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Chapter 1 : Psychological adaptation - Wikipedia

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Both hyperplasia and hypertrophy occur as compensatory mechanisms to an increased workload on the organ or cell. To remember which is which, think of the prefix and suffix that make up the word. If cells are divided into cells that are capable of dividing, and cells that are incapable of dividing, we can also divide the way they react to increased stress. An example of this is in myocytes, or cardiac muscle cells in myocardial fibres. Thus, the heart mainly responds to an increased workload by hypertrophy. Other examples are adult skeletal muscles and neurons. Physiologic vs Pathologic Hypertrophy and Hyperplasia: Hypertrophy and hyperplasia, while it can be physiological to aid the body, may also be disease related, or pathological, and is a very important indicator of disease. An example of workload induced hypertrophy would be the muscle enlargement in bodybuilders as muscles are forced to tolerate new loads. An example of hormone-induced hypertrophy is within the endometrium and myometrium of the uterus, as estrogen upregulation during the follicular stage of the menstrual cycle stimulates an increase in muscle proteins in the stroma of the endometrium and the large smooth muscle layer of the myometrium, and thus, muscle size. The most popular and easily understood examples of these would be the physiologic compensatory hyperplasia that occurs in the liver to restore the liver to normal size after an individual donates a lobe of the liver. Hormonal hyperplasia can be most easily illustrated in the breast, as cells within the breast proliferate greatly due to estrogen and progesterone at puberty and pregnancy. Caused mainly by an inappropriate or excessive action of hormones and growth factors acting on target cells. For example, benign prostatic hyperplasia illustrated above occurs due to excessive action of androgens such as dihydrotestosterone on testosterone receptors on the prostate gland. Alternatively, endometrial hyperplasia can also occur due to an imbalance between estrogen and progesterone, that causes an increase in the absolute or relative amount of estrogen, promoting an increase in cell proliferation in the endometrium, producing irregular menstrual bleeds. Thus, endometrial hyperplasia may eventually become endometrial cancer. Hyperplasia is also a response to certain viral infections, such as HPV, that interfere with the ability of the cell to regulate cell proliferation. Similarly, if one kidney has a problem, then the opposite kidney increases its size to function at a higher efficiency to compensate for the opposite kidney note the kidney cells also undergo hyperplasia. Mechanism of Hyperplasia and Hypertrophy: Hyperplasia is the result of growth factor driven proliferation of mature cells, and in some cases, by the increased output of new cells from tissue stem cells. It occurs due to increased transcription factor production due to: Hypertrophy results from an increase in proliferation of cellular proteins. The increase in cellular proteins in cardiac myocytes in particular can occur due to several stimuli, such as mechanical stretch receptors which detect an increase workload, increase in growth factors and the presence of agonists. There are 3 basic steps in the synthesis of these cellular proteins: The integrated action of mechanical receptors, agonists and growth factors activates signal transduction pathways. These signal transduction pathways produce several transcription factors. These transcription factors in turn cause the increase in muscle protein synthesis and thus, hypertrophy. It should also be noted that hypertrophy is indeed, also mediated by the conversion of adult form of contractile proteins, to the larger neonatal form of contractile proteins. Atrophy can also be either physiologic or pathologic. Physiologic Atrophy is actually very common in the transition to the fetal body to the adult body. Physiologic atrophy occurs most evidently in the thymus gland and the thyroglossal duct. Notice how much smaller the thymus gland is in the adult when compared to the fetus! The thymus gland is responsible for the maturation of T-lymphocytes, and thus, once they have matured, the thymus plays no significant function, and it atrophies. Similarly, the thyroglossal duct produces the thyroid gland via a long duct, and since only the distal part or the lower part of the duct forms the gland, the proximal part is unnecessary and is removed by atrophy. There may also be physiologic atrophy in adult life, and this occurs in the uterus just after giving birth. This is because the uterus was enlarged so as to allow sufficient contractile force from the endometrium to push the baby out of the womb, and also enlarged to house the developing fetus. After birth, this is no longer required, and portions of the uterus atrophy. Pathologic atrophy

has several causes: Disuse atrophy occurs when there is a decrease in the use of a particular organ or muscle. This can occur pathologically by conditions that prevent use of the particular organ or muscle. For example, if a particular individual is immobilized by fracturing a bone, and must be restricted to complete bed rest, he cannot use the muscle, and the body decides to decrease the size of the cell so as to divert nutrients elsewhere. Usually, this is reversible once usage restarts. Disuse atrophy also occurs in poliomyelitis, as muscle weakness in the disease will eventually prevent movement, and the muscle atrophies. When denervation occurs, muscle cells receive no nervous signals, and also lose trophic factors from nerves that promote growth, resulting in atrophy. Gradual decrease in blood supply to the tissue due to gradual occlusion of the artery supplying the tissue causes a decreased delivery of nutrients to the tissue, and atrophy occurs. This type of atrophy also occurs when diseases that affect the appetite occur, as fewer nutrients are consumed and regions of the body, especially muscle, atrophies. Loss Of Endocrine Stimulation: Some tissues in the body grow in response to hormones, such as the breast, which grows in response to estrogen and progesterone stimulation. If these hormones are lost, or the endocrine system does not stimulate the body organs, these regions atrophy. Tissue compression results in the tissue undergoing atrophy to decrease size so as to fit comfortably in its original space. This occurs very commonly in the growth of tumors, that grow and suppress surrounding, normal tissues. The mechanism is believed to be the compression of surrounding blood capillaries that supply surrounding tissues, and thus may also be classified as an ischemic atrophy. Atrophy results primarily from decreased protein synthesis due to decreased metabolic activity, and increased proteolysis in cells. This proteolysis occurs via 2 mechanisms: Nutrient deficiencies activiate ubiquitin ligases, which attach the protein, ubiquitin to cellular proteins. Ubiquitin serves as a cellular target, and marks the entire ubiquitin-protein complex for breakdown via proteasome activity. Increased autophagic vacuole formation occurs as the cell rapidly degrades or eats its own components so as to decrease nutrient demand to match the nutrient supply. Some residue from autophagy is called lipofuscin granules, a brown pigment that builds up as autophagy increases â€” causing tissues undergoing this type of atrophy to appear brown. This type of atrophy is called brown atrophy. Metaplasia Metaplasia is a reversible change where one differentiated cell type epithelial or mesenchymal is replaced by another cell type. It occurs when a cell that is unable to withstand stress is replaced by another cell type that is better able to handle and deal with the stress. The best example of an epithelial metaplasia is a change from ciliated columnar type cells to stratified squamous type cells in the respiratory tract in response to chronic irritation, the most important example of which is smoking. In the diagram above, clearly visible is the gradual conversion of the normal mucus producing, ciliated columnar cells to a more rugged stratified squamous layer of cells, which is better able to survive against the harsh chemicals within cigarette smoke. A conversion of columnar cells to squamous stratified cells also occur in the ducts of the salivary glands and pancreas, or bile duct in the presence of damaging stones. In both these cases, the more rugged stratified squamous cells allow the survival of the cell in its harsh environment. The disadvantage of this, however, is the intended effect of the original cell type is now lost. For example, in the respiratory epithelium, the columnar cells which usually produce mucus and protect from infection via cilia are now absent, and it is easer for the lung to become infected. Thus, metaplasia must be reversed whenever possible. If the irritation is prolonged however, then malignant metaplasia may occur, which may eventually result in cancer. Connective tissue metaplasias may also occur, where mesenchymal cells such as osteocytes, adipocytes and fibroblasts form in irregular areas such as within muscle. These usually are pathological and irregular, occurring not as an adaptive change, but directly due to cell and tissue injury. Stem cells are found in the epithelia and the embryonic mesenchyme. Thus, these precursor cells actually differentiate across a new pathway, that generates a different type of cell entirely. These stimuli all serve as stimuli that direct the cells towards a specific differentiation pathway. Of special note is Vitamin A, or retinoic acid. Vitamin A controls gene transcription directly by directly acting on nuclear retinoid receptors, affecting the direction of cell differentiation. Thus, either a vitamin A absence or excess can cause metaplasia, as in the metaplasia of respiratory tract in Vitamin A absence. Dysplasia Dysplasia refers to abnormal changes in cellular shape, size and organization. Obviously then, it is not physiologic, and is in fact pathologic. There is therefore an irreversible increase in the production of immature cell types, and a decrease in production of mature cells. It

can therefore be contrasted with metaplasia since metaplasia is the reversible replacement of mature cells with another mature cell type, while dysplasia produces random, immature cell types, an irreversible change. If allowed to penetrate the basement membrane, it becomes malignant cancer, capable of metastasizing. There are 4 principal features of dysplasia: Here are a couple extra resources:

Chapter 2 : Cardiac hypertrophy: useful adaptation or pathologic process?

*Adaptation In Pathological Processes () [William Henry Welch] on calendrierdelascience.com *FREE* shipping on qualifying offers. This scarce antiquarian book is a facsimile reprint of the original.*

Atrophy Atrophy indicates a decline in the size of a cell. Atrophy of more variety of cells leads to a reduced size or wasting of the worried tissue, organ or part of the body. Reasons for Atrophy Atrophy is because of many varieties of causes such as: Poor nutrition Absence of work or exercise Loss of control by nerves or hormones Intrinsic disease of the tissue or organ. Types of Atrophy Atrophy is of 2 types, physiological atrophy and pathological atrophy Examples of physiological atrophy are the atrophy of thymus in childhood and tonsils in adolescence. The pathological atrophy prevails in skeletal muscle, cardiac muscle, sex organs and brain. Hypertrophy Hypertrophy is a boost in the size of a cell. Hypertrophy represents the renovation of a cell, typically in response to an increased work. Muscle cells hardly ever divide. Subsequently, the majority of the growth of a muscle is because of hypertrophy of existing muscle cells, for instance, hypertension a boost in arterial blood pressure increases the work on the left ventricle of the heart. The muscle cells of the left ventricle hypertrophy in order to deal with the extra work. Another example is the increased size of the biceps muscle in people participated in difficult exercise. Hypertrophy is of 3 types. Physiological Hypertrophy Physiological hypertrophy is the boost in size due to increased work or exercise. The typical physiological hypertrophy consists of: Boost wholesale of skeletal muscles that take place in response to strength training exercise Ventricular hypertrophy: Boost in size of ventricular muscles of the heart which is helpful just if it takes place in response to exercise. Pathological Hypertrophy Boost in cell size in response to pathological modifications is called pathological hypertrophy. An example is the ventricular hypertrophy that takes place due to pathological conditions such as high blood pressure , where the work of ventricles boosts. Compensatory Hypertrophy Compensatory hypertrophy is the boost in size of the cells of an organ that takes place in order to compensate the loss or dysfunction of another organ of exact same type. Examples are the hypertrophy of one kidney when the other kidney stops working; and the boost in muscular strength of an arm when the other arm is inefficient or lost. Hyperplasia Hyperplasia is a boost in cell number through mitosis. The majority of cells in the body replicate, although at differing rates. This failure to replicate indicates that the body has a minimal capability to repair damage arising from the death of neurones. Hyperplasia is of 3 types. Physiological Hyperplasia Physiological hyperplasia is the brief adaptive response to regular physiological modifications in the body. For instance, throughout the proliferative phase of each menstrual cycle, the endometrial cells in uterus boost in number. Compensatory Hyperplasia Offsetting hyperplasia is the boost in the variety of cells in order to change the harmed cells of an organ or the cells have gotten rid of from the organ. Offsetting hyperplasia assists the tissues and organs in regrowth. It prevails in the liver. After the surgical elimination of the broken part of the liver , there is a boost in the variety of liver cells leading to regrowth. Offsetting hyperplasia is likewise typical in epithelial cells of intestine and epidermis. Pathological Hyperplasia Pathological hyperplasia is the boost in the variety of cells due to an unusual boost in hormone secretion. It is likewise called hormone hyperplasia. For instance, in gigantism, hypersecretion of growth hormone causes hyperplasia that leads to overgrowth of the body. Mitosis Mitosis needs replication of the genetic details. The complementary DNA strands different, and each strand functions as a template As soon as the DNA has actually replicated, somatic cells divide and produce 2 daughter cells with genetic material identical to that of the parent cell unless changed by mutation. Following mitosis, cells can continue along one of 2 courses. Stem cells go into G1phase and continue through another mitotic cycle Additionally, the cells might distinguish and go into G0phase. Mitosis can be divided into 4 phases: In prophase, 2 centrioles move towards opposite poles of the cell, the nucleolus vanishes, and the chromatin threads of DNA ended up being noticeable as structures called chromosomes By metaphase, the nuclear envelope has actually entirely vanished and the chromosomes are connected to their centromeres. At the end of this phase, the chromatin divides into different strands of chromosomes Anaphase even more divides the cell, with proof of pinching of the cell membrane. In telophase, the cell divides into 2 identical daughter cells having the exact same genetic

material as the parent cell. Effective replication needs the maintenance of the initial DNA series. Mutations result when a mistake takes place in the DNA replication process Mutations in somatic cells have unforeseeable consequencesâ€" perhaps benign, perhaps deadlyâ€" however the modification is restricted to that person. Mutations in gametes can be handed down to the offspring, modifying the DNA in every cell of that offspring. Dysplasia Dysplasia is the condition identified by the unusual modification in size, shape and organisation of the cell. Dysplasia is ruled out as real adaptation and it is recommended as associated to hyperplasia. It prevails in epithelial cells of cervix and respiratory tract. Metaplasia Metaplasia is the condition that includes replacement of one type of cell with another type of cell. It is of 2 types. Physiological Metaplasia Replacement of cells in typical conditions is called physiological metaplasia. Examples are the change of cartilage into bone and change of monocytes into macrophages. Pathological Metaplasia Pathological metaplasia is the irreparable replacement of cells due to continuous direct exposure to hazardous stimuli. For instance, persistent cigarette smoking leads to change of typical mucus producing ciliated columnar epithelial cells into non-ciliated squamous epithelial cells, which are incapable of producing mucus These changed cells might end up being cancerous cells if the stimulus cigarette smoking is extended.

Chapter 3 : Cellular Adaptation To Stress â€“ The Art Of Medicine

The two previous volumes in this series are Thomas Thacher, A Brief Rule to Guide Common People of New England How to Order Themselves and Theirs on the Small Pocks, Or Measels, , and John Morgan, Discourse upon the Institution of Medical Schools in America,

Atrophy[edit] Atrophy is a decrease in cell size. If enough cells in an organ atrophy the entire organ will decrease in size. Thymus atrophy during early human development childhood is an example of physiologic atrophy. Skeletal muscle atrophy is a common pathologic adaptation to skeletal muscle disuse commonly called "disuse atrophy". Tissue and organs especially susceptible to atrophy include skeletal muscle, cardiac muscle, secondary sex organs , and the brain. Hypertrophy[edit] Hypertrophy is an increase in cell size. If enough cells of an organ hypertrophy so will the whole organ. The heart and kidneys have increased susceptibility to hypertrophy. Hypertrophy involves an increase in intracellular protein rather than cytosol intracellular fluid. Hypertrophy may be caused by mechanical signals e. An example of physiologic hypertrophy is in skeletal muscle with sustained weight bearing exercise. An example of pathologic hypertrophy is in cardiac muscle as a result of hypertension. Hyperplasia[edit] Hyperplasia is an increase in the number of cells. It is the result of increased cell mitosis , or division. The two types of physiologic hyperplasia are compensatory and hormonal. Compensatory hyperplasia permits tissue and organ regeneration. It is common in epithelial cells of the epidermis and intestine , liver hepatocytes , bone marrow cells, and fibroblasts. It occurs to a lesser extent in bone , cartilage , and smooth muscle cells. Hormonal hyperplasia occurs mainly in organs that depend on estrogen. For example, the estrogen-dependent uterine cells undergo hyperplasia and hypertrophy following pregnancy. Pathologic hyperplasia is an abnormal increase in cell division. A common pathologic hyperplasia in women occurs in the endometrium and is called endometriosis. Metaplasia[edit] Metaplasia occurs when a differentiated cell of a certain type is replaced by another cell type, which may be less differentiated. It is a reversible process thought to be caused by stem cell reprogramming. Stem cells are found in epithelia and embryonic mesenchyme of connective tissue. A prominent example of metaplasia involves the changes associated with the respiratory tract in response to inhalation of irritants, such as smog or smoke. The bronchial cells convert from mucus -secreting, ciliated , columnar epithelium to non-ciliated, squamous epithelium incapable of secreting mucus. These transformed cells may become dysplasic or cancerous if the stimulus e. Dysplasia is not considered a true adaptation; rather, it is thought to be related to hyperplasia and is sometimes called "atypical hyperplasia". Tissues prone to dysplasia include cervical and respiratory epithelium, where it is strongly associated with the development of cancer; it may also be involved in the development of breast cancer. Although dysplasia is reversible, if stress persists, then dysplasia progresses to irreversible carcinoma.

Chapter 4 : Cell Injury & Adaptation

Adaptation in Pathological Processes Volume 5 by Welch, William H.. Softcover. New. Lang: eng, Vol: Volume 5, Pages Reprinted in with the help of original edition published long back [].

His theory dictates that adaptations are traits that arise from the selective pressures a species faces in its environment. These can include conscious social strategies, subconscious emotional responses guilt, fear, etc. Evolutionary psychologists consider a number of factors in what determines a psychological adaptation, such as functionality, complexity, efficiency, and universality. Evolved adaptation vs learned behaviour[edit] An area of disagreement arises between evolutionary psychologists, cognitive scientists and behaviourists on where to draw the line on what is considered a psychological adaptation, and what is considered a learned behaviour. Evolutionary psychology proposes that the human psychology consists primarily of psychological adaptations, [2] which is opposed by the tabula rasa or blank slate model of human psychology. Early behaviourists, like B. Skinner , tended to the blank slate model and argued that innate behaviors and instincts were few, some behaviourists suggesting that the only innate behavior was the ability to learn. Sexual selection[edit] The mating strategies of both sexes can be simplified into different psychological adaptations. There is extensive evidence that incest avoidance, which is the tendency to avoid sexual intercourse with close relatives is an evolved behavioural adaptation. Evolutionary psychologists argue that incest avoidance adapted due to the greater chance of producing children with severe disabilities when mating with relatives, and because genetic variability offers an increase in fitness regarding offspring survival. Heuristic problem solving and consistent preference for behavioral patterns are considered by some evolutionary psychologists to be psychological adaptations. Psychological adaptation in males[edit] Human males have developed psychological adaptations, which make them attractive to the opposite sex in order to increase their reproductive success. Examples of some of these other adaptations include strategies to entice females, strategies to retain a partner and the desire for short-term relationships. Women find humorous men more attractive. Humour[edit] It has been researched that humour is sexually selected and acts as a fitness indicator. In turn, males have developed an adaptation in which they produce humour to attract women. Historically, men fight with each other as a mate retention strategy. Waist-to-hip ratio[edit] Human males have developed an adaptation in which they find women more attractive if they show cues of fertility, such as a good waistâ€”hip ratio. Women with a waist-to-hip ratio of 0. Mate retention[edit] Males have developed behaviours that help them to retain a mate, also known as mate guarding , in order to enhance reproductive success in long-term relationships. Examples are intersexual manipulations which involves the male manipulating the way his partner views their current relationship and to repulse her from other relationships. In extreme cases, some men have developed intersexual adaptations that restrict their partner from interacting with other males, including the use of violence. By doing this, women are less likely to stray from her current relationship, even if it is due to fear. Short-term mating[edit] Human males have also developed an adaptation in which they have a desire for short-term relationships more than females do. Evolutionarily, it is thought that males have a desire to reproduce as much as they can, and short-term relationships are a good way to inseminate many women with his sperm in order for his genes to continue through generations. There is much evidence for how this short-term mating has evolved psychologically for males, beginning with the desire for a variety of sex partners. It seems that a larger percentage of men, in every culture of the world, desire more than one sex partner in one month compared to women. This would reduce the number of partners a male could pursue and succeed with. A psychological adaptation for the purpose of reproductive success can be seen in female mate choice. David Buss , an evolutionary psychologist, examines the fundamental principles of selection pressures that create human mate preferences in his contribution to the publication The Adapted Mind. Research suggests females are able to use external cues displayed by males such as territory or physical possessions. For example, women are able to evaluate the long-term presence of testosterone in men by observing facial testosterone cues. Women in the fertile phase of their menstrual cycle perceive masculine faces as healthier and more attractive than feminine male faces. Males who display testosterone cues show a

female that they are able to offset the high physiological costs such as immunosuppressant effects. Women may also form groups with men and women as a protective alliance against potential rapists. Margaret Profet , an evolutionary biologist, provides evidence for this adaptation in a literature review on pregnancy sickness. Evidence lies in the finding that women who experience more extreme cases of pregnancy sickness tend to be less likely to miscarry or have babies with birth defects. This fits the criteria for an adaptation as it enhances fitness and increases reproductive success â€" it results in greater fertility of the mother and contributes to the health of the developing embryo. Researchers dispute whether this is actually a psychological adaptation, however evidence advocates it is the result of strong selective pressures in our hereditary past. For example, the toxins are found only in natural wild plant foods, not processed foods in our modern-day environment. Furthermore, pregnant women experiencing sickness have been found to avoid particular bitter or pungent smelling foods, potentially containing toxins. Pregnancy induced sickness only typically occurs 3 weeks after conception, around the time when the embryo has started forming major organs and is therefore at the highest risk.

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In cell biology and pathophysiology, cellular adaptation refers to changes made by a cell in response to adverse environmental changes. The adaptation may be physiologic(al) (normal) or pathologic(al) (abnormal).

Chapter 8 : Cellular adaptation - Wikipedia

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Chapter 9 : Cell Adaptation And Growth: Hypertrophy And Hyperplasia

Cellular adaptation is the process whereby cells adapt to a stressful of noxious situation in order to continue to survive and proliferate List mechanisms of cell injury Cells can be injured by stress, noxious stimuli, or accumulation of substances such as calcium, fat, and iron.