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PREVENTION OF TB

Understanding Childhood Cancer

+ BENEFITS OF SLEEP

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Dear Reader,

One of the great aspects of this job is having the opportunity to talk with and listen to the many different manufacturers, distributors, and of course the huge network of dealers that is the backbone of our industry. Years ago I never would

have ever imagined I would be in this position, and it is amazing. To say I really enjoy this job is an understatement. What makes Diagnostics Update.com so unique is their informative and educative ways to the nation. The staff and management is always looking for ways to inform their readers on how to tackle different

medical issues. Basically, you want more people to enjoy reading more and more.

That said, there is still the need to get more readers to embrace healthy routines within and outside the homestead.

This February 2017 issue we focus on Prevention of TB.

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Therefore, some information in this publication may have change by the time you read it.



UNDERSTANDING CHILDHOOD CANCER

There's cancer and there's childhood cancer. It has different causes and effects.

While adult cancer is often related to exposure to an environmental factor (e.g. cigarette smoke), childhood cancer is most often genetically based. We need to understand childhood cancer to find better ways to treat and, ultimately, cure this disease.

Cancer and Stem Cell Biology

Genetic and epigenetic abnormalities enable cancer stem cells to hijack normal stem cell self-renewal mechanisms and multiply out of control, causing cancer. The major goal of the Cancer and Stem Cell Biology Group is to understand the mechanisms that regulate aberrant self-renewal and drug resistance in malignant stem cells, and to develop cancer stem cell-targeted therapies that are more effective and less toxic for patients. Our research will generate new insights into cancer stem cell biology, identify novel therapeutic targets, and provide pre-clinical validation of therapeutic potential. These studies therefore have the potential to lead to the development of novel therapeutic strategies that directly and selectively kill cancer stem cells, which are now considered to be the root cause of tumour resistance to chemotherapy, relapse

and ultimate disease progression.

Molecular Carcinogenesis

Very little is known about the factors that lead to the development of cancer in children. The overall strategy of the Molecular Carcinogenesis Program is to dissect the mechanisms of cancer initiation and progression and to use this information to develop more effective treatments and prevention strategies for childhood cancer.

Our objectives are to:

- Better understand the molecular basis of embryonal cancer initiation
- Identify and target the novel oncofactors of mycn oncogene for neuroblastoma treatment
- Develop and characterise the novel small molecule compounds that overcome mycn-initiated cell-death resistance
- Decipher mechanisms of neuroblastoma tumourigenesis using single cell profiling
- Develop targeted combination chromatin-modifier therapies for neuroblastoma treatment

Neuroblastoma tumour initiation

As with most childhood cancers, neuroblastoma, a peripheral nervous system cancer, arises in embryonal cells. In the womb, the development of normal organs requires rapid growth of cells making up the nerves,

brain and blood cells. However, this rapid growth must stop once mature nerves or blood cells have formed in their correct place in the foetal body. The embryonal cells, which come together to form the normal organs, are produced in excess of what is required. Embryonal cells not eradicated at this time persist and, in some instances, can later cause childhood cancer.

Very little is known about the mechanisms that cause embryonal cells to persist, or how they undergo further changes that lead to cancer in some children. Using a transgenic experimental model that develops neuroblastoma in a very similar manner to the human disease, we have shown that the expression of a cancer-promoting oncoprotein, MYCN, begins the process of neuroblastoma tumour initiation. We found MYCN expression occurs in specialised nerve cells near the spine in a short time-window soon after birth. These cells would normally undergo cell death very soon after birth.

We have dissected the pathway by which MYCN blocks the normal process of nerve cell death and identified individual components of the death-signal that are altered by MYCN. Our work has pinpointed the exact part of the MYCN protein that is required to cause this effect.

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Childhood Cancer

FROM PAGE 3

Our research is at a very exciting stage. We have identified a crucial protein mediator of the MYCN signal and a therapeutic target in the disease called 'Facilitates Chromatin Transcription' (FACT). FACT and MYCN expression create a forward feedback loop in neuroblastoma cells essential for maintaining mutual high expression. FACT inhibition by the small molecule Curaxin compound, CBL0137, markedly reduces tumor initiation and progression in vivo. CBL0137 is currently being trialled on adults.

Targeting novel MYCN oncofactors for the treatment of neuroblastoma

For children with high-risk neuroblastoma, the five-year survival rate is 40-50%. Most neuroblastoma patients present with a far advanced disease which doesn't respond well to conventional chemotherapy, and thus neuroblastoma accounts for 15% of all child cancer deaths.

Further, the drugs used to treat children with cancer are older general cancer drugs (used for more than 40 years) which can cause serious acute side-effects on normal growing tissues. The cost of supportive care required to manage the side-effects far exceeds the cost of the chemotherapy.

Current drug discovery strategies in the pharmaceutical industry do not focus on child cancer because of its low incidence and because many of the common molecular targets in adult cancers are rare in child cancer. Thus, there is an urgent need for drugs with high specificity for cancer cells but low toxicity for the normal growing tissues of a child. Developing such drugs requires identification and validation of appropriate molecular targets, and the technology and capability to translate that knowledge into new drug discovery.

We have identified a protein called PA2G4 as a novel therapeutic target in these highly malignant tumours. The PA2G4 inhibitor WS6 has shown strong treatment effect in our neuroblastoma mouse models. But despite this remarkable potency, WS6 will likely benefit from combining it with different drugs to minimise toxicity and prevent relapse.

Our research will investigate the mechanism by which PA2G4 functions in neuroblastoma



and use this to guide development of WS6 combination therapies.

Initiation and progression of childhood leukaemia

Leukaemia, like neuroblastoma, is an embryonal cancer. It arises in embryonal cells. As a baby develops in the womb, its embryonal cells usually mature to become all the specialised tissues and organs of the body.

Under normal circumstances, any embryonal cells left over after formation of these tissues and organs die by a natural pre-programmed process. But sometimes these embryonal cells persist and, in rare cases, go on to become cancerous. What causes a non-cancerous embryonal cell to change into a cancer cell is not well understood.

We have obtained the transgenic mouse model of B-cell lymphoma, a disease closely related to acute lymphoblastic leukaemia of the B-cell lineage.

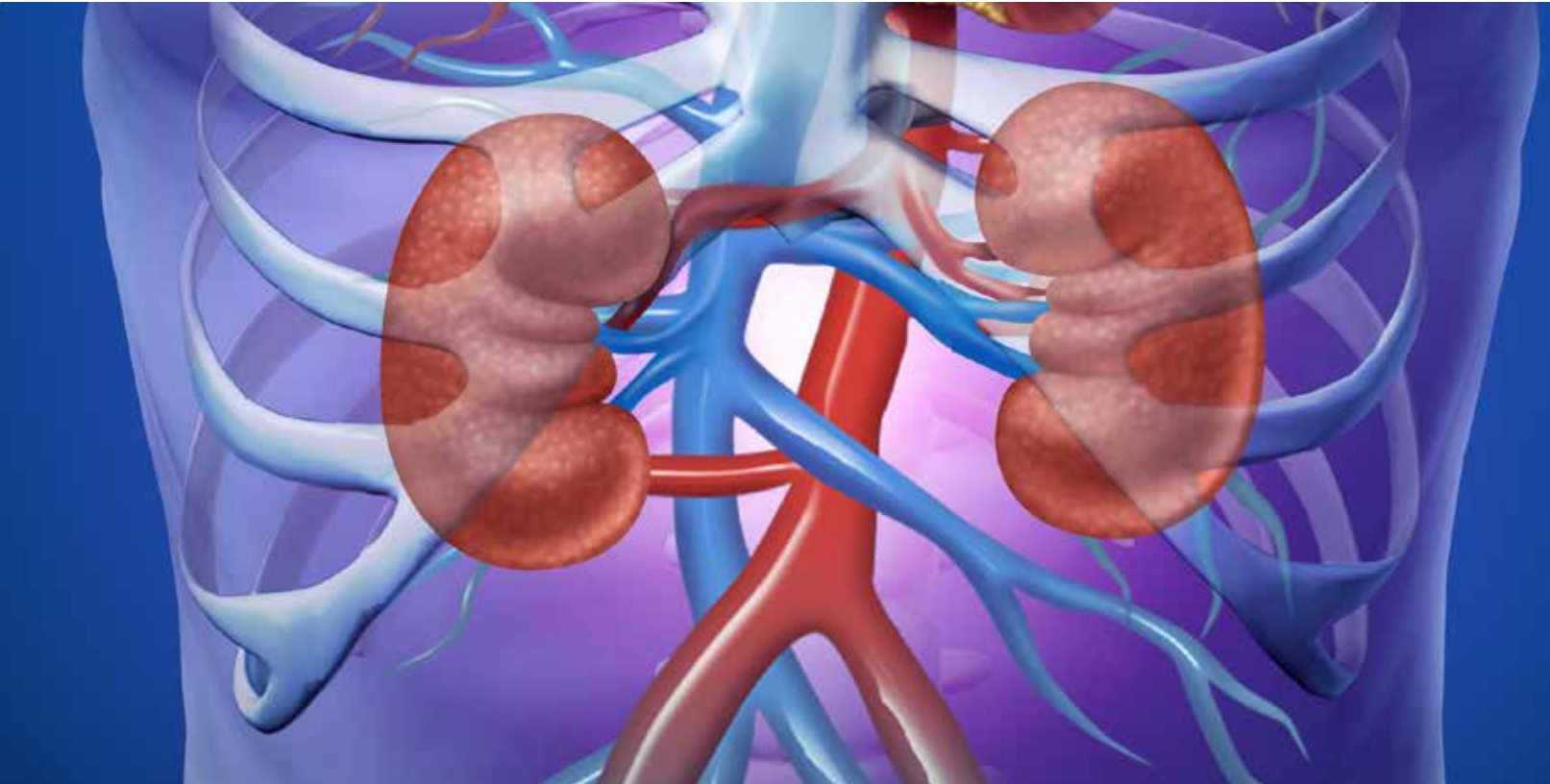
The Eμ-Myc mouse model is based on over-expression of the c-Myc oncogene and mirrors the biology and genetic development of human B-cell malignancies. We aim to investigate the underlying mechanisms that cooperate with c-myc over-expression during the B-cell hyperplasia stage (pre-cancer stage), which contributes to B-cell malignancies and tumourigenesis.

The Eμ-myc model is highly relevant for testing in vivo efficacy of compounds identified in laboratory, both in tumour initiation and established tumour treatment.

Source: ccia.org.au

WHY WORLD KIDNEY DAY IS CELEBRATED

OBJECTIVES OF WORLD KIDNEY DAY



World kidney day is celebrated all over the world on second of Thursday in the month of March in order to raise the public awareness about the kidneys importance and its contributions to the overall health. It is celebrated to make the common public aware about the diseases and problems of the kidneys in order to reduce the occurrence of kidney diseases as well as all the associated health problems of the kidneys. Some of the objectives of celebrating the world kidney day are mentioned below:

- It is celebrated to highlight the kidney problems related to the common health disorders like diabetes, high blood pressure which may lead to the Chronic Kidney Diseases.
- It is celebrated to encourage the common public through the systematic screening of all patients having problems like diabetes or hypertension.
- It is celebrated to motivate and promote the common public for the better prevention by describing them all aspects of the prevention measures in order to get prevented from such kidney problems.
- It is celebrated to instruct the medical professionals about all aspects of the kidneys as well as teaching them to play their key role

in the detection and prevention of kidneys problems among the people of high risk populations.

- It is celebrated to get together of all the medical professionals from the local and national health authorities in order to control the spread of Chronic Kidney Diseases.
- It is celebrated to deal with the high risk problems as well as implement the new strategies by motivating all the governments' authorities.
- It is celebrated to encourage the people about the kidneys donation and transplantation as a best option of life saving for getting free from the kidney failure or other Chronic Kidney Diseases.
- It is celebrated to encourage the people for the early detection and prevention methods of the kidney problems to reduce the future complications and deaths and disability from the chronic renal and cardiovascular failure.

How World Kidney Day is Celebrated

World Kidney Day is celebrated every year all across the world to gather millions of people at one place to raise the voice for the kidney health awareness. Variety of local, national or international level events are being organized

for years by the kidney national associations, organizations, kidney health stakeholders, healthcare professionals, authorities and individuals to make a difference in the society for the kidney health.

Variety of physical activity events like walking, cycling, jogging, fitness, dancing and etc are organized to get together. Fact sheets and posters of the related event are distributed in the schools, community centers and other educational institutions, news publishing at the websites or web pages and promotion of the campaign motto through the blogs, forums, twitter or Facebook and other informational websites.

Kidneys health related topics like importance of kidney, kidney diseases and problems, kidney transplantation and life-saving aspect of the kidney donation are discussed in the classrooms, job places or other public places.

At the big kidney health centers, students and researchers organize meetings to discuss their own research works, lecture on the chronic kidney diseases, prevention measures, renal transplants, dietary and treatment advice and etc.

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World Kidney Day

FROM PAGE 5

Public health announcements are taken place at various TV channels on both national and international level to make aware the common public about kidney donation, transplantation, early detection, prevention measures, treatment, lack of donor organs or use of deceased donor organs and so many topics. National and international level kidney problems conferences are held to discuss about to get solution.

Other topics which are discussed are kid's renal diseases, chronic renal diseases of adults, peritoneal and hemodialysis, diet for the patients with renal diseases and etc. Free health checkups are organized such as screening of blood glucose level, creatinine level, urine test, blood pressure and etc by the courtesy of health minister for the general public.

How to Take Care of Your Kidneys

Before knowing the points of kidneys care, you must have to answer yourself of some questions like are you at risk, do you suffering from the high blood pressure, do you have diabetes, do you have an earlier family history of kidney disease, are you obese or overweight, do you have smoking habit, are you more than 50 years of age, are you belong of African, Aboriginal, Hispanic or Asian origin. If your answers are yes to any of the question, you must meet your health practitioner or doctor to get the right solution as some early chronic kidney diseases never show any signs or symptoms.

If you are really health conscious then meet your doctor to avoid any type of delay in the kidney failure as well as get the right treatment early at the right time. You would be surprised that a person with a simple kidney problem can lose up to 90% of his kidney functions without experiencing any signs or symptoms.

Follow the following 8 Golden Rules for Better Kidney Prevention

Any of the kidney disease attacks like a silent killer and affect the quality of life. Below are mentioned some easy steps to get prevented from the risk of developing kidney problems:

1. Help your kidneys by keeping yourself fit and active as exercises helps in reducing blood pressure and thus reduces the risk of developing Chronic Kidney Disease. This event

celebration motivates people for daily walking, running and cycling exercises.

2. Help your kidneys by maintaining and controlling the normal the blood sugar level as high blood sugar level lead to the diabetes and thus kidney damage. This event celebration motivates people with diabetes to get regular medications, tests and check up of their kidney functions.

3. Make your kidneys healthy by regular monitoring of your blood pressure as high blood pressure lead to the heart attack or stroke thus causes kidney damage. The normal blood pressure level of any person is 120/80. This event celebration encourages people to adopt healthy lifestyle and dietary changes, discuss their problems with doctor, monitor blood pressure on regular basis and etc.

4. Keep your kidneys healthy by eating healthy and maintaining normal weight as overweight and unhealthy eating habit lead to the diabetes, heart diseases and many other problems lead to the Chronic Kidney Disease. This event celebration motivates people about the dietary habits and weight control measures like reducing the salt intake (5-6 grams or 1 tsf of salt a day), limit the intake of processed or restaurant foods, daily physical exercises and etc.

5. Keep your kidneys healthy by maintaining the normal fluid intake on daily basis (at least 3 to 4 litres a day) as it helps the kidneys to filters out sodium, urea and other body toxins from body which may lead to the risk of developing chronic kidney diseases. World kidney day celebration on global basis encourages the people about proper fluid intake.

6. Keep your kidneys healthy and fit by avoiding smoking or getting in contact with other smoking person as it slows down the blood flow to the kidneys which lessens their ability to function well as well as enhances the risk of kidney cancer by 50%. This event celebration promotes the people to keep their kidneys healthy by demonstrating the loss through smoking.

7. Keep your kidneys healthy by avoiding the intake counter pills on regular basis as these are non-steroidal anti-inflammatory drugs (ibuprofen) which may lead to the kidney damage and various diseases. Such medications may cause arthritis or back pain and put your kidneys at risk.

8. Keep your kidneys healthy by getting proper and regular check up of your kidney functions and developing of diabetes, hypertension, obese, family history of kidney disease and etc.

Symptoms of Kidney Problems

Most of the people never show symptoms until it gets advance however, some of the symptoms like swollen ankles and legs, fatigue, early tiredness, difficulty in concentration, low appetite, haematuria or occurrence of blood in urine, albuminuria or foamy urine or occurrence of albumin protein in urine and etc can be felt if noticed carefully. Some other symptoms of reduced kidney functions are:

- Alteration in the amount of urine, appearance of urine and frequency of passing urine during night
- Pain in abdomen in the kidney areas
- Difficulty in sleeping
- High blood pressure
- Headache
- Shortness of breath
- Feeling of vomiting or vomiting
- Bad breath

Early Detection of Kidney Diseases

Most of the people ignore their common problem that's why they remain undiagnosed in the early stages of kidney problems. World kidney day celebration is a way to call everyone on stage at one place in order to get checked early if developing or having any risk of kidney disease. This event celebration brings people together and encourages them about the simple kidney function tests to get diagnosed of any risk factors which may lead to kidney problems.

Never let your kidney problems to destroy your precious kidney functions as it progresses very silently without any symptoms. The early detection of kidney problem is very necessary to get the suitable treatment to prevent your kidney damage, deterioration and complications. Through this event celebration, simple laboratory tests of kidney are carried out by taking small samples of blood in order to measure the values of creatinine, albumin excretion and estimate the GFR (glomerular filtration rate).

The availability of Serum Creatinine level in the blood, albumin in urine and blood sugar level measures the overall kidney health and its functions or Glomerular Filtration Rate. Creatinine, a waste product comes from the muscle activity, is generally getting removed from blood through the normal kidney functions, when its level rises in blood it denotes the slowness in kidney function. Normal GFR is 100 ml/min, but when it falls below 60 ml/min it indicates some serious kidney problems and immediate need to meet your kidney specialist. The presence of albumin in urine indicates the risk of GFR problem and premature heart attacks or strokes.

THE IMPORTANCE OF CHILDHOOD IMMUNIZATIONS

- It's true that newborn babies are immune to many diseases because they have antibodies they got from their mothers. However, the duration of this immunity may last only a month to about a year. Further, young children do not have maternal immunity against some vaccine-preventable diseases, such as whooping cough.
- If a child is not vaccinated and is exposed to a disease germ, the child's body may not be strong enough to fight the disease. Before vaccines, many children died from diseases

that vaccines now prevent, such as whooping cough, measles, and polio. Those same germs exist today, but babies are now protected by vaccines, so we do not see these diseases as often.

- Immunizing individual children also helps to protect the health of our community, especially those people who are not immunized. People who are not immunized include those who are too young to be vaccinated (e.g., children less than a year old cannot receive the measles vaccine but can

be infected by the measles virus), those who cannot be vaccinated for medical reasons (e.g., children with leukemia), and those who cannot make an adequate response to vaccination.

Also protected, therefore, are people who received a vaccine, but who have not developed immunity. In addition, people who are sick will be less likely to be exposed to disease germs that can be passed around by unvaccinated children. Immunization also slows down or stops disease outbreaks.

Prevention Of TB

Tuberculosis, or TB, is a disease (usually of the lungs) that's easily transmitted through the air when an infected person speaks, laughs or coughs. Although TB is rare and highly treatable, you will still need to take measures to prevent tuberculosis in certain situations, especially if you have already tested positive for latent TB (an inactive form of TB which affects approximately 1/3 of the world's population). Start with Step 1 below to find out more.

How to Avoid Contracting TB

Avoid exposing yourself to people with active TB.

Obviously the most important precaution you can take to prevent TB is to avoid being around people with active TB, which is highly contagious, especially if you have already tested positive for latent TB. More specifically:

- Don't spend long periods of time with anyone who has an active TB infection, especially if they have been receiving treatment for less than two weeks. In particular, it is important to

avoid spending time with TB patients in warm, stuffy rooms.

- If you are forced to be around TB patients, for example if you work in a care facility where TB is currently being treated, you will need to take protective measures, such as wearing a face mask, to avoid breathing in the TB bacteria.

- If a friend or family member has active TB, you can help to rid them of the disease and lessen your own risk of contracting it by ensuring that they strictly follow treatment instructions.



Know if you are "at-risk".

Certain groups of people are considered to be more at-risk of developing TB than others. If you are a member of ones of these groups, you need to be more vigilant about protecting yourself from TB exposure. Some of the main at-risk groups are as follows:

- People with weakened immune system, such as those with HIV or AIDs.
- People who live with or care for

someone with active TB, such as a close relative or a doctor/nurse.

- People who live in crowded, confined spaces such as prisons, nursing homes or homeless shelters.
- People who abuse drugs and alcohol, or have little or no access to proper health care.
- People who live in or travel to countries where active TB is common, such as countries in Latin America, Africa and parts of Asia.



Prevention Of TB

Lead a healthy lifestyle.

People who are in poor health are more susceptible to the TB virus, as their disease resistance is lower than in healthy people. Therefore, it is important to do your best to lead a healthy lifestyle.

- Eat a healthy, balanced diet with plenty of fruit, vegetables, whole grains and lean meat. Avoid fatty, sugary and processed foods.
- Exercise often, at least 3 to 4 times a week.

Try to incorporate some good cardiovascular exercise into your workouts, such as running, swimming or rowing.

- Cut down on alcohol consumption and avoid smoking or taking drugs.
- Get plenty of good quality sleep, ideally between 7 and 8 hours a night.
- Maintain good personal hygiene and try to spend as much time as possible outdoors, in the fresh air.



Get the BCG vaccination to prevent TB.

The BCG (Bacille Calmette-Guerin) vaccine is used in many countries to help prevent the spread of TB, especially among small children. However, the vaccine is not commonly used in the US, where infection rates are low and the disease is highly treatable. Therefore, the CDC does not recommend the vaccine as a routine immunization. In fact, the CDC only recommends the BCG vaccine for U.S. citizens in

the following situations:

- When a child has been tested negative for TB but will continue
- be exposed to the disease, especially strains that are resistant to treatment.
- When a healthcare worker is continually exposed to tuberculosis, especially strains that are resistant to treatment.
- Before travelling to another country where tuberculosis is prevalent.



How to Diagnose and Treat TB

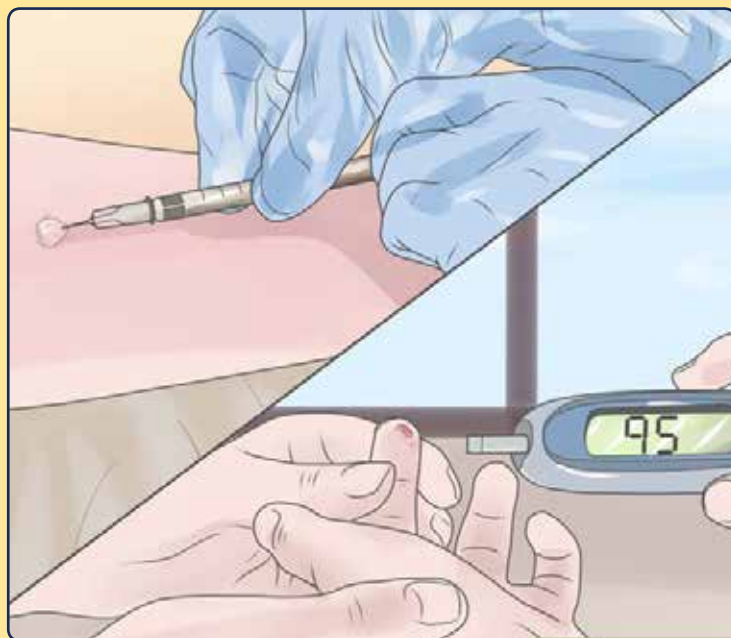
Schedule a TB test if you have been exposed to someone with tuberculosis.

If you have recently been exposed to someone with active TB and believe there is a chance you might have contracted the disease, it is important to consult your health care provider immediately. There are 2 methods for TB testing:

- **Skin test:** The Tuberculin Skin Test (TST) requires injecting a protein solution sometime between 2 and 8 weeks after contact with an infected person. The patient must return to the medical provider 2 or 3 days later to have the skin reaction interpreted.

● **Blood test:** Although it's not as commonplace as the skin test, the TB blood test only requires a single doctor visit and is less likely to result in misinterpretation by a medical professional. It is the necessary option for anyone who has received the BCG vaccination, as the vaccine can interfere with the accuracy of the tuberculin skin test.

- If your TB test is positive, you will need to undergo additional testing. Health professionals will need to determine whether you have a latent TB (which is not contagious) or active TB disease before proceeding with treatment. Tests may include a chest x-ray and a sputum test.



Prevention Of TB

Begin immediate treatment for latent TB.

If you test positive for latent TB, you should consult with your doctor about the best course of action.

- Although you don't feel sick with a latent TB, and it isn't contagious, you will probably

Begin immediate treatment for active TB.

If you test positive for active TB, it is essential that you begin treatment as soon as possible.

- Symptoms of active TB include cough, fever, weight loss, fatigue, night sweats, chills and a loss of appetite.

- Nowadays, active TB is highly treatable with a combination of antibiotic medications, however the duration of treatment can be quite long, usually between six to twelve months.

- The most common medications to treat TB

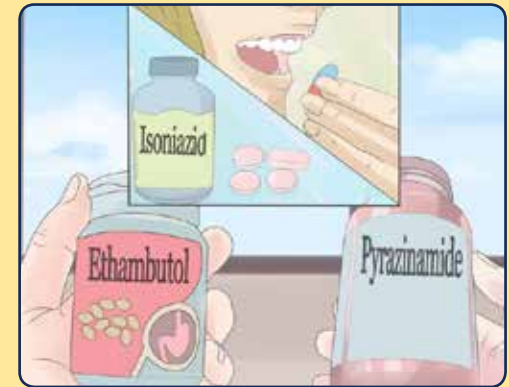
be prescribed a course of antibiotics to kill the inactive TB germs and prevent tuberculosis from turning into an active disease.

- The 2 most common treatments are: Taking isoniazid daily or twice a week. The duration of the treatment is 6 or 9 months. Or taking rifampin daily for 4 months.



include isoniazid, rifampin (Rifadin, Rimactane), ethambutol (Myambutol) and pyrazinamide. With active TB, you will usually need to take a combination of these drugs, especially if you have a particularly drug-resistant strain.

- If you follow your treatment plan exactly, you should start to feel better within a matter of weeks and you should no longer be contagious. However, it is essential that you finish your course of treatment, otherwise the TB will remain in your system and potentially become more drug resistant



How to Avoid Spreading TB

Stay at home. If you have active TB, you will need to take precautionary steps to avoid passing the disease onto others. You will need to stay at home from work or school for several weeks following diagnoses and avoid sleeping or spending long periods of time in a room with other people.

Ventilate the room. The TB virus spreads more easily in enclosed spaces with stagnant air. Therefore, you should open any windows or doors to let fresh air in and contaminated air out.

Cover your mouth. Just like when you have a cold, you will need to cover your mouth whenever you cough, sneeze or even laugh. You can use your hand if necessary, but using

a tissue is preferable.

Wear a mask. If you are forced to be around people, it's a good idea to wear a surgical mask that covers your mouth and nose, at least during the first three weeks following infection. This helps to lessen the risk of you passing the virus to someone else.



Finish your course of medication. It is absolutely essential that you finish whatever course of medication your doctor prescribes. Failing to do so gives the TB bacteria a chance to mutate, making the virus much more resistant to medications, and therefore more deadly. Finishing your course of medications is the safest option not only for you, but for those around you.



Community Q&A

What should I do if I feel a cold coming on after having completed a six month treatment? Talk to your doctor and see what kind of prescriptions are safe for you to take. Do not try anything over the counter because you may not be able to predict the possible side affects.

Which foods are good for boosting the immunity system? Fruits and vegetables in general are great. Citrus fruits, peppers, spinach, broccoli, and garlic are some good ones. Yogurt. Nuts. Fish. Chicken soup or chicken. Tea, especially green tea. Spices like ginger and turmeric.

Is it possible that a spoon or fork can easily transmit the virus or TB? No, the tuberculosis bacteria does not affect a person when swallowed. It affects lungs and has to reach the person's respiratory system to be active.

Source: www.wikihow.com/Prevent-Tuberculosis

New study published in Lancet Respiratory Medicine highlights QIAGEN's QuantiFERON-TB potential to predict active tuberculosis risk in infants

Screening with QuantiFERON-TB Gold (QFT) can detect latent tuberculosis (TB) infection in otherwise healthy young children and can predict which are likely to progress to the active stage of this life-threatening respiratory disease, as shows data published in The Lancet Respiratory Medicine journal last week.

Results from the study of more than 2,500 young children in South Africa suggest that screening with the modern QuantiFERON-TB blood test could save lives in countries with a high TB burden by identifying those children most at risk of developing active disease. The study noted young children are particularly vulnerable to TB, with up to 20% of those infected by the bacteria developing the active TB disease.

"This study marks a true milestone. For the first time, there is a test that has demonstrated the potential to quantify the risk for young children to develop active tuberculosis. Researchers found that those with a QuantiFERON-TB test result above a certain threshold were far more likely than others to get sick with the active disease. TB is a terrible killer of children in high-burden countries, so early diagnosis and treatment could save many lives," said Dr. Masae Kawamura, Senior Director, TB Medical and Scientific Affairs, at QIAGEN.

The study was authored by researchers at the Stanford University School of Medicine, the South African Tuberculosis Vaccine Initiative, London School of Hygiene & Tropical Medicine, the Desmond Tutu HIV Centre, the Jenner Institute at Oxford and Aeras, a non-profit devoted to development of TB vaccines. Medical data was analyzed from more than 2,500 South African babies who were all healthy, HIV-negative and had no known TB exposure who were enrolled from 2009 to 2012 in a trial of a potential TB vaccine that in the end did not prove effective in preventing TB. The researchers in the trial used QuantiFERON to measure infection in the children, who were all tested at the start of the trial and again at one year and two years. When the 2,512 children in the study were tested at a year, 172 of them, or 6.8%, were found to be positive carriers of the TB bacteria, a very high rate of infection, the researchers reported. Of these, 30 had already been diagnosed and treated for the active disease. The researchers more closely examined the other 142 children who tested positive but hadn't yet developed TB. They found children



Results suggest benefits of quantitative screening of young children in countries with high TB burden

with higher values on the QuantiFERON test results had been more likely to develop the active disease, making it the first study to show the importance of assessing different levels of the test values in children.

In South Africa and many other countries, most children are never tested for latent TB infection when it is still preventable from converting to active disease. Instead, active TB is found passively, after seeking care because of symptoms from advanced TB disease. TB is the leading cause of death in South Africa among both adults and children. The researchers said they are now exploring the feasibility of scaling up TB screening programs for children in South Africa for prevention.

The test used in the South African study was QuantiFERON-TB Gold, the third generation of QIAGEN's proprietary technology for the detection of latent infections. QFT is the modern gold standard to detect latent TB infection, but large meta-analysis studies undertaken in the past, using standard thresholds show minimal predictive value for TB progression. The results of this study show the use of quantitative values to predict risk among young children points to a new potential application.

QIAGEN's fourth-generation QuantiFERON-TB Gold Plus (QFT-Plus) is now available in more than 60 countries around the world, and was recently submitted for U.S. regulatory approval. The fourth-generation test is the first assay with novel CD8 T-cell stimulating antigens. The availability of QFT-Plus to measure CD8 T-cell response has been cited by the World Health

Organization (WHO) as a potential factor in identifying adults at greater risk of progressing to active TB.

Tuberculosis is a contagious bacterial infection spread primarily through the air. Patients with the active pulmonary form of this disease can spread it through coughing. In 2015, the WHO estimates about 10.4 million new cases of active TB worldwide and 1.8 million deaths from TB.

In latent TB infection, the bacterium infects a person but does not cause symptoms unless it progresses to the active disease. On a global basis, about one-third of people are estimated to have latent TB infection, and about 5-10% of those individuals, if untreated, will progress to active disease at some point. Screening of high-risk individuals and treatment for latent infection play a growing role in global tuberculosis control efforts.

QIAGEN partners with governments and health organizations around the world to fight tuberculosis and continues to develop innovative new technologies. QuantiFERON-TB Gold is the modern standard for diagnosing latent TB infection – faster, less labor-intensive and more accurate than the century-old tuberculin skin test. In 2015 QIAGEN launched QuantiFERON-TB Gold Plus in Europe and other markets with CE-IVD marking. More than 30 million tests using QuantiFERON-TB technology have been distributed globally. To learn more about QFT and QFT-Plus, please visit:

**<http://www.QuantiFERON.com.TEST>
AVAILABLE AT DIAGNOFIRM MEDICAL
LABORATORY**

Make The Most Of Save Your Vision Month

Save Your Vision month is held every March and aims to increase awareness regarding good eye care. With computers becoming an everyday part of people's lives, the risk of eye strain and damage is higher than before. Apart from ordinary eye care, this month specially focuses on eye care in the work place with an emphasis on employers to take eye care and health seriously.

Taken For Granted

Save Your Vision Month reminds many people of a rather shocking thing, that most of us take our vision for granted. Seeing is one of the easiest things to do in the world- you just have to open your eyes. Apart from that, so much of our lives are based on visual stimulation. From work to entertainment, our eyes form a large part of our everyday lives. Unfortunately, most of us don't think about actual eye care until something goes wrong. It's important to note that just like visiting the dentist regularly is important, regular eye checks are also important. Some of the benefits of regular eye exams are very apparent. For instance, if the power of your eyesight is decreasing or faulty, corrective measures can be taken immediately. This is much healthier compared

to putting up with eye strain until it becomes a real problem to see. Eye checks can also tell you a lot about your general state of health. For example, diabetes is very often diagnosed via an eye exam. Other diseases like glaucoma can be quickly detected and treated by going for regular eye tests.

Eye Care At Work

Today, almost every work place is fitted with computers, whether it's a corporate office or a small library. One of the biggest problems of continued and persistent computer use is eye strain. Many people who use computers for long stretches of time tend to complain about symptoms like dry eyes, blurry vision and eye strain. While it might not be feasible to cut down on computer use, there are a number of ways to maintain good eye care and health while you work.

First of all, regular eye exams are a must and it's important to tell your doctor how much computer work you do each day. When using your computer, make sure that you stop for breaks at regular intervals. It's a good idea to just get up and walk to a window and just have a look outside. Allowing the eyes to look away from the screen, particularly at something soothing can be very resting for

the eyes. One problem many computer users face is a problem they probably aren't even aware of- that is the fact that they don't blink. When staring continuously at your monitor, you will blink a lot less than normal- this is what causes the problem of dry eye. When working at your computer, make a conscious effort to blink as much as possible. In fact, closing your eyes for a few seconds can really help as well. If you still face a problem, consider buying artificial tears and applying them to keep your eyes moist. If possible, install a humidifier in your work area.

The way you sit at your computer also plays a big role in the health of your eyes. Make sure the monitor is about 20 inches away from your eyes. The top of the monitor should be tilted a little below your eye level. Also make sure that you keep your monitor free of dust and fingerprints, as these can greatly reduce clarity.

Last but definitely not least, remember that eating healthy can indeed improve the health of your eyes. Eating plenty of fresh vegetables and fruits as well as getting a good night's sleep are all important ways to preserve the health of your eyes. During this Save Your Vision Month, it's important to take the necessary steps towards better eye care.

BENEFITS OF SLEEP

It may seem obvious that sleep is beneficial. Even without fully grasping what sleep does for us, we know that going without sleep for too long makes us feel terrible, and that getting a good night's sleep can make us feel ready to take on the world. Scientists have gone to great lengths to fully understand sleep's benefits. In studies of humans and other animals, they have discovered that sleep plays a critical role in immune function, metabolism, memory, learning, and other vital functions. The features in this section explore these discoveries and describe specific ways in which we all benefit from sleep.

Why Do We Sleep, Anyway?

At a Glance

- Our bodies regulate sleep in much the same way that they regulate eating, drinking,

and breathing. This suggests that sleep serves a similar critical role in our health and well-being.

- Although it is difficult to answer the question, "Why do we sleep?" scientists have developed several theories that together may help explain why we spend a third of our lives sleeping.
- Understanding these theories can help deepen our appreciation of the function of sleep in our lives.

Hunger and Eating; Sleepiness and Sleep

As with eating well, good sleep is a staple of optimal health.

While we may not often think about why we sleep, most of us acknowledge at some level that sleep makes us feel better.

We feel more alert, more energetic, happier, and better able to function following a good



night of sleep. However, the fact that sleep makes us feel better and that going without sleep makes us feel worse only begins to explain why sleep might be necessary.

One way to think about the function of sleep is to compare it to another of our life-sustaining activities: eating.

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BOTSWANA'S FIRST IN VITRO FERTILISATION LABORATORY

In vitro fertilisation is an assisted reproductive technology that by-passes the natural fertilisation within the fallopian tubes (in vivo fertilisation) to accomplish fertilisation within the laboratory. Consequently in vitro fertilisation (IVF) is primarily indicated in a couple whose female partner has damaged, blocked or absent tubes.

In recent times, owing to its relatively good success rates IVF is indicated in a number of conditions including male factor infertility, impaired ovulation in the female, endometriosis and in the presence of anti-sperm antibodies.

Infertility, defined as failure of a heterosexual couple to conceive after regular (2 -3 times a week), unprotected sex for at least 1 year (if over 35yrs) or 2 years (if under 35yrs), is a common problem, affecting 15% of couples in their fertile years.

While basic fertility problems are amenable to treatment through general gynaecologists, complicated fertility problems require the services of reproductive (fertility) specialists, who have up to date only been accessible in South Africa. The need to travel, accommodation etc., in a foreign land often complicates and compounds the cost of assisted reproductive technology, which is already out of reach for the majority of

patients. Gaborone Fertility Clinic IVF LAB is Botswana's first in providing novel assisted reproductive technology (ART) services. The clinic is situated in Diagnofirm premises in Partial, making Diagnofirm to continue in its legacy to pave the way in the provision of advanced laboratory services in Botswana. ART services include in vitro fertilisation (IVF), intracytoplasmic sperm injection (ICSI), intracytoplasmic morphologically selected sperm injection (IMSI), sperm freezing, egg freezing, embryo freezing, ovarian and testicular tissue freezing, egg and sperm donation, semen analysis and sperm washing, gamete intra-fallopian sperm injection (GIFT) and zygote intra-fallopian sperm injection (ZIFT).

The Technology

In vitro fertilisation is a high-tech dependent laboratory process. It is preceded by

controlled ovarian hyperstimulation under the direction of a fertility specialist. The aim is to produce 6-15 eggs that are harvested in the laboratory concurrent with harvesting sperm from the male partner. It is following this harvest that the process of IVF begins.

Egg identification, fertilisation and incubation

Eggs are collected under ultrasound guidance and each egg is identified under a powerful phase contrast microscope. Under the microscope the egg surrounded by cumulus oophorous cells appears bluish.

The egg is stripped from the cumulus cells if ICSI will be done or left with its cumulus if the conventional IVF would be conducted.

In conventional fertilisation the egg is incubated with sperm in a specially designed incubator and fertilisation is observed after 18hrs. In the advanced ICSI, usually indicated in male factor infertility, a suitable sperm is identified under a very special microscope and injected into the egg. Fertilisation is then observed after 16-18hrs.

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TOP LEFT: An unfertilised egg with a polar body; Top Right: A fertilised egg with 2 pronuclei and 2 polar bodies . Bottom Left: Cleaving embryo at 4 cell stage. Bottom Right: Cleaving embryo at 8 cell stage(3 days after fertilisation)



Lamina Flow Cabinet – handling of eggs and sperms happen in a lamina flow cabinet

BOTSWANA'S FIRST IN VITRO FERTILISATION LABORATORY



CO2 Incubator

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The zygote (fertilised egg) is then incubated for 72-120hrs in special media under sterile conditions. Successful incubation requires a stable temperature, pH, humidity, a special Carbondioxide to oxygen to nitrogen ratio and an extremely low air particles size. Rigorous monitoring and quality assurance play a central role in managing and controlling the internal lab environment to ensure optimal conditions for embryo culture. Following incubation, the embryo is

transferred into the uterus under ultrasonic guidance. A special glue is used to hold the embryo in place until it buries itself into the uterine walls where it grows into a fully grown fetus. Any blood, trauma to maternal tissues, the type of embryo catheter, difficulty in transfer owing to abnormal cervical anatomy or transfer without a sonar may affect the success of the IVF cycle.

Semenology lab

Semenology lab (semen analysis, washing



An ICSI Rig

and concentration) is central to the IVF process. Sperm washing is required to separate a subpopulation of sperm with progressive motility and normal morphology, elimination of dead sperm and debris and to aid capacitation. Capacitation is a process of separating sperm from seminal fluids. It results in a biochemical transformation of sperm increasing their hyperactive motility and potentiates sperm acrosomal reaction, a process that is critical in sperm penetration of the egg to achieve fertilisation.

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BOTSWANA'S FIRST IN VITRO FERTILISATION LABORATORY

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Sperm may be prepared via different techniques, i.e. double wash, migration techniques, filtration techniques and density gradient centrifugation.

In patients with HIV and other infectious diseases, in order to reduce horizontal transmission to the other partner and to reduce vertical transmission to the unborn child, a combination technique with swim up and density gradient centrifugation suffices to remove the viral particles from sperm.

Gamete and Embryo freezing lab

The freezing of sperm, eggs and embryos is an essential part of the IVF process. Semen may be frozen for different reasons including; fertility preservation (e.g. before cancer treatment or vasectomy), in male factor infertility in which the male produces extremely small number of sperm, where the male experiences severe masturbatory distress impairing production of sperm when required after egg harvest, due to the planned absence of the male partner during an IVF treatment cycle and for purposes of sperm donation and/or quarantining for sexually transmissible diseases.

In females egg freezing is indicated in those with an incomplete family under going treatment for cancer, those undergoing bone marrow transplant, lupus nephritis, Behcets' disease, acute glomerulonephritis, those with a family history of premature ovarian failure. Delaying pregnancy for social reasons(e.g. among career-focussed women, those looking after ailing family member etc) is another indication for egg freezing where thawing of the eggs is carried out at a later time when social factors have abated.

Embryo freezing is done where a couple has a number of embryos left after successful fertilisation and culture of the harvested eggs. In the normal course of the IVF process the best embryos are selected for transfer in order to give the couple the best chance of success.



Liquid Nitrogen Freezing storage container

The remaining embryos are left for selection into the next cycles of IVF depending on their number and quality.

Of recent, freezing of ovarian tissue either as whole ovary with interval re-implantation into its vascular pedicle or some ovarian cortical strips has been incorporated into IVF practice. If ovarian strips are preserved they could either be re-implanted into the forearm or in the abdomen in order to aid easy access following controlled ovarian hyperstimulation.

The freezing of sperm obtained from testicular sperm extraction or aspiration is a normal part of the IVF process in men who have no detectable sperm in their semen or where sperm is found albeit in minute quantities.

It is important to note that the technology for whole ovarian freezing or ovarian strips

is considered an experimental procedure. Following transplantation of ovarian tissue, ovarian hyperstimulation with injectable hormones is possible.

Another option is to harvest eggs in their premature state either before transplantation or post-transplantation and culture them in the lab to maturity, in what is termed in vitro maturation, which in itself is considered an experimental procedure.

IVF Success Rates

Over the years the success of IVF have improved from 1% per menstrual cycle to 35% per cycle. The success of IVF is largely dependent on the female age, the duration of infertility (worse if duration is ≥ 3 yrs) and the type of infertility. At the age of 42 years for example the take home baby rate is about 15% compared to 50% at the age of 28 years.

Benefits Of Sleep

FROM PAGE 11

Hunger is a protective mechanism that has evolved to ensure that we consume the nutrients our bodies require to grow, repair tissues, and function properly. And although it is relatively easy to grasp the role that eating serves—given that it involves physically consuming the substances our bodies need—eating and sleeping are not as different as they might seem.

Both eating and sleeping are regulated by powerful internal drives. Going without food produces the uncomfortable sensation of hunger, while going without sleep makes us feel overwhelmingly sleepy. And just as eating relieves hunger and ensures that we obtain the nutrients we need, sleeping relieves sleepiness and ensures that we obtain the sleep we need. Still, the question remains: Why do we need sleep at all? Is there a single primary function of sleep, or does sleep serve many functions?

An Unanswerable Question?

Scientists have explored the question of why we sleep from many different angles. They have examined, for example, what happens when humans or other animals are deprived of sleep. In other studies, they have looked at sleep patterns in a variety of organisms to see if similarities or differences among species might reveal something about sleep's functions. Yet, despite decades of research and many discoveries about other aspects of sleep, the question of why we sleep has been difficult to answer.

The lack of a clear answer to this challenging question does not mean that this research has been a waste of time. In fact, we now know much more about the function of sleep, and scientists have developed several promising theories to explain why we sleep. In light of the evidence they have gathered, it seems likely that no single theory will ever be proven correct. Instead, we may find that sleep is explained by two or more of these explanations. The hope is that by better understanding why we sleep, we will learn to respect sleep's functions more and enjoy the health benefits it affords. This essay outlines several current theories of why we sleep.

Theories of Why We Sleep

Inactivity Theory



Arctic Fox at rest.

One of the earliest theories of sleep, sometimes called the adaptive or evolutionary theory, suggests that inactivity at night is an adaptation that served a survival function by keeping organisms out of harm's way at times when they would be particularly vulnerable. The theory suggests that animals that were able to stay still and quiet during these periods of vulnerability had an advantage over other animals that remained active. These animals did not have accidents during activities in the dark, for example, and were not killed by predators. Through natural selection, this behavioral strategy presumably evolved to become what we now recognize as sleep. A simple counter-argument to this theory is that it is always safer to remain conscious in order to be able to react to an emergency (even if lying still in the dark at night). Thus, there does not seem to be any advantage of being unconscious and asleep if safety is paramount.

Energy Conservation Theory

Although it may be less apparent to people living in societies in which food sources are plentiful, one of the strongest factors in natural selection is competition for and effective utilization of energy resources. The energy conservation theory suggests that the primary function of sleep is to reduce an individual's energy demand and expenditure during part of the day or night, especially at times when it is least efficient to search for food.



Lions conserving energy after a meal.

Research has shown that energy metabolism is significantly reduced during sleep (by as much as 10 percent in humans and even more in other species). For example, both body temperature and caloric demand decrease during sleep, as compared to wakefulness. Such evidence supports the proposition that one of the primary functions of sleep is to help organisms conserve their energy resources. Many scientists consider this theory to be related to, and part of, the inactivity theory. Restorative Theories

Another explanation for why we sleep is based on the long-held belief that sleep in some way serves to "restore" what is lost in the body while we are awake. Sleep provides an opportunity for the body to repair and rejuvenate itself. In recent years, these

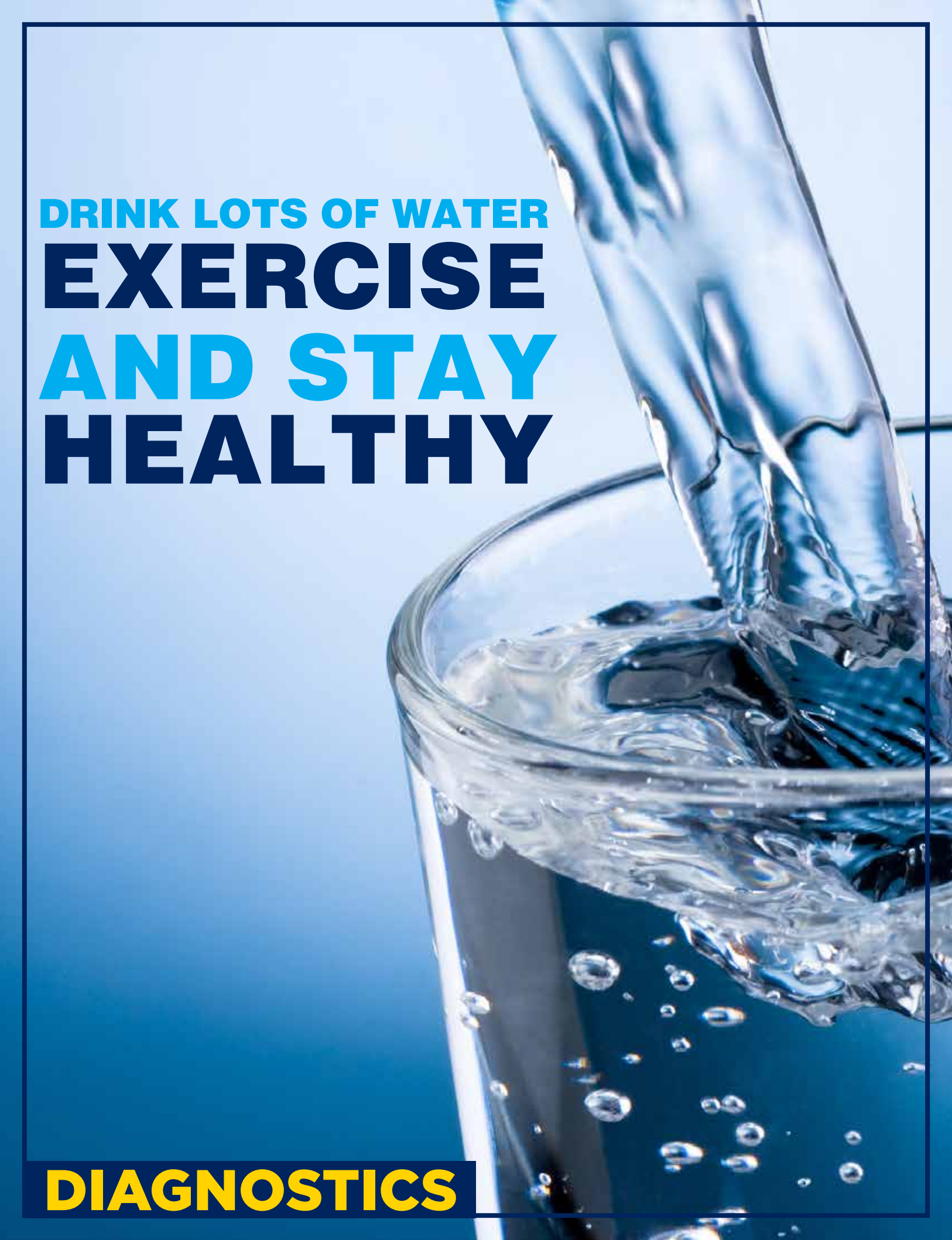
ideas have gained support from empirical evidence collected in human and animal studies. The most striking of these is that animals deprived entirely of sleep lose all immune function and die in just a matter of weeks. This is further supported by findings that many of the major restorative functions in the body like muscle growth, tissue repair, protein synthesis, and growth hormone release occur mostly, or in some cases only, during sleep.

Other rejuvenating aspects of sleep are specific to the brain and cognitive function. For example, while we are awake, neurons in the brain produce adenosine, a by-product of the cells' activities. The build-up of adenosine in the brain is thought to be one factor that leads to our perception of being tired. (Incidentally, this feeling is counteracted by the use of caffeine, which blocks the actions of adenosine in the brain and keeps us alert.) Scientists think that this build-up of adenosine during wakefulness may promote the "drive to sleep." As long as we are awake, adenosine accumulates and remains high. During sleep, the body has a chance to clear adenosine from the system, and, as a result, we feel more alert when we wake.

The Learning Process and Sleep



Healthy sleep is essential for optimal learning and memory function. Sleep, learning, and memory are complex phenomena that are not entirely understood. However, animal and human studies suggest that the quantity and quality of sleep have a profound impact on learning and memory. Research suggests that sleep helps learning and memory in two distinct ways. First, a sleep-deprived person cannot focus attention optimally and therefore cannot learn efficiently. Second, sleep itself has a role in the consolidation of memory, which is essential for learning new information. Although the exact mechanisms are not known, learning and memory are often described in terms of three functions. Acquisition refers to the introduction of new information into the brain. Consolidation represents the processes by which a memory becomes stable. Recall refers to the ability to access the information (whether consciously or unconsciously) after it has been stored.

A close-up, high-speed photograph of water being poured from a glass pitcher into a clear glass. The water is captured mid-pour, creating a dynamic splash with many small bubbles and droplets. The background is a soft, out-of-focus blue, and the entire image is framed by a thin dark blue border.

DRINK LOTS OF WATER
EXERCISE
AND STAY
HEALTHY

DIAGNOSTICS