AMITY UNIVERSITY
JHARKHAND

Vol. 2, No. 1 | Jan - March, 2025

Bio-Rhythms

(An Initiative of Amity Institute of Biotechnology)

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From Vice-Chancellor Desk

Prof. (Dr.) Ashok K Srivastava,
Vice Chancellor,
Amity University Jharkhand, Ranchi

It is with immense pleasure that I congratulate the Amity Institute of Biotechnology on the release of the 4th edition (Vol.2, No.1) of their departmental newsletter, Bio-Rhythms. This quarterly publication is a testament to the institute's commitment to disseminating knowledge and showcasing cutting-edge research in the field of biotechnology.

As we navigate the complexities of the 21st century, the significance of biotechnology in addressing pressing global challenges cannot be overstated. This discipline has the potential to revolutionize human healthcare, sustainable development, and environmental conservation. I am confident that the research and innovations featured in this newsletter will contribute meaningfully to the ongoing discourse in biotechnology and inspire future generations of scientists and researchers.

I commend the Editorial Team of Bio-Rhythms for their tireless efforts in curating this impressive collection of research articles, reviews, and updates. Your dedication to promoting academic excellence and knowledge sharing is truly commendable.

I extend my best wishes to the Amity Institute of Biotechnology as they continue to push the frontiers of biotechnology research and education. Please join me in congratulating the Amity Institute of Biotechnology on this milestone achievement. I look forward to witnessing the continued growth and success of this esteemed institution.

From HOI Desk

Dr. Jayeeta Chattopadhyay
Deputy Director (R&D)
& HOI, Amity University Jharkhand, Ranchi

I am glad to note that the Amity Institute of Biotechnology of Amity University Jharkhand is releasing Newsletter entitled "Bio-Rhythms". I believe that this Newsletter would provide an opportunity for transmission of knowledge based on latest research and are considered to be an essential part of academic programmes of all renowned Universities. I would like to congratulate the Amity Institute of Biotechnology for their commitment and sincerity. I strongly believe that this Newsletter would definitely be a foundation for the growth of news ideas towards a better tomorrow.

From HOD Desk

Dr. Amit K Dutta,
HOD, Amity Institute of Biotechnology

The Newsletter Bio-Rhythms is being released by Amity Institute of Biotechnology of Amity University Jharkhand. This will focus the attention of the Students and Faculty Members working in various disciplines of Life Sciences as well as Biotechnology from fundamental studies to research applications. It is expected that this Newsletter will provide a forum to the young students and entrepreneurs to interact on the recent developments and identify emerging feature areas of growth in the field of biotechnology.

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Bio-Rhythms

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From the Editorial Desk

Dr. Jutishna Bora
Editor (Bio-Rhythms)
& Asst. Professor,
Amity Institute of
Biotechnology,

It is my priviledge and honour as the Editor of the Newsletter "Bio- Rhythms" published by Amity Institute of Biotechnology of Amity University Jharkhand, Ranchi. I am sure that this initiative of the department under the mentoring of Hon'ble Vice Chancellor Sir and the Higher Officials of the University will boost the thoughts of the student's mind for writing the news related sciences and reading information as well. I thank from the Members Editorial Board to the contributors of this Newsletter "Bio-Rhythms".

From the Editorial Team

Dr. Dhananjay Kumar Pandey
Member-Editorial
Team (Bio-Rhythms)
Amity Institute of
Biotechnology

It is with profound pleasure, humility and anticipation that we release the 4th edition (Vol.2, No.1) departmental newsletter, Bio-Rhythms. This will focus the attention of the Students and Faculty Members working in various disciplines of Life Sciences as well as Biotechnology from fundamental studies to research applications. On behalf of the Editorial Team, I would like to extend a very warm welcome to the release of this Newsletter. I take this opportunity to thank our All the Authors, editors and anonymous reviewers, all of whom have volunteered to contribute to the success of the Newsletter-Bio-Rhythms.

Department Overview

Amity Institute of Biotechnology (AIB) over the years has seen exponential growth and has cemented its credentials both in the field of Teaching and Research. Our vision has been to impart quality education to budding biotech professionals and foster strong interdisciplinary Research in frontier areas of biotechnology. Currently a team of 12 highly qualified and dedicated members form the backbone for teaching and research endeavors at AIB. Apart from providing in depth knowledge of core biotechnology subjects the students are provided with additional training in soft skills and foreign language, opportunities to explore extracurricular activities provide a holistic and enriching experience to students.

Faculty members at AIB are involved in interdisciplinary research in frontier areas such as cancer, natural and synthetic therapeutic agents, Bioprocess Technology, Bioremediation, Algal Biotechnology, Bioinformatics to name a few The convergences of various technologies have the potential to fundamentally change our operational, competitive and employment landscape. The field of Biotechnology signals a growing trend involving crosstalk amongst sciences, engineering and the growing processing power of the fastest computers which have been utilized for developing personalized medicines and significantly enhanced drug delivery, the use of new energy generators and supercomputers designed on interconnected biological processes, precise control over properties including biocompatibility of materials and miniature sensors that enable significantly improved diagnosis and real-time health monitoring. The students are equipped with the desired skills/ competencies like the ability to analyse statistical and technical data, modern tool usage and thorough understanding of legal and regulatory matters in Biotechnology Industry.

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Moringa oleifera as an Anti-cancer Agent against Breast and Colorectal Cancer

Ms. Zoya Mahtab
B.Sc BT, Batch: 2022-25

Moringa oleifera L (MO) (Family: Moringaceae) is a perennial angiosperm plants, which includes several other species. It is a native of the Himalayan region that is widely cultivated throughout tropical and sub-tropical countries of the world including India. The plant has numerous medicinal applications and is used as a traditional medicine for the treatment of various illnesses such as skin diseases, respiratory distress, ear and dental infections, hypertension, diabetes, anemia, and cancer.

The Pharmacological importance of the leaves extract containing bio-active compounds are well described by few Well-known scientists of the World. We are doing research on Moringa and in this study we focused upon the effect of Moringa oleifera extracts from leaves(MOL), bark(MOB) and seeds(MOS) to observe its efficacy as an anti-cancer agent on breast and colorectal cancers. Anti-cancer properties of Moringa oleifera could be attributed to the bioactive compounds present in the extracts from this plant. This is a novel study because no report has yet been cited on the effectiveness of Moringa extracts obtained in the locally grown environment as an anti-cancer agent against breast and colorectal cancers. We can proudly say that this type of innovative molecular study is the first of its kind to evaluate the anti-malignant properties of Moringa not only in leaves but also in bark. In our experience both the leaf and bark extracts of Moringa collected from the different regions of Chhattisgarh state possess anti-cancer activity that can be used to develop new drugs for the treatment of breast and colorectal cancers.

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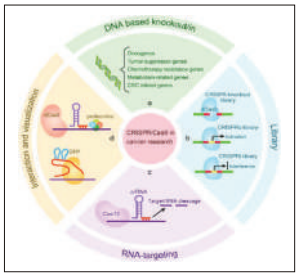
Bio-Rhythms

CRISPR-Cas9 and Genome Editing: Revolutionizing Biotechnology

Ms. Kavya
B.Tech BT,
Batch 2023-2027



CRISPR-Cas9 stands for Clustered Regularly Interspaced Short Palindromic Repeats and CRISPR-associated protein 9, a groundbreaking genome-editing technology, has revolutionized the field of biotechnology. Discovered as part of a bacterial immune system, CRISPR-Cas9 allows scientists to make precise, targeted changes to the DNA of living organisms, opening new possibilities in medicine, agriculture, and beyond. This system functions like molecular scissors, guided by RNA sequences that match the target DNA sequence. The Cas9 enzyme cuts the DNA at the desired location, enabling the addition, removal, or alteration of specific genetic material. This precision makes CRISPR-Cas9 more efficient and versatile than previous genome-editing methods. In medicine, CRISPR-Cas9 holds promise for treating genetic disorders by correcting mutations at their source. Clinical trials are underway to evaluate its effectiveness in treating conditions like sickle cell anemia, muscular dystrophy, and certain types of cancer. By editing the genes responsible for these diseases, CRISPR-Cas9 offers potential cures rather than merely treating symptoms. Agriculture has also benefited from CRISPR-Cas9 technology. Scientists can create crops that are more resistant to pests, diseases, and environmental stresses, leading to higher yields and reduced reliance on chemical pesticides. For example, CRISPR has been used to develop rice varieties that are more tolerant to drought and tomatoes that resist fungal infections. These advancements contribute to global food security and sustainable farming practices. Despite its potential, CRISPR-Cas9 raises significant ethical and safety concerns. Off-target effects, where unintended parts of the genome are edited, pose risks that require thorough investigation.

Additionally, the possibility of germline editing, which can pass changes to future generations, sparks debates about the ethical implications of human genetic modification. Ensuring responsible use of this technology necessitates robust regulatory frameworks and ongoing ethical discourse As CRISPR-Cas9 technology continues to advance, its applications will expand, potentially transforming various fields. Researchers are exploring its use in creating biofuels, developing new antibiotics, and combating climate change. Ongoing innovation and careful consideration of ethical issues will be crucial in harnessing the full potential of CRISPR-Cas9 for the betterment of society. CRISPR-Cas9 is a revolutionary tool in genome editing, offering unprecedented precision and versatility. Its applications in medicine and agriculture are transforming these fields, though ethical and safety considerations remain paramount. With responsible use, CRISPR-Cas9 promises to drive significant advancements in biotechnology.

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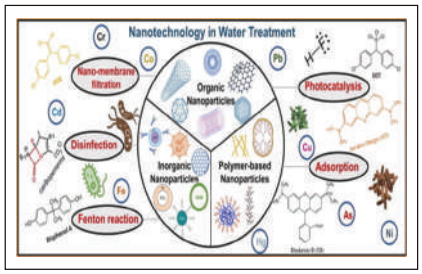
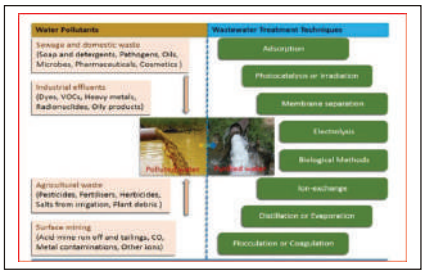
Plants and Nanomaterial Based Water Treatment

Ms. Poonam Kumari Yadav
M.Sc BT, Batch 2024-2026

Nanotechnology is used in physical, chemical and biological systems. It is utilized in the water treatment where nanomaterial is used for purify the water by adsorption of dye, metal, pathogen removal, pollutant and removal of harmful material that impact on the quality of water. Nanomaterials show hydrophilic and hydrophobic interaction that are useful in adsorption, catalysis etc. Nanomaterials have large surface area that used to remove toxic particles and disease causing bacteria. Nanomaterials are used in water treatment on small and large scale.





Nanotechnology has an impact on many scientific and technical fields, including environmental safety. Environmental applications of nanotechnology include water and wastewater treatment, in which different nanomaterials utilize adsorption and separation processes, as well as a variety of other approaches, to remove pollutants, pathogens, and other hazardous elements. Since Graphene is just a single layer of carbon atoms connected in a hexagonal pattern, it is also extremely thin and lightweight, and therefore an attractive material for nanotechnology applications. Graphene oxide membranes are capable of forming a perfect barrier when dealing with liquids and gasses. They can effectively separate organic solvent from water and remove water from a gas mixture to an exceptional level. They have even been proved to stop helium, the hardest gas to block. Nanomaterials as high-performance adsorbents, photocatalysts, and aquatic disinfectants are being explored for their potential. Their good properties include high performance, rapid kinetics, specificity, photochemical efficiency of the broad range, and powerful anti-bacterial activity. Nanomaterial - GRAPHENE are more preferred because it have large surface area and high absorption capacity to purify the contaminant of wastewater and it will help to remove the contaminant from wastage water. Nanomaterial have antibacterial and antimicrobial activity and highly used in water purification. Engineered nanomaterial(ENM) occur in water bodies by release of industry product. Metallic nanomaterial like silver or zinc based are in sewage water. Due to serious water problem, the water treatment is the need of hour and our work is focused on the same.

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Bio-Rhythms

Cuproptosis in Cancer

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Cuproptosis was a copper-dependent and was a distinct type of cell death that was distinctive from other existing forms of cell death. Trace elements like copper have been found in the human body and are highly correlated with biological characteristics associated with tumors in addition to distinct signaling pathways. Moreover, excessive levels of copper may lead to cell death, and specific procedures and forms of copper-induced cell death remain largely unknown. According to a recent study, cuproptosis, which was previously thought to be highly associated with the lipoic acid (LA) pathway and mitochondrial respiration, could represent a distinct type of cell death. Cuproptosis and cellular metabolism are closely associated, and high levels of aerobic respiration usually occur across various cancer forms. A high mitochondrial metabolic state is seen in several tumor forms, including melanoma, breast cancer, leukaemia, malignancies particularly tumor stem cells, and drug-resistant tumors. Studies also indicates that tumour cells treated with specific anticancer medications, such as proteasome inhibitors (PI), have increased mitochondrial metabolism. An increasing number of researchers are employing bioinformatic analysis to focus on the critical connection between cuproptosis and the cancer process. Copper is an essential transition metal that has two functions for cells: on the one hand, it served as a co-factor for many enzymes by donating or receiving electrons; on the other hand, an accumulation of copper can lead to a series of cellular metabolic dysfunctions and eventually cell death. People primarily get copper from food, with organ meats and shellfish typically having the highest concentrations. The current recommended intake of copper for adults is 0.8–2.4 mg/day to maintain systemic copper homeostasis. Researchers have also been interested in the role of copper in tumor processes. Studies on thyroid, stomach, gallbladder, lung, prostate, and breast malignancies have all shown a statistically significant rise in serum copper ion levels in tumor patients as compared to normal patients. Patients with gallbladder cancer also showed higher levels of copper ions in their gallbladder tissue. Furthermore, serum copper ion concentrations were higher in lung cancer patients with a worse clinical stage, and these concentrations were likewise linked to a worse clinical prognosis. The control of copper homeostasis and the interaction between various protein types are essential for the normal functioning of copper ions in cancer cells.

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Artificial intelligence in food biotechnology: trends and perspectives

Ms. Khushboo Pandey
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Artificial intelligence is a set of technologies that stimulate human intelligence which allow computers to initiate aspects of human thinking and behaviour to achieve autonomous learning, natural language processing, computer version and other technologies. The application of AI in the food industry has been growing for years reasons comprising, food sorting, classification and prediction of the parameters, quality control and food safety. AI enhances food biotechnology by supporting food enzymes engineering, microbial metabolic engineering, food safety and food microbiology. Drug manufacturing, chemical analysis of various compounds, sequencing of RNA and DNA, enzyme studies and other similar biological processes require support from AI.

AI has played a key role which shapes which shapes new approaches in the research and development of enzymes for industrial applications, including food enzymes. In fact, AI can support each phase of the development of new enzyme from its discovery by the manipulation of big datasets those generated using metagenomics or classical single enzyme mutational biochemistry. AI technology is especially important to the development of precision fermentation by driving the genetic manipulation of 'cell factories' towards the production of custom molecules, including proteins. TOMRA and TENSOR flow are two popular AI tools that use a combination of high resolution cameras, laser technology system, and IR spectroscopy. AI represents a powerful tool to study large datasets and to carry out comprehensive analyses to develop strategies. A self optimizing AI tools greatly support the continuous improvement of these standards, paving the way to the development of rapid and cost-effective methods to determine toxic compounds in food. Precision fermentation is based on the use of microbes mainly yeast and fungi to produce a specific molecule in a scalable process. Microbial toxins and toxic chemicals are the major factor contributing to food safety risks the integration of AI and machine learning software used for assessing food toxicity has led big improvement in terms of rapidity and cost- effectiveness of food analyses to detect toxic compounds of chemical and biological origins. AI cannot work completely without human intervention, barriers include lack of data in digital format concerns about privacy due to the need to store food safety data on public platforms. We can say that AI and ML are completely revolutionizing the entire food industry by reducing human errors and increasing safety standards.

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Targeting tumor markers in ovarian cancer treatment

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At the worldwide level, ovarian cancers (OC) are the most prevalent, fatal, and stage-dependent tumours, particularly in female patients. This is especially true in the United States. The administration of medications that directly target the abnormalities in tumour cells that are responsible for their development, proliferation, and metastasis is what is known as targeted therapies. The purpose of these therapies is to treat specific individuals. Currently, there are a number of potential therapeutic targets that might be utilised in the field of gynaecological cancers, particularly in breast and ovarian cancers. These targets include tumor-intrinsic signalling pathways, angiogenesis, homologous recombination deficiency, hormone receptors, and immunologic components. There is a lack of a good screening procedure, which is principally responsible for the fact that breast tumours are frequently discovered in advanced stages. On the other hand, numerous tumour indicators have been the subject of substantial research and have been utilised in order to assess the state, progression, and efficacy of pharmacological treatments for this sickness. Recently, there have been technical developments in the fields of bioinformatics, genomics, proteomics, and metabolomics. These advancements have made it easier to investigate and identify biomarkers that were previously unknown.

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Bio-Rhythms

CRISPR and Gene Editing: Revolutionizing Genetics and Shaping the Future of Medicine

Ms. Amrita Mishra
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CRISPR is short for Clustered Regularly Interspaced Short Palindromic Repeats, and it is a game-changing gene-editing tech that can make highly specific changes to your DNA. Initially identified as an immune system in bacteria, CRISPR employs an RNA-guided enzyme (e.g. Cas9) to recognize and slice out portions of DNA that correspond with a precise sequence (which may have been mutated). Using this mechanism, researchers can more precisely and efficaciously insert, delete or change genetic material. This emerging tech has the potential to revolutionize the medical applications from correcting genetic diseases, to developing individualized therapeutics and even improving agriculture through genetically modified crops. In medicine, CRISPR technology holds the potential to correct genetic mutations responsible for hereditary diseases such as cystic fibrosis, Duchenne muscular dystrophy, and sickle cell anemia. Researchers are developing therapies that use CRISPR to edit the genes within a patient's cells, potentially offering cures for previously untreatable conditions. Furthermore, CRISPR is instrumental in creating personalized medicine approaches, where treatments are tailored to an individual's genetic makeup. Agriculture has also been boosted by CRISPR. It is applied to create new plant varieties with more desirable characteristics which include resistance to pest, diseases and climatic problems. This could lead to improved methods of farming that farming could be more sustainable hence produce more food. Likewise, CRISPR could possibly underpin the optimization of livestock with the aim to upgrade the healthcare, the rate of growth, and the levels of disease resistance. Despite its promise, CRISPR and gene editing raise several ethical and safety concerns. There are dangers that it could act at sites other than the target and make several other changes in the DNA which could be dangerous or undesirable. Human germline editing raises further ethical debates surrounding human germline editing, where changes made to the DNA of embryos could be passed on to future generations, raising questions about long-term impacts on humanity and the natural gene pool. The legal landscape for the use of CRISPR technology is relatively open, as the officials of various countries and science organizations try to compromise between progress in the sphere and adequate control. Societal acceptance is also relevant as researcher's views of gene editing technologies and how society accepts these technologies affect their development. As the technology of the CRISPR lengthens, it will be possible to revolutionize many branches of science and medicine. Continued scientific work continues to improve both the specificity and efficiency of the genetic scissors and to resolve the issues of both the moral and physical consequences that go with these fascinating methods. This is why the future of CRISPR is incredibly promising and is one of the most innovative and revolutionary segments of the modern biotechnology.

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THE MINDS MATTER - Exploring the mental health issues

Ms. Roshni Jha
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Batch 2023-2027

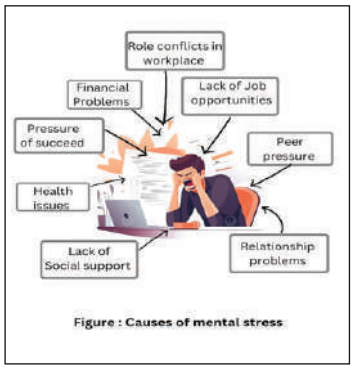

Figure : Causes of mental stress

Stress is the emotional strain or tension that an individual feels as a reaction to numerous demanding and influential conditions. Stressors refer to difficult or compelling situations. Stressors can be internal or external, and include life events such as losing a significant other, low socioeconomic position, relationship issues, occupational hurdles, and familial or environmental causes. An individual's reaction to pressures determines the course of their life. Health is defined as a condition of complete social, emotional, and physical well-being, rather than simply the absence of sickness. Stress is a common risk factor for poor health outcomes due to poor adaptability and dealing with stresses. Stressors can put a burden on one's physical, psychological, and behavioural well-being, resulting in long-term negative consequences.

Stress is described as any cognitive, emotional, or physical pressure that, when built up, has an immediate or indirect impact on an individual's work, work-related, or personal life.There are three sorts of stress that can occur in any environment: physical, emotional, and cognitive. Any of these pressures are caused by work overload, repetitive duties that misjudge an individual's capacity, and job mismatch. Work overload problems are linked to psychological or physical stress, either directly or indirectly.Stress has an impact on human performance, either individually or in groups, and represents a unique relationship between the person and the environment that the person judges for his own well-being.

Stress is related with a variety of physical health effects on an individual.The findings show that stress causes a variety of acute and long-term physical impacts, including increased heart rate, perspiration, elevated blood pressure, and long-term development of the cardiac ailment. Furthermore, stress caused the development of gastrointestinal illnesses such as peptic ulcers and irritable bowel syndrome.Physical health impacts are explained by a variety of mechanisms, including sympathetic nervous system overstimulation and hypothalamic-pituitary-adrenocortical axis activation.

Mental health refers to your overall psychological well-being. It includes the way you feel about yourself, the quality of your relationships, and your ability to manage your feelings and deal with difficulties.Staying active is as good for the brain as it is for the body.If you have concerns, stresses or worries, sharing these with someone who cares is one of the most effective ways to calm your nervous system and relieve stress. Sometimes listening to others in a safe and supported way can help you develop wider perspectives.Yoga, mindfulness, meditation and deep breathing can help reduce overall levels of stress.It matters more than many people think. Sleep is our body and mind's best way to recharge and rejuvenate.

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Spinal stenosis

Ms. Priya
B.Tech BT,
Batch 2023-2027

When imaging the spine of the elderly, narrowing of the spinal canal, or foramina, is frequently observed. Spinal stenosis of the lumbar spine, cervical spine, or both is diagnosed only when neurogenic claudication and/or cervical myelopathy symptoms are present (the thoracic spine is extremely seldom involved). According to epidemiological data, there may be one instance of cervical spine stenosis for every 100,000 people and five cases of lumbar spine stenosis for every 100,000 people. Cervical spine stenosis is the most common cause of cervical myelopathy in adults over 50.

Spinal narrowing causing symptoms might be acquired, or most commonly, congenital. Systemic illnesses, including endocrinopathies (like Cushing disease or acromegaly), disorders of calcium metabolism (like hyporarthhyroidism and Paget disease), inflammatory diseases (like rheumatoid arthritis), and viral infections, may be the cause of the latter. In cases of cervical spondylotic myeloptahy, physical examination is usually abnormal; in cases of lumbar spinal stenosis, however, it is usually normal. As a result, the diagnosis of spinal stenosis depends on the clinical picture that matches the obvious causal alterations found using imaging methods, particularly CT and MRI. For the purpose of establishing a differential diagnosis—vascular claudication, specifically—other auxiliary diagnostic tests are more likely to be productive. The majority of patients present gradually, and non-operative management is recommended as the initial course of treatment. Surgery is recommended for steadily. The primary surgical approach involves decompression (laminectomy, foraminotomy, discectomy, corpectomy) according on the anatomical level and kind of narrowing. If spinal stability and sagittal balance are in danger, extra instrumentation may be used. The major goal of surgery for cervical spine stenosis is to stop the disease's progression. There is class 1b evidence supporting the short-term benefits of surgery for lumbar stenosis.