



GENETIC DISORDER, HPO, OMIM and ClinVar

Nov 23 2024

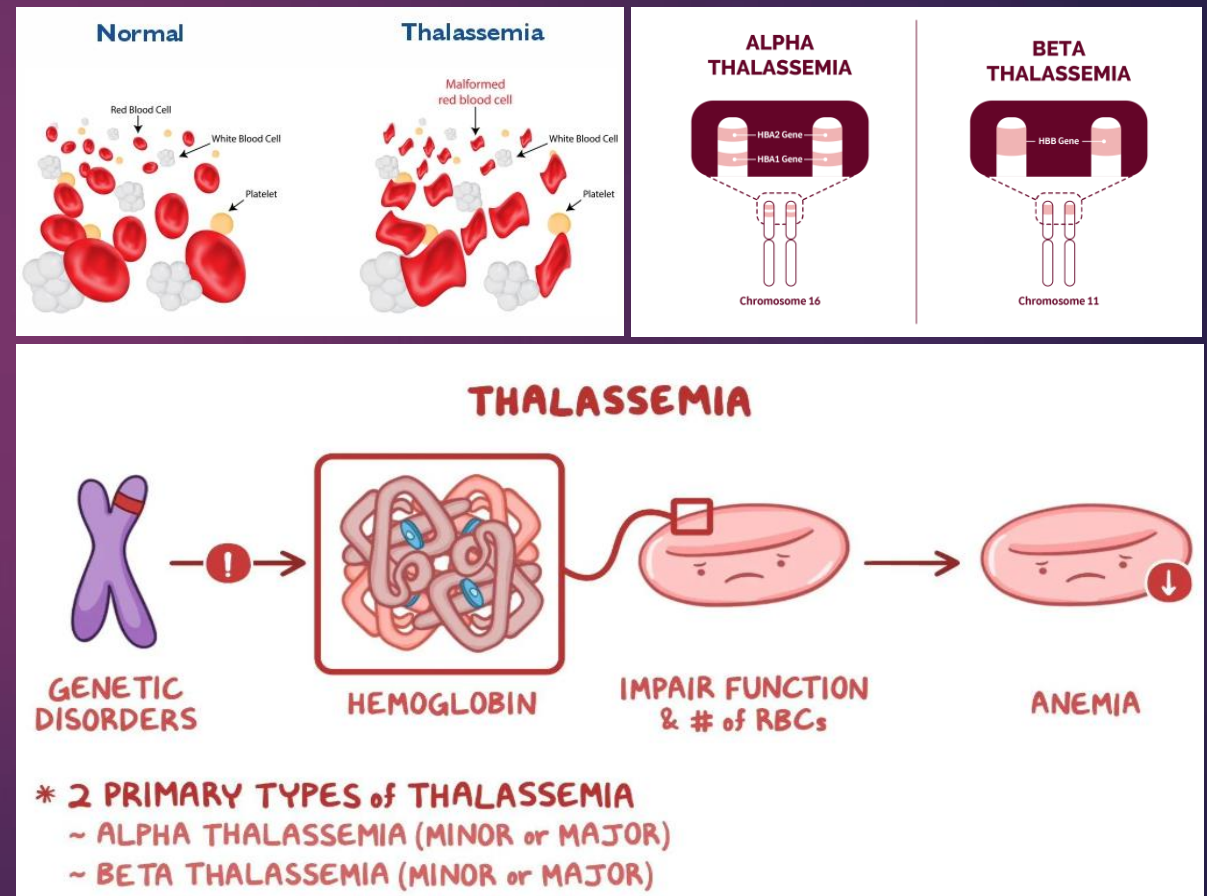
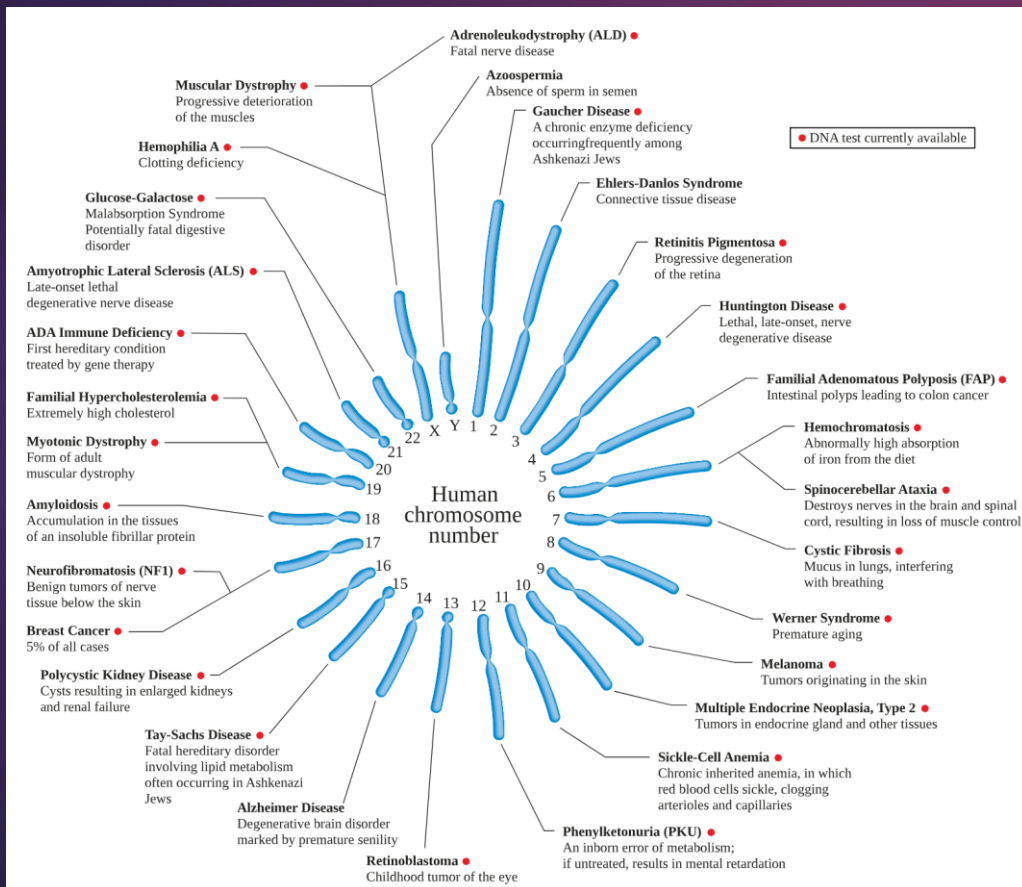
Giảng viên: TS. Lưu Phúc Lợi
Luu.p.loi@googlemail.com

Content of Lecture 3

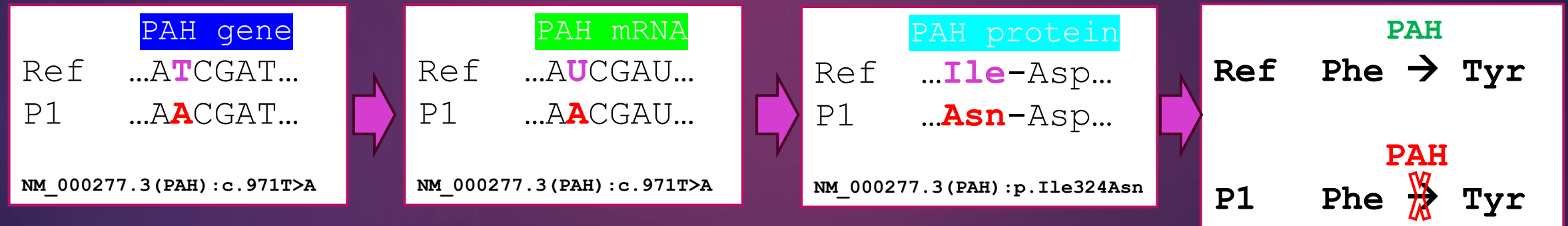
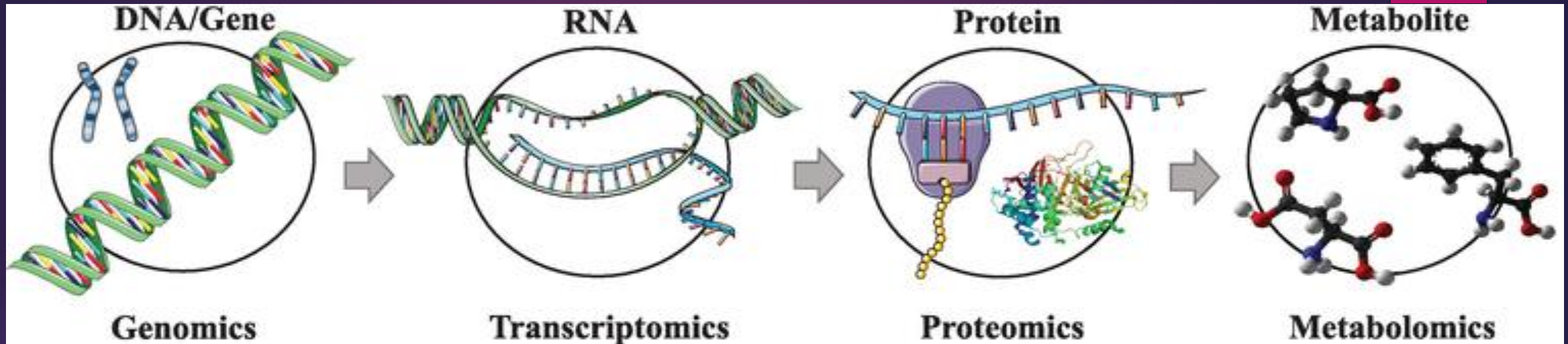
1. Genetic disorder
2. Introduction to HPO (The Human Phenotype Ontology)
3. Introduction to OMIM
4. Introduction to ClinVar

Genetic disorder

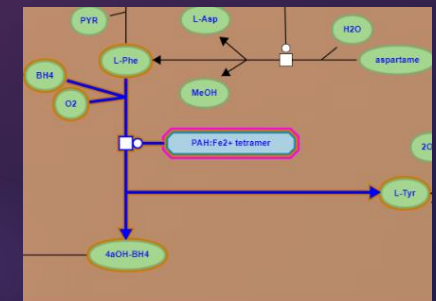
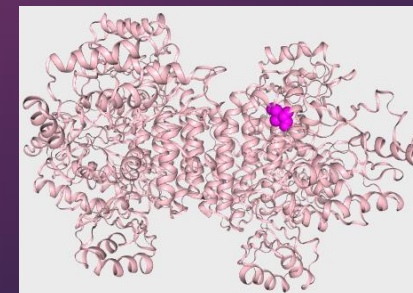
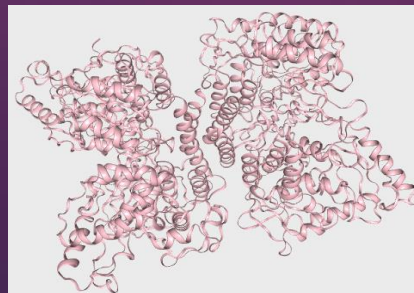
- A genetic disorder is a health problem caused by one or more abnormalities in the genome. It can be caused by a mutation in a single gene or multiple genes or by a chromosome abnormality.



Quan hệ nhân quả: Biến thể gen và bệnh di truyền



10.5772/intechopen.71769



Multigenerational Conditions

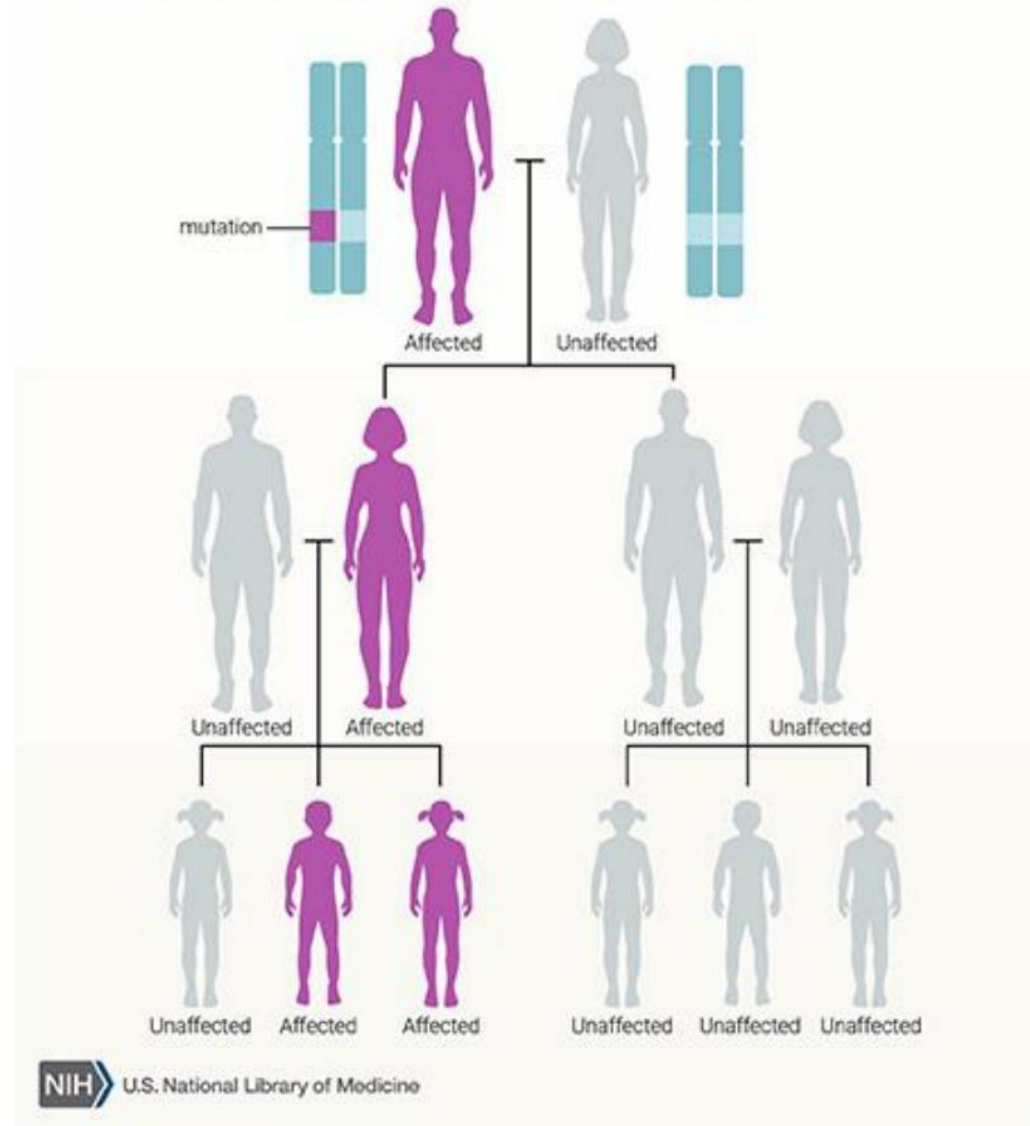
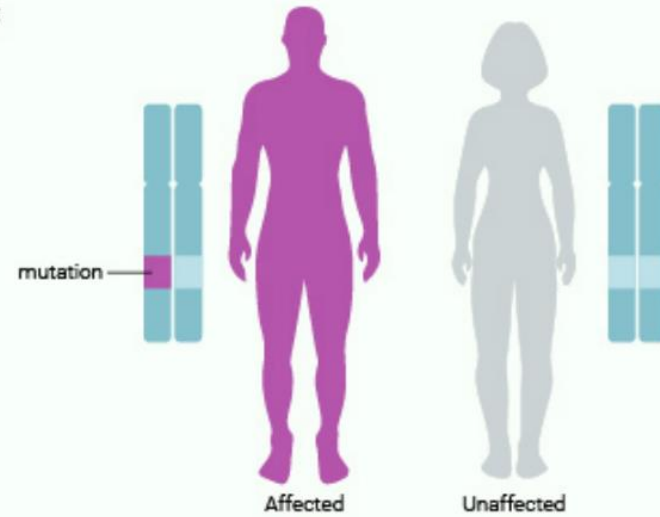


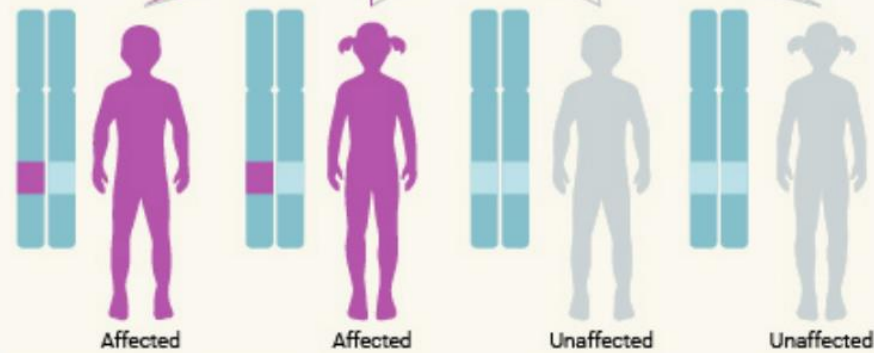
FIGURE 1: Three generations of a family with a genetic disorder.

Autosomal Dominant

Parents



Children

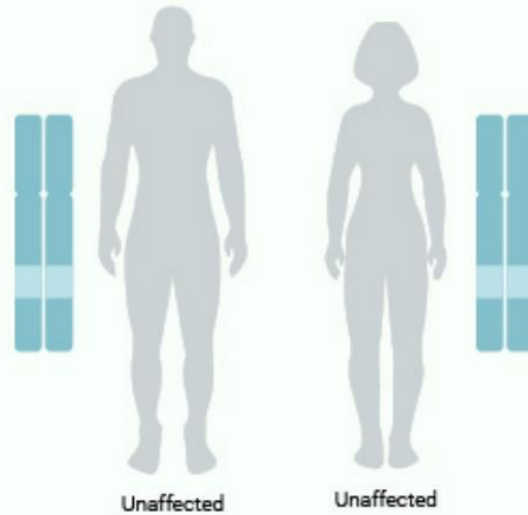


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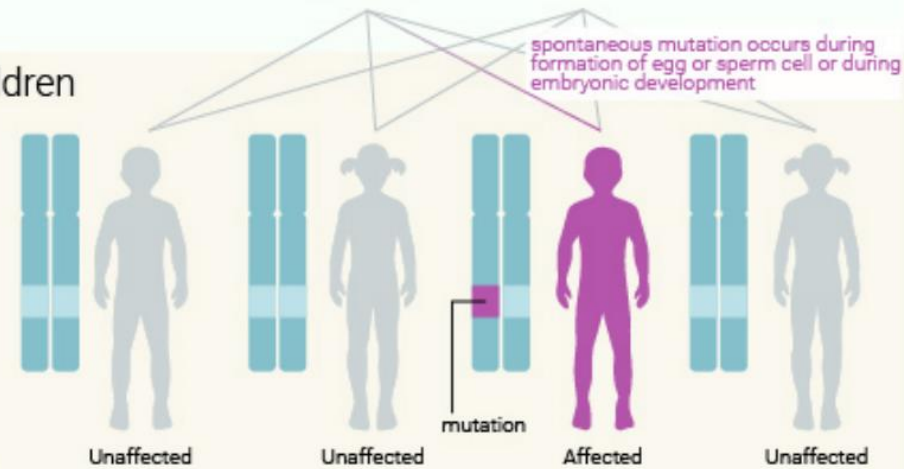
FIGURE 2: A parent with an autosomal dominant condition passes the altered gene to two affected children. Two other children do not receive the altered gene, and are unaffected.

Autosomal Dominant - New Mutation

Parents



Children

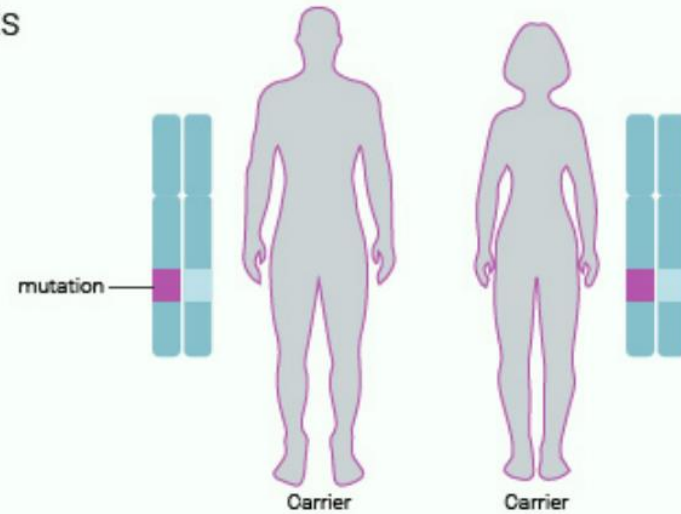


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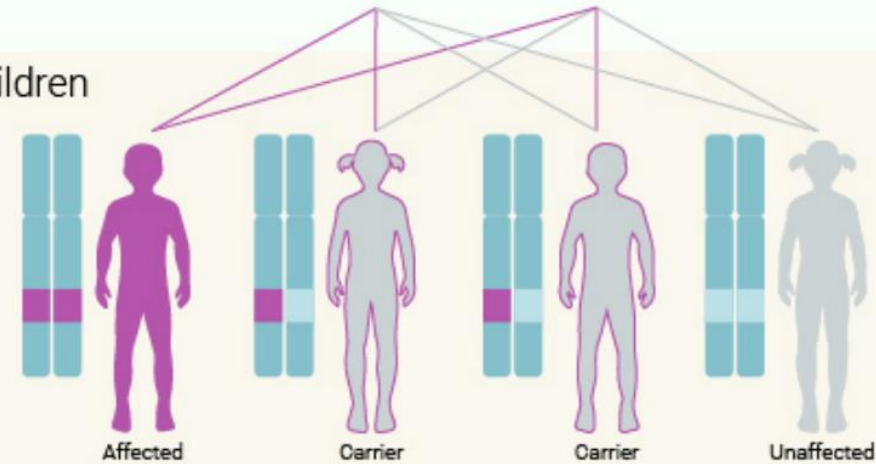
FIGURE 3: Neither parent has the mutated gene. A spontaneous mutation occurs during the formation of an egg or sperm cell during embryonic development, leading to an affected child.

Autosomal Recessive

Parents



Children

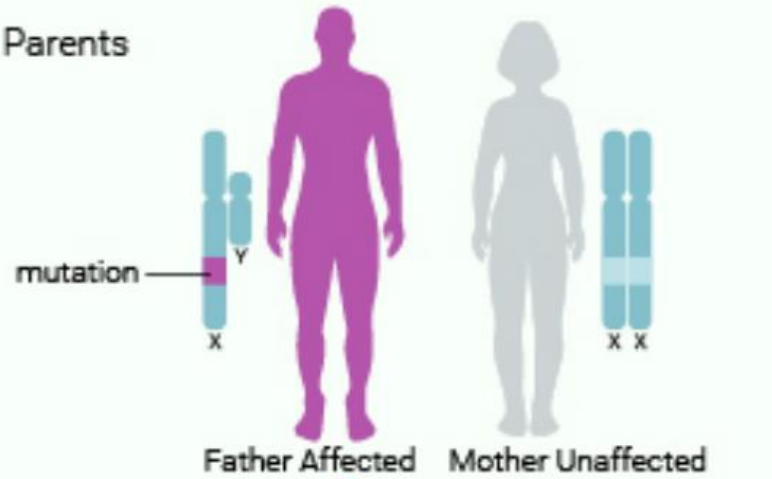


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FIGURE 4: Both parents carry one copy of a mutated gene. In the next generation, one child is affected with the condition, two children are carriers, and one is unaffected and not a carrier.

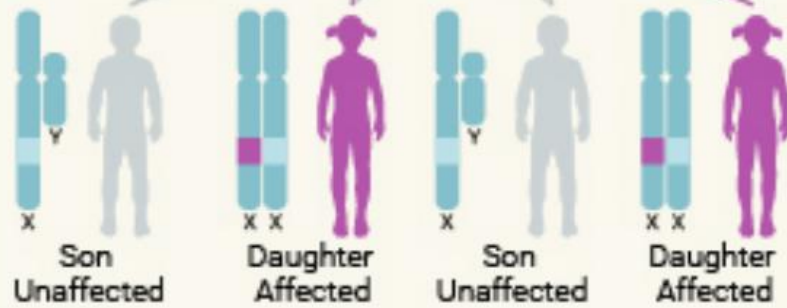
X-Linked Dominant

Parents

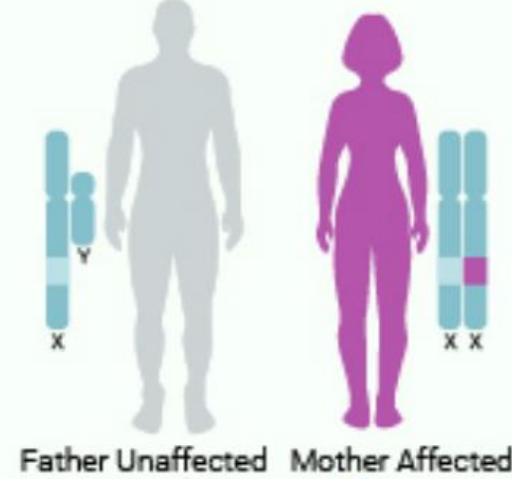


Father Affected Mother Unaffected

Children



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Father Unaffected Mother Affected

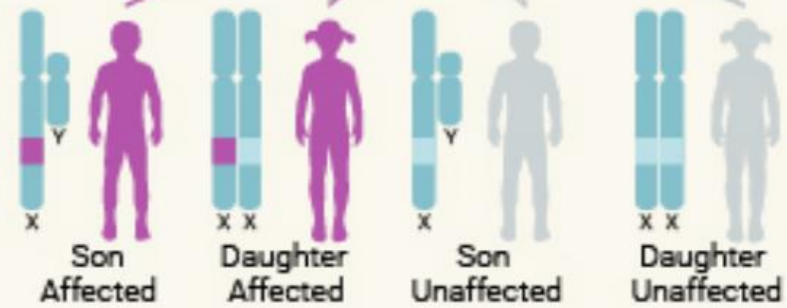


FIGURE 5: Inheritance of an X-linked dominant disorder depends on which parent is affected.

X-Linked Recessive

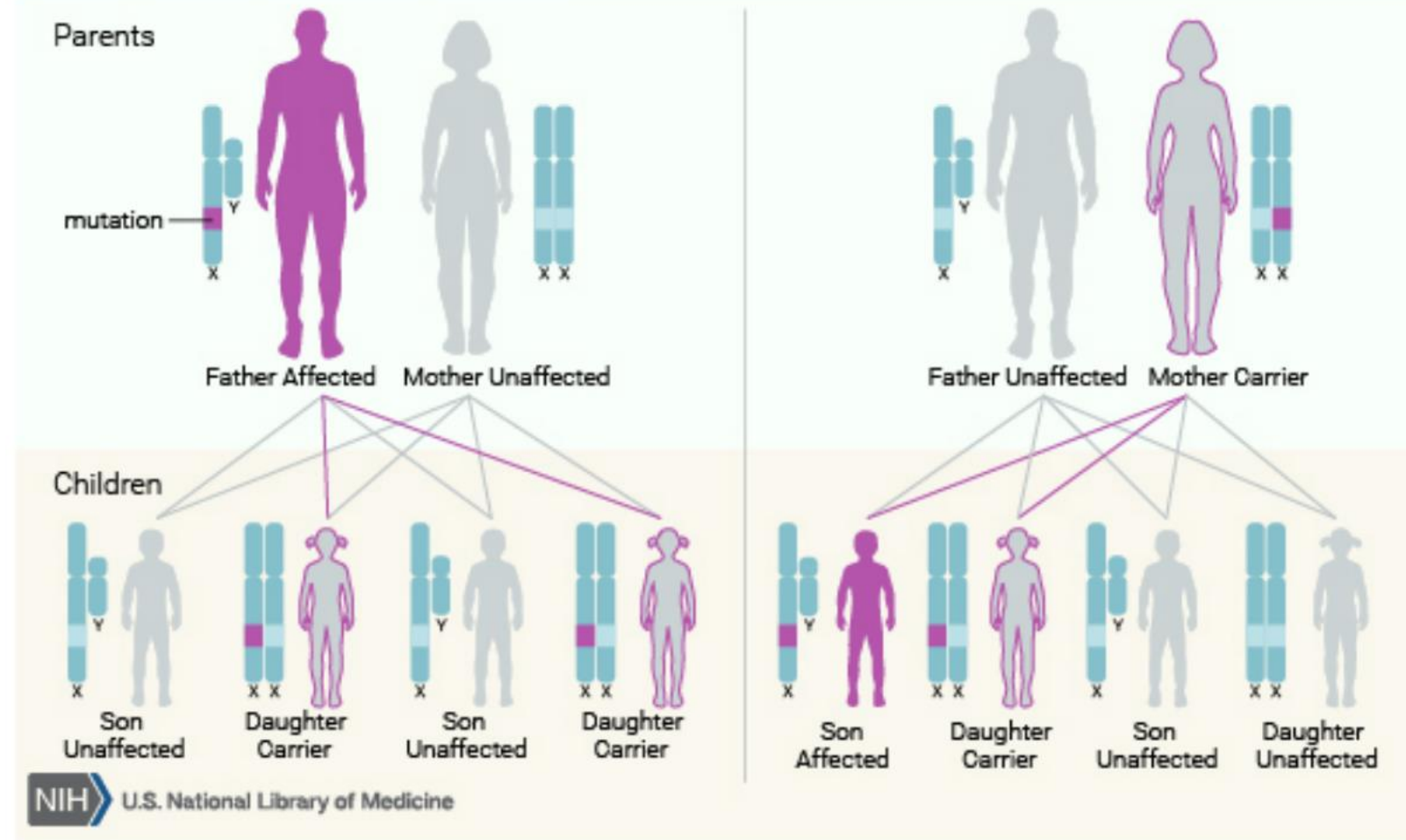
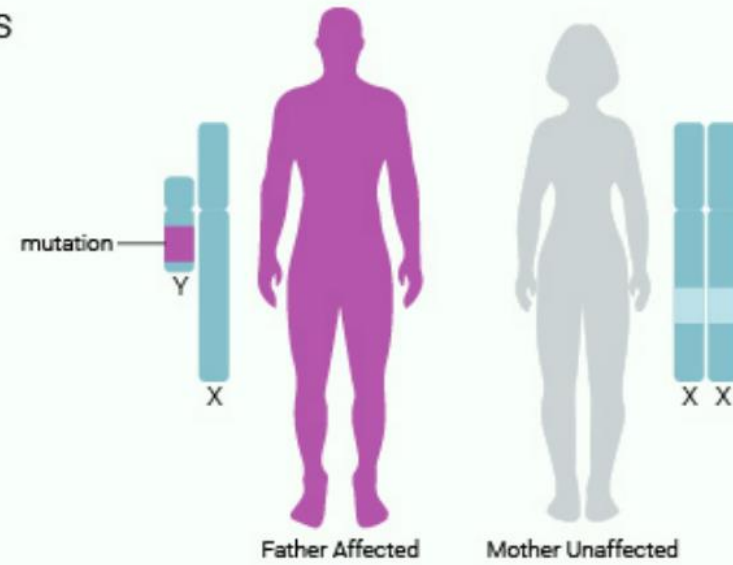


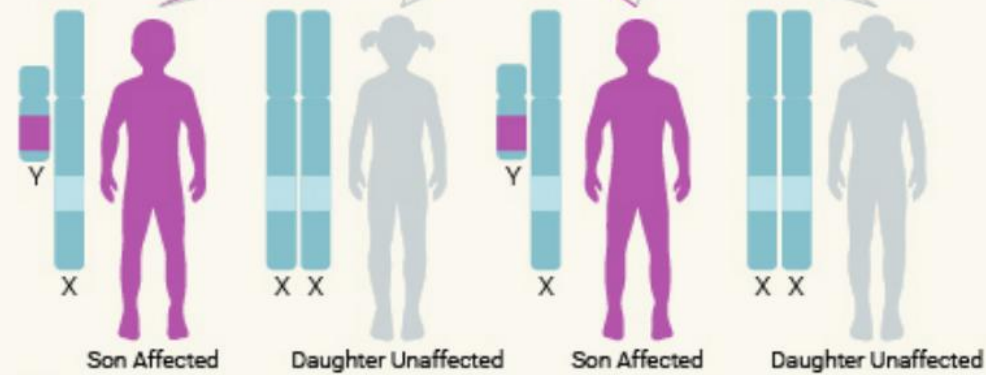
FIGURE 6: Two generations of a family with an X-linked recessive disorder. In this form of inheritance, the chance of being affected or being a carrier depends on whether the mother or the father has the mutated gene on the X chromosome.

Y-Linked

Parents



Children

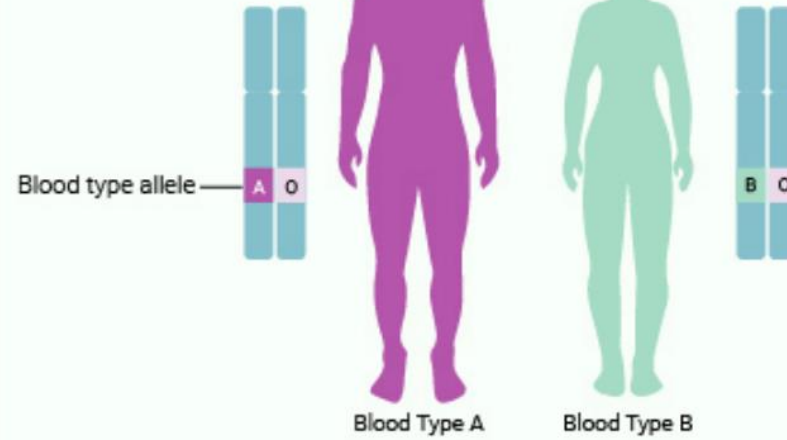


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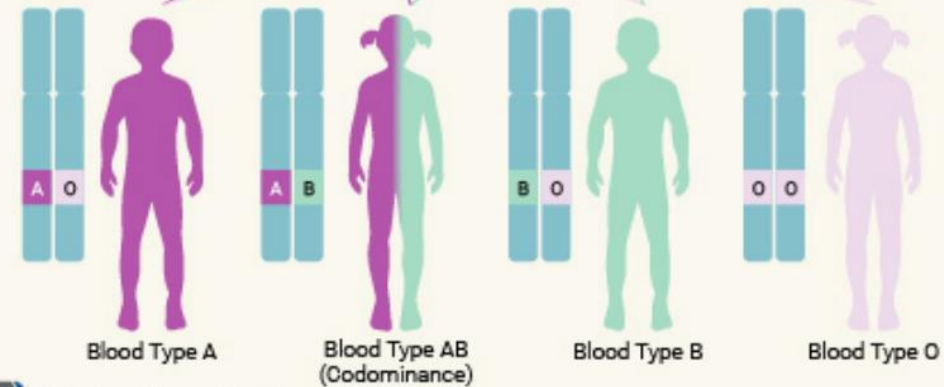
FIGURE 7: A father and sons are affected with a Y-linked disorder, which is

Codominance - example Blood Type

Parents



Children

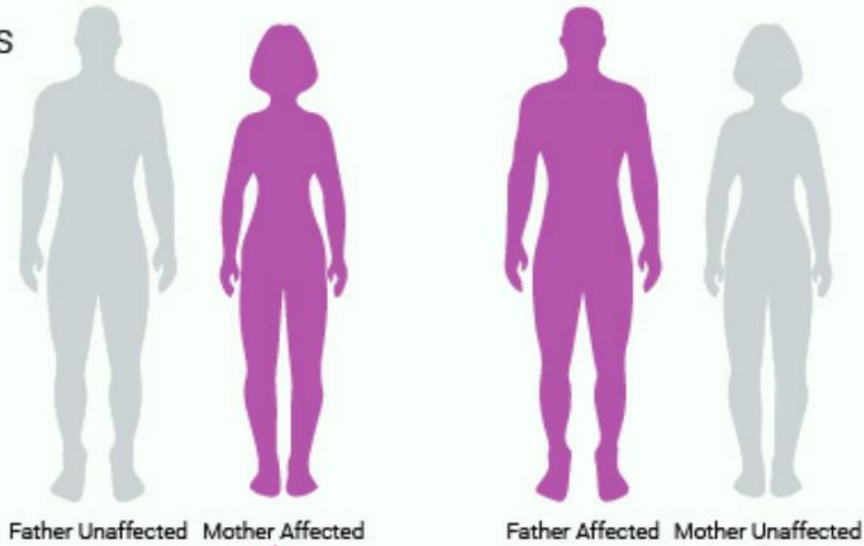


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FIGURE 8: ABO blood type is an example of a trait with codominant inheritance.

Mitochondrial

Parents



Children



Children Affected

Mitochondrial DNA is only
inherited from the mother

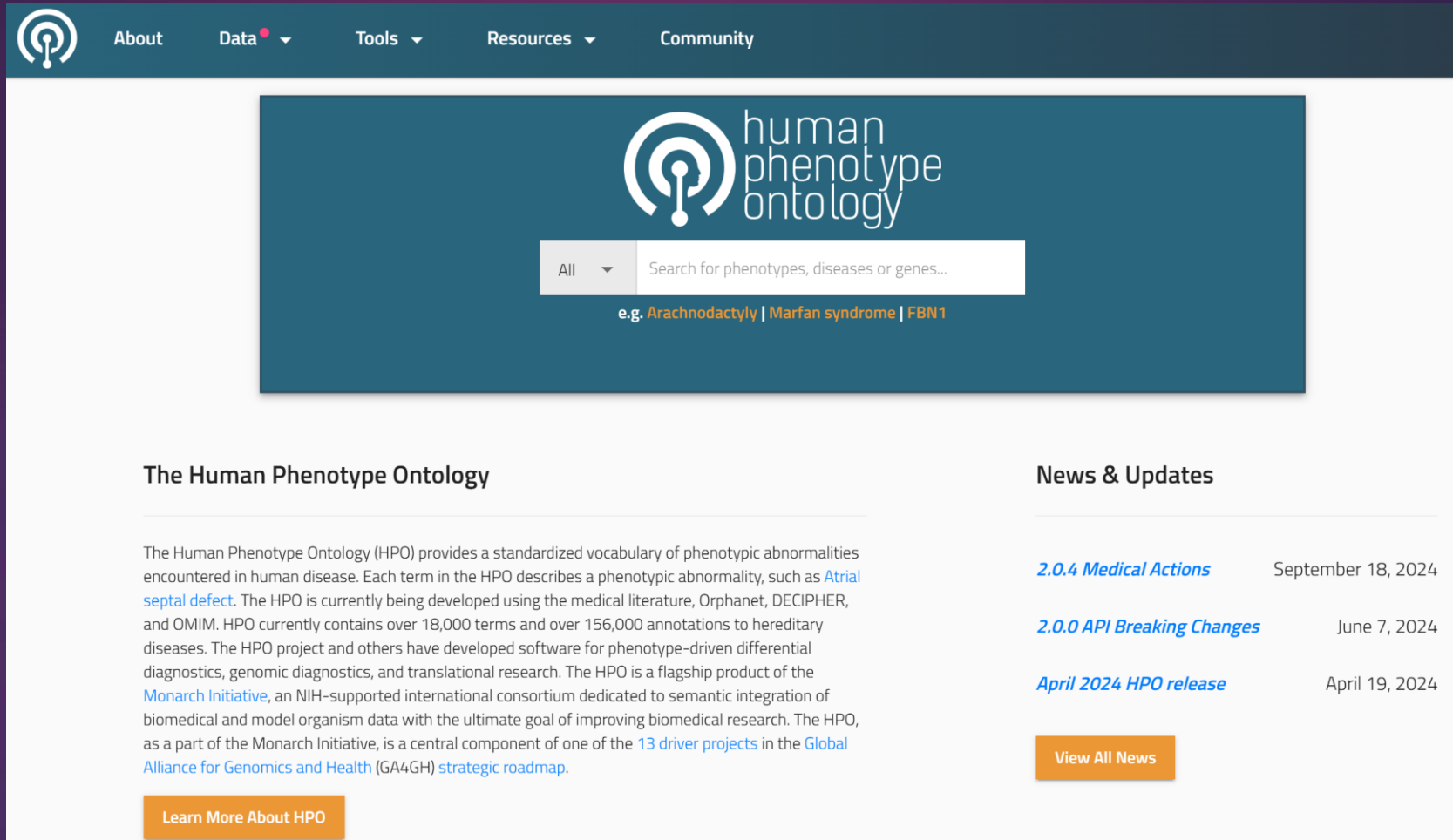


Children Unaffected

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FIGURE 9: The inheritance of a mitochondrial disorder depends whether the mother or the father has the mutation in mitochondrial DNA.

The Human Phenotype Ontology (HPO)



The screenshot shows the homepage of the Human Phenotype Ontology (HPO) website. The header is dark teal with a logo on the left and navigation links: About, Data (with a red dot), Tools, Resources, and Community. Below the header is a large teal banner featuring the HPO logo and a search bar. The search bar has a dropdown menu set to 'All' and a placeholder text 'Search for phenotypes, diseases or genes...'. Below the search bar, it lists examples: 'e.g. Arachnodactyly | Marfan syndrome | FBN1'. The main content area is divided into two columns. The left column is titled 'The Human Phenotype Ontology' and contains a paragraph describing the HPO's purpose and its association with the Monarch Initiative. At the bottom of this column is an orange button labeled 'Learn More About HPO'. The right column is titled 'News & Updates' and lists three recent updates: '2.0.4 Medical Actions' dated September 18, 2024, '2.0.0 API Breaking Changes' dated June 7, 2024, and 'April 2024 HPO release' dated April 19, 2024. At the bottom of this column is an orange button labeled 'View All News'.

The Human Phenotype Ontology

The Human Phenotype Ontology (HPO) provides a standardized vocabulary of phenotypic abnormalities encountered in human disease. Each term in the HPO describes a phenotypic abnormality, such as [Atrial septal defect](#). The HPO is currently being developed using the medical literature, Orphanet, DECIPHER, and OMIM. HPO currently contains over 18,000 terms and over 156,000 annotations to hereditary diseases. The HPO project and others have developed software for phenotype-driven differential diagnostics, genomic diagnostics, and translational research. The HPO is a flagship product of the [Monarch Initiative](#), an NIH-supported international consortium dedicated to semantic integration of biomedical and model organism data with the ultimate goal of improving biomedical research. The HPO, as a part of the Monarch Initiative, is a central component of one of the [13 driver projects](#) in the [Global Alliance for Genomics and Health \(GA4GH\) strategic roadmap](#).

[Learn More About HPO](#)

News & Updates

2.0.4 Medical Actions	September 18, 2024
2.0.0 API Breaking Changes	June 7, 2024
April 2024 HPO release	April 19, 2024

[View All News](#)

<https://hpo.jax.org/>

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Search Results For "Marfan syndrome"

Not seeing what you're looking for? [Contribute a term](#)

Term Results [86]			
Disease Results [7]			
Gene Results [0]			
Filter			
Term Identifier	Term Name	Matching String	Synonym Match
HP:0000012	Urinary urgency		Yes
HP:000100	Nephrotic syndrome		Yes
HP:0000840	Adrenogenital syndrome		Yes
HP:0001071	Angiokeratoma corporis diffusum		Yes
HP:0001097	Keratoconjunctivitis sicca		Yes
HP:0001156	Brachydactyly		Yes
HP:0001357	Plagiocephaly		Yes

Hierarchy

Nephrotic syndrome HP:000100

English Chinese Czech Dutch French German Italian Japanese Spanish Turkish

Nephrotic syndrome is a collection of findings resulting from glomerular dysfunction with an increase in glomerular capillary wall permeability associated with pronounced proteinuria. Nephrotic syndrome refers to the constellation of clinical findings that result from severe renal loss of protein, with proteinuria and hypoalbuminemia, edema, and hyperlipidemia.

Synonyms: Nephrosis

Comment: In adults, nephrotic syndrome is characterized by protein excretion of 3.5 g or more per day. In children, nephrotic syndrome is accompanied by protein excretion of more than 40 mg/m²/h and hypoalbuminemia < 2.5 mg/dL.

Cross References: SNOMEDCT_US:52294009 UMLS:C0027726

Export Associations Translate your language

Disease Associations Gene Associations (Inferred) Medical Actions LOINC Associations

Filter by disease






Disease ID	Disease Name
OMIM:255580	Nephrotic syndrome, type 1

The Human Phenotype Ontology (HPO)

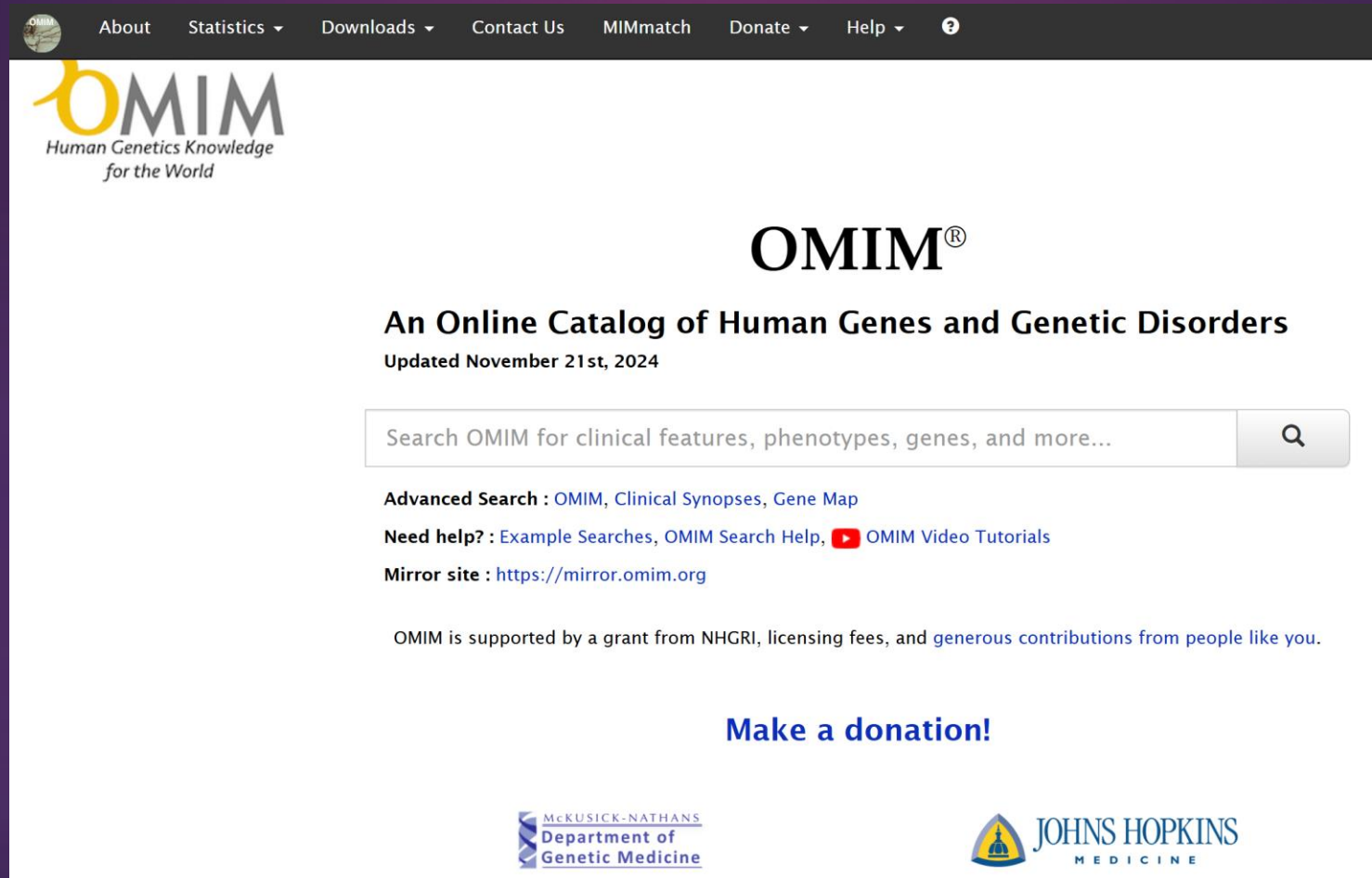
Disease Associations	Gene Associations [Inferred]	Medical Actions	LOINC Associations
Filter by gene			
Gene Id		Gene Symbol	
NCBIGene:4868		NPHS1	
NCBIGene:112858		TP53RK	
NCBIGene:2013		EMP2	
NCBIGene:286204		CRB2	
NCBIGene:9688		NUP93	
NCBIGene:9863		MAGI2	
139 gene associations.			

<https://hpo.jax.org/browse/term/HP:0000100>

The Human Phenotype Ontology (HPO)

Disease Associations	Gene Associations [Inferred]	Medical Actions	LOINC Associations	
MaXo Id	MaXo Name	Relation	Sources	
MAXO:0000653	angiotensin receptor blocker therapy	TREATS	PubMed 	
MAXO:0000640	corticosteroid agent therapy	TREATS	PubMed 	
MAXO:0000297	immune suppressant agent therapy	TREATS	PubMed 	
MAXO:0000190	RAAS inhibitor therapy	TREATS	PubMed 	
MAXO:0000652	ACE inhibitor therapy	TREATS	PubMed 	
				5 medical actions.

OMIM: An Online Catalog of Human Genes and Genetic Disorders



The screenshot shows the OMIM website homepage. At the top is a dark navigation bar with links: About, Statistics, Downloads, Contact Us, MIMmatch, Donate, Help, and a question mark icon. Below the navigation bar is the OMIM logo with the tagline "Human Genetics Knowledge for the World". The main heading is "OMIM®" followed by "An Online Catalog of Human Genes and Genetic Disorders" and "Updated November 21st, 2024". A search bar with the placeholder text "Search OMIM for clinical features, phenotypes, genes, and more..." and a magnifying glass icon is present. Below the search bar are links for "Advanced Search : OMIM, Clinical Synopses, Gene Map", "Need help? : Example Searches, OMIM Search Help, OMIM Video Tutorials", and "Mirror site : https://mirror.omim.org". A paragraph states "OMIM is supported by a grant from NHGRI, licensing fees, and generous contributions from people like you." Below this is a "Make a donation!" link. At the bottom are logos for the McKusick-Nathans Department of Genetic Medicine and Johns Hopkins Medicine.

OMIM
Human Genetics Knowledge
for the World

OMIM®

An Online Catalog of Human Genes and Genetic Disorders

Updated November 21st, 2024

Search OMIM for clinical features, phenotypes, genes, and more...



Advanced Search : [OMIM](#), [Clinical Synopses](#), [Gene Map](#)

Need help? : [Example Searches](#), [OMIM Search Help](#), [OMIM Video Tutorials](#)

Mirror site : <https://mirror.omim.org>


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<https://omim.org/>

NCBI OMIM: An Online Catalog of Human Genes and Genetic Disorders

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OMIM

OMIM is a comprehensive, authoritative compendium of human genes and genetic phenotypes that is freely available and updated daily. OMIM is authored and edited at the McKusick-Nathans Institute of Genetic Medicine, Johns Hopkins University School of Medicine, under the direction of Dr. Ada Hamosh. Its official home is omim.org.

Using OMIM

[Getting Started](#)

[FAQ](#)

OMIM tools

[OMIM API](#)

Related Resources

[ClinVar](#)

[Gene](#)


[GTR](#)

[MedGen](#)

Last updated on: 21 Nov 2024

<https://www.ncbi.nlm.nih.gov/omim>

ClinVar: Reports of human variations classified for diseases and drug responses

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ACTGATGGTATGGGGCCAAGAGATATATCT
CAGGTACGGCTGTCATCACTTAGACCTCAC
CAGGGCTGGGCATAAAAGTCAGGGCAGAGC
CCATGGTGCATCTGACTCCTGAGGAGAAGT
GCAGTTGGTATCAAGGTTACAAGACAGGT
GGCACTGACTCTCTCTGCCTATTGGTCTAT

ClinVar

ClinVar aggregates information about genomic variation and its relationship to human health.

Using ClinVar

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- [ACMG Recommendations for Reporting of Secondary Findings](#)
- [ClinVar Submission Portal](#)
- [Submissions](#)
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Related Sites

- [ClinGen](#)
- [GeneReviews®](#)
- [GTR®](#)
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Xin chân thành cảm ơn!

LUU PHUC LOI, PHD

ZALO: 0901802182

LUU.P.LOI@GOOGLEMAIL.COM