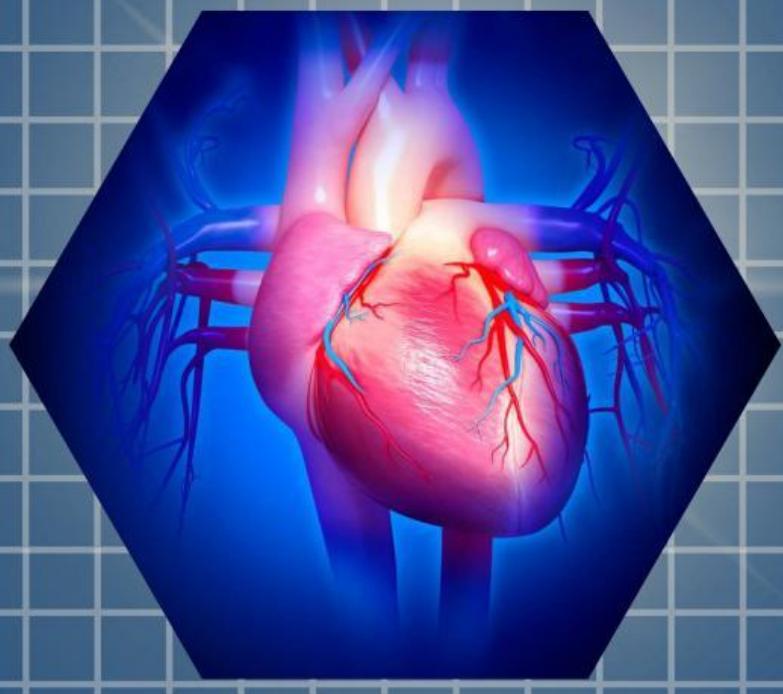


# Kardiovaskular Disease



Group :

Group Members :

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_

## A. Introduction

### Questions

What do you know about genetics?

What diseases can be caused by genetic factors?

Do you know about hypertension?

What factors can cause a person to develop hypertension?

Do you know that one of the causes of hypertension is exposure to aromatic chemical substances? Give the explanation!

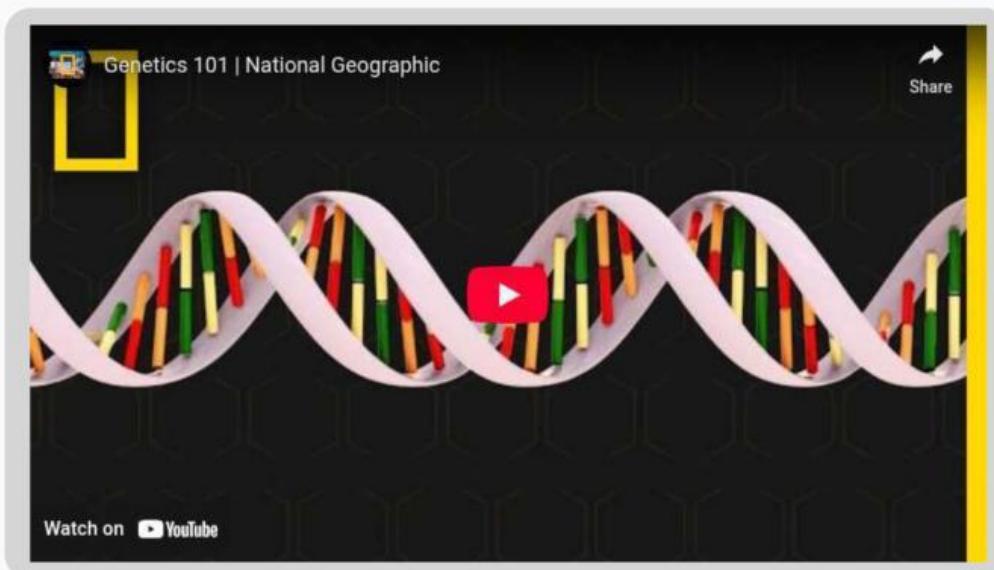
What are the serious complications that can arise from uncontrolled high blood pressure?

### Expected Answer

Now, let's watch a video genetics and hypertension

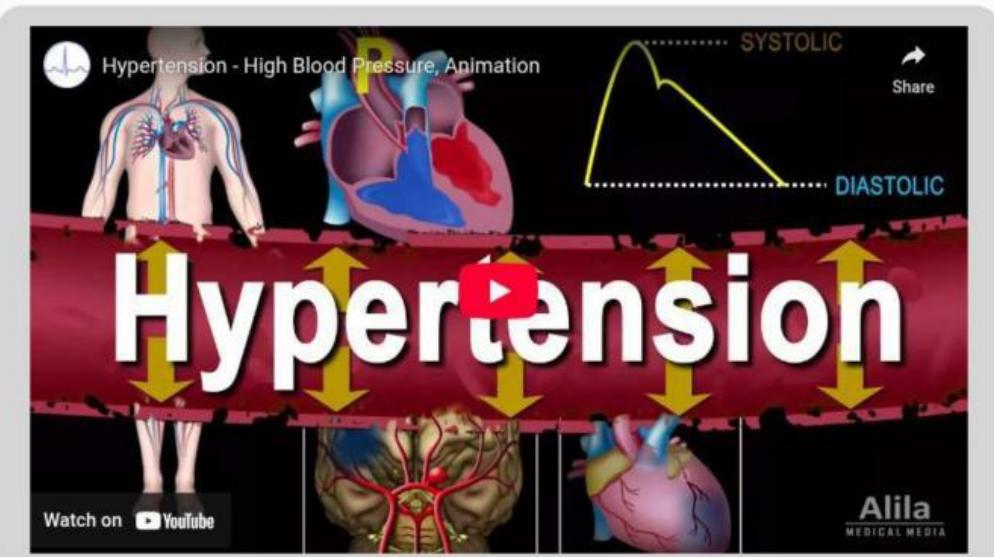
### a). Genetics

[https://youtu.be/v8tJGlicgp8?  
si=JICn0P61yEz5JL8m](https://youtu.be/v8tJGlicgp8?si=JICn0P61yEz5JL8m)



### b). Hypertension

[https://youtu.be/JtBtk00EiVM?  
si=W86YyjZsfpACfBYS](https://youtu.be/JtBtk00EiVM?si=W86YyjZsfpACfBYS)



## B. Investigations

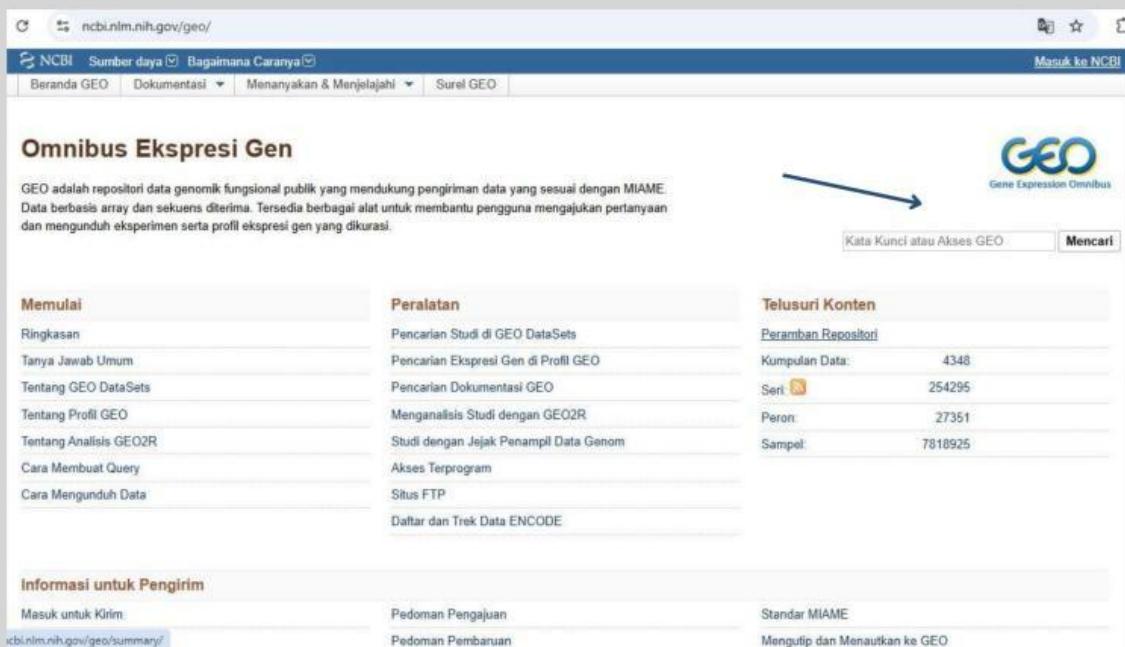
A 40-year-old woman who worked in the textile industry for 15 years complained of progressive shortness of breath, easy fatigue and swelling of the lower limbs. Her work history involved continuous exposure to aromatic amine chemicals used in the fabric dyeing process.

On physical examination, signs of pulmonary arterial hypertension (PAP) such as a loud second heart sound and enlarged jugular veins were found. Echocardiographic examination and right heart catheterization confirmed elevated pulmonary artery pressure (mPAP > 25 mmHg) with increased pulmonary vascular resistance.

Using GEO (Gene Expression Omnibus)

1. Access the NCBI GEO link: <https://www.ncbi.nlm.nih.gov/geo/>

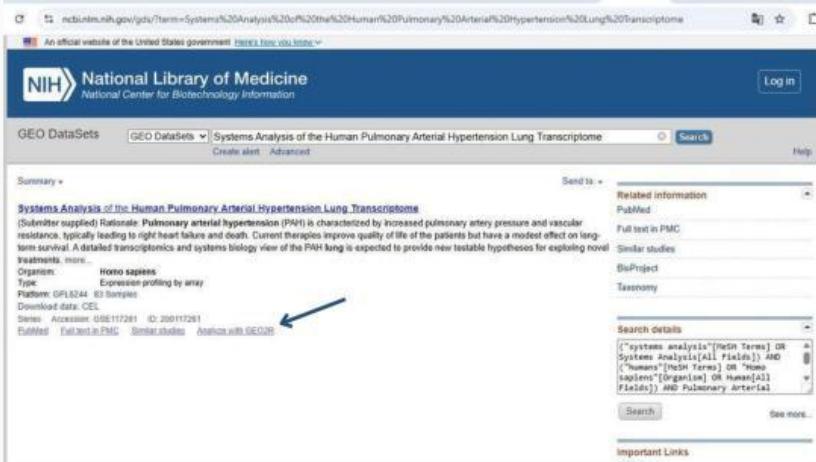
2. Enter the keywords "Systems Analysis of the Human Pulmonary Arterial Hypertension Lung Transcriptome" in the search field.



The screenshot shows the NCBI GEO website interface. At the top, there is a navigation bar with links for NCBI, Sumber daya, Bagaimana Caranya, Beranda GEO, Dokumentasi, Menanyakan & Menjelajahi, and Sures GEO. On the right side, there is a search bar with the placeholder "Kata Kunci atau Akses GEO" and a "Mencari" button. The main content area is titled "Omnibus Ekspresi Gen". It features a brief description of GEO as a functional genomics repository for public data submission, mentioning MIAME and GEO2R. Below this, there are three columns of links: "Memulai" (Ringasan, Tanya Jawab Umum, Tentang GEO DataSets, Tentang Profil GEO, Tentang Analisis GEO2R, Cara Membuat Query, Cara Mengunduh Data), "Peralatan" (Pencarian Studi di GEO DataSets, Pencarian Ekspresi Gen di Profil GEO, Pencarian Dokumentasi GEO, Menganalisis Studi dengan GEO2R, Studi dengan Jejak Penampil Data Genom, Akses Terprogram, Situs FTP, Daftar dan Trek Data ENCODE), and "Telusuri Konten" (Peramban Repository, Kumpulan Data: 4348, Seri: 254295, Peron: 27351, Sampel: 7818925). At the bottom, there is a section for "Informasi untuk Pengirim" with links for Masuk untuk Kirim, Pedoman Pengajuan, Pedoman Pembaruan, Standar MIAME, Mengutip dan Menautkan ke GEO, and a link to the summary page: [ncbi.nlm.nih.gov/summary/](https://www.ncbi.nlm.nih.gov/geo/summary/).

3. Select the search result

#### 4. Click the "Analyze with GEO2R" button



5. Select "Define Groups", then create 2 groups namely PAH and Control. The PAH group contains infected patients while the control group contains healthy patients.

6. Group each group by source name. "Lung\_all PAH" is grouped in the PAH group, while "Lung\_FD" is grouped in the control group.

7. After everything is grouped, the data is analyzed by clicking "Analyze"



GEO ID	Sample ID	Source	Lung	Disease	Gender
PAH	GSE11726142	PHB_977	Lung_all PAH	all PAH	FFM
PAH	GSE11726143	PHB_978	Lung_all PAH	all PAH	FFM
PAH	GSE11726144	PHB_379	Lung_all PAH	all PAH	Other
PAH	GSE11726145	PHB_983	Lung_all PAH	all PAH	FFM
Control	GSE11726146	PHB_982	Lung_FD	FD	Failed Donor
Control	GSE11726147	PHB_983	Lung_FD	FD	Failed Donor
PAH	GSE11726148	PHB_384	Lung_all PAH	all PAH	FFM
PAH	GSE11726149	PHB_385	Lung_all PAH	all PAH	FFM

**GEO2R** Options Profile graph R script

**Quick start**

- Specify a GEO Series accession and a Platform if prompted.
- Click 'Define groups' and enter names for the groups of Samples you plan to compare, e.g. test and control.
- Assign Samples to each group. Highlight Sample rows then click the group name to assign those Samples to the group. Use the Sample metadata (title, source and characteristics) columns to help determine which Samples belong to which group.
- Click 'Analyze' to perform the calculation with default settings.
- You may change settings in the Options tab.

How to use

Analyze

8. Results can be seen in visualizations and tables.

9. Note the following to be able to identify:

Column	Explanation
Gene.symbol	Gene name
logFC (log Fold Change)	Change value of gene expression. - Positive: gene up (overexpressed) - Negative: gene down (underexpressed)

To read the logFC consider the following criteria:

- $\log FC > 1 \rightarrow$  Genes are expressed higher in the patient (e.g. proinflammatory genes).
- $\log FC < -1 \rightarrow$  Genes are expressed lower in patients (e.g. protective genes such as vasodilators).

10. Analyse the results through the data from the table to determine the relationship between genes and cases. Analyse the data referring to the gene names viz: EDN1, PDGFB, BMPR2, NOS3. Analyse by reading the logFC according to the criteria in the previous point. Provide an explanation of the meaning of the logFC results of these genes by relating them to the case.

**Fill in the column below based on the investigation results!**

Gene	logFC	Gene Explanation
BMPR2		
EDN1		
NOS3		
PDGFB		

Answer the questions below by linking to the previous answers!

1. What happens if the EDN1 gene is overexpressed in the lung?

2. Why is the BMPR2 gene important for keeping blood vessels healthy?

3. What happens if the NOS3 gene is decreased and the body lacks nitric oxide (NO)?

4. The PDGFB gene is increased in HAP patients. What do you think will happen if this gene makes the lung blood vessel walls thicker?

Please answer the following questions again

## Questions

**What do you know about genetics?**

**What diseases can be caused by genetic factors?**

**Do you know about hypertension?**

**What factors can cause a person to develop hypertension?**

**Do you know that one of the causes of hypertension is exposure to aromatic chemical substances? Give the explanation!**

**What are the serious complications that can arise from uncontrolled high blood pressure?**

## Expected Answer