Glomerular basement membrane disorders

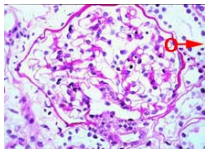
On this page we describe the normal glomerular basement membrane (GBM) and then some of the diseases that involve it.

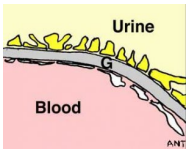
Inherited diseases of the GBM include:	Other diseases of the GBM include:
Alport syndrome	Goodpasture's (anti-GBM) disease
Thin GBM disease	Fibrillary nephritis
Benign familial haematuria	Other disorders
Nail patella syndrome	

Some of these disorders are the subject of research in Edinburgh: more information. Because of this, this are is covered in more detail than you will find in many places on the Internet.

The normal GBM

The GBM forms the boundary between blood and urine. Across it, water and other small molecules from the blood are filtered. This is described a little more in our page on normal kidneys. The GBM is made of a meshwork of proteins and other constituents. **Type IV collagen** and **laminin** are present in the largest quantities. Some specialized subtypes of these molecules are only found in specialised basement membranes such as the GBM. These are sometimes involved in kidney diseases.





NORMAL GBM. LEFT – a single glomerulus. There are one million of these in each kidney.
RIGHT – a close up of the GBM (**G**) around part of one tiny blood vessel in a glomerulus (red circle in left hand diagram)

Alport syndrome

Alport syndrome is the second most common inherited cause of kidney failure. It is caused by a defect in one of the specialised types of type IV collagen. The GBM deteriorates with time, leading to progressive loss of glomeruli, often with deafness. Further information on Alport syndrome.

Thin GBM disease

Is exactly what it says. The GBM is thin, and must sometimes break, as it causes blood to appear in the urine. However it seems to repair without any ill effect, as thin GBM disease does not usually cause serious trouble.

The condition often runs in families, and can be a cause of benign familial haematuria (see below).

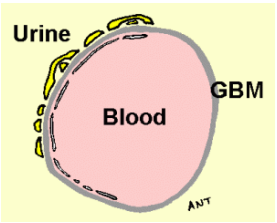
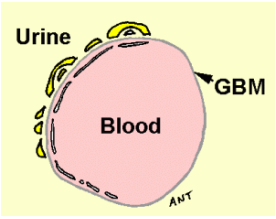


Diagram of a normal GBM in a glomerulus (compare with the diagram above)



The same with a thin GBM

The disease is diagnosed by a kidney biopsy in which the glomerulus is examined using an electron microscope to measure the thickness of the GBM. These measurements are not easy, and the normal thickness of the GBM varies a little with age. The approximate normal thickness is about one quarter of one thousandth of a millimetre.

Some people with thin GBM disease carry an abnormal type IV collagen gene of the type that can cause Alport syndrome (see above). However they also have a normal copy of the same gene, which is usually enough to prevent serious trouble (cells contain two copies of all genes, except for those genes carried on the X chromosome. Where a disease only occurs if both copies are abnormal it is called 'recessive'. Cystic fibrosis is the most common recessive disorder). Only when two people who both have abnormal genes have children together is there a risk that their children could have Alport syndrome (a maximum of a 1 in 4 chance for each child). This happens rarely and accounts for a small minority of cases of Alport syndrome.

Some people with thin GBM develop more severe kidney trouble. Read more about this on the Alport syndrome page, in the section about Carriers. We don't know why some people get more severe kidney disease. If you have Thin GBM Nephropathy (TBMN), it is wise to have an annual check of blood pressure, urine for protein, and probably a blood test of kidney function to be sure all is remaining well.

There is a discussion of conditions causing blood to appear in the urine in our page on haematuria.

Further information on thin GBM disease? We haven't found any good sources.
Let us know if you do.

Benign familial haematuria

The name just means that there is an inherited cause for blood appearing in the urine, and that those who have it don't usually come to any harm. Thin GBM disease (see above) often appears to explain this condition, but there may be other possible explanations. If kidney biopsies have shown thin GBM disease in other family members, it will not usually be necessary to undertake it in everyone who has blood in the urine.

There is a discussion of conditions causing blood to appear in the urine in our page on haematuria.

Nail-patella syndrome

This rare inherited condition has a surprising and unusual mix of different features. People who inherit it may have hardly anything to see, or they may have all of these. The most common features are:

Common abnormalities in nail patella syndrome:
Nails: nails of the thumbs and of the first finger or two are abnormally small and badly formed. How many nails are affected, and how badly, varies
Knee caps (patellae) – are usually missing or underdeveloped
Elbows – often do not straighten properly (this is called a contracture)
Iliac horns – these can be seen on X-rays of the pelvis, but aren't visible from the outside
Other problems with joints and skeleton are found in some people. These can include scoliosis (curvature of the spine), contracture of other joints besides the elbow, and congenital foot abnormalities. Aches and pains may sometimes be caused by these changes.
Kidneys – can have an abnormality of the GBM, and occasionally fail (see below)
Glaucoma – has been found quite commonly in patients with nail patella syndrome

Inheritance of the disease is 'autosomal dominant', which means that on average, one in two of the children of someone with Nail Patella Syndrome will inherit the condition. However people vary very much in how severely they are affected – from badly, to hardly at all.

Kidney disease does not always occur, and when it does it may be minor. Unfortunately in some people it is more serious and it may cause a protein leak (nephrotic syndrome), and in time progress to kidney failure. No way to prevent this from happening is known. Treatment is the same as for nephrotic syndrome and kidney failure of other types.

The gene causing Nail Patella Syndrome has been identified and is called LMX1B. This gene seems to control the amount of collagen produced in GBM, although how it causes the other features of the disease is not known.

Further information is available from:

Nail Patella Syndrome Worldwide	a not-for-profit organisation at www.nailpatella.org

Goodpasture's disease

Goodpasture's disease is an 'autoimmune' condition in which there can be severe inflammation affecting the kidneys and or lungs. More information is available:

- Short information on Goodpasture's disease
- More information on Goodpasture's disease

Fibrillary nephritis

This is a very rare condition in which the GBM is thickened by abnormal fibres that can be seen using an electron microscope. This disease has been discovered relatively recently and unfortunately remains poorly understood. It often causes a protein leak and nephrotic syndrome. Deterioration to kidney failure is common.

Other diseases affecting the GBM

The GBM is thickened with normal basement membrane material in two common kidney disease, membranous nephropathy and diabetic nephropathy (kidney disease caused by diabetes). Follow the links for further information.

Acknowledgements: The author of this page was Neil Turner. It was first published in 2001. The date it was last modified is shown in the footer.