DOWNLOAD PDF GENETICS OF NEUROLOGICAL DISORDERS

Chapter 1 : Genetic Testing for Neurological Disorders | Invitae

Hereditary neurological disorders (HNDs) are relatively common in children compared to those occurring in adulthood. Recognising clinical manifestations of HNDs is important for the selection of genetic testing, genetic testing results interpretation, and genetic consultation. Meanwhile, advances in.

Where can I get more information? What is autism spectrum disorder? Autism spectrum disorder ASD refers to a group of complex neurodevelopment disorders characterized by repetitive and characteristic patterns of behavior and difficulties with social communication and interaction. The symptoms are present from early childhood and affect daily functioning. Some children and adults with ASD are fully able to perform all activities of daily living while others require substantial support to perform basic activities. A diagnosis of ASD includes an assessment of intellectual disability and language impairment. ASD occurs in every racial and ethnic group, and across all socioeconomic levels. However, boys are significantly more likely to develop ASD than girls. Even as infants, children with ASD may seem different, especially when compared to other children their own age. They may become overly focused on certain objects, rarely make eye contact, and fail to engage in typical babbling with their parents. In other cases, children may develop normally until the second or even third year of life, but then start to withdraw and become indifferent to social engagement. The severity of ASD can vary greatly and is based on the degree to which social communication, insistence of sameness of activities and surroundings, and repetitive patterns of behavior affect the daily functioning of the individual. Social impairment and communication difficulties Many people with ASD find social interactions difficult. The mutual give-and-take nature of typical communication and interaction is often particularly challenging. Children with ASD may fail to respond to their names, avoid eye contact with other people, and only interact with others to achieve specific goals. Often children with ASD do not understand how to play or engage with other children and may prefer to be alone. People with ASD may have very different verbal abilities ranging from no speech at all to speech that is fluent, but awkward and inappropriate. Some children with ASD may have delayed speech and language skills, may repeat phrases, and give unrelated answers to questions. In addition, people with ASD can have a hard time using and understanding non-verbal cues such as gestures, body language, or tone of voice. For example, young children with ASD might not understand what it means to wave goodbye. People with ASD may also speak in flat, robot-like or a sing-song voice about a narrow range of favorite topics, with little regard for the interests of the person to whom they are speaking. Repetitive and characteristic behaviors Many children with ASD engage in repetitive movements or unusual behaviors such as flapping their arms, rocking from side to side, or twirling. They may become preoccupied with parts of objects like the wheels on a toy truck. Children may also become obsessively interested in a particular topic such as airplanes or memorizing train schedules. Many people with ASD seem to thrive so much on routine that changes to the daily patterns of life â€” like an unexpected stop on the way home from school â€” can be very challenging. Some children may even get angry or have emotional outbursts, especially when placed in a new or overly stimulating environment. Certain known genetic disorders are associated with an increased risk for autism, including Fragile X syndrome which causes intellectual disability and tuberous sclerosis which causes benign tumors to grow in the brain and other vital organs â€” each of which results from a mutation in a single, but different, gene. Recently, researchers have discovered other genetic mutations in children diagnosed with autism, including some that have not yet been designated as named syndromes. While each of these disorders is rare, in aggregate, they may account for 20 percent or more of all autism cases. People with ASD also have a higher than average risk of having epilepsy. Children whose language skills regress early in life â€” before age 3 â€” appear to have a risk of developing epilepsy or seizure-like brain activity. About 20 to 30 percent of children with ASD develop epilepsy by the time they reach adulthood. Additionally, people with both ASD and intellectual disability have the greatest risk of developing seizure disorder. ASD symptoms can vary greatly from person to person depending on the severity of the disorder. Symptoms may even go unrecognized for young children who have mild ASD or less debilitating handicaps. Autism spectrum disorder is diagnosed by clinicians based on symptoms, signs, and testing

according to the Diagnostic and Statistical Manual of Mental Disorders-V, a guide created by the American Psychiatric Association used to diagnose mental disorders. Children should be screened for developmental delays during periodic checkups and specifically for autism at and month well-child visits. Very early indicators that require evaluation by an expert include: A comprehensive evaluation requires a multidisciplinary team, including a psychologist, neurologist, psychiatrist, speech therapist, and other professionals who diagnose and treat children with ASD. The team members will conduct a thorough neurological assessment and in-depth cognitive and language testing. Because hearing problems can cause behaviors that could be mistaken for ASD, children with delayed speech development should also have their hearing tested. Scientists believe that both genetics and environment likely play a role in ASD. There is great concern that rates of autism have been increasing in recent decades without full explanation as to why. Researchers have identified a number of genes associated with the disorder. Imaging studies of people with ASD have found differences in the development of several regions of the brain. Studies suggest that ASD could be a result of disruptions in normal brain growth very early in development. These disruptions may be the result of defects in genes that control brain development and regulate how brain cells communicate with each other. Autism is more common in children born prematurely. Environmental factors may also play a role in gene function and development, but no specific environmental causes have yet been identified. The theory that parental practices are responsible for ASD has long been disproved. Multiple studies have shown that vaccination to prevent childhood infectious diseases does not increase the risk of autism in the population. Twin and family studies strongly suggest that some people have a genetic predisposition to autism. Identical twin studies show that if one twin is affected, then the other will be affected between 36 to 95 percent of the time. There are a number of studies in progress to determine the specific genetic factors associated with the development of ASD. In families with one child with ASD, the risk of having a second child with the disorder also increases. Many of the genes found to be associated with autism are involved in the function of the chemical connections between brain neurons synapses. Researchers are looking for clues about which genes contribute to increased susceptibility. In some cases, parents and other relatives of a child with ASD show mild impairments in social communication skills or engage in repetitive behaviors. Evidence also suggests that emotional disorders such as bipolar disorder and schizophrenia occur more frequently than average in the families of people with ASD. The mutation then occurs in each cell as the fertilized egg divides. These mutations may affect single genes or they may be changes called copy number variations, in which stretches of DNA containing multiple genes are deleted or duplicated. Autism risk also increases in children born to older parents. There is still much research to be done to determine the potential role of environmental factors on spontaneous mutations and how that influences ASD risk. For many children, symptoms improve with age and behavioral treatment. During adolescence, some children with ASD may become depressed or experience behavioral problems, and their treatment may need some modification as they transition to adulthood. People with ASD usually continue to need services and supports as they get older, but depending on severity of the disorder, people with ASD may be able to work successfully and live independently or within a supportive environment. There is no cure for ASD. Therapies and behavioral interventions are designed to remedy specific symptoms and can substantially improve those symptoms. The ideal treatment plan coordinates therapies and interventions that meet the specific needs of the individual. Most health care professionals agree that the earlier the intervention, the better. In these interventions therapists use highly structured and intensive skill-oriented training sessions to help children develop social and language skills, such as applied behavioral analysis, which encourages positive behaviors and discourages negative ones. In addition, family counseling for the parents and siblings of children with ASD often helps families cope with the particular challenges of living with a child with ASD. Antipsychotic medications are used to treat severe behavioral problems. Seizures can be treated with one or more anticonvulsant drugs. Medication used to treat people with attention deficit disorder can be used effectively to help decrease impulsivity and hyperactivity in people with ASD. Parents, caregivers, and people with autism should use caution before adopting any unproven treatments. The mission of the National Institute of Neurological Disorders and Stroke NINDS is to seek fundamental knowledge about the brain and nervous system and to use that knowledge to reduce the burden of neurological

disease. Department of Health and Human Services agencies, the Department of Education, and other governmental organizations, as well as public members, including individuals with ASD and representatives of patient advocacy organizations. Such biomarkers could aid in understanding how and why ASD occurs in some children but not others, and help to identify patients who might benefit from early intervention. Other ACE centers and networks are investigating early brain development and functioning; genetic and non-genetic risk factors, including neurological, physical, behavioral, and environmental factors present in the prenatal period and early infancy; and potential therapies. NINDS funds additional research aimed at better understanding the factors that lead to ASD, including other studies on genetic disorders associated with ASD, such as TSC, Fragile X Syndrome, Phelan-McDermid syndrome which features such autism-like symptoms as intellectual disability, developmental delays, and problems with developing functional language , and Rett syndrome a disorder that almost exclusively affects girls and is characterized by slowing development, intellectual disability, and loss of functional use of the hands. Many of these studies use animal models to determine how specific known mutations affect cellular and developmental processes in the brain, yielding insights relevant to understanding ASD due to other causes and discovering new targets for treatments. For example, NINDS-funded researchers are investigating the formation and function of neuronal synapses, the sites of communication between neurons, which may not properly operate in ASD and neurodevelopmental disorders. Other studies use brain imaging in people with and without ASD to identify differences in brain connectivity and activity patterns associated with features of ASD. Researchers hope that understanding these alterations can help identify new opportunities for therapeutic interventions. The goals of the consortium are to understand shared mechanisms across these syndromes, which may suggest common approaches to their treatment. NINDS supports autism spectrum disorder research through clinical trials at medical centers across the United States to better our knowledge about ASD treatment and care. Additional studies can be found at www. People should talk to their doctor before enrolling in a clinical trial.

Chapter 2 : Neurogenetics - Wikipedia

The third edition of The Genetics of Neurological Disorders incorporates the most recent advances in genetics into this comprehensive reference. The classification of diseases within the text has been updated in line with the change in practice necessitated by the newest findings in the field.

Numbness in the legs or arms Changes in coordination or balance Weakness Tremors Medication: Drug Options for Neurological Issues While it is understandable that the thought of being diagnosed with a neurological disorder may be frightening, it is important to understand that drug options for neurological issues are available. Such options can help you or your loved one to better manage your condition, reduce symptoms and improve your quality of life. Possible Options The type of medication that may be used for the treatment of your neurological disorder will depend on your condition. Possible options for neurological drugs may include corticosteroids, which are often indicated for the treatment of multiple sclerosis. This type of medication may assist with decreasing inflammation. Medication Side Effects When taking medication for the treatment of any condition or disorder, it is important to understand that you may experience certain side effects. Medication side effects related to the treatment of neurological disorders can vary based on your own situation and the type of medication in question. In some instances, it may be possible to develop dependence to the medication you are taking. This can occur even if it is a prescription medication, and you are taking it for the treatment of a serious health problem, such as a neurological disorder. Drug Addiction, Dependence and Withdrawal If you have developed a drug addiction, dependence and withdrawal are two critical components you need to understand. Dependence can develop when you take medication over a period of time. Depending on the addictive nature of the medication and your own personal situation, dependence can sometimes develop quickly. If you do become dependent on your medication, you will experience withdrawal symptoms when you abruptly stop taking the medication. Symptoms can include headaches, nausea and tremors. Addiction generally means you also have a psychological dependence on the medication in addition to a physical dependence. Medication Overdose The potential for medication overdose is quite real and should not be taken lightly. In instances where an individual has become dependent on a medication, they may begin taking increasingly larger doses of the medication in order to achieve the same effects. This can result in an overdose â€” a serious medical situation that can be fatal. If you believe that you or someone you know may be taking too much medication and could be at risk for overdose, it is important to seek help right away. Please contact us at. Depression and Neurological Problems Depression and neurological problems are often interrelated. Due to the debilitating nature of depression, individuals who suffer from it as well as neurological problems may find recovery to be challenging without professional assistance. Many different treatment options are available that can assist you with the treatment of your depression, including therapy in combination with medication. Addiction and Neurological Disorders Seeking help from a facility that offers the ability to make a dual diagnosis, such as a diagnose of an addiction compounded by a neurological disorder, is critical for achieving an optimal recovery. If one issue is treated but the other is left untreated, the chances of achieving a full recovery can be diminished. In a treatment facility that focuses on addressing both addiction and neurological issues, you will be able to receive the critical help you need for your addiction while at the same time ensuring that your neurological disorder is also treated. Getting Help for a Neurological Issue Regardless of how long you have suffered, it is important to know that assistance is available. With professional medical treatment, it is possible to manage your neurological disorder while also treating any other comorbid condition, such as addiction. The key is to choose a treatment facility that specializes in the treatment of neurological problems. If you have noticed signs and symptoms of neurological problems in yourself or someone else, please do not delay in asking for help on treating neurological problems today. Call us now at. Neurons are constantly delivering and receiving information from and to the body. Learn more about what this means here. Our helpline is offered at no cost to you and with no obligation to enter into treatment.

Chapter 3 : Neurological Problem Symptoms, Causes and Effects - calendrierdelascience.com

At NorthShore, genetic testing is available for these hereditary neurological disorders and others. Family history, ages at diagnosis and neurological features in a family are used to determine the likelihood of an inherited neurological condition and, if one is suspected, which gene(s) should be analyzed.

Statistical analysis[edit] Logarithm of odds LOD is a statistical technique used to estimate the probability of gene linkage between traits. A key benefit of this technique is its ability to give reliable results in both large and small sample sizes, which is a marked advantage in laboratory research. By identifying specific genetic markers for the genes of interest in a recombinant inbred strain , the amount of interaction between these genes and their relation to the observed phenotype can be determined through complex statistical analysis. In a neurogenetics laboratory, the phenotype of a model organisms is observed by assessing the morphology of their brain through thin slices. Human beings pose a greater challenge for QTL analysis because the genetic population cannot be as carefully controlled as that of an inbred recombinant population, which can result in sources of statistical error. The hosts are then screened with the aid of a toxic drug that the selectable marker is resistant to. The use of recombinant DNA is an example of a reverse genetics, where researchers create a mutant genotype and analyze the resulting phenotype. In forward genetics , an organism with a particular phenotype is identified first, and its genotype is then analyzed. By studying creatures with simpler nervous systems and with smaller genomes, scientists can better understand their biological processes and apply them to more complex organisms, such as humans. Due to their low-maintenance and highly mapped genomes, mice, Drosophila , [19] and C. Zebrafish [21] and prairie voles [22] have also become more common, especially in the social and behavioral scopes of neurogenetics. In addition to examining how genetic mutations affect the actual structure of the brain, researchers in neurogenetics also examine how these mutations affect cognition and behavior. One method of examining this involves purposely engineering model organisms with mutations of certain genes of interest. These animals are then classically conditioned to perform certain types of tasks, such as pulling a lever in order to gain a reward. The speed of their learning, the retention of the learned behavior, and other factors are then compared to the results of healthy organisms to determine what kind of an effect â€" if any â€" the mutation has had on these higher processes. The results of this research can help identify genes that may be associated with conditions involving cognitive and learning deficiencies. Model organisms, while important, cannot completely model the complexity of the human body, making volunteers a key part to the progression of research. These tissue samples are then genetically sequenced, and the genomes are added to current database collections. The growth of these data bases will eventually allow researchers to better understand the genetic nuances of these conditions and bring therapy treatments closer to reality. Current areas of interest in this field have a wide range, spanning anywhere from the maintenance of circadian rhythms , [24] the progression of neurodegenerative disorders, the persistence of periodic disorders, and the effects of mitochondrial decay on metabolism. It is starting to become clear that most genetically influenced behaviors are due to the effects of many variants within many genes, in addition to other neurological regulating factors like neurotransmitter levels. Due to fact that many behavioral characteristics have been conserved across species for generations, researchers are able to use animal subjects such as mice and rats, but also fruit flies, worms, and zebrafish, [19] [20] to try to determine specific genes that correlate to behavior and attempt to match these with human genes. Such traits include mating, aggression, foraging, social behavior and sleep patterns. This conservation of behavior across species has led biologists to hypothesize that these traits could possibly have similar, if not the same, genetic causes and pathways. Studies conducted on the genomes of a plethora of organisms have revealed that many organisms have homologous genes , meaning that some genetic material has been conserved between species. If these organisms shared a common evolutionary ancestor, then this might imply that aspects of behavior can be inherited from previous generations, lending support to the genetic causes â€" as opposed to the environmental causes â€" of behavior. Outward displays of aggression are seen in most animals Throughout the animal kingdom, varying styles, types and levels of aggression can be observed leading scientists to believe that there

might be a genetic contribution that has conserved this particular behavioral trait. The following wiki links may prove helpful:

Chapter 4 : Using genetic testing to transform care for neurological disorders | Individualized Medicine blog

The primary NIH organization for research on Genetic Brain Disorders is the National Institute of Neurological Disorders and Stroke Disclaimers MedlinePlus links to health information from the National Institutes of Health and other federal government agencies.

Where can I get more information Diagnostic tests and procedures are vital tools that help physicians confirm or rule out the presence of a neurological disorder or other medical condition. A century ago, the only way to make a positive diagnosis for many neurological disorders was by performing an autopsy after a patient had died. But decades of basic research into the characteristics of disease, and the development of techniques that allow scientists to see inside the living brain and monitor nervous system activity as it occurs, have given doctors powerful and accurate tools to diagnose disease and to test how well a particular therapy may be working. Perhaps the most significant changes in diagnostic imaging over the past 20 years are improvements in spatial resolution size, intensity, and clarity of anatomical images and reductions in the time needed to send signals to and receive data from the area being imaged. These advances allow physicians to simultaneously see the structure of the brain and the changes in brain activity as they occur. Scientists continue to improve methods that will provide sharper anatomical images and more detailed functional information. Researchers and physicians use a variety of diagnostic imaging techniques and chemical and metabolic analyses to detect, manage, and treat neurological disease. Some procedures are performed in specialized settings, conducted to determine the presence of a particular disorder or abnormality. Depending on the type of procedure, results are either immediate or may take several hours to process. Certain tests, ordered by the physician as part of a regular check-up, provide general information, while others are used to identify specific health concerns. Blood tests are also used to monitor levels of therapeutic drugs used to treat epilepsy and other neurological disorders. Analysis of the fluid that surrounds the brain and spinal cord can detect meningitis, acute and chronic inflammation, rare infections, and some cases of multiple sclerosis. Chemical and metabolic testing of the blood can indicate protein disorders, some forms of muscular dystrophy and other muscle disorders, and diabetes. Urinalysis can reveal abnormal substances in the urine or the presence or absence of certain proteins that cause diseases including the mucopolysaccharidoses. Genetic tests include the following: Amniocentesis, usually done at weeks of pregnancy, tests a sample of the amniotic fluid in the womb for genetic defects the fluid and the fetus have the same DNA. About 20 milliliters of fluid roughly 4 teaspoons is withdrawn and sent to a lab for evaluation. Test results often take weeks. Chorionic villus sampling, or CVS, is performed by removing and testing a very small sample of the placenta during early pregnancy. The sample, which contains the same DNA as the fetus, is removed by catheter or fine needle inserted through the cervix or by a fine needle inserted through the abdomen. It is tested for genetic abnormalities and results are usually available within 2 weeks. CVS should not be performed after the tenth week of pregnancy. This noninvasive test can suggest the diagnosis of conditions such as chromosomal disorders see ultrasound imaging, below. Some tests require the services of a specialist to perform and analyze results. X-rays can be used to view any part of the body, such as a joint or major organ system. Since calcium in bones absorbs x-rays more easily than soft tissue or muscle, the bony structure appears white on the film. Any vertebral misalignment or fractures can be seen within minutes. Tissue masses such as injured ligaments or a bulging disc are not visible on conventional x-rays. The fluoroscope x-ray tube is focused on the area of interest and pictures are either videotaped or sent to a monitor for viewing. A contrast medium may be used to highlight the images. Fluoroscopy can be used to evaluate the flow of blood through arteries. The following list of available proceduresâ€”in alphabetical rather than sequential orderâ€”includes some of the more common tests used to help diagnose a neurological condition. It is used to diagnose stroke and to determine the location and size of a brain tumor, aneurysm, or vascular malformation. This test is usually performed in a hospital outpatient setting and takes up to 3 hours, followed by a 6- to 8-hour resting period. The patient, wearing a hospital or imaging gown, lies on a table that is wheeled into the imaging area. While the patient is awake, a physician anesthetizes a small area of the leg near the groin and then inserts a catheter into a major artery located there. The catheter is threaded through the

body and into an artery in the neck. Once the catheter is in place, the needle is removed and a guide wire is inserted. A small capsule containing a radiopaque dye one that is highlighted on x-rays is passed over the guide wire to the site of release. The dye is released and travels through the bloodstream into the head and neck. A series of x-rays is taken and any obstruction is noted. Patients may feel a warm to hot sensation or slight discomfort as the dye is released. A small sample of muscle or nerve is removed under local anesthetic and studied under a microscope. The sample may be removed either surgically, through a slit made in the skin, or by needle biopsy, in which a thin hollow needle is inserted through the skin and into the muscle. A small piece of muscle or nerve remains in the hollow needle when it is removed from the body. The biopsy is usually performed at an outpatient testing facility. Performed in a hospital, this operation is riskier than a muscle biopsy and involves a longer recovery period. These scans are used to study organ function or injury or disease to tissue or muscle. Types of brain scans include computed tomography, magnetic resonance imaging, and positron emission tomography see descriptions, below. The procedure is usually done in a hospital. The patient is asked to either lie on one side, in a ball position with knees close to the chest, or lean forward while sitting on a table or bed. The doctor will locate a puncture site in the lower back, between two vertebrate, then clean the area and inject a local anesthetic. The patient may feel a slight stinging sensation from this injection. Once the anesthetic has taken effect, the doctor will insert a special needle into the spinal sac and remove a small amount of fluid usually about three teaspoons for testing. Most patients will feel a sensation of pressure only as the needle is inserted. A common after-effect of a lumbar puncture is headache, which can be lessened by having the patient lie flat. Risk of nerve root injury or infection from the puncture can occur but it is rare. The entire procedure takes about 45 minutes. Computed tomography, also known as a CT scan, is a noninvasive, painless process used to produce rapid, clear two-dimensional images of organs, bones, and tissues. Neurological CT scans are used to view the brain and spine. They can detect bone and vascular irregularities, certain brain tumors and cysts, herniated discs, epilepsy, encephalitis, spinal stenosis narrowing of the spinal canal , a blood clot or intracranial bleeding in patients with stroke, brain damage from head injury, and other disorders. Many neurological disorders share certain characteristics and a CT scan can aid in proper diagnosis by differentiating the area of the brain affected by the disorder. Scanning takes about 20 minutes a CT of the brain or head may take slightly longer and is usually done at an imaging center or hospital on an outpatient basis. The patient lies on a special table that slides into a narrow chamber. A sound system built into the chamber allows the patient to communicate with the physician or technician. As the patient lies still, x-rays are passed through the body at various angles and are detected by a computerized scanner. A light sedative may be given to patients who are unable to lie still and pillows may be used to support and stabilize the head and body. Persons who are claustrophobic may have difficulty taking this imaging test. Occasionally a contrast dye is injected into the bloodstream to highlight the different tissues in the brain. Patients may feel a warm or cool sensation as the dye circulates through the bloodstream or they may experience a slight metallic taste. Although very little radiation is used in CT, pregnant women should avoid the test because of potential harm to the fetus from ionizing radiation. This outpatient procedure is usually performed at a testing facility or a hospital. The patient is asked to put on a metal-free hospital gown and lie on an imaging table. The physician numbs the skin with anesthetic and inserts a thin needle, using x-ray guidance, into the spinal disc. Once the needle is in place, a small amount of contrast dye is injected and CT scans are taken. The contrast dye outlines any damaged areas. More than one disc may be imaged at the same time. Patient recovery usually takes about an hour. Pain medicine may be prescribed for any resulting discomfort. This test is most often performed at an imaging center. The patient is asked to put on a hospital or imaging gown. Following application of a topical anesthetic, the physician removes a small sample of the spinal fluid via lumbar puncture. The sample is mixed with a contrast dye and injected into the spinal sac located at the base of the lower back. The patient is then asked to move to a position that will allow the contrast fluid to travel to the area to be studied. The dye allows the spinal canal and nerve roots to be seen more clearly on a CT scan. The scan may take up to an hour to complete. Electroencephalography, or EEG, monitors brain activity through the skull. EEGs are also used to evaluate sleep disorders, monitor brain activity when a patient has been fully anesthetized or loses consciousness, and confirm brain death. Prior to taking an EEG, the person must avoid caffeine intake and

prescription drugs that affect the nervous system. The electrodes also called leads are small devices that are attached to wires and carry the electrical energy of the brain to a machine for reading. A very low electrical current is sent through the electrodes and the baseline brain energy is recorded. Patients are then exposed to a variety of external stimuliâ€”including bright or flashing light, noise or certain drugsâ€”or are asked to open and close the eyes, or to change breathing patterns. The electrodes transmit the resulting changes in brain wave patterns. Since movement and nervousness can change brain wave patterns, patients usually recline in a chair or on a bed during the test, which takes up to an hour. Testing for certain disorders requires performing an EEG during sleep, which takes at least 3 hours. In order to learn more about brain wave activity, electrodes may be inserted through a surgical opening in the skull and into the brain to reduce signal interference from the skull. Electromyography, or EMG, is used to diagnose nerve and muscle dysfunction and spinal cord disease. During an EMG, very fine wire electrodes are inserted into a muscle to assess changes in electrical voltage that occur during movement and when the muscle is at rest. The electrodes are attached through a series of wires to a recording instrument.

Chapter 5 : Genetics of hereditary neurological disorders in children - Huang - Translational Pediatrics

Neurological diseases represent one of the gravest challenges to human in the 21st century, with the prevalence of disorders such as Alzheimer's and Parkinson's increasing as populations age across the globe.

Using genetic testing to transform care for neurological disorders By Sharon Rosen Our nervous system is made up of complex biological pathways that control everything we do, including breathing, thinking, speaking, moving and feeling. Some patients with unexplained neurological symptoms search for years for a diagnosis and treatment. Scientists and physicians have suspected that many neurological conditions had underlying genetic causes. The question has been how to verify that. Advances in DNA testing technology provide new, more accurate ways to pinpoint genetic variations that lead to neurological disease. Armed with this knowledge, physicians can then offer patients targeted treatments for their condition. The paper, Neurology Individualized Medicine: When to Use Next-Generation Sequencing Panels, provides an overview of the different types of DNA testing now available through advanced technology known as next generation sequencing, the advantages and shortfalls of each method and how to select a genetic test for a patient based on their particular neurological symptoms. Many different genetic causes can lead to similar symptoms in patients. Three types of DNA testing to consider Whether you are a patient or a provider, it is important to understand the different types of genetic testing available. The paper explains concepts that can help you understand what tests are best for you or your patient in a clinical setting. The authors highlight three methods of next generation sequencing used to identify genetic links to disease: Targeted panel testing examines a select group of genes connected to disease, often testing from 50 to genes. Whole exome sequencing examines only a small portion of the whole genome but includes all genes that have been shown to have a connection to disease. How do physicians determine which genomic testing method to use when trying to diagnose a neurological disorder? According to the authors, it depends on the number of genes that may be involved in causing a particular disease. Targeted panel testing The authors advocate using targeted-panel next generation sequencing for neurological disorders which may be caused by more than one type of genetic variation. This approach has been a successful diagnostic tool for inherited neurological conditions such as neuropathy, myopathy muscle disease , motor neuron disease a progressive disease that affects the nerves in the brain and spinal cord and epilepsy syndromes. Advantages to using targeted-panel testing include: Lower costs for conducting DNA sequencing of a smaller set of genes and analyzing the data generated by the tests. Provides in depth analysis of specified genes that are known to cause disease and accurate identification of genetic variants, which can be used to make decisions about patient care. Produces a smaller number of variations with unknown importance, which can be difficult to interpret, compared to other genetic testing methods that examine a broader range of genes. Whole genome or whole exome sequencing On the other hand, there are benefits to using broader genomic testing methods to diagnose certain neurological disorders. The authors recommend using whole genome sequencing or whole exome sequencing to explore disorders with unknown genetic origins. For example, these approaches may be able to provide a diagnosis for patients who have searched unsuccessfully for a diagnosis using traditional clinical testing or for patients with developmental delays or autism. In these cases, the broader approaches offer the opportunity to discover new genetic variants that could be responsible for these conditions. When selecting these broader approaches, providers should recognize the disadvantages of these tests which include: Higher costs for genetic testing and data analysis Longer turnaround time to receive test results More genetic variations with unknown significance are identified, making the results more challenging to interpret Higher likelihood of identifying unexpected genetic predispositions to disease, in addition to the neurological disorder Proper use of genetic tests can enhance patient care According to the authors, the key to effective use of genetic testing is collaboration. Clinicians, laboratory geneticists and bioinformatics experts must work together to develop guidelines to select the right genetic tests, accurately interpret results and then use this information to guide patient care. This collaboration can have a tremendous impact on patient care by: Avoiding improper therapies and additional costly invasive therapies such as biopsy. Identifying specific prognostic and disease management

information. Offering family genetic counseling for conditions that could impact other family members. Providing opportunities for patients to participate in clinical trials and have access to emerging drug therapies. Mayo Clinic Proceedings Symposium on Precision Medicine This paper is the second in Mayo Clinic Proceedings Symposium on Precision Medicine, a series of articles that cover a wide range of topics in personalized medicine. Watch for upcoming articles in the symposium, which will focus on how personalized medicine and genomics are impacting patient care. Learn more about the series. Get the latest news from the Center for Individualized Medicine. Save the date for the next Individualizing Medicine Conference on Oct.

Chapter 6 : List of neurological conditions and disorders - Wikipedia

Neurological diseases are defined as an inappropriate function of the peripheral or central nervous system due to impaired electrical impulses throughout the brain and/or nervous system that may.

Neurological Disorders Main Document A neurological disorder is defined as any disorder of the body nervous system. Structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms. Examples of symptoms include paralysis, muscle weakness, poor coordination, loss of sensation, seizures, confusion, pain and altered levels of consciousness. The specific causes of neurological problems vary, but can include genetic disorders, congenital abnormalities or disorders, infections, lifestyle or environmental health problems including malnutrition, and brain injury, spinal cord injury or nerve injury. There are many recognized neurological disorders, some relatively common, but many rare. They may be assessed by neurological examination, and studied and treated within the specialties of neurology and clinical neuropsychology. Mental disorders, on the other hand, are "psychiatric illnesses" or diseases which appear primarily as abnormalities of thought, feeling or behavior, producing either distress or impairment of function. Neurological disorders affect the brain as well as the nerves found throughout the human body and the spinal cord. These three parts of the body work together and are referred to as the central nervous system that control everything in the body. Neurology is the medical science that deals with the nervous system and disorders that affect it. Conditions that are classed as mental disorders, or learning disabilities and forms of Intellectual disability, are not themselves usually dealt with as neurological disorders. Neurological disorders can be categorized according to the primary location affected, the primary type of dysfunction involved, or the primary type of cause. The broadest division is between central nervous system disorders and peripheral nervous system disorders. Neurological disorders can affect an entire neurological pathway or a single neuron. According to the University of California, San Francisco, there are more than neurological disorders that strike millions each year. These diseases and disorders inflict great pain and suffering on millions of patients and their families, and cost the U. For definitions of the parts that make up the brain see our glossary and Definitions of Human Brain Components For some interesting information on the human brain visit our reference page Human Brain Facts for answers, and facts pertaining to the brain. Alphabetical glossary and definitions of medical terms and health conditions. Children who are born without this membrane and also have other abnormalities, pituitary deficiencies and abnormal development of the optic disk have a disorder known as septo-optic dysplasia. Acid Lipase Disease - is a name used to describe two related disorders of fatty acid metabolism. These fatty substances, called lipids, include waxes, oils, and cholesterol. Acid Maltase Deficiency - Glycogen storage disease type II also called Pompe disease or acid maltase deficiency is a rare genetic disorder caused by a deficiency in the enzyme acid alpha-glucosidase GAA EC 3. Acquired Epileptiform Aphasia - Landau-Kleffner syndrome LKS is a rare, childhood neurological disorder characterized by the sudden or gradual development of aphasia the inability to understand or express language and an abnormal electro-encephalogram EEG. LKS affects the parts of the brain that control comprehension and speech. The disorder usually occurs in children between the ages of 5 and 7 years. Acute Disseminated Encephalomyelitis - is an immune mediated disease of brain. It usually occurs following a viral infection or vaccination, but it may also appear spontaneously. It is similar in some ways to multiple sclerosis, and is considered part of the Multiple sclerosis borderline. It is believed to be a result of damage to the nerve innervating a muscle of the eye known as the ciliary body. Alternately, the problem may be located at the ciliary ganglion, a kind of nerve junction structure from which the nerve to the ciliary body runs. The pupil is characteristically poorly reactive to light but slowly reactive to accommodation. Adrenoleukodystrophy - is one of a group of genetic disorders called the leukodystrophies that cause damage to the myelin sheath, an insulating membrane that surrounds nerve cells in the brain. People with ALD accumulate high levels of saturated, very long chain fatty acids VLCFA in the brain and adrenal cortex because they do not produce the enzyme that breaks down these fatty acids in the normal manner. The loss of myelin and the progressive dysfunction of the adrenal gland are the primary characteristics of ALD. Agenesis

of the Corpus Callosum - ACC is a rare birth defect congenital disorder in which there is a complete or partial absence of the corpus callosum. Agenesis of the corpus callosum occurs when the corpus callosum, the band of tissue connecting the two hemispheres of the brain, does not develop typically in utero. In addition to agenesis of the corpus callosum, other callosal disorders include hypogenesis partial formation , dysgenesis malformation of the corpus callosum, and hypoplasia underdevelopment of the corpus callosum. Agnosia - is a loss of ability to recognize objects, persons, sounds, shapes, or smells while the specific sense is not defective nor is there any significant memory loss. It is usually associated with brain injury or neurological illness, particularly after damage to the right parietal lobe. Aicardi Syndrome - is a rare genetic disorder. Aicardi syndrome is characterized by the following: Absence of the corpus callosum, either partial or complete the corpus callosum is the part of the brain which sits between the right and left sides of the brain and allows the right side to communicate with the left. Infantile spasms a form of seizures Lesions or "lacunae" of the retina of the eye that are very specific to this disorder. Other types of defects of the brain such as microcephaly , small brain ; enlarged ventricles; or porencephalic cysts a gap in the brain where there should be healthy brain tissue. Aicardi syndrome only affects females, and in very rare cases, males with Klinefelter syndrome XXY. The spectrum of neurological disorders is broad and involves the central nervous system, or CNS brain and spinal cord and the peripheral nervous system, or PNS nerves outside the brain and spinal cord, and related muscle. Alexander Disease - is a slowly progressing and fatal neurodegenerative disease. It is a very rare disorder which results from a genetic mutation and mostly affects infants and children, causing developmental delay and changes in physical characteristics. It is characterized by acute onset of severe convulsions leading to rapid intellectual and bodily breakdown. Other traits are blindness, deafness, myoclonus, spasticity, choroathetosis, cerebellar ataxia, growth retardation, plus terminal decortication. Manifests in early childhood and usually causes death within months. Alternating Hemiplegia - Alternating hemiplegia is a rare neurological disorder that develops in childhood, usually before the first 4 years. The disorder is characterized by recurrent but temporary episodes of paralysis on one side of the body. The UMN findings include hyperreflexia and spasticity. They result from degeneration of the lateral corticospinal tracts in the spinal cord. The LMN findings include weakness, atrophy, and fasciculations. ALS is eventually fatal because of respiratory muscle weakness. Anencephaly - is a condition present at birth that affects the formation of the brain and skull bones surrounding the head. Often, the brain lacks part or all of the cerebrum. There is no bony covering over the back of the head and there may also be missing bones around the front and sides of the head. Aneurysm - An aneurysm or anneurism is a localized, blood-filled dilation of a blood vessel caused by disease or weakening of the vessel wall. Aneurysms most commonly occur in arteries at the base of the brain and in the aorta the main artery coming out of the heart. The bulge in a blood vessel can burst and lead to death at any time. The larger an aneurysm becomes, the more likely it is to burst. Aneurysms can usually be treated. Angelman Syndrome - Symptoms of Angelman syndrome are learning disability, jerky movements, a tendency to seizures and a happy, sociable personality. Children with Angelman syndrome often do not learn to sit until around one year of age. The majority of children will learn to walk but with a stiff legged gait. Many children with Angelman syndrome have a facial appearance with a wide, smiling mouth, deep set eyes and prominent chin. These features become more prominent as children get older. Angiomatosis - refers to little knots of capillaries in various organs. These tend to be cavernous hemangiomas, which are sharply defined, sponge-like tumors composed of large, dilated, cavernous vascular spaces. Anoxia - Hypoxia is a pathological condition in which the body as a whole generalized hypoxia or region of the body tissue hypoxia is deprived of adequate oxygen supply. Hypoxia in which there is complete deprivation of oxygen supply, is referred to as anoxia. In the case of altitude sickness, where hypoxia develops gradually, the symptoms include headaches, fatigue, shortness of breath, a feeling of euphoria and nausea. In severe hypoxia, or hypoxia of very rapid onset, changes in levels of consciousness, seizures, coma and death occur. It is not a result of deficits in sensory, intellect, or psychiatric functioning. Depending on the area and extent of the damage, someone suffering from aphasia may be able to speak but not write, or vice versa, or display any of a wide variety of other deficiencies in language comprehension and production, such as being able to sing but not speak. Aphasia may co-occur with speech disorders such as dysarthria or apraxia of speech. Apraxia - is a

neurological disorder characterized by loss of the ability to execute or carry out learned purposeful movements, despite having the desire to and the physical ability to perform the movements. It is a disorder of motor planning which may be acquired or developmental, but may not be caused by in-coordination, sensory loss, or failure to comprehend simple commands. Arachnoid Cysts - represent benign cysts that occur in the cerebrospinal axis in relation to the arachnoid membrane and do not communicate with the ventricular system. They usually contain clear, colorless fluid that is most likely normal cerebrospinal fluid, but they rarely contain xanthochromic fluid. Arachnoid cysts also occur within the spinal canal, in which arachnoid cysts or arachnoid diverticula may be located subdurally or in the epidural space. Spinal arachnoid cysts are commonly located dorsal to the cord in the thoracic region. Arachnoiditis - is a neuropathic disease caused by the inflammation of the arachnoid, one of the membranes that surround and protect the nerves of the central nervous system, including the brain and spinal cord. The arachnoid can become inflamed because of an irritation from chemicals, infection from bacteria or viruses, as the result of direct injury to the spine, chronic compression of spinal nerves, or complications from spinal surgery or other invasive spinal procedures. It occurs in almost all children born with both spina bifida and hydrocephalus. The cerebellar tonsils are elongated and pushed down through the opening of the base of the skull blocking the flow of cerebrospinal fluid CSF. The brainstem, cranial nerves, and the lower portion of the cerebellum may be stretched or compressed. Arteriovenous Malformation - AVMs are defects of the circulatory system that are generally believed to arise during embryonic or fetal development or soon after birth. Although AVMs can develop in many different sites, those located in the brain or spinal cord can have especially widespread effects on the body. Most people with neurological AVMs experience few, if any, significant symptoms. The malformations tend to be discovered only incidentally, usually either at autopsy or during treatment for an unrelated disorder. AS is distinguished from the other ASDs in having no general delay in language or cognitive development. Coordination problems such as clumsy or awkward movements and unsteadiness, occurs in many different diseases and conditions. The spinal cord becomes thinner and nerve cells lose some of their myelin sheath, the insular covering on all nerve cells that helps conduct nerve impulses. Ataxia Telangiectasia - is a rare, childhood neurological disorder that causes degeneration in the part of the brain that controls motor movements and speech. Its most unusual symptom is an acute sensitivity to ionizing radiation, such as X-rays or gamma-rays.

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The specific causes of neurological problems vary, but can include genetic disorders, congenital abnormalities or disorders, infections, lifestyle or environmental health problems including malnutrition, and brain injury, spinal cord injury or nerve injury.

This means that as much as people would like to blame diets, vaccines, and other outside forces, the factor of genetics plays a role, whether we like it or not. Senior author of the study, Jeremiah Scharf, M. According to Stanford University , people with depression seem to be genetically predisposed because of a series of genetic changes that can then be influenced by outside factors. But how do we inherit traits and disorders from one side or the other? He was, however, the first one to clearly document his findings. He experimented largely with the pea plant. While pea plants are a far cry from neurological disorders, the genetics work the same way. Some Vocabulary I constructed this image with information from my high school biology courses, Kidshealth. These chromosomes reside in the nuclus of the cell. Genes â€" Genes reside on the chromosomes. Genes are bits of genetic material that are replicated. Alleles â€" Versions of genes, variations. Basically, there might be a gene for the color of the eyes. The allele is a gene, but it might be a gene with the DNA informaion for blue eyes, while another allele will have the genetic material for brown eyes. Alleles are either dominant or recessive. We express alleles like this in written form. This example has alleles for brown or blue eyes. In a Punnett Square, we cross the genetics of the grandparents, mother, and father. For example, Mary and John are expecting a baby. Just a note, we have names for different combinations of alleles. According to our calculations, the baby has: In truth, eyes have more genes involvedâ€¦similarly to the genes that are involved in neurological disorders. That means, the possibilities of traits inherited on our chromosomes through genes get significantly to my limited mind, infinitely more complicated. Now, multiply that 3 gene sequence by hundreds or thousands, and imagine all the different possible combinations imaginable. See why humanity has so many varieties? So it gets more complicated with each added gene? Now, says one of these genes is the one carrying the disorder, or even parts of it. Some disorders, like we talked about above about ADHD, Autism , Schizophrenia, and probably more, have parts carried on more than one gene. A Spectrum Disorder is one that varies in severity. Some individuals have mild cases, some have severe cases, and some have only a few symptoms of the disorder. Click image to enlarge. And Why is This Important? But it is important in understanding neurological disorders for a number of reasons: It helps us to understand how disorders are transferred from one generation to the next. If the genes for a disorder are dominant, the child has a higher chance of inheriting the disorder. If the genes for the disorder are recessive, the child has a lower chance of inheriting the disorder, but he can still pass them on to his own children. Certain events can trigger disorders that were lying dorman in people. Because certain genes show similar changes in different disorders again, like ADHD, Bipolar, and Schizophrenia , it makes sense for many neurologicals to be comorbid. Although, no one knows exactly how yet. In Conclusion To be honest, scientists are just beginning to tap the human genome. If you have any suggestions, questions, or comments about organizational strategies, please share them in the Comment Box below.

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Genetic testing for neurological diseases â€¢ How it is done - Candidate gene testing - Gene panels - Genome-wide analysis â€¢ Advantages.

Chapter 9 : A to Z List of Neurological Disorders - Disabled World

This is a list of major and frequently observed neurological disorders (e.g., Alzheimer's disease), symptoms (e.g., back pain), signs (e.g., aphasia) and syndromes (e.g., Aicardi syndrome). There is disagreement over the definitions and criteria used to delineate various disorders and whether some of these conditions should be classified as.