

TREATMENTS FOR CHILDREN

Glomerulonephritis

Depending on the type of GN your child has, there are different medicines to help manage it. In very serious cases of GN, treatment focuses on the immune system to stop it from damaging the kidneys.

In the short-term, GN treatment tries to:

- Stop inflammation so the kidney filters (glomeruli) can repair themselves
- Manage complications such as high blood pressure, protein in the urine and swelling (edema)

In the long-term, GN treatment tries to:

- Maintain kidney function
- Stop GN from coming back

Some medicines that treat GN may interact with other treatments, foods, and medicines.

Always talk to the pediatric nephrology clinic team before making any changes to your child's medicines.

Kidney Health

Treatments for Children

Prednisone

Azathioprine

Mycophenolate mofetil

Cyclophosphamide

Rituximab

Cyclosporine

Tacrolimus

Plasma exchange

Prednisone

CHILDREN

Prednisone is an oral corticosteroid medicine. It weakens your child's immune system to stop it from attacking healthy cells and tissues. Prednisone replaces a hormone called cortisol that your child's body makes when they're stressed or sick.



Common side effects may include:

- Heartburn, upset stomach (nausea)
- Problems with how your child acts (behaviour—your child may have tantrums, be moody, have trouble sleeping, or have bad dreams)
- Gaining weight and feeling very hungry
- High blood pressure
- Growing more hair or getting acne (pimples)
- Thinner skin that bruises easily
- Higher risk of infections



More serious side effects may include, especially if taking prednisone for a long time:

- Prednisone can slow your child's growth and affect puberty
- Your child's bones may become weaker
- Your child's hip bone can get damaged. They may limp or have trouble walking or moving around. This is rare
- Prednisone can cause high blood sugar (diabetes). Your child may be more thirsty than usual, need to pee more often, or start wetting the bed at night
- Your child may have some vision problems. Take your child for regular visits to the eye doctor

HOW DOES MY CHILD TAKE PREDNISONE?

If your child takes prednisone for a long time, they must not stop taking it suddenly. When it's time, your child's healthcare provider will help you slowly lower the dose until it's safe for your child to stop taking it.

To know what to do if your child missed a dose or threw up prednisone: myhealth.alberta.ca/GN/treatments

CAN PREDNISONE INTERACT WITH OTHER MEDICINES?

Talk to your child's doctor or pharmacist before you give your child any new medicines (non-prescription and prescription), herbal products, or vitamins. Some live vaccines (like measles, mumps, rubella [MMR] vaccine or chickenpox vaccine) aren't safe while your child is taking prednisone. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking prednisone. Talk to your child's healthcare provider before they get any vaccines.



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist or the pediatric nephrology team to learn more about prednisone. They can also help manage any side effects your child may have.

Prednisone can make it harder for your child to fight infections. All family members should wash their hands well and often. Keep your child away from people who are sick. Your child's doctor or dietitian will make sure they're getting enough

calcium and vitamin D from food, supplements, or both.

Be sure to tell all your child's healthcare providers about your child's prednisone while they're taking it and for 12 months after they stop. This is because your child may need to take prednisone for a short time if they're unwell or have surgery, as it can take time for your child's body to make cortisol normally.



Learn more about prednisone.

myhealth.alberta.ca/GN/treatments

Azathioprine

CHILDREN

Azathioprine is a medicine that weakens your child's immune system. It stops the body from making white blood cells and prevents them from working. White blood cells help the body fight infections and diseases, and cause a lot of the damage (inflammation) in kidney disease. In high doses, azathioprine has been used to treat cancer and given to people after an organ transplant. In lower doses, it can weaken the immune system for children with GN. Your child's healthcare provider may also prescribe this medicine with others that weaken the immune system, such as prednisone.



Common side effects may include:

- Upset stomach, throwing up, diarrhea
- Low blood cell counts (bone marrow suppression)
- Muscle aches
- Fever
- Rash



More serious side effects may include:

- Serious infections
- Liver problems
- Slightly higher risk of cancer, especially skin cancer and blood cancer



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist, or the pediatric nephrology team to learn more about azathioprine. They can also help manage any side effects your child may have.

Azathioprine can make it harder for your child to fight infections. All family members should wash their hands

well and often. Keep your child away from people who are sick.

Go for regular blood work to check for low blood cell counts and liver problems. Contact your child's healthcare provider if you notice your child is more tired than usual, has bleeding, or is bruising easily.

This medicine can make your child's skin more sensitive to the sun. Make sure they wear sunscreen and sunglasses. Cover them up with clothing to protect them from the sun.



Learn more about azathioprine.

myhealth.alberta.ca/GN/treatments

HOW DOES MY CHILD TAKE IT?

Give your child this medicine with food to help with stomach upset.

If your child throws up less than 30 minutes after taking their medicine, give them another dose, only once. If it's after 30 minutes, don't give them another dose.

If your child missed their last dose, give the missed dose as soon as you remember. If it's almost time for the next dose, skip the missed dose.

Give the next dose at the regular time. Don't give your child 2 doses at a time to make up for 1 missed dose.

CAN AZATHIOPRINE INTERACT WITH OTHER MEDICINES?

Talk to your child's doctor or pharmacist before you give your child any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some live vaccines (like measles, mumps, rubella [MMR] vaccine or chickenpox vaccine) aren't safe while your child is taking azathioprine. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking this medicine. Talk to your child's healthcare provider before they get any vaccines.

If your teenager is sexually active or pregnant visit myhealth.alberta.ca/GN for more information

Mycophenolate mofetil

CHILDREN

Mycophenolate mofetil (MMF) is a medicine that weakens your child's immune system. It stops the body from making white blood cells and prevents them from working. White blood cells help the body fight infections and diseases, and cause a lot of the damage (inflammation) in kidney disease. MMF is most commonly used for people who have had organ transplants, but it's also used to treat people with GN. Your child's healthcare provider may also prescribe this medicine with other medicines that weaken their immune system, such as prednisone.



Common side effects may include:

- Diarrhea
- Heartburn, throwing up, stomach upset (nausea)
- Low blood cell counts (bone marrow suppression)



More serious side effects may include:

- Serious infections
- Liver problems
- Stomach ulcers or bleeding
- Slightly higher risk of skin or blood cancers



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist, or the pediatric nephrology team to learn more about MMF. They can also help manage any side effects your child may have.

MMF can make it harder for your child to fight infections. All family members should wash their hands

well and often. Keep your child away from people who are sick.

Go for regular blood work to check for low blood cell counts and liver problems. Contact your child's healthcare provider if you notice your child is more tired than usual, has bleeding, or is bruising easily.

This medicine can make your child's skin more sensitive to the sun. Make sure they wear sunscreen, sunglasses, and cover them up with clothing to protect them from the sun.



Learn more about mycophenolate mofetil.

myhealth.alberta.ca/GN/treatments

HOW DOES MY CHILD TAKE MMF?

Food affects how your child's body absorbs MMF. Your child should always take MMF the same way, either always with food, or always without food. Giving MMF with food may help if it gives your child an upset stomach or diarrhea.

If your child throws up less than 30 minutes after taking MMF, give the dose again, only once. If it's been longer than 30 minutes, do not give the dose again.

If your child missed their last dose, give the missed dose as soon as you remember. If it's almost time for their next dose, skip the missed dose. Give the next dose at the regular time. Do not give your child 2 doses at a time to make up for 1 missed dose.

CAN MMF INTERACT WITH OTHER MEDICINES?

Talk to your child's doctor or pharmacist before you give your child any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some live vaccines (like measles, mumps, rubella [MMR] vaccine or chickenpox vaccine) aren't safe while your child is taking MMF. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking MMF. Talk to your child's healthcare provider before they get any vaccines.

If your teenager is sexually active or pregnant visit myhealth.alberta.ca/GN for more information

Cyclophosphamide

CHILDREN

Cyclophosphamide, in high doses, is a chemotherapy drug to kill cancer cells. In lower doses, it can also weaken the immune system in people with kidney disease. It does this by stopping the body from making white blood cells and by preventing white blood cells from working. White blood cells cause a lot of the damage (inflammation) related to GN. Your healthcare provider may also prescribe this medicine to your child with other medicines that weaken the immune, such as prednisone.



Common side effects may include:

- Headache
- Upset stomach (nausea), throwing up, diarrhea
- Face turning red and warm (flushing)
- Hair loss (this tends to happen only with higher doses. Hair grows back after your child stops taking cyclophosphamide)
- Feeling weak or tired
- Low blood cell counts
- Sores in the mouth or throat



More serious side effects may include:

- Serious infections
- Bladder problems
- Problems getting pregnant or getting someone else pregnant later in life (this is rare when this medicine is used for kidney disease)
- Slightly higher risk of cancer



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects.

Talk to your child's doctor, pharmacist, or pediatric nephrology team to learn more about cyclophosphamide. They can also help manage any side effects your child may have.

Cyclophosphamide can make it harder for your child to fight infections. All family members should wash their hands well and often. Keep your child away from people who are sick.

Go for regular blood work to check for low blood cell counts. Contact your child's healthcare provider if you notice your child is more tired than usual, has bleeding, or is bruising easily.



Learn more about cyclophosphamide:

- oral
- injection

myhealth.alberta.ca/GN/treatments

HOW DO I TAKE IT?

Your child may get this medicine by mouth or injected into a vein through an IV (intravenous). If your child takes it by mouth, they should take it in the morning with food. It's important for your child to take their dose early in the day so they have time to drink and pee a lot. This helps with bladder problems.

If your child throws up less than 30 minutes after taking cyclophosphamide, give the dose again, only once. If it's been longer than 30 minutes, do not give the dose again.

If your child missed their last dose, give the missed dose as soon as you remember. If it's almost time for their next dose, skip the missed dose. Give the next dose at the regular time. Do not give your child 2 doses at a time to make up for 1 missed dose.

CAN CYCLOPHOSPHAMIDE INTERACT WITH OTHER MEDICINES?

Talk to your child's doctor or pharmacist before you give your child any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some live vaccines (like measles, mumps, rubella (MMR) vaccine or chickenpox vaccine) aren't safe while your child is taking cyclophosphamide. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking cyclophosphamide. Talk to your child's healthcare provider before they get any vaccines.

If your teenager is sexually active or pregnant visit myhealth.alberta.ca/GN for more information

Treatments for GN

Rituximab

CHILDREN

Rituximab is a biologic medicine. This means it's made from a living source. It's a special antibody (protein the body makes to fight off infections and diseases) that targets certain cells and weakens your child's immune system. It can be used to kill some cancer cells and for some types of autoimmune disease (where the body attacks its own healthy cells and tissues). Your child's healthcare provider may also prescribe this medicine with other medicines that weaken the immune system, such as prednisone.



Common side effects may include:

- Headache
- Fever
- Upset stomach (nausea), throwing up, diarrhea
- Mild or moderate allergic reaction when they get this medicine, including feeling itchy, getting a rash, or having a heavy feeling in your chest. Your child will get medicine before they get rituximab to help stop this from happening



More serious side effects may include:

- Serious allergic reactions, including throat swelling and low blood pressure (anaphylaxis)
- Low white blood cell counts
- Serious infections
- Very rare serious skin problems (such as Stevens-Johnson syndrome)
- A very rare nerve disorder that usually leads to death (progressive multifocal leukoencephalopathy or PML)



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist, or their pediatric nephrology team to learn more about rituximab. They can also help manage any side effects your child may have.

Rituximab can make it harder for your child to fight infections. All family members should wash their hands well and often. Keep your child away from people who are sick.

Your child may have to take an antibiotic to protect against a rare lung infection called PJP prophylaxis.



Learn more about rituximab.

myhealth.alberta.ca/GN/treatments

HOW DOES MY CHILD TAKE RITUXIMAB?

For kidney disease, your child will get rituximab as a series of intravenous infusions, where the medicine is put into their vein with an IV. This is usually once a week or every 2 weeks for 1 to 4 doses. For some types of GN, your child may get the infusions every 6 months. Each infusion can take up to 8 hours.

CAN RITUXIMAB INTERACT WITH OTHER MEDICINES?

Talk to your child's doctor or pharmacist before you give your child any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some live vaccines (like measles, mumps, rubella [MMR] vaccine or chickenpox vaccine) aren't safe while your child is taking rituximab. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking rituximab. Talk to your child's healthcare provider before they get any vaccines.

If your teenager is sexually active or pregnant visit myhealth.alberta.ca/GN for more information

Cyclosporine

CHILDREN

Cyclosporine is a medicine called a calcineurin inhibitor. It weakens your child's immune system by stopping the body from making white blood cells. White blood cells help the body fight infections and diseases, and they cause a lot of the damage (inflammation) related to kidney disease. Cyclosporine is most commonly used for people who have had organ transplants, but it's also used to treat people with GN. Your child's healthcare provider may also prescribe this medicine with other medicines that weaken their immune system, such as prednisone.



Common side effects may include:

- High blood pressure
- Headache
- Hair growth
- Shaking (tremors)
- High cholesterol
- Gums getting larger



More serious side effects may include:

- Kidneys not working properly
- Serious infection
- Slightly higher risk of cancer, especially skin cancer



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist, or the pediatric nephrology team to learn more about cyclosporine. They can also help manage any side effects your child may have.

This medicine can make it harder for your child to fight infections. All family members should wash their hands well and often. Keep your child away from people who are sick.

This medicine can make your child's skin more sensitive to the sun. Make sure they wear sunscreen, sunglasses, and cover them up with clothing to protect them from the sun.



Learn more about cyclosporine.

myhealth.alberta.ca/GN/treatments

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HOW DOES MY CHILD TAKE THIS MEDICINE?

Your child must take this medicine regularly at the same time every day. They can take it with or without food, but they should take them the same way each time.

While your child is taking this medicine, they'll need to have regular blood tests to check the levels of medicine in the blood. Follow the exact instructions for how to do the blood tests.

If your child throws up less than 30 minutes after taking their medicine, give them another dose, only once. If it's after 30 minutes, don't give them another dose.

If your child missed their last dose, give the missed dose as soon as you remember. If it's almost time for the next dose, skip the missed dose.

Give the next dose at the regular time. Don't give your child 2 doses at a time to make up for 1 missed dose.

CAN CYCLOSPORINE INTERACT WITH OTHER MEDICINES?

Don't give your child grapefruit or grapefruit juice when they're taking this medicine. These fruits can change the levels of medicine in their body. Cyclosporine can interact with many other medicines. Talk to your doctor or pharmacist before your child takes any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some vaccines (immunizations like measles, mumps, rubella [MMR] or chickenpox vaccine) aren't safe while tacrolimus. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking cyclosporine or tacrolimus. Talk to your child's doctor before they get any vaccines.

Tacrolimus

CHILDREN

Tacrolimus is a medicine called a calcineurin inhibitor. It weakens your child's immune system by stopping the body from making white blood cells, which help the body fight infections and diseases and cause a lot of the damage (inflammation) related to kidney disease. Tacrolimus is most commonly used for people after organ transplants, but it's also used to treat people with GN. Your child's healthcare provider may also prescribe this medicine with other medicines that weaken the immune system, such as prednisone.



Common side effects may include:

- High blood pressure
- Headache
- Shaking (tremors)
- High cholesterol
- High blood sugar (diabetes)



More serious side effects may include:

- Kidneys not working properly
- Serious infection
- Brain problems such as seizures
- Slightly higher risk of cancer, especially skin cancer



Managing side effects

Your child's healthcare provider has prescribed this medicine because not taking it is more dangerous to your child than any side effects. This is not a list of all the side effects. Talk to your child's doctor, pharmacist, or their pediatric nephrology team to learn more about tacrolimus. They can also help manage any side effects your child may have.

This medicine can make it harder for your child to fight infections. All family members should wash their hands well and often. Keep your child away from people who are sick.

This medicine can make your child's skin more sensitive to the sun. Make sure they wear sunscreen, sunglasses, and cover them up with clothing to protect them from the sun.



Learn more about tacrolimus.

myhealth.alberta.ca/GN/treatments

If your teenager is sexually active or pregnant visit myhealth.alberta.ca/GN for more information

HOW DOES MY CHILD TAKE THIS MEDICINE?

Your child must take this medicine regularly at the same time every day. They can take it with or without food, but they should take them the same way each time.

While your child is taking this medicine, they'll need to have regular blood tests to check the levels of medicine in the blood. Follow the exact instructions for how to do the blood tests.

If your child throws up less than 30 minutes after taking their medicine, give them another dose, only once. If it's after 30 minutes, don't give them another dose.

If your child missed their last dose, give the missed dose as soon as you remember. If it's almost time for the next dose, skip the missed dose. Give the next dose at the regular time. Don't give your child 2 doses at a time to make up for 1 missed dose.

CAN TACROLIMUS INTERACT WITH OTHER MEDICINES?

Don't give your child grapefruit or grapefruit juice when they're taking this medicine. These fruits can change the levels of medicine in their body. Tacrolimus can interact with many other medicines. Talk to your doctor before your child takes any new medicines (non-prescription and prescription), herbal products, or vitamins.

Some vaccines (immunizations like measles, mumps, rubella [MMR] or chickenpox vaccine) aren't safe while your child is taking cyclosporine or tacrolimus. It's still important for your child to have their regular vaccines, but you may need to wait until after they're done taking tacrolimus. Talk to your child's doctor before they get any vaccines.

Plasma exchange

Plasma exchange (also called plasmapheresis or apheresis) is a way to clean the blood. When you have certain types of GN—or other autoimmune diseases—the antibodies you make to fight harmful things like viruses attack your healthy cells and tissues. These antibodies are found in plasma (the liquid part of your blood). In plasma exchange, your plasma is taken out of your body, separated from the blood cells, and replaced with good donor plasma or a plasma substitute.



What does it treat?

In the context of GN, plasma exchange is primarily used for the treatment of anti-GBM disease. Although it may be considered for certain cases of ANCA-associated vasculitis or other rare kidney diseases.

Your healthcare provider will talk to you about whether plasma exchange is the right treatment for you.



How does it work?

During a plasma exchange, a needle or central line catheter (IV) is placed in a vein. Small amounts of blood are slowly removed. The blood moves through a machine that separates the plasma from blood cells. The plasma is thrown out and donor plasma (or a plasma substitute, like albumin) is returned to your body through the IV line.

One plasma exchange usually removes 65% to 70% of the problem antibodies. The treatment takes 2 to 3 hours. How often you need this treatment depends on the type of GN you have and how sick you are.



What can I expect?

If you have a smaller IV catheter, your arms will be propped on pillows. Throughout your treatment, you'll be asked to pump a fist to help with blood flow. You may have bruising or discomfort where the IV goes in. If you have a larger catheter or port, your arms will be free during treatment.

You may feel a bit numb and tingly, have an upset stomach (nausea), or feel light-headed. Tell a plasma exchange team member if you have any side effects during your treatment. They can help you manage them.

You may feel tired for the rest of the day after treatment. Drink lots of fluids afterwards. It's best to have someone drive you home until you know how the treatments will affect you.



How do I prepare?

Drink lots of fluids (non-alcoholic) for a couple of days before a plasma exchange. It's also a good idea to eat something before your treatment. Ask your doctor about when to take your medicines on the day of your plasma exchange, because this treatment can affect medicine levels in your body.

WHAT ARE THE RISKS?

There is a small risk (in 4-5% of people) of problems from plasma exchange.

- Bleeding, blood clot
- Infection
- Collapsed lung or lung injury
- Bad reaction (fever, allergic reaction)
- Citrate toxicity—feeling sick to your stomach, throwing up, chills, twitching, spasms, seizures, and heart rhythm problems
- Low blood pressure, too much blood in part of the heart (volume overload), electrolyte imbalances

Your healthcare provider has prescribed this treatment because not having it is more dangerous to you than any side effects. Talk your healthcare team to learn more about plasma exchange. They can also help you manage any side effects.



Learn more about plasma exchange.

myhealth.alberta.ca/GN/treatments