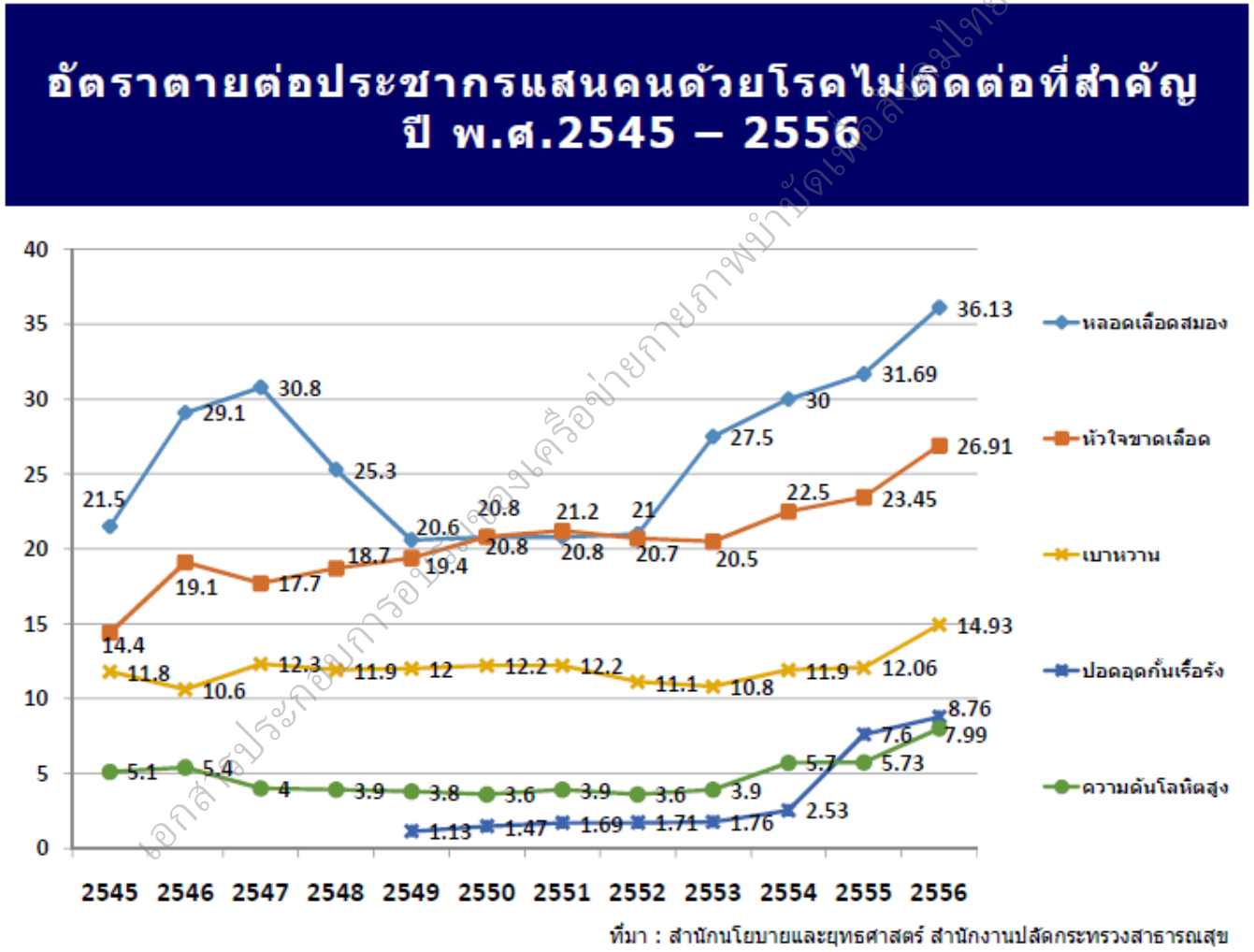
Key Facts of NCDs

- Each year, 15 million people die from a NCD between the ages of 30 and 69 years; over 85% of these "premature" deaths occur in low- and middle-income countries.



Deaths from NCDs before the age of 70 as a percentage of total deaths from NCDs

Key Facts of NCDs - THAILAND

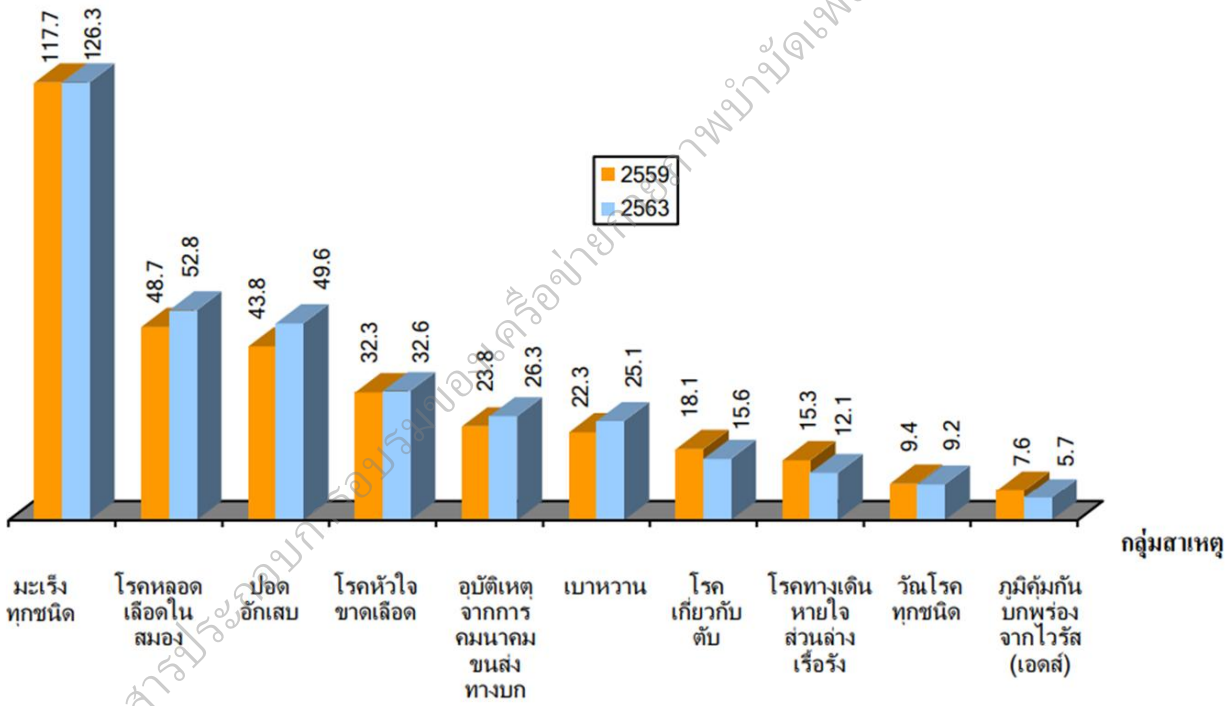


ที่มา : สำนักนโยบายและยุทธศาสตร์ สำนักงานปลัดกระทรวงสาธารณสุข

Key Facts of NCDs - THAILAND

ภาพ 2.3 ก : อัตราตาย จำแนกตามสาเหตุที่สำคัญ ต่อประชากร 100,000 คน ประเทศไทย พ.ศ. 2559 และ 2563

Figure 2.3 A : Mortality Rates by Leading Cause of Death per 100,000 Population Thailand, 2016 and 2020



ที่มา: กองยุทธศาสตร์และแผนงาน กระทรวงสาธารณสุข

Source: Strategy and Planning Division, Ministry of Public Health

เอกสารประกอบการอบรมของเครือข่ายการภาพบำบัดเพื่อสังคมเชยปลอดบุหรี่

The World's Leading Causes of Death

The “4 x 4 x 4 Model”

4 Modifiable Risk Factors	4 Metabolic Risk Factors	4 Diseases
Tobacco use	Abnormal blood lipids	Cardiovascular diseases
Unhealthy diets	High blood glucose	Diabetes
Physical inactivity	High blood pressure	Cancer
Harmful use of alcohol	Overweight/obesity	Chronic respiratory disease

เอกสารประกอบการฝึกอบรมของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

NCDs and Their Shared Risk Factors

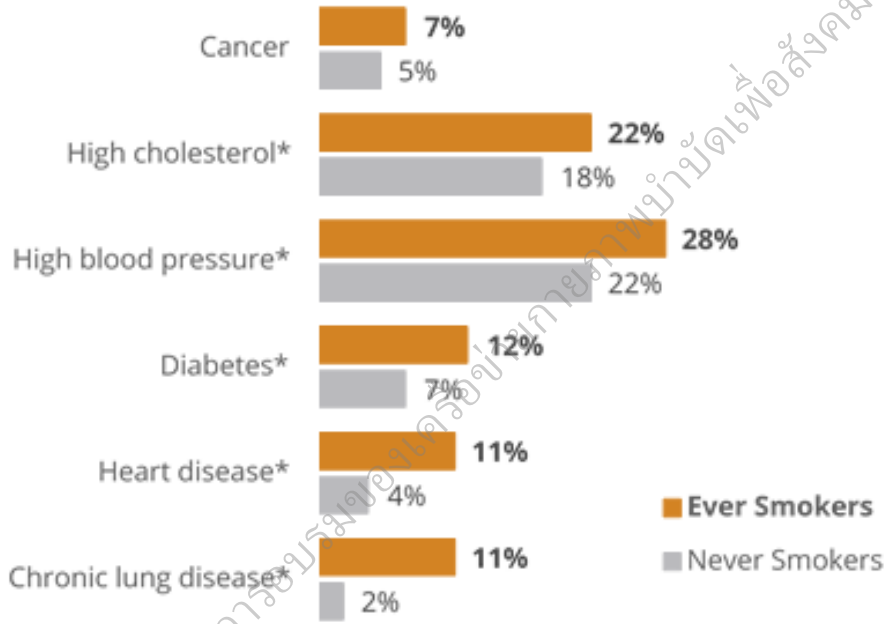
	Tobacco Use	Unhealthy diets	Physical Inactivity	Harmful Use of Alcohol
Cardio-vascular	✓	✓	✓	✓
Diabetes	✓	✓	✓	✓
Cancer	✓	✓	✓	✓
Chronic Respiratory	✓			

Noncommunicable Diseases
World Health Organization

World Health Organization

Figure 1: Chronic Diseases More Common in Individuals Who Have Smoked

Percentage of nonsmokers versus current and former smokers who were told by a healthcare professional they had...



Note: Never smokers have smoked fewer than 100 cigarettes in their lifetime. Ever smokers have smoked at least 100 cigarettes in their lifetimes. Chronic lung disease does not include asthma. Cancer does not include skin cancer.

* Statistically significant difference between never and ever smokers.

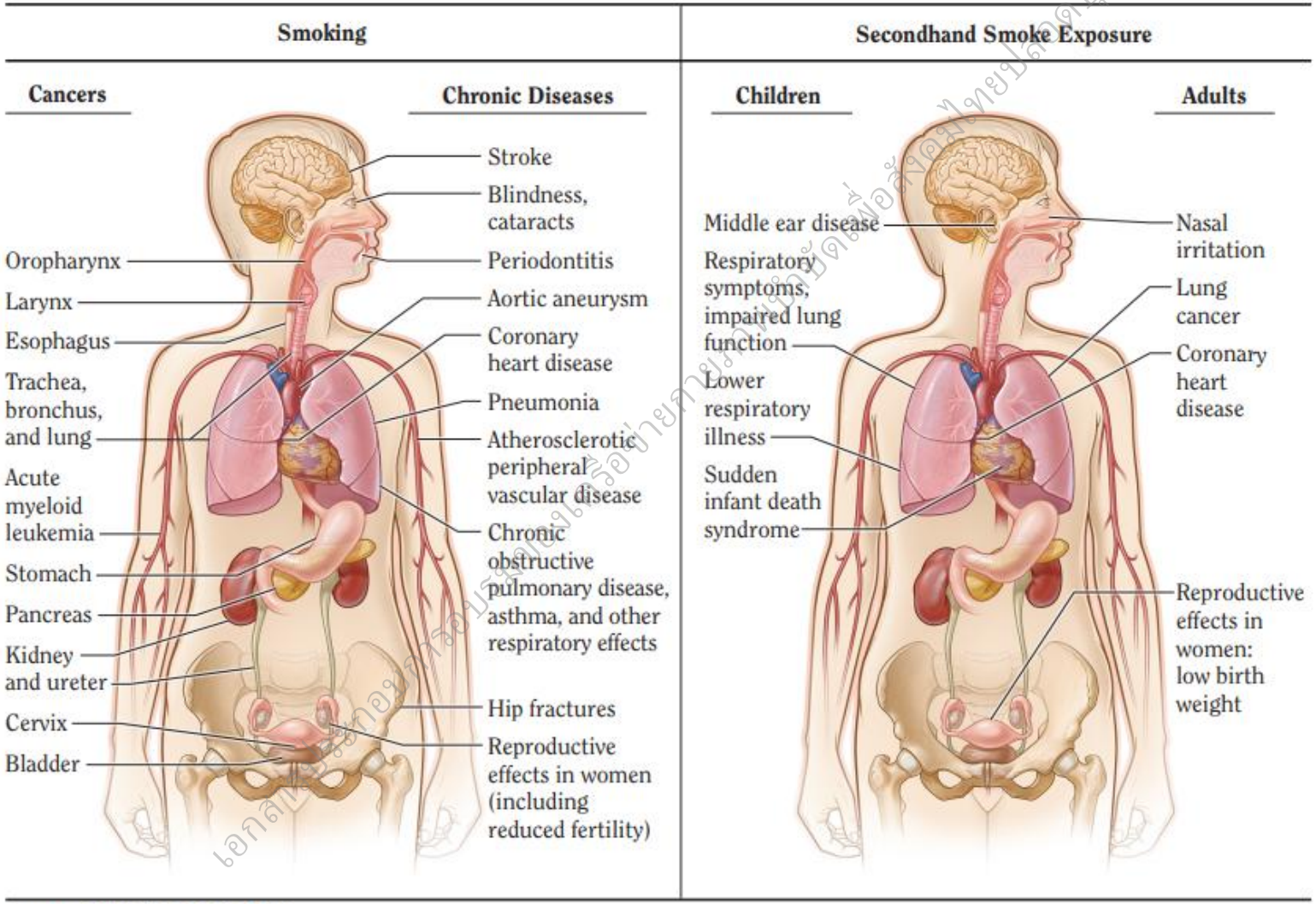
Source: WYSAC, 2018

WYOMING SURVEY & ANALYSIS CENTER

ห้องสมุดคณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล เพื่อการใช้งานเพื่อการศึกษาเท่านั้น ห้ามมิให้ใช้ประโยชน์ด้านการค้า

Mahidol University
Wisdom of the Land

Figure 1.1 **The health consequences causally linked to smoking and exposure to secondhand smoke**



Source: USDHHS 2004, 2006.

Electronic Cigarettes (e-cigarettes)

- E-cig, Vaping device, Electronic nicotine delivery system (ENDS)
- A relatively new and developing electronic nicotine delivery system that became commercially available in 2004.
- Battery-powered heating elements connected to a tank or reservoir that contains a mixture of nicotine, flavors, and other chemicals

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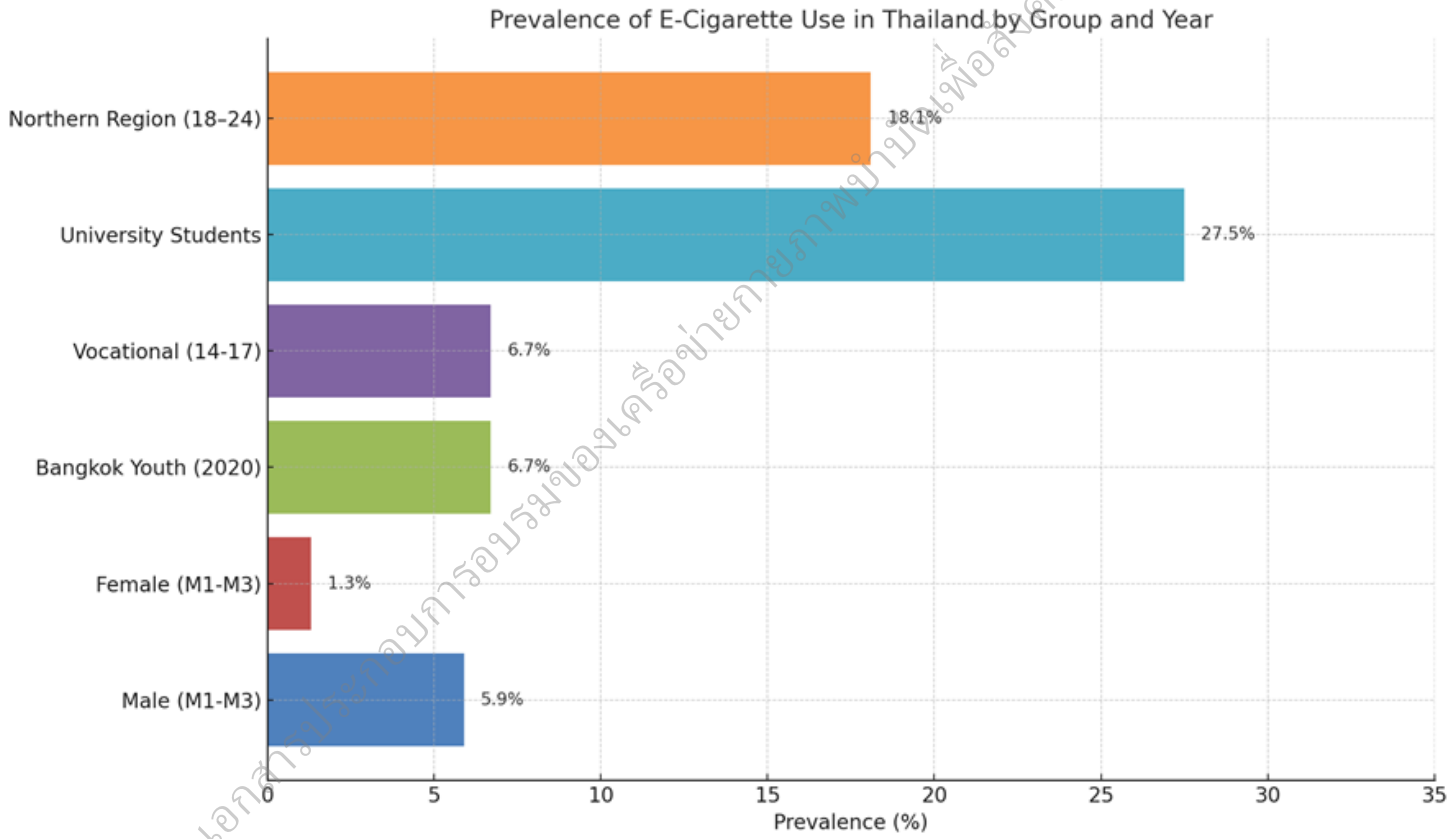
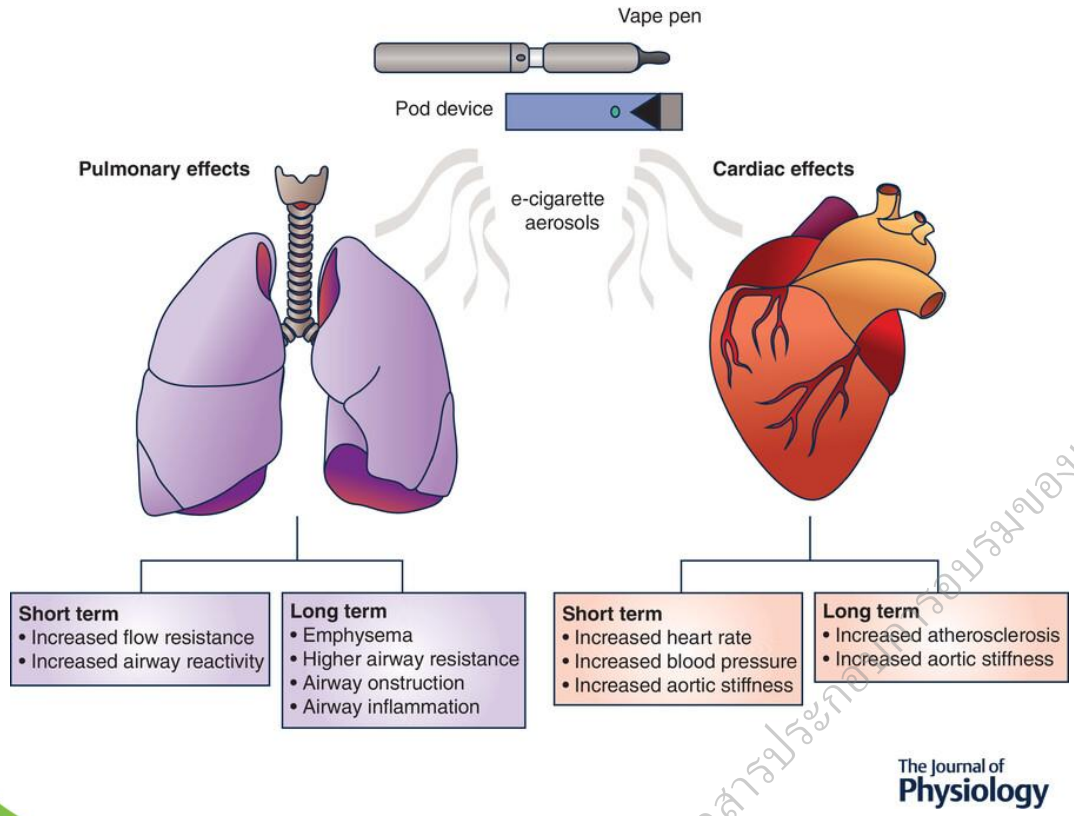
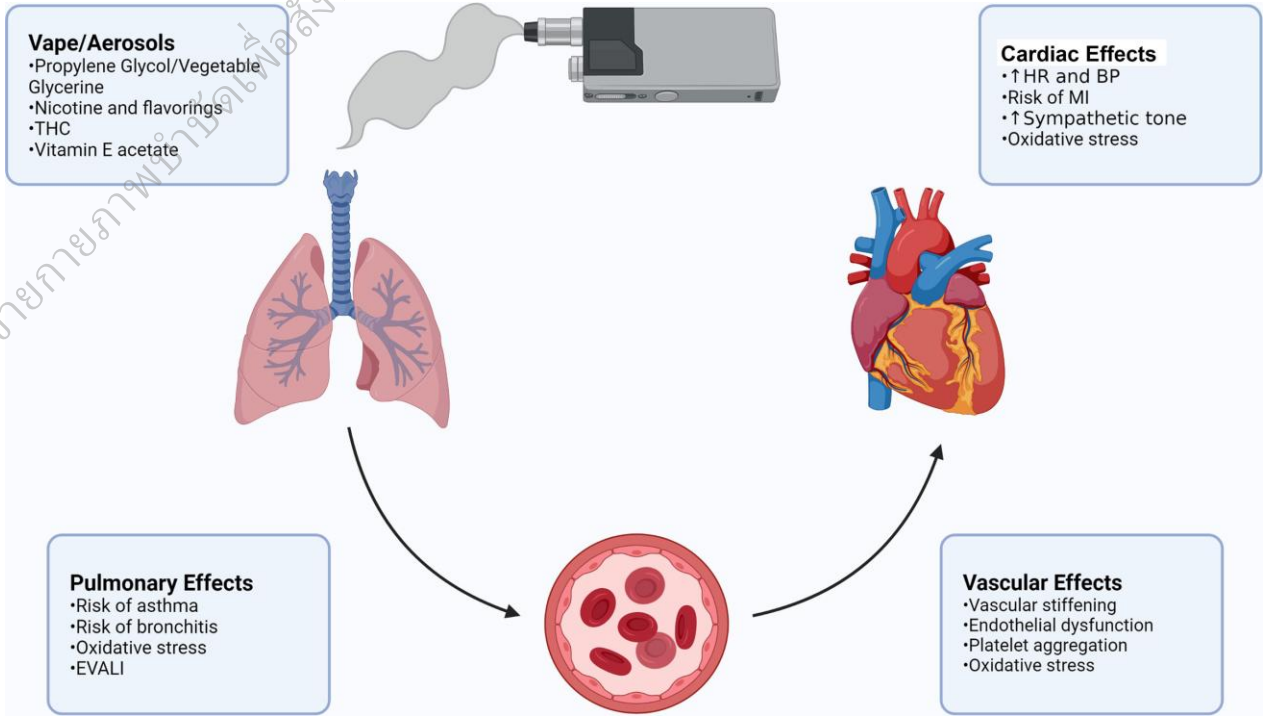
Prevalence of E-Cigarette Use in Thailand 2019-2024



Cardiopulmonary Effects of E-Cigarette Use

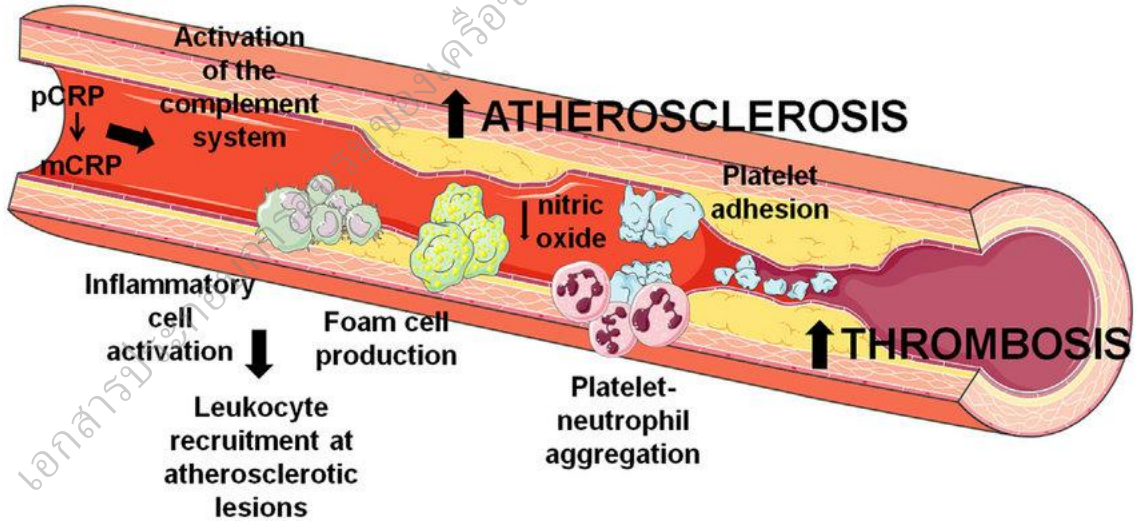




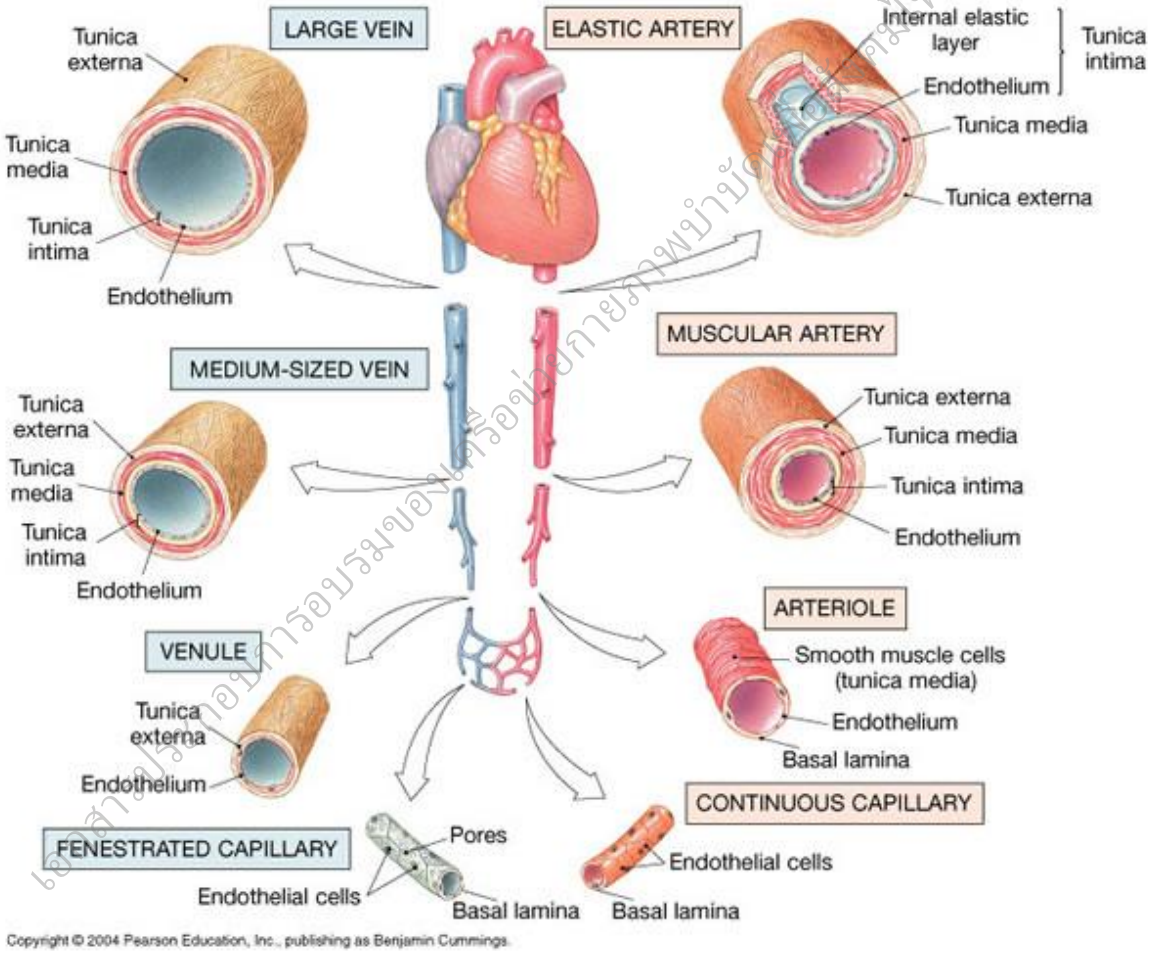
Circulation. 2022;145:219–232.

Subclinical Atherosclerosis as a Mechanism Linked Smoking and CVD

- Subclinical atherosclerosis is an early indicator of atherosclerotic burden and its timely recognition can slow or prevent progression to CVD.
- Individuals with subclinical atherosclerosis are a priority for primary prevention.



Vascular Structure



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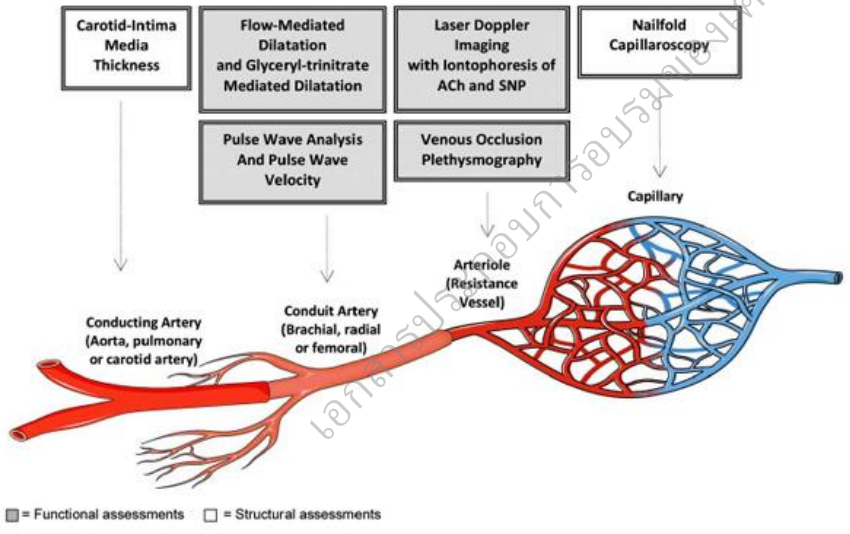
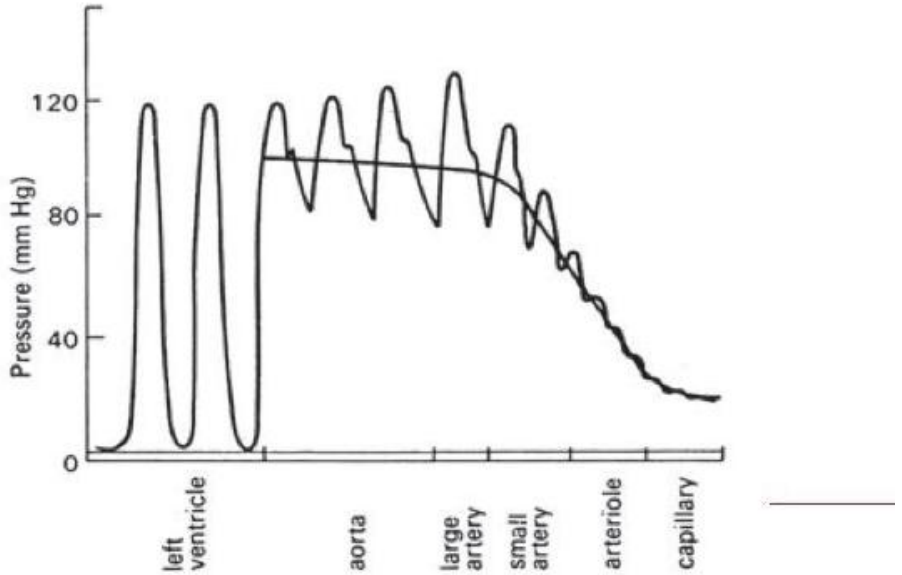
Arterial Function

- **Conduit**
  - To deliver blood from the left ventricle to tissue capillaries
- **Cushion**
  - To cushion the pulsations generated by the heart so that capillary blood flow is continue

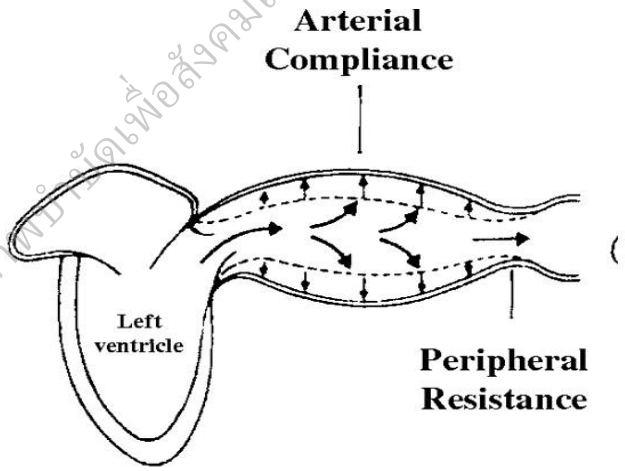




Arterial Compliance / Stiffness

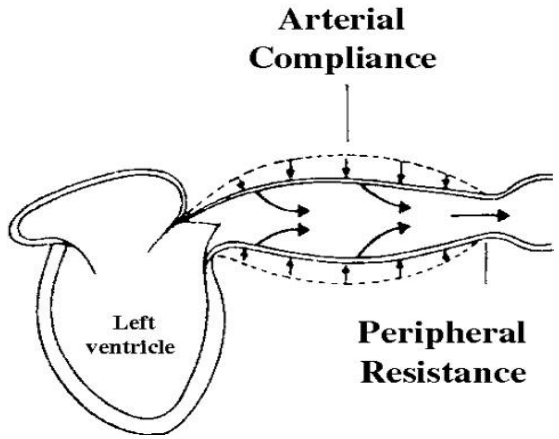
A. Systole

In normally compliant arterial system important part of the stroke volume is stored in the arteries during ventricular systole stretching the arterial walls



B. Diastole

During ventricular diastole the previously stretched arterial walls recoils with the stored volume insuring continuous perfusion of tissues and organs

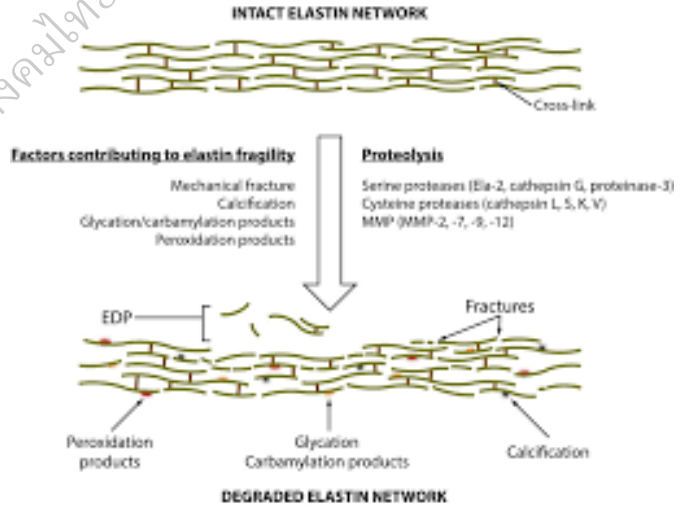


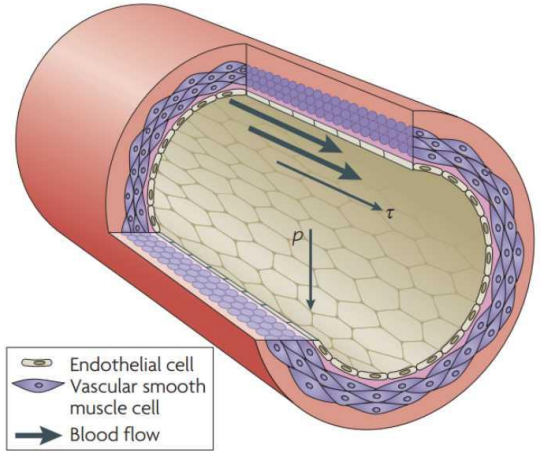
เอกสารประกอบการอบรมของเครือข่ายภาคีนักวิจัยเพื่อสังคมไทยปลอดบุหรี่

Mechanisms Mediated Arterial Stiffness

- **Structural changes**
  - fragmentation of elastin
  - Increase collagen deposition
  - Vascular smooth muscle cells hypertrophy
  - Interstitial cell adhesion molecules

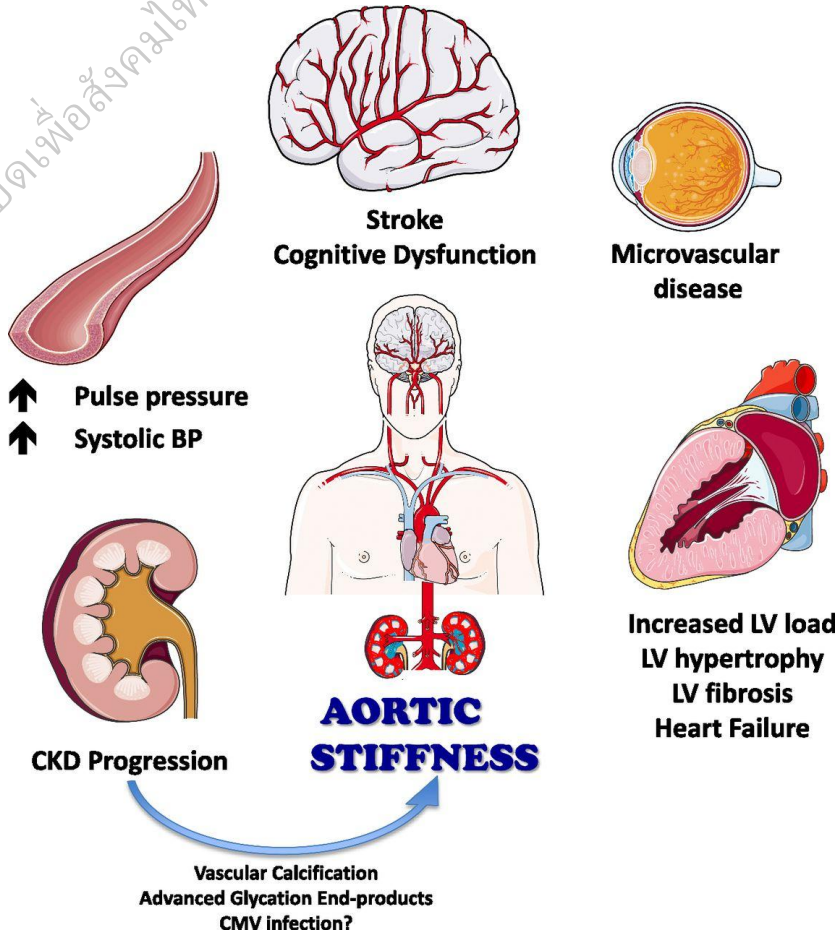
- **Functional changes**
  - Increased SNA causes increased vascular smooth muscle tone
  - Reduced endothelial dilator product





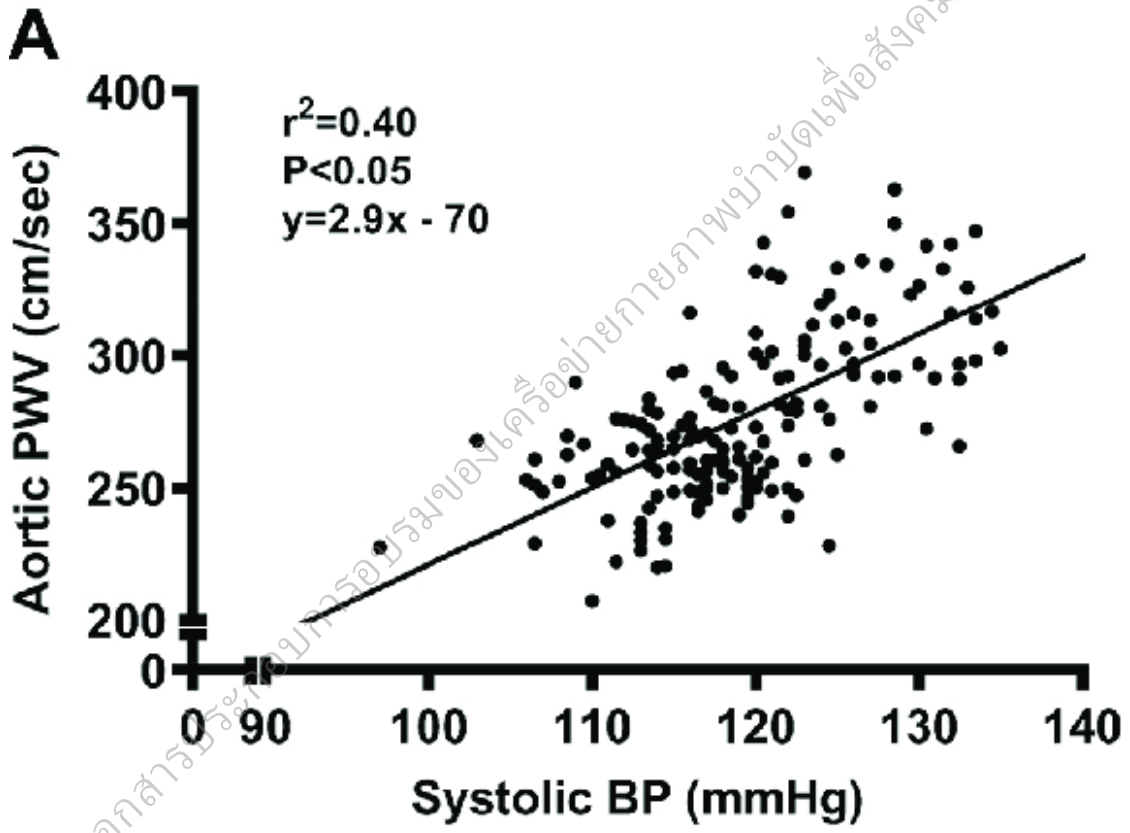
Arterial Stiffness

- Progressive hardening of the vascular wall
- Resulting in faster velocity of wave travel (PWV)
- Increased arterial stiffness can contribute to the development of CVDs.



เอกสารประกอบการอบรมเครือข่ายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

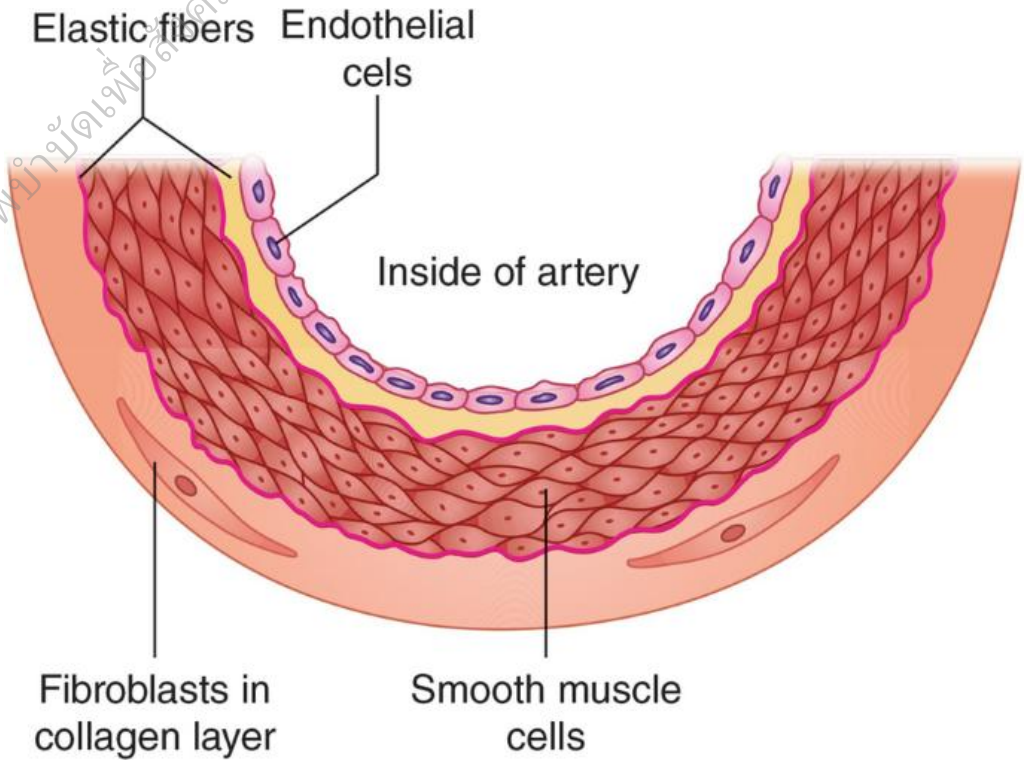
Arterial Stiffness & Blood Pressure



เอกสารนี้เป็นทรัพย์สินของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดภัย

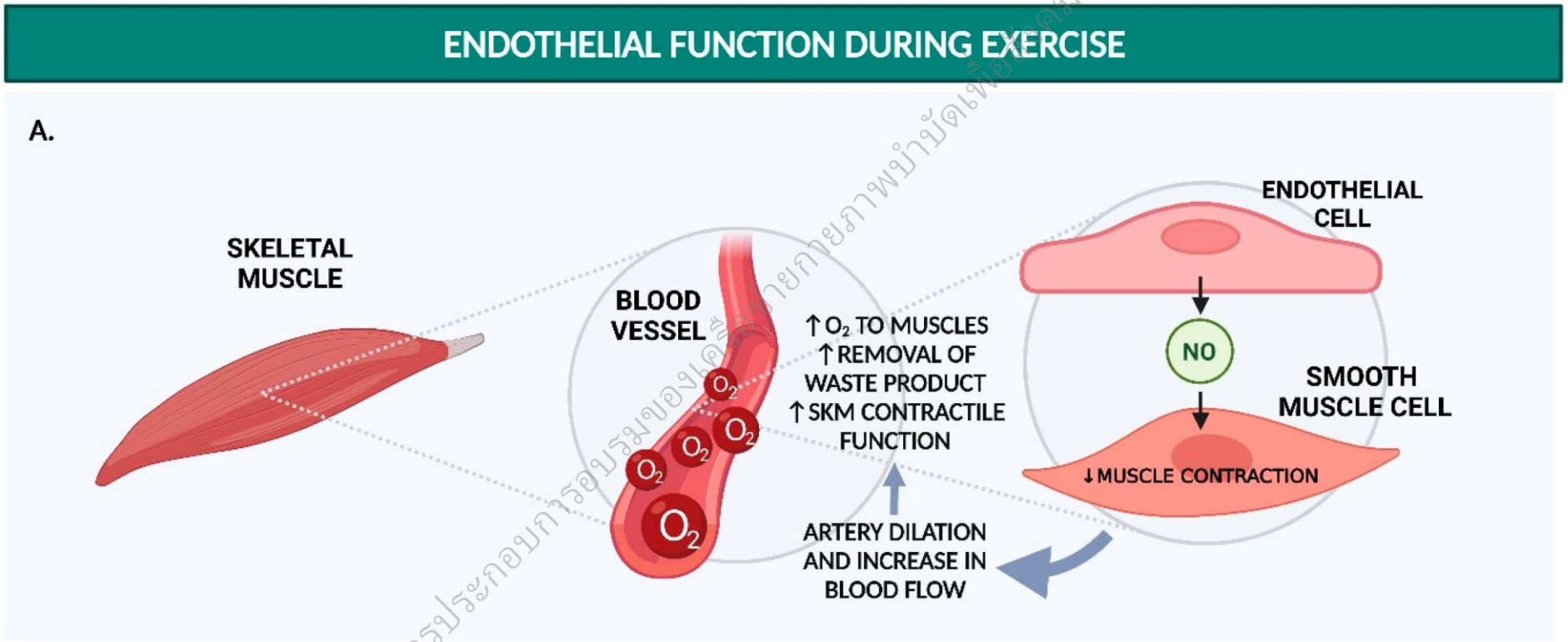
Vascular Endothelium

- A large paracrine organ that secretes numerous factors regulating vascular tone, cell growth, platelet and leukocyte interactions.



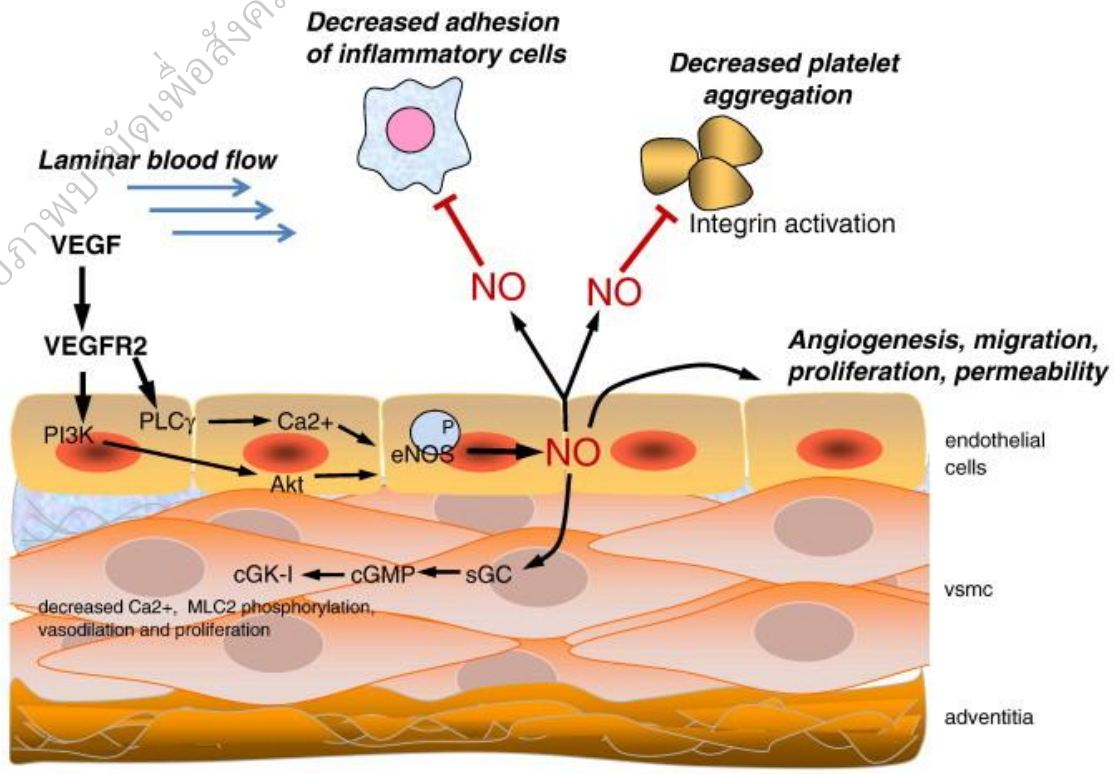
เอกสารประกอบการอบรมของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

Vascular Endothelial Function



Protective Action of Nitric Oxide (NO)

- Smooth muscle relaxation and vasodilatation
- Essential for regulation of blood pressure
- Reduces proliferation of vascular smooth muscle
- Protects blood vessel intima from injurious consequences of platelet aggregation

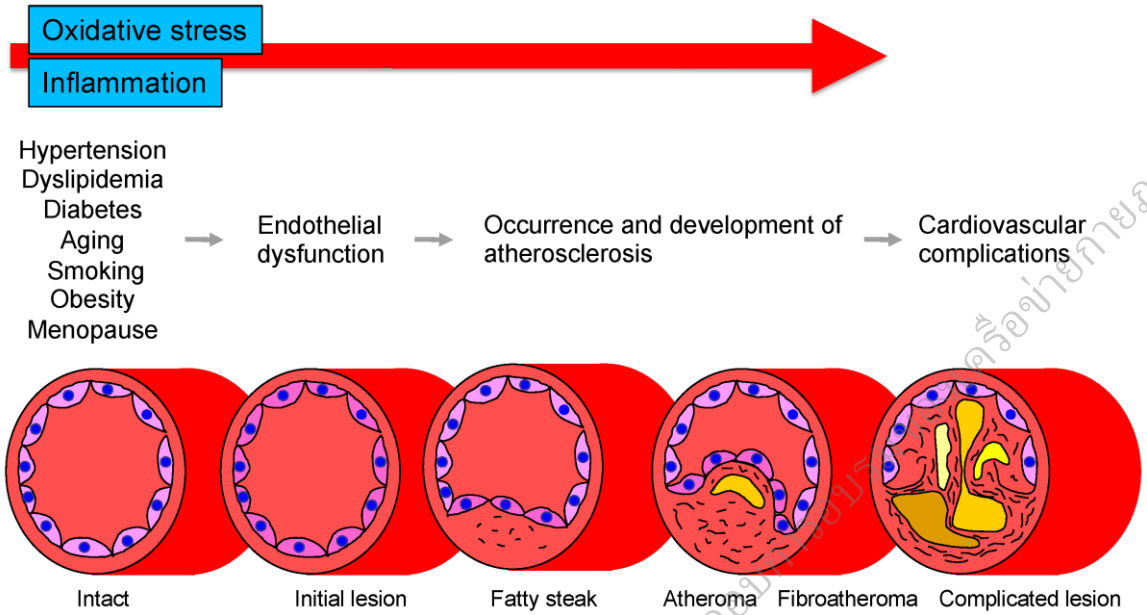


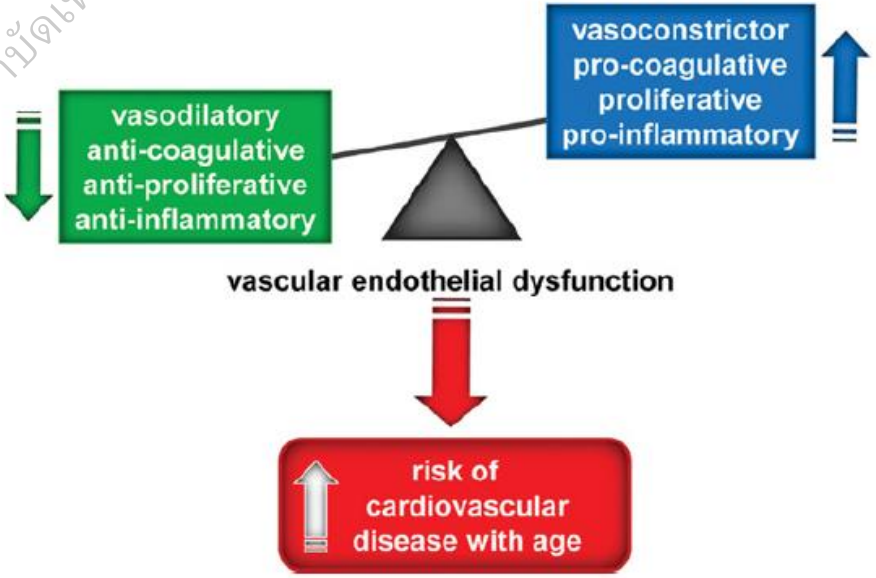
Vascular Endothelial Dysfunction

- Takes place gradually by age and menopause
- Mainly due to reduced bioavailability and bioactivity of nitric oxide (NO)
- Major factor in the development of atherosclerosis, and heart failure
- Associate with major CVD risk factors including smoking, hypercholesterolemia, hypertension, hyperglycemia, diabetes, obesity, and chronic inflammation

เอกสารประกอบการอบรมเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

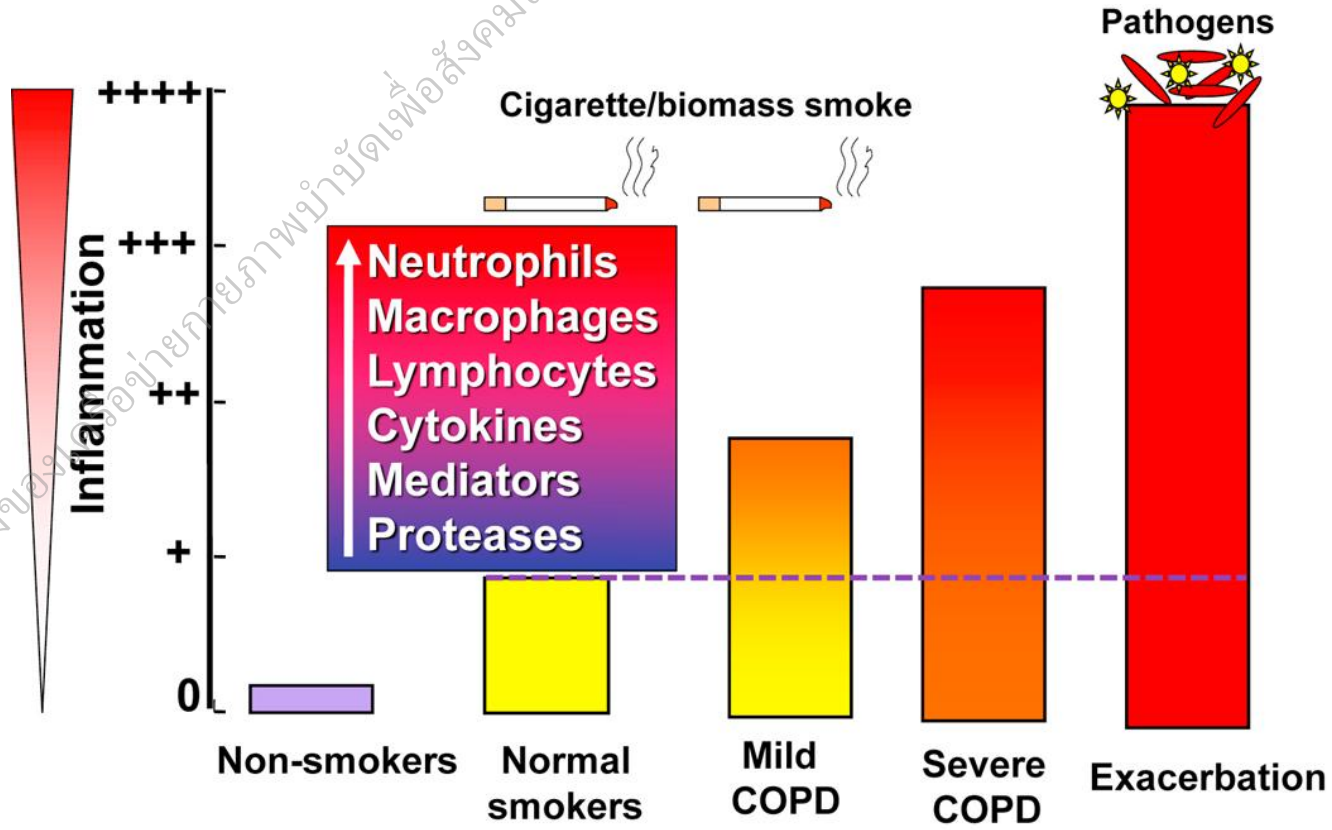
Vascular Endothelial Dysfunction & CVD





Mechanisms Linking Smoking & Chronic Diseases

- Cigarette smoking and/or exposure to noxious particles evoke an inflammatory response with increased macrophage and neutrophil infiltration into the lungs.



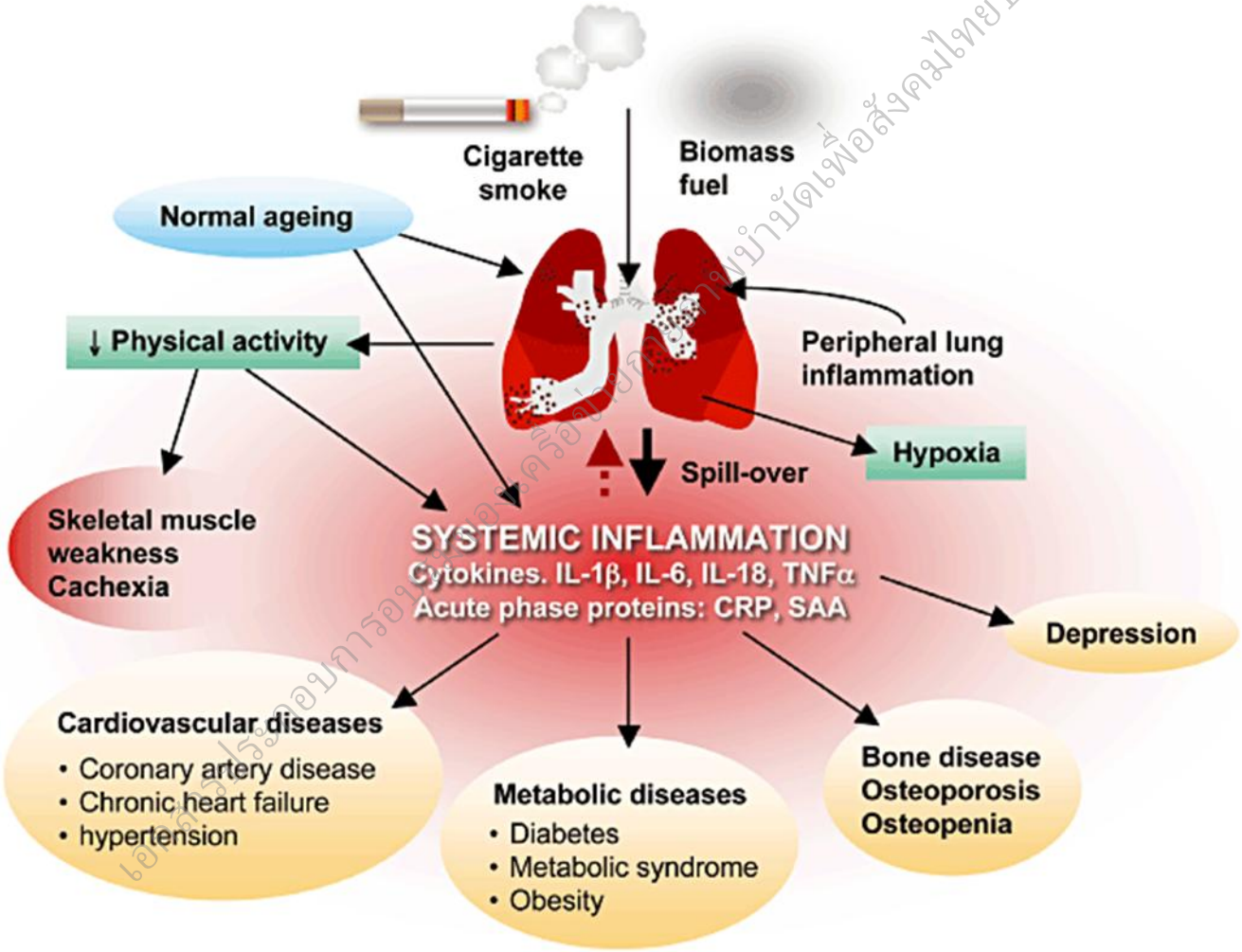
เอกสารประกอบการอบรมออนไลน์โครงการพัฒนาศักยภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

Mechanisms Linking Smoking & Chronic Diseases

- Oxidants enter the pulmonary compartment via direct inhalation of cigarette smoke.
- Oxidative damage activates resident cells in the lung (e.g. epithelial cells and alveolar macrophages), to recruit additional inflammatory cells and perpetuate oxidative stress in the lung
- Persistent inflammation, accompanied by chronic oxidative stress resulting in the “spill over” of pro-inflammatory mediators into the systemic circulation

เอกสารประกอบการอบรมของศูนย์วิชาการ กรมควบคุมโรค เพื่อสังคมไทยปลอดบุหรี่

Mechanisms Linking Smoking & Chronic Diseases

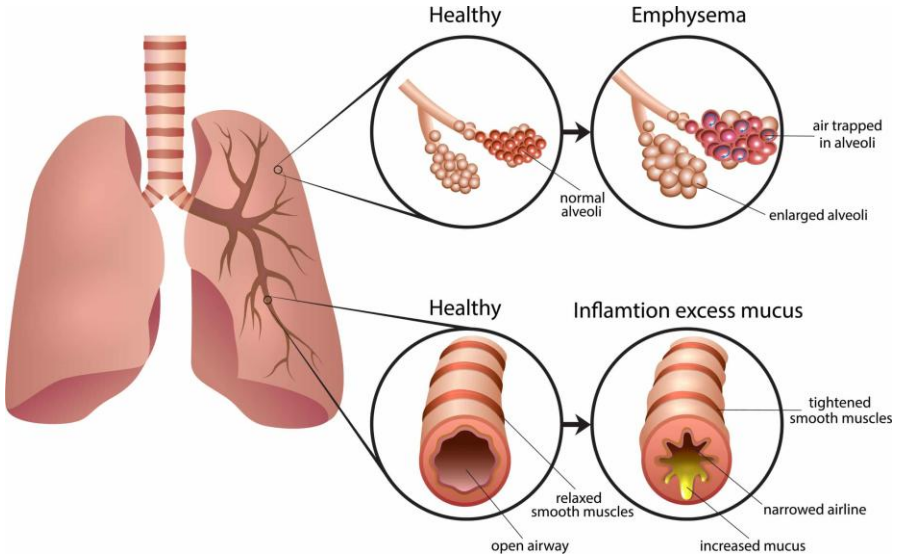


Chronic Respiratory Disease

- Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable, and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

- The most common respiratory symptoms include dyspnea, cough, and/or sputum production.

- The main risk factor for COPD is tobacco smoking.

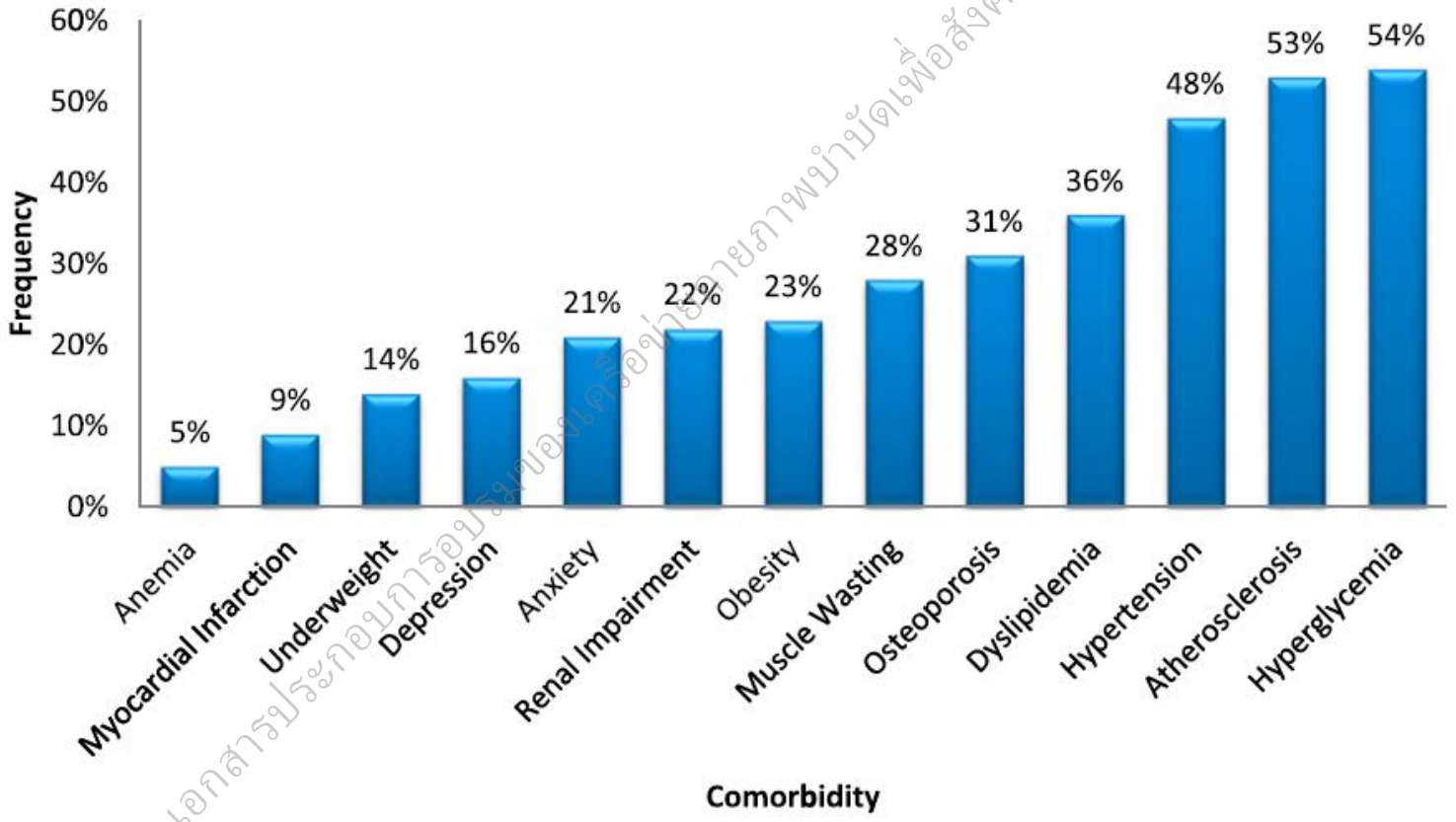


COPD and Comorbidity

- COPD often coexists with other diseases (comorbidities) that may have a significant impact on the disease course.
- Comorbidities not only affect symptom burden, functional performance, and health status in patients with COPD but also the risk of hospitalization and mortality.
- In general, the presence of comorbidities should not alter COPD treatment, and comorbidities should be treated per usual standards regardless of the presence of COPD.

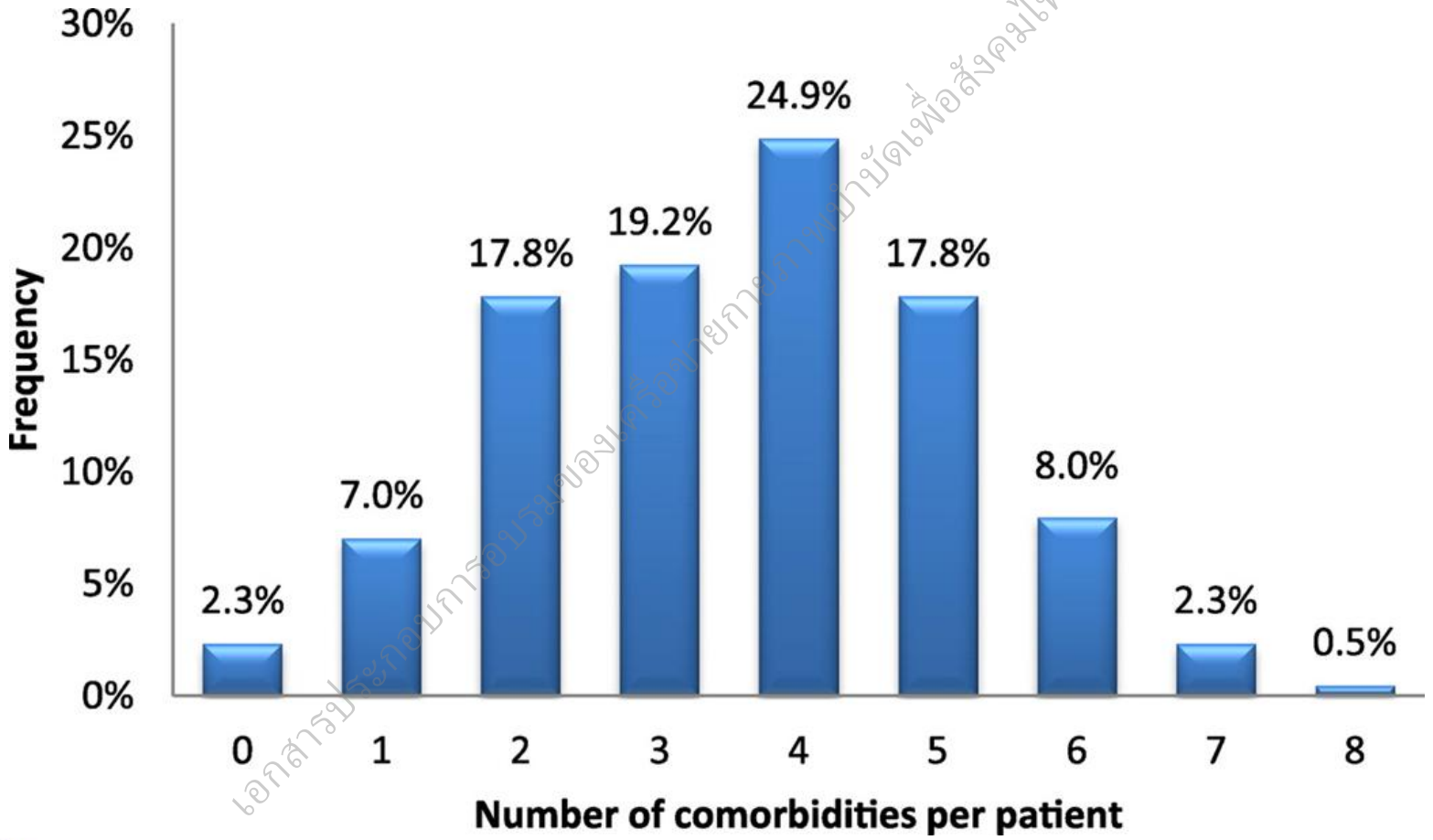
เอกสารประกอบการอบรมของเครือข่ายสายการบำบัดเพื่อสังคมไทยปลอดบุหรี่

COPD and Comorbidity



VanfleterenL.E.G.W., et al. AJRCCM 2013 Apr;187(7):728-35

COPD and Comorbidity

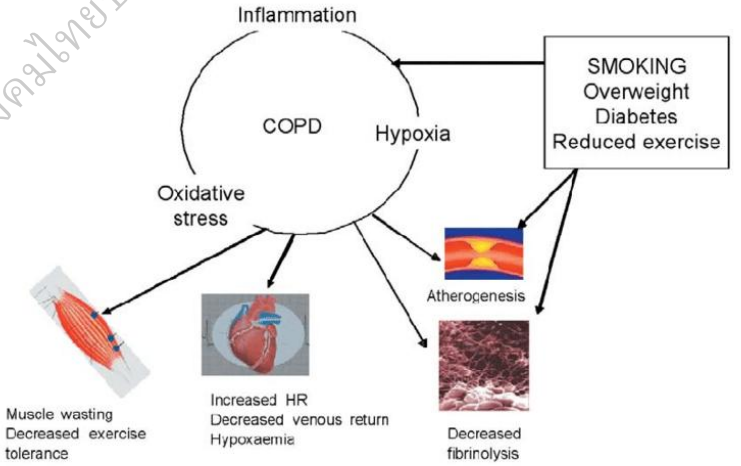


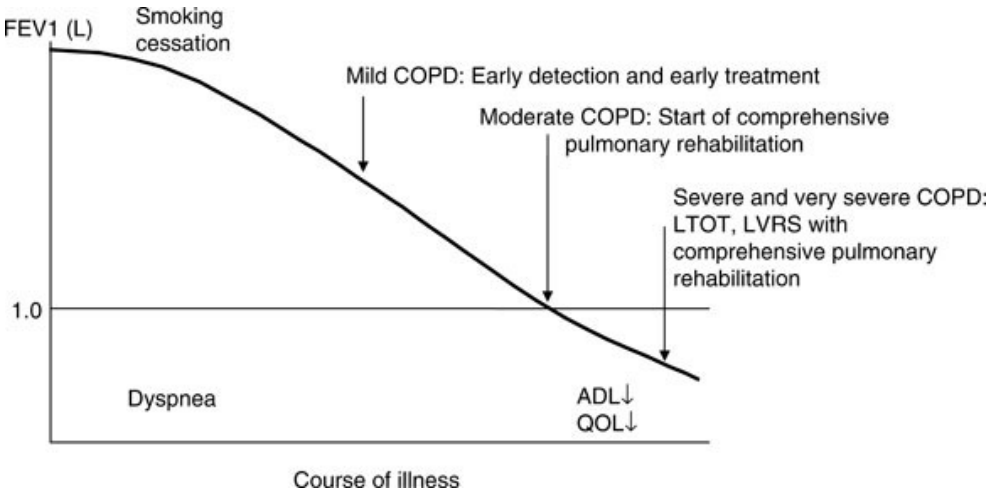
VanfleterenL.E.G.W., et al. AJRCCM 2013 Apr;187(7):728-35

Mechanisms Linking COPD and Comorbidity

- Impaired pulmonary function decreases oxygen-exchange efficiency, which in turn would trigger hypoxemia and limit physical activity.

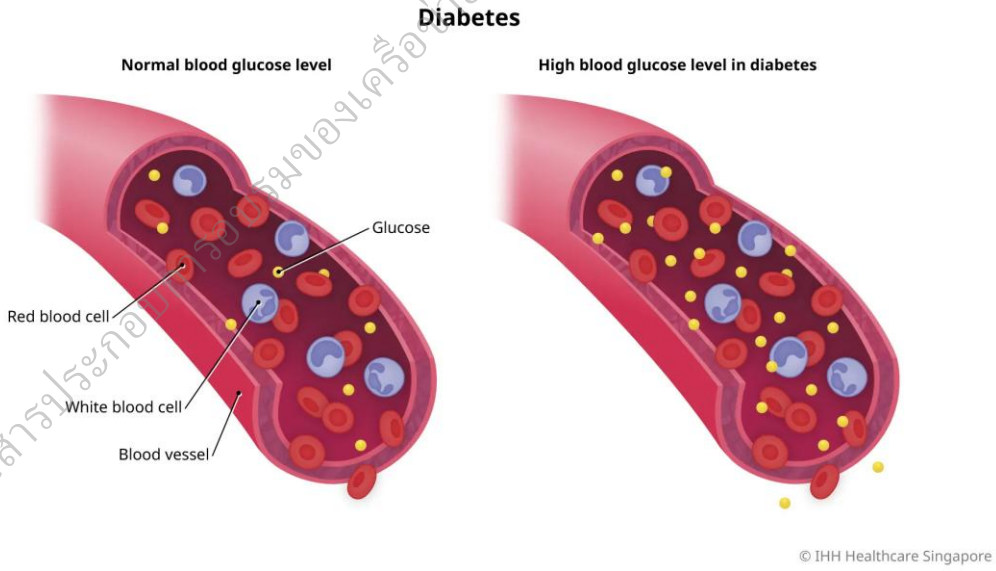
- Both hypoxemia and physical inactivity *per se* are capable of directly and indirectly promoting the development of cardiovascular disease (CVD), metabolic syndrome, and other comorbidities





Diabetes Mellitus (DM)

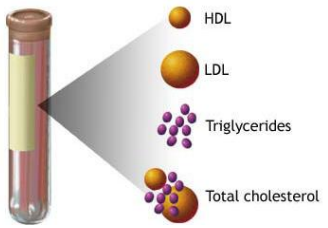
- Diabetes is the sixth leading cause of death in the US and the leading cause of blindness, kidney failure, and limb amputations.
- Diabetes is an independent risk factor for cardiovascular disease



เอกสารประกอบการบรรยายเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

At Risk for Type 2 Diabetes

- Physical inactivity
- Obesity , particularly upper-body fat distribution
- First-degree relative with diabetes
- Blood pressure at or above 140/90 mmHg
- Delivered a baby weighing more than 4 kg or developed gestational diabetes
- HDL-C level of 35 mg/dL or below and/or a triacylglycerol level of 250 mg/dL or above
- Impaired fasting plasma glucose (FPG >100 and <126 mg/dl)



เอกสารประกอบการอบรมของเครือข่ายเวยภาพบำบัดเพื่อสังคมไทยปลอดหนุ่มสู่

Diabetes Symptoms

- Glycosuria: Presence of glucose in the urine
  - High blood glucose that kidney tubules filter and void in the urine
- Polyuria: Frequent urination
  - Excessive glucose in renal filtrate create an osmotic effect that diminishes water reabsorption
- Polydipsia: Excessive thirst
- With decreased glucose uptake, cells are relied on fat catabolism. This produces an excess of ketoacids and fall of plasma pH

เอกสารประกอบการอบรมของเครือข่ายวิทยภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

Diabetes Symptoms

- Polyphagia: Extreme hunger
- Increased fatigue
- Irritability
- Blurry vision
- Numbness or tingling in the extremities (hands, feet)
- Slow-healing wounds or sores
- Abnormally high frequency of infection

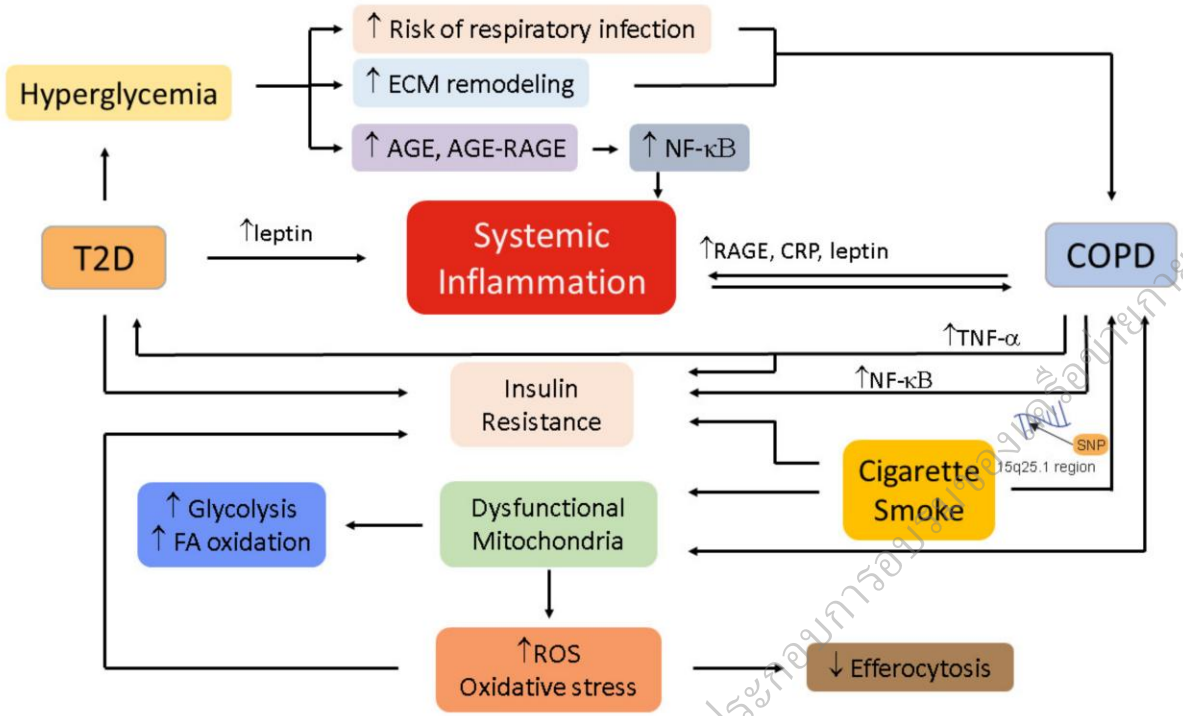
เอกสารประกอบการอบรมผ่านเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

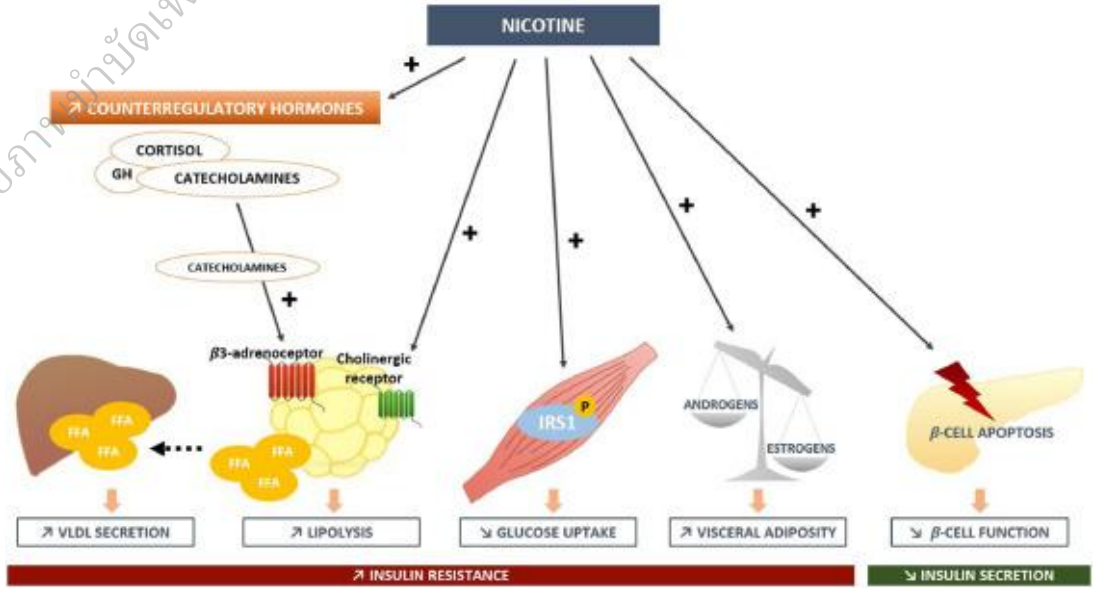
Complications of Type 2 Diabetes

- Both microvascular and macrovascular diseases
  - Retinopathy
  - Peripheral and autonomic neuropathy
  - Nephropathy
  - Peripheral vascular disease
  - Atherosclerotic cardiovascular and cerebrovascular disease
  - Hypertension
  - Susceptibility to infections

เอกสารประกอบการอบรมของเครือข่ายภาษาเพื่อสุขภาพไทยปลอดภัย

Mechanisms Linking Smoking & DM





Medicina 2022, 58(8), 1030
Diabetes Metab. 2022 Nov;48(6):101370.

Mechanisms Linking Smoking & DM

Mechanisms	Contribution to DM
Insulin resistance	Reduces glucose uptake in tissues
β-cell dysfunction	Decreases insulin production
Chronic inflammation	Disrupts insulin signaling and promotes tissue damage
Oxidative stress	Impairs insulin action and β-cell integrity
Endothelial dysfunction	Limits glucose delivery to tissues
Dyslipidemia and obesity	Promotes insulin resistance and metabolic syndrome

เอกสารประกอบการอบรมของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

Cancer

- Cancer is the uncontrolled growth and spread of cells that arises from a change in one single cell.
- The transformation from a normal cell into a tumor cell is a multistage process where growths often invade surrounding tissue and can metastasize to distant sites.

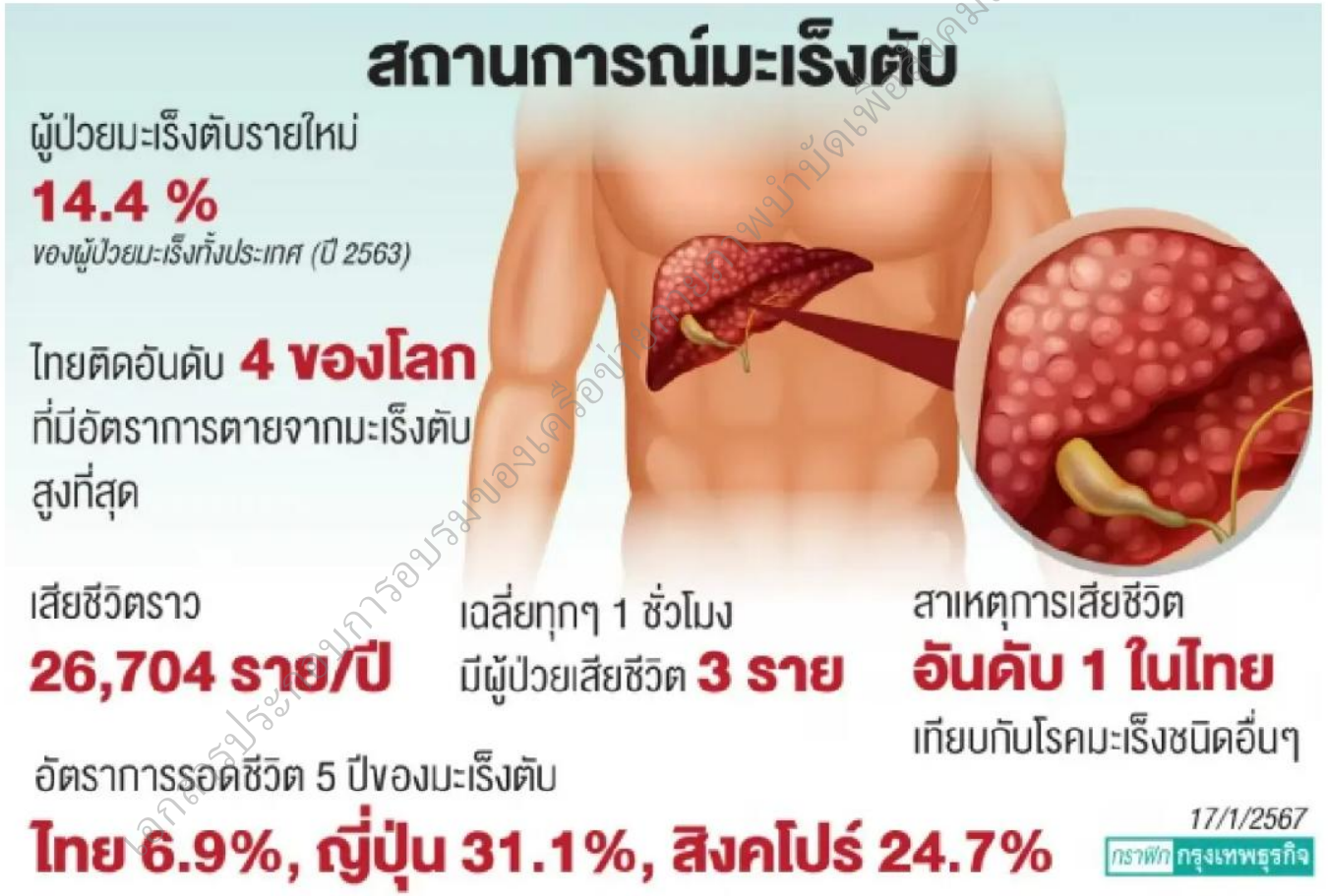
เอกสารประกอบการอบรมของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

Cancer: *The majority of cancer deaths*

- In high-income countries, the leading causes of cancer deaths are lung cancer among men and breast cancer among women.
- In low- and middle-income countries cancer levels vary according to the prevailing underlying risks. In sub-Saharan Africa, for example, cervical cancer is the leading cause of cancer death among women.

เอกสารประกอบการอบรมของสถาบันการแพทย์ฉุกเฉินแห่งชาติ

Cancer
Thailand Facts and Figures



Voice of liver, 2024

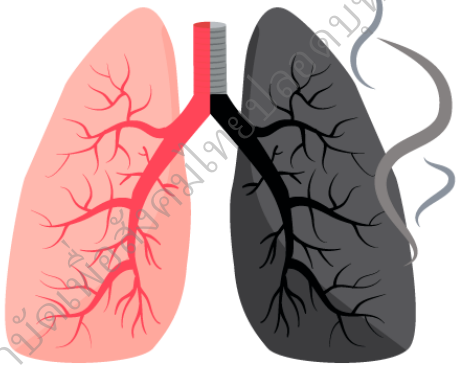
Cancer: Risk factors for cancer

- Tobacco use
- Unhealthy diet
- Insufficient physical activity
- The harmful use of alcohol
- Infections (hepatitis B, hepatitis C; liver cancer, human papillomavirus (HPV); cervical cancer, Helicobacter pylori; stomach cancer
- Radiation
- Variety of environmental and occupational exposures of varying importance

เอกสารประกอบการอบรมเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่

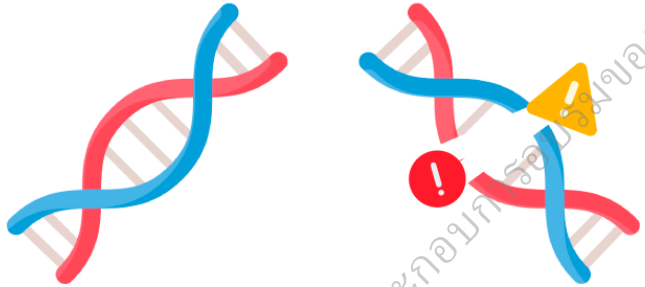
How can smoking cause cancer?

1 Cigarette smoke releases over 5,000 different chemicals

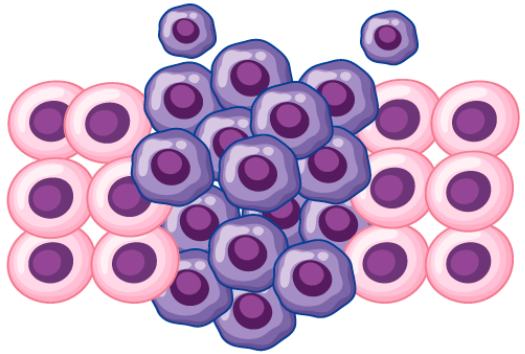


2 Harmful chemicals enter our lungs and then affect the entire body

3 Chemicals damage our DNA, including parts that protect us from cancer



4 Other chemicals make it harder for cells to repair DNA damage



5 This DNA damage can cause cancer in cells

Source: Cancer Research UK

เอกสารประกอบการเรียนการสอนของเครือข่ายภาพบำบัดแห่งประเทศไทย

https://www.issuesonline.co.uk/articles/how-does-smoking-cause-cancer

เอกสารประกอบการอบรมของเครือข่ายกายภาพบำบัดเพื่อสังคมไทยปลอดบุหรี่