pulmonary arterial hypertension

Pulmonary arterial hypertension is a progressive disorder characterized by abnormally high blood pressure (hypertension) in the pulmonary artery, the blood vessel that carries blood from the heart to the lungs. Pulmonary arterial hypertension is one form of a broader condition known as pulmonary hypertension. Pulmonary hypertension occurs when most of the very small arteries throughout the lungs narrow in diameter, which increases the resistance to blood flow through the lungs. To overcome the increased resistance, blood pressure increases in the pulmonary artery and in the right ventricle of the heart, which is the chamber that pumps blood into the pulmonary artery. Ultimately, the increased blood pressure can damage the right ventricle of the heart.

Signs and symptoms of pulmonary arterial hypertension occur when increased blood pressure cannot fully overcome the elevated resistance. As a result, the flow of oxygenated blood from the lungs to the rest of the body is insufficient. Shortness of breath (dyspnea) during exertion and fainting spells are the most common symptoms of pulmonary arterial hypertension. People with this disorder may experience additional symptoms, particularly as the condition worsens. Other symptoms include dizziness, swelling (edema) of the ankles or legs, chest pain, and a rapid heart rate.

Frequency

In the United States, about 1,000 new cases of pulmonary arterial hypertension are diagnosed each year. This disorder is twice as common in females as in males.

Genetic Changes

Mutations in the *BMPR2* gene are the most common genetic cause of pulmonary arterial hypertension. This gene plays a role in regulating the number of cells in certain tissues. Researchers suggest that a mutation in this gene promotes cell division or prevents cell death, resulting in an overgrowth of cells in small arteries throughout the lungs. As a result, these arteries narrow in diameter, which increases the resistance to blood flow. Blood pressure in the pulmonary artery and the right ventricle of the heart increases to overcome the increased resistance to blood flow.

Mutations in several additional genes have also been found to cause pulmonary arterial hypertension, but they are much less common causes of the disorder than are *BMPR2* gene mutations. Variations in other genes may increase the risk of developing pulmonary arterial hypertension or modify the course of the disease (usually making it more severe). Changes in as-yet-unidentified genes may also be associated with this condition.

Although pulmonary arterial hypertension often occurs on its own, it can also be part of syndromes that affect many parts of the body. For example, this condition is occasionally found in people with systemic scleroderma, systemic lupus erythematosus, critical congenital heart disease, or Down syndrome.

Researchers have also identified nongenetic factors that increase the risk of developing pulmonary arterial hypertension. These include certain drugs used as appetite suppressants and several illegal drugs, such as cocaine and methamphetamine. Pulmonary arterial hypertension is also a rare complication of certain infectious diseases, including HIV and schistosomiasis.

Inheritance Pattern

Pulmonary arterial hypertension is usually sporadic, which means it occurs in individuals with no known family history of the disorder. These non-familial cases are described as idiopathic pulmonary arterial hypertension. About 20 percent of these cases are caused by mutations in one of the genes known to be associated with the disease, but most of the time a causative gene mutation has not been identified.

Inherited cases of this disorder are known as familial pulmonary arterial hypertension. When the condition is inherited, it most often has an autosomal dominant pattern of inheritance, which means one copy of an altered gene in each cell is sufficient to cause the disorder. However, many people with an altered gene never develop pulmonary arterial hypertension; this phenomenon is called reduced penetrance.

Other Names for This Condition

- Ayerza syndrome
- familial primary pulmonary hypertension
- FPPH
- idiopathic pulmonary hypertension
- PAH
- PPH
- PPHT
- primary pulmonary hypertension
- sporadic primary pulmonary hypertension

Diagnosis & Management

These resources address the diagnosis or management of pulmonary arterial hypertension:

- GeneReview: Heritable Pulmonary Arterial Hypertension
  https://www.ncbi.nlm.nih.gov/books/NBK1485
- Genetic Testing Registry: Primary pulmonary hypertension
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0152171/
- Genetic Testing Registry: Primary pulmonary hypertension 2
  https://www.ncbi.nlm.nih.gov/gtr/conditions/CN178221/
- Genetic Testing Registry: Primary pulmonary hypertension 3
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C3809192/
- Genetic Testing Registry: Primary pulmonary hypertension 4
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C3809198/
- MedlinePlus Encyclopedia: Pulmonary hypertension
  https://medlineplus.gov/ency/article/000112.htm

These resources from MedlinePlus offer information about the diagnosis and management of various health conditions:

- Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html
- Drug Therapy
  https://medlineplus.gov/drugtherapy.html
- Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html
- Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html
- Palliative Care
  https://medlineplus.gov/palliativecare.html

Additional Information & Resources

<u>MedlinePlus</u>

- Encyclopedia: Pulmonary hypertension
  https://medlineplus.gov/ency/article/000112.htm
- Health Topic: Pulmonary Hypertension
  https://medlineplus.gov/pulmonaryhypertension.html

Genetic and Rare Diseases Information Center

- Pulmonary arterial hypertension
  https://rarediseases.info.nih.gov/diseases/7501/pulmonary-arterial-hypertension

Additional NIH Resources

- National Heart, Lung, and Blood Institute
  https://www.nhlbi.nih.gov/health/health-topics/topics/pah/

Educational Resources

- American Thoracic Society
  https://www.thoracic.org/patients/patient-resources/resources/pulmonary-hypertension.pdf
- Boston Children's Hospital
  http://www.childrenshospital.org/conditions-and-treatments/conditions/pulmonary-hypertension
- Centers for Disease Control and Prevention (CDC)
  https://www.cdc.gov/DHDSP/data_statistics/fact_sheets/fs_pulmonary_hypertension.htm
- Cincinnati Children's Hospital Medical Center
  https://www.cincinnatichildrens.org/health/p/pulmonary-hypertension
- Cleveland Clinic
  http://my.clevelandclinic.org/health/articles/pulmonary-hypertension-causes-symptoms-diagnosis-treatment
- Disease InfoSearch: Idiopathic pulmonary hypertension
  http://www.diseaseinfosearch.org/Idiopathic+pulmonary+hypertension/3758
- Disease InfoSearch: Pulmonary Hypertension
  http://www.diseaseinfosearch.org/Pulmonary+Hypertension/6088
- MalaCards: heritable pulmonary arterial hypertension
  http://www.malacards.org/card/heritable_pulmonary_arterial_hypertension
- Merck Manual Consumer Version
  http://www.merckmanuals.com/home/lung-and-airway-disorders/pulmonary-hypertension/pulmonary-hypertension
- Ohio State University Medical Center
  https://wexnermedical.osu.edu/lung-pulmonary/pulmonary-hypertension
- Orphanet: Heritable pulmonary arterial hypertension
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=275777
- Orphanet: Idiopathic and/or familial pulmonary arterial hypertension
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=422

- Orphanet: Idiopathic pulmonary arterial hypertension
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=275766
- Orphanet: Pulmonary arterial hypertension
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=182090
- Pulmonary Hypertension Clinical & Research Team, Vanderbilt University School of Medicine: Resources
  https://medschool.vanderbilt.edu/pah/publication/resources

Patient Support and Advocacy Resources

- American Heart Association
  http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/What-is-Pulmonary-Hypertension_UCM_301792_Article.jsp
- PH Central
  http://www.phcentral.org
- Pulmonary Hypertension Association
  https://www.phassociation.org/sslpage.aspx?pid=197
- RareConnect
  https://www.rareconnect.org/en/community/pulmonary-hypertension

GeneReviews

- Heritable Pulmonary Arterial Hypertension
  https://www.ncbi.nlm.nih.gov/books/NBK1485

Genetic Testing Registry

- Primary pulmonary hypertension
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0152171/
- Primary pulmonary hypertension 2
  https://www.ncbi.nlm.nih.gov/gtr/conditions/CN178221/
- Primary pulmonary hypertension 3
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C3809192/
- Primary pulmonary hypertension 4
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C3809198/

ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22pulmonary+arterial+hypertension%22+OR+%22primary+pulmonary+hypertension%22

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28primary+pulmonary+hypertension%5BTI%5D%29+OR+%28pulmonary+arterial+hypertension%5BTI%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+360+days%22%5Bdp%5D

OMIM

- PULMONARY HYPERTENSION, PRIMARY, 1
  http://omim.org/entry/178600
- PULMONARY HYPERTENSION, PRIMARY, 2
  http://omim.org/entry/615342
- PULMONARY HYPERTENSION, PRIMARY, 3
  http://omim.org/entry/615343
- PULMONARY HYPERTENSION, PRIMARY, 4
  http://omim.org/entry/615344

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