
Source: Medline (70-73) 70128719

Deficiency diseases/ Aflatoxins adverse effects/ Anaemia Hypochromic prevention and control Nutrition Preschool/ Deficiency Diseases prevention and control/ Food Analysis/ Food Contamination/ History of Medicine 20th Cent/ India/ Infant/ Lathyrism prevention and control Liver Diseases chemically induced/ Nutrition Disorders prevention and control/ Nutrition Surveys/ Nutritional Requirements/ Pellagra epidemiology/ Pregnancy/ Pregnancy Complications Haematology drug therapy/ Protein Deficiency epidemiology/ Protein Deficiency therapy Vitamin A administration and dosage/ Vitamin A Deficiency epidemiology/ Vitamin A Deficiency therapy/ Deficiency Diseases epidemiology Nutrition/ Nutrition Disorders epidemiology/ Review/ Historical article/ Mycotoxins/ Aflatoxins/ Anaemia/ Carotene/ Contamination Deficiency/ Drugs/ Epidemiology lathyrism/ Food/ History/ India lathyrism/ Lathyrism/ Lathyrism complications/ Lathyrism drug therapy Lathyrism epidemiology/ Lathyrism history/ Lathyrism/ Lathyrism mycotoxins/ Lathyrism nutrition/ Lathyrism prevention/ Lathyrism review/ Lathyrism therapy/ Liver/ Nutrition disorders/ Pellagra/ Prevention lathyrism/ Lathyrism prevention/ Protein/ Protein deficiency Reports/ Surveys/ Vitamin A/ Vitamins.


Source: Medline (70-73) 70103925

Adolescence/ Adult/ Aflatoxins poisoning/ Avitaminosis/ Calcium/ Carotene/ Child/ Child Preschool/ Deficiency Diseases complications/ Dogs Ducks/ Food Analysis/ Haplorhini/ India/ Infant/ Infant Nutrition Disorders/ Infant Newborn/ Iron/ Kwashiorcor/ Lathyrism etiology/ Nutrition Surveys/ Nutritional Requirements/ Pellagra/ Pigeons/ Pregnancy/ Protein Deficiency complications/ Socioeconomic Factors/ Vitamin A therapeutic use/ Vitamin A Deficiency/ Deficiency Diseases/ Nutrition/ Nutrition Disorders/ Protein Deficiency/ Mycotoxins/ Aflatoxins Deficiency/ Food/ India lathyrism/ Lathyrism/ Lathyrism Adolescence/ Lathyrism complications/ Lathyrism India/ Lathyrism mycotoxins/ Lathyrism nutrition/ Humans/ Poultry/ Protein/ Surveys/ Trace elements/ Vitamin A/ Vitamins.


Source: Medline (70-73) 7036630

Accessory Nerve/ Hypoglossal Nerve/ Middle Age/ Vagus Nerve/ Brain Diseases etiology/ Lathyrism complications/ Optic Atrophy complications/ Neurology/ Age/ Brain/ Brain diseases/ Lathyrism/ Lathyrism etiology/ Nerves/ Optic.


Source: Agricola (70_78) CAIN 719047140, reprintDE

Lathyrus/ Poisonous plants/ Lathyrus folklore/ Agriculture/ Folklore Lathyrus/ Lathyrus etiology/ Lathyrus/ Reprint.


Source: Medline (70-73) 71026545

Blood Coagulation/ Erythrocytes drug effects/ Favisin etiology/ Glycosides toxicity/ Goitre chemically induced/ Lathyrism etiology/ Lectin toxicity/ Plant Proteins toxicity/ Pyridoxine antagonists and inhibitors/ Rats/ Vitamin D antagonists and inhibitors/ Vitamin E antagonists and inhibitors/ Plant Poisoning/ Rodents/ Antinutritional factors/ Trypsin inhibitor/ Protease inhibitor/ Glycosides/ Blood/ Drugs/ Erythrocytes Favisin/ Glycine max/ Goitre/ Lathyrism/ Lathyrism rats/ Lectin/ Plant proteins/ Protein/ Pyridoxine/ Tocopherols/ Toxicity/ Vitamin E Vitamins.


Source: Medline (70-73) 71093276

Beta aminopropionitrile toxicity/ Cyanides toxicity/ Lathyrism etiology/ Trypsin Inhibitors toxicity/ Antinutritional factors/ Trypsin inhibitor Protease inhibitor/ Agriculture/ Aminopropionitriles/ HCN/ Lathyrism/ BAPN/Toxicity beta aminopropionitrile/ Toxicity.


Source: Medline (70-73) 70151235

Horse Diseases chemically induced/ Horse Diseases complications/ Lathyrism chemically induced/ Lathyrism etiology/ Plant Poisoning complications/ Horse Diseases etiology/ Lathyrism veterinary/ Nitriles adverse effects/ Plant Poisoning veterinary/ HCN/ Ruminants/ Cattle Horse/ Agriculture/ Cyanides/ Experimental lathyrism/ Horse diseases/ Horses lathyrism/ Lathyrism complications/ Lathyrism experimental/ Lathyrism Franchise/ Lathyrism horses/ Nitriles/ Plant poisoning/ Sorghum.


Source: Medline (70-73) 72067718
Animals Newborn/ Brain drug effects/ Cardiovascular/ Carbon Isotopes/ Rats/ Adenine Nucleotides metabolism/ Aminotransferases metabolism/ Ammonia metabolism/ Brain enzyymology/ Glutaminase metabolism/ Lathyrism enzymology/ Peptide Hydrolases metabolism/ Toxin pharmacology Rodents/ Neurology/ Antinutritional factors/ Lathyrus sativus/ Ammonia/ Brain/ Drugs/ Enzyme/ Hydrolases/ Hydrolysis/ Lathyrism Lathyrism animals/ Lathyrism mechanisms/ Lathyrism rats/ Mechanism/ Metabolism/ Plant/ Neurotoxin/ Peptides/ Toxin.

Source: Medline (70-73) 72214132
Abortion Veterinary/ Animals Newborn/ Pregnancy/ Selenium poisoning/ Sheep/ Sheep Diseases chemically induced/ Spine abnormalities Abnormalities Drug Induced veterinary/ Forelimb abnormalities/ Hindlimb abnormalities/ Lathyrism veterinary/ Plant Poisoning veterinary Sheep Diseases/ Animals/ Ruminants/ Toxicity/ Nutrition/ Neurology/ Agriculture/ Animal feed/ Drugs/ Experimental lathyrism/ Feed/ Feed ruminants/ Feed Lathyrus ochrus/ Heavy metals/ Hindlimbs/ Lathyrism/ Lathyrism animals/ Lathyrism experimental/ Lathyrism France Lathyrism nutrition/ Lathyrus ochrus/ Lathyrus toxicity/ Metals/ Nutrition plant/ Nutrition animal/ Plant poisoning/ Ruminant feed/ Ruminants nutrition/ Selenium/ Sheep feed/ Spine/ Trace elements.

Source: Medline (70-73) 72047022
Lathyrism sheep/ Sheep lathyrism/ Experimental lathyrism sheep/ Sheep experimental lathyrism/ Ruminants/ Osteolathyrism/ Agriculture/ Diet Experimental lathyrism/ Dietary/ Lathyrism/ Lathyrism experimental/ Lathyrism France/ Lathyrism veterinary/ Sheep.

Source: Medline (70-73) 72047022
Aminopropionitrile adverse effects/ Haplorrhini/ Lathyrism complications/ Paralysis etiology/ Neurology/ Beta aminopropionitrile/ Amino acids Aminopropionitrile/ India/ India lathyrism/ Lathyrism/ Lathyrism etiology/ Lathyrism/ Neurolathyrism/ Paralysis/ Primates/ BAPN.

Mitchell (1971) investigated the geographical distribution of the disease lathyrism which results after excessive consumption of the legume, Lathyrus sativus, a medical problem that manifests as severe irreversible paralysis of the lower extremities.
Source: Agricola (70_78) CAIN 729010449
Toxicity/ Lathyrism/ Nutrition/ Lathyrus sativus/ Diet/ Distribution plants/ Lathyrism nutrition/ Lathyrus toxicity/ Toxicity L. sativus Epidemiology lathyrism/ Lathyrism epidemiology/ Nutritional geography/ Geography nutritional.

Lathyrism/ Sulfur/ ODAP/ NPAA toxicity/ Cytotoxicity NPAA/ Cytotoxicity amino acids/ Amino acids toxicity/ Neurology/ Amino acids Brain/ Cytotoxicity/ Infant/ Nervous system/ NPAA/ Toxicity ODAP/ Toxicity.

Source: Medline (70-73) 71230723
Lathyrism complications/ Muscular Dystrophy complications/ Peripheral Nerve Diseases complications/ Spinal Cord Compression complications/ Syphilis complications/ Paraplegia etiology/ Neurology/ India/ India lathyrism/ Lathyrism/ Lathyrism etiology/ Lathyrism India Muscles/ Nerves/ Periphera/ Peripheral/ Spinal cord/ Surveys.

Source: Medline (70-73) 72162737
India/ Lathyrism/ Nutritional Requirements/ Pellagra/ Protein Energy Malnutrition/ Nutrition/ Nutrition Disorders/ Famine/ Malnutrition Energy/ India malnutrition/ India lathyrism/ Lathyrism India/ Lathyrism nutrition/ Lathyrism review/ Protein/ Review.

Source: Medline (70-73) 72141947
Alcoholim complications/ Anaemia Pernicious etiology/ Beriberi etiology/ Demyelinating Diseases/ Electromyography/ Lathyrism complications/ Malabsorption Syndromes etiology/ Nerve Degeneration/ Neural Conduia/ Nicotinic Acids/ Pantothenic Acid/ Pellagra etiology/ Pyridoxine Deficiency complications/ Rats/ Riboflavin Deficiency complications/ Thiamine Deficiency complications/ Vitamin B Deficiency complications/ Vitamin B 12 Deficiency complications/ Nutrition Disorders complications/ Peripheral Nerve Diseases etiology Rodents/ Neurology/ Famine/ Malnutrition/ Anaemia/ Beriberi/ Binding sites/ Deficiency/ Demyelination/ Lathyrism/ Lathyrism electromyography/ Lathyrism etiology/ Lathyrism nerve degeneration/ Lathyrism nutrition/ Lathyrism rats/ Malabsorption/ Manihot esculenta Cassava/ Myelin/ Nerves/ Neural/ Nutrition/ Nutrition disorders/ Pellagra/ Peripheral/ Pyridoxine/ Riboflavin/ Syndrome/ Thiamine/ Vitamin B Vitamins.
Source: Medline (70-73) 74305516

Chick Embryo Preschool/ Dogs/ Haplorhini/ India/ Infant/ Lathyrism prevention and control/ Pellagra drug therapy/ Vitamin A Deficiency drug therapy/ Nutrition Disorders/ Carotene/ Ceylon/ Chickens/ Deficiency/ Drugs/ Embryo/ India lathyrism/ Lathyrism/ Lathyrism drug therapy/ Lathyrism India/ Lathyrism nutrition/ Lathyrism prevention/ Lathyrism therapy/ Nutrition/ Pellagra/ Prevention lathyrism/ Lathyrism prevention Vitamin A/Vitamins.

Source: Grmek (1980)

Source: ref Pushpamma (1989)

Source: Agricola (70_78) CAIN 739189756

Source: Medline (70-73) 74052515


Source: Medline (70-73) 73155541

Source: Medline (70-73) 73155540

Source: ref ex Kaul et al. (1989)

Source: reprintDE

Source: Medline 75082682

Avidin analysis/ Cardiac Glycosides analysis/ Cyanosis etiology/ Diet/ Environmental Pollution/ Ergot Alkaloids analysis/ Favism etiology Food Additives/ Food Analysis/ Food Contamination/ Food Microbiology/ Food Preservation/ Food Processing Industry/ Goitre etiology Lathyrism etiology analysis/ Mercury analysis/ Pesticide Residues analysis/ Plants Edible/ Selenium analysis/ Toxic analysis/ Food Poisoning Antinutritional factors/ Agriculture/ Glycosides/ Mycotoxins/ Alkaloids/ Cardiac glycosides/ Contamination/ Environment/ Favism/ Food/ Food
p..., Heavy metals/ Lathyrism/ Lathyrism nutrition/ Meat/ Mercury/ Metals/ Microbiology/ Nutrition
Pesticides/ Pollution/ Processing/ Review/ Selenium/ Toxin/ Trace elements.

Lathyrism India/ India lathyrism/ Incidence/ India/ Lathyrism/ Humans/ Physiology not plant.

Source: Medline 74294586
Brain Diseases complications/ Diagnosis Differential/ Epilepsy complications/ Lathyrism diagnosis/ Raynaud's Disease complications
Scleroderma Circumscribed diagnosis/ Scleroderma Systemic diagnosis/ Spinal Cord Diseases complications Disorders complications/ Nervous system diseases complications/ Scleroderma Circumscribed complications/ Scleroderma Systemic complications/ Neurology/ Syndrome/ Brain
Brain diseases/ Diagnosis/ Lathyrism/ Lathyrism complications/ Mental/ Nervous system/ Psychology/ Spinal cord/ Nervous system diseases.

Source: Medline 74163833
Bioassay/ Child/ Chromatography Thin Layer/ Dansyl Compounds/ Diagnosis Differential/ Dipeptidases blood/ Erythrocytes enzymology
Leukocytes enzymology/ Metabolism Inborn Errors complications/ Metabolism Inborn Errors diagnosis/ Peptides isolation and purification
Peptides urine/ Proline urine/ Proteinuria diagnosis/ Time Factors/ Aminoaciduria Renal etiology/ Dipeptidases metabolism/ Lathyrism enzymology/ Metabolism Inborn Errors enzymology/ Syndrome/ Blood/ Chromatography/ Chromosomes/ Chromosome aberrations/ Deficiency Diagnosis/ Enzymes/ Erythrocytes/ Isolation/ Lathyrism/ Lathyrism Bioassay/ Lathyrism complications/ Lathyrism diagnosis/ Lathyrism etiology/ Humans/ Metabolism/ Peptides/ Proline/ Purification.

Source: Medline 74287281
Alkaloids/ Biotransformation/ Child/ Fish Products/ Food Additives/ Food Analysis/ Lathyrism etiology/ Mercury/ Nitriles/ Oxoalates/ Plants
Edible/ Solanine/ Terpenes/ Thioalcohols/ Thymol/ Antagonists/ Food Poisoning/ Poisons analysis/ Toxin analysis/ Antinutritional factors
Glycosides/ Mycotoxins/ Fish/ Food/ Heavy metals/ Lathyrism/ Lathyrism mycoToxin/ Lathyrism nutrition/ Humans/ Metals/ Nutrition/ Review
Inositol.

India lathyrism/ Lathyrism India/ India/ Uttar Pradesh/ Lathyrism/ Paralysis/ Uttar Pradesh.

Source: Medline 76084882
Adult/ Age Factors/ Aged/ Atherosclerosis/ Blood Pressure/ Cholesterol blood/ Colchicine therapeutic use/ Cortisone therapeutic use
Hypertension blood/ Hypertension complications/ Lathyrism complications/ Middle Age/ Rabbits/ Risk/ Sex Factors/ Hypertension physiopathology/ Rodents/ Age/ Blood/ Cholesterol/ Colchicine/ Hypertension/ Lathyrism/ Lathyrism Aged/ Lathyrism physiopathology/ Sex.

Lathyrism India/ India lathyrism/ Lathyrus sativus low ODAP/ Lathyrus sativus detoxification/ Detoxification L. sativus/ Lathyrus sativus Detoxification/ India/ India lathyrism/ Lathyrus sativus.

Haskell, B. E. (1975). The food that cripples. Ill Res 17 (1):12-13 (author affiliation: Illinois, Agricultural Experiment Station/DNAL 100-IL64 Experiment-Station-State-Agricultural)
Source: Agricola (70_78) CAIN 759027035
India lathyrism/ Lathyrism India/ Lathyrus sativus human consumption/ Human consumption L. sativus/ Lathyrus sativus Agriculture/ Food Human consumption/ India/ India L. sativus/ Lathyrus sativus consumption/ Lathyrism/ Humans.

Dioscorides/ Lathyrus/ Arabic medicine/ History.

Source: Medline 75155362
Alkaloids/ Animal Diseases etiology/ Atropine/ Cardiac Glycosides/ Chemistry/ Lathyrism etiology/ Plant Poisoning etiology/ Protoveratrin.
Senecio/ Sparteine/ Steroids/ Teratogens pharmacology/ Terpenes/ Thioalcohols/ Tocantine/ Toxin pharmacology/ Tropane/ Plants/ Teratogens
Antinutritional factors/ Beta aminopropionitrile/ Glycosides/ Aminopropionitriles/ Lathyrism/ Lathyrism animals/ Phytochemistry/ Plant poisoning/ Nicotiana/ BAPN/ Toxin.

Source: reprint

Animal/ Female/ Males/ Mice/ Alopecia/ Brain/ Lathyrus sativus microbiology/ Lathyrism mycotoxins/ Penicillium/ Isolation/ Purification Microbiology L. sativus/ Mycotoxins L. sativus/ Rodents/ Neurology/ Antinutritional factors/ Lathyrus sativus/ Mycotoxins/ Fungi/ Mycology Isolation/ Lathyrism/ Lathyrus sativus/ Mycology/ Seed/ Spain/ Spain L. sativus/ Toxin/ reprint.

Biochemistry/ Osteolathyrism/ Dissertations/ Distribution plants/ Experimental lathyrism/ Lathyrism/ Lathyrism Biochemistry/ Lathyrism experimental/ Lathyrism France/ Metabolism.

Source: ref ex Kaul et al. (1989)
ODAP metabolism/ Lathyrism metabolism/ Lathyrism physiology/ Lathyrus sativus/ Lathyrism India/ India lathyrism/ India/ India L. sativus/ India lathyrism/ Lathyrism India/ Metabolism/ ODAP/ Plant physiology.

Source: ref ex Lal and Swarup (1989), reprint

Source: ref ex Haque and Mannan (1989)
Lathyrism Bangladesh/ Bangladesh lathyrism/ FAO/ Bangladesh/ Lathyrism/ Reports.

Osteolathyrism/ Dissertations/ Distribution plants/ Experimental lathyrism/ Lathyrism experimental/ Lathyrism France/ Lathyrism rats/ Rodents.

Source: Medline 77012095
History of Medicine 20th Cent/ Rats/ Wisconsin/ Lathyrism history/ Rodents/ History/ Lathyrism/ Lathyrism nutrition/ Lathyrism rats/ Nutrition Review.

Light and electron microscopic studies were made of the anterior horn cells in a case of neurolathyrism. Eosinophilic inclusions were observed at the light microscopic level. Fine structural study revealed the presence of two types of cytoplasmic inclusions. The first were aggregates of filaments, approximately 80-100 A in width, arranged in small bundles. The second were crystalloid structures composed of elongated elements, about 800 A wide, with hexagonal cross sections. The relationship to each other and the significance of these inclusions are unknown.
Source: Medline 76274380; Reprinted with permission Copyright 1976 Springer Verlag
Aged/ Cellular Inclusions ultrastructure/ Spinal Cord Diseases pathology/ Anterior Horn Cells ultrastructure/ Lathyrism pathology/ Motor Neurons ultrastructure/ Neurology/ Age/ Anterior horn/ Lathyrism/ Lathyrism Aged/ Motor neurons/ Neurolathyrism/ Neurons/ Spinal cord.

Lathyrus sativus toxicity/Lathyrism/ Lathyrus sativus/ Chemistry/ India/ India L. sativus/ India lathyrism/ Lathyrism India/ Lathyrus toxicity Poison/ Toxicity L. sativus/ Toxicity.
Source: CGC_95_2
Lathyrism/ Lathyrus spp toxicity/ Chemistry/ Lathyrus spp/ Lathyrus toxicity/ Poison/ Toxicity Lathyrus spp/ Toxicity.

Source: Medline 77012096
Beta aminopropionitrile isolation and purification/ Chemistry/ Glutamates/ Lathyrism history/ Lathyrus odoratus/ Beta aminopropionitrile Aminopropionitriles/ History/ Isolation/ Lathyrism/ Lathyrism nutrition/ Nutrition/ Purification/ Review/ BAPN.

Source: Medline 77004495
Lathyrism electromyography/ Lathyrism pathology/ Lathyrism complications/ Lathyrism motor Neurons/ Lathyrism paraplegia etiology Lathyrism spasm etiology/ Neurology/ Electromyography/ Lathyrism/ Lathyrism etiology/ Motor neurons/ Neurolathyrism/ Neurons/ Paraplegia Spasm/ Spasticity.

Source: ref ex Haque and Mannan (1989)
Lathyrism Bangladesh/ Bangladesh lathyrism/ FAO/ Bangladesh/ Lathyrism/ Reports.

Source: ref ex Tekle-Haimanot (1989)
Lathyrism Ethiopia/ Ethiopia lathyrism/ Ethiopia/ Lathyrism/ Rehabilitation/ Reports.

Source: Medline 77171469
Anterior Horn Cells pathology/ Chronic Disease/ Electromyography/ Leg innervation/ Lipofuscin/ Middle Age/ Motor Neurons pathology Muscular Atrophy etiology/ Muscular Atrophy physiology/ Neural Conduction/ Paralysis/ Lathyrism physiopathology/ Motor Neurons Neurology/ Age/ Anterior horn/ Lathyrism/ Lathyrism electromyography/ Lathyrism etiology/ Lathyrism motor neurons/ Lathyrism pathology Motor neurons/ Muscles/ Neural/ Neurolathyrism/ Neurons.

Source: Medline 78128932
Adolescence/ Adult/ Aged/ Child/ Child Preschool/ India/ Lathyrism prevention and control/ Middle Age/ Lathyrism epidemiology/ Age Epidemiology lathyrism/ India lathyrism/ Lathyrism/ Lathyrism Adolescence/ Lathyrism Aged/ Lathyrism India/ Lathyrism prevention/ Humans Prevention lathyrism/ Lathyrism prevention.

Source: Medline 78088661
Haplorhini/ Lathyrism chemically induced/ Rats/ Amino acids Diamino metabolism/ Brain metabolism/ Neurotoxins metabolism/ Plants Toxic Spinal Cord metabolism/ Synaptosomes metabolism/ Rodents/ Neurology/ Lathyrus sativus/ Synaptosomes/ Amino acids/ Brain/ Lathyrism Lathyrus rats/ Lathyrus toxicity/ Metabolism plant/ Neurotoxins/ Spinal cord/ Synapses/ Tissue/ Toxicity L. sativus/ Toxicity.

We examined the central nervous system of a 67-year-old man who showed symptoms of lathyrism after being imprisoned at age 35 and fed on a diet of chick peas, Lathyrus sativus. The most obvious changes were loss of axons and myelin in the pyramidal tract in the lumbar spinal cord. These alterations correlated with spastic paraparesis. Other changes at the same level were a mild degree of degeneration of anterior horn cells. Pallor of Goll's tracts and axonal swelling in Goll's nuclei were also observed. A few examples of senile plaques and neurofibrillar tangles were observed in Ammon's horn.
Source: Medline 78051413
Lathyrism Aged/ Lathyrism hippocampus pathology/ Lathyrism etiology/ Lathyrism medulla oblongata pathology/ Lathyrism motor Neurons pathology/ Lathyrism nerve degeneration/ Lathyrism pyramidal tracts pathology/ Lathyrism central Nervous system pathology/ Lathyrism pathology/ Neurology/ Lathyrus sativus/ Axons/ Lathyrism symptoms/ Age/ Anterior horn/ Central Nervous system/ Chickens/ Diet Hippocampus/ Lathyrism/ Lathyrism hippocampus/ Humans/ Medulla/ Motor neurons/ Myelin/ Nerves/ Nervous system/ Neurolathyrism Neurons/ Nuclei/ Pyramidal tract/ Spasticity/ Spastic paraparesis/ Spinal cord/ Symptoms lathyrism.

Source: reprint


Source: Medline 79053352


Anterior horns of the spinal cord from cervical and lumbar regions and dorsal root ganglia from these same levels were studied for ultrastructural changes in imino-dipropionitrile (IDPN) treated rats. Normal saline-injected rats, treated identically, served as controls for this study. In the spinal cord axonal balloons or dystrophic axons appeared in lightly myelinated or unmyelinated axons within 24 h after the third injection of IDPN. At this time hind leg paralysis had not yet developed. In addition to axonal changes, a few dendrites also showed neurofibrillary degeneration. Central chromatolytic changes were observed in most of the neurons, with evidence of generalised oedema present within the cord. In the dorsal root ganglia axonal balloons were very prominent and showed neurofibrillary hypertrophy. Neurofibrillar material was also noted in the perikarya of medium-sized ganglion cells.

Source: Medline 78141459; Reprinted with permission Copyright 1978 Springer Verlag


Ethiopia lathyrism/ Lathyrism Ethiopia/ Neurology/ Ethiopia/ Lathyrism/ Lathyrism review/ Neurolathyrism/ Reports/ Review.


Paraplegia is a common problem in developing countries. They are the most pitiable group of cases seen, but they can all be offered some help, however limited one's resources. The main causes are Potts Disease, arachnoiditis, tropical spastic paraplegia, trauma, lathyrism and cord compression. The usual trauma is falling from trees and the use of trained monkeys to gather leaves and nuts whilst humorous should not be dismissed. The author saw some 35 cases of paraplegia, of which four are described--two good results and two bad. The physician going to a developing country is advised to prepare himself for the care of these cases and to be prepared to motivate staff, patients and relatives. He will find local medical assistants are kind and enthusiastic and rapidly acquire the necessary skills. Nearly all cases should receive a simple and inexpensive anti-tuberculous regime, vitamins and a very generous diet. Necessary equipment required for the home should be locally made and nothing requiring more than simple maintenance should be used.

Source: Medline 78115080; Reprinted with permission. Copyright (1978) Stockton Press

Adult/ Child/ Nepal/ Paraplegia etiology/ Paraplegia therapy/ Diet/ Lathyrism/ Lathyrism etiology/ Lathyrism therapy/ Leaves/ Humans Paraplegia/ Primates/ Spasticity/ Spastic paraplegia/ Tropics/ Vitamins.


Source: Medline 79081526, reprint

Aflatoxins analysis L. sativus/ Microbiology L. sativus/ Legumes toxins/ Mice/ Penicillium isolation and purification/ Prunus chemically induced/ Seed/ Alopecia chemically induced/ Food Contamination mycotoxins/ Lathyrism complications/ Spain lathyrism/ Lathyrism Spain Rodents/ Antinutritional factors/ Lathyrus sativus/ Mycotoxins/ Aflatoxins/ Alopecia/ Contamination/ Food contamination/ Food/ Fungi Mycology/ Isolation/ Lathyrism/ Lathyrism etiology/ Lathyrism mycotoxins/ Microbiology/ Penicillium/ Purification/ Spain/ Spain L. sativus Toxin/ reprint.


[**La légende et la réalité de la nocivité des fèves [Legend and reality in relation to the toxicity of Vicia faba]**](https://example.com/document)


[**La légende et la réalité de la nocivité des fèves [Legend and reality in relation to the toxicity of Vicia faba]**](https://example.com/document)


[**La légende et la réalité de la nocivité des fèves [Legend and reality in relation to the toxicity of Vicia faba]**](https://example.com/document)


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[**La légende et la réalité de la nocivité des fèves [Legend and reality in relation to the toxicity of Vicia faba]**](https://example.com/document)

The concept of sharp distinction between these two pathological entities. They are of a nature to throw some doubt on the correctness of the currently prevailing findings which are similar to those found in experimental osteolathyrism have never been described in clinical.


Source: Medline 80242455

Middle Age/ Paraplegia etiology/ Lathyrism complications/ Age/ Lathyrism/ Lathyrism etiology/ Paraplegia.


beta,beta'-Iminodipropionitrile (IDPN) is a neurotoxic substance, which induces choreiform movements for life in rats and mice. As for the phenotype this seems to be a suitable animal model for the comparison with Huntington's chorea in man. In our experiments we have tested the effect of IDPN on different developmental stages of the branchiopode Artemia salina. One-day old nauplii show the strongest reaction to the substance. As little as 10(5) g IDPN/l culture medium induces in one-day old nauplii a characteristically altered swimming behaviour. This behavioural response of the one-day old nauplii may possibly serve as a basis for a simple qualitative biological assay for the detection of IDPN or its effective metabolite, respectively.

Source: Medline 80242171

Aging/ Behaviour Animal drug effects/ Chemistry/ Mice/ Rabbits/ Swimming/ Artemia salina drug effects/ Lathyrism chemically induced Nervous system drug effects/ Nitriles pharmacology/ Rodents/ Bioassay nauplii swimming behaviour (Artemia salina)/ Neurology/ Bioassay Chorea/ Drugs/ Lathyrism/ Lathyrism animal models/ Lathyrism animals/ Lathyrism Bioassay/ Lathyrism rats/ Humans/ Models/ Nervous system/ Neurotoxins/ Nitriles/ Rats.


Lathyrism symptoms/ Lathyrism India/ Lathyrism symptoms/ India/ India lathyrism/ Lathyrism/ Paraplegia/ Symptoms lathyrism.


In a review of the roentgenological files of 22 patients suffering from spastic paraplegia due to neurolathyrism, 3 patients were found to present abnormal skeletal findings. 2 patients showed absence of union of the secondary ossification centres of the iliac crests, the ischial tuberosities and the vertebral bodies. Their age at the time of ingestion of poisonous *Lathyrus sativus* plants was 19 and 20 years. The 3rd patient had bowing and thickening of his right femoral shaft. He was 22 years old at the time of poisoning. These findings which are similar to those found in experimental osteolathyrism have never been described in clinical neurolathyrism. They are of a nature to throw some doubt on the correctness of the currently prevailing concept of sharp distinction between these two pathological entities.

Source: Medline 80224764; Reprinted with permission Copyright 1980 S Karger AG, Basel, Switzerland


Two hundred patients with chronic neurolathyrism were clinically examined, 25 to 35 years after exposure to the Lathyrus sativus pea. All the patients were prisoners in a labour camp under similar nutritional and physical conditions at the outbreak of the syndrome. The main symptoms were spastic paraparesis and a neurogenic bladder, both of varying degree. In addition lower motor neuron involvement with muscular atrophies was noticed in 14 cases and simulated amyotrophic lateral sclerosis. A lathyric sensory neuropathy was found in 12 patients. No cranial lesions or psychiatric disorders were found. Laboratory tests including 5 CSF specimens were normal. HLA typing was unremarkable. Our overall impression was that chronic neurolathyrism in the long run shows a gradually slow progressive course. Source: Medline 81225713


Special investigations were undertaken in the group of patients suffering from chronic neurolathyrism as described in part one of our work. X-ray films of the skeleton were taken of 45 patients. Pathologic findings similar to experimental osteolathyrism were revealed in 5 patients. These observations have not been described before. Sural nerve biopsies were taken from three patients with lathyric sensory neuropathy. Electron microscopy revealed mainly thick myelin sheaths which extended into the axonal regions. The picture is similar to the 'tomaculous' neuropathy of Bradley. The lower motor neuron was involved in a few cases, manifested by delayed nerve conduction time and muscular atrophies. Source: Medline 81225714


A neurotoxic amino acid, beta-N-oxalyl-L-alpha,beta-diaminopropionate (beta-ODAP), found in seeds of Lathyrus sativus and a possible causative agent of neurolathyrism, was equipotent with kainate as a depolarizing agent of frog spinal cord ventral roots. beta-ODAP and kainate appeared to act on a common receptor, as their actions could not be differentiated pharmacologically. These results could explain some of the symptoms of neurolathyrism.


Neurolathyrism is a disease that has crippled many thousands in the Indian subcontinent and elsewhere during the past several centuries (1). It struck poor people who used the seeds of Lathyrus sativus as the principal item in their diet continuously for a period of at least two to three months. The disease appeared to affect humans almost exclusively. No experimental animal model was available to facilitate biomedical research on the subject until recently, when we produced the condition in guinea pigs (2). When guinea pigs having a subacute deficiency of L-ascorbic acid were fed for four to five weeks on a diet of cooked L. sativus seeds supplemented with minerals and the usual vitamins except for L-ascorbic acid, they developed typical symptoms of neurolathyrism, affecting the hind limbs. The same condition also appeared within two to three hours following intraperitoneal administration of an extract of L. sativus (3) in guinea pigs previously made deficient in ascorbic acid by omitting it from a normal diet that did not include any L. sativus seeds. We further found that L-ascorbic acid not only protected the animals from the neurotoxic effect of L. sativus, but also had a curative effect on those that had earlier become paralysed by the toxicity of the seeds. We subsequently produced the same symptoms of neurolathyrism in monkeys made deficient in ascorbic acid by feeding them cooked L. sativus seeds or by administering extracts of L. sativus intraperitoneally. Thus, a subacute deficiency of L-ascorbic acid that was not severe enough to produce scurbutic symptoms was found to be a precondition for the appearance of neurolathyrism attributed to L. sativus seeds. This also explained the failure to produce experimental neurolathyrism in laboratory animals that do not require any dietary supply of L-ascorbic acid or that were provided this vitamin in the experimental diet before we suspected that its


Lathyrus sativus socioeconomics/ Socioeconomics L. sativus/ Economics/ Lathyrus sativus/ Agriculture/ Incidence/ Lathyrism/ Lathyrism economics/ Prevalence.

Source: ref ex Lal and Swarup (1989)
Lathyrism India/ India lathyrism/ India/ India Madhya Pradesh/ Lathyrism/ Madhya Pradesh.

Source: ref ex Tiwari (1994)
Lathyrism socioeconomics/ Socioeconomics lathyrism/ Bangladesh poverty/ Poverty Bangladesh/ Economics/ Bangladesh/ Lathyrism Lathyrism Bangladesh/ Lathyrism economics/ Rural.

Source: Medline 83107362
Lathyrism/ Lathyrism pathology/ Spinal Cord pathology/ Neurology/ Age/ India/ India lathyrism/ Lathyrism/ Lathyrism India/ Humans Microbiology/ Spinal cord.

Source: Medline 83211293
Lathyrism genetics/ Adolescence/ Adult/ Aminopropionitrile poisoning/ Bone and Bones pathology/ Lathyrism genetics/ Lathyrism pathology/ Lathyrism diagnosis/ Toxicity/ Lathyrus sativus/ Aminopropionitriles/ Bone/ Diagnosis/ Lathyrism/ Lathyrism Adolescence/ Lathyrus sativus toxicity/ BAPN Toxicity beta aminopropionitrile/ Toxicity L. sativus.

Source: ref ex Kaul et al. (1989)
Lathyrism nutrition/ Lathyrism/ Nutrition.

Source: CGC_95_2
Lathyrism/ Bangladesh/ Dhal/ Khesari/ Lathyrism Bangladesh/ Lathyrus sativus.

Lathyrism/ Lathyrus sativus/ Lathyrism nutrition/ Nutrition.

date is estimated.
Lathyrus sativus India/ India L sativus/ Lathyrism review/ Lathyrus sativus/ Constraints/ Delhi/ Grain legumes/ Pulses/ Grain legumes India/ India/ India L sativus production/ India lathyrism/ Lathyrism/ Lathyrism India/ Review.

Two hundred patients with chronic neurolathyrism were examined 25-35 years after the appearance of signs and symptoms of intoxication of the chickling pea. Their daily food intake, in a German forced labor camp during World War II, consisted of 400 g Lathyrus sativus peas cooked in water plus 200 g bread baked of barley and straw. Apart from the classic signs of neurolathyrism, i.e., a spastic paraparesis, in five cases, the skeletal findings observed were similar to experimental osteolathyrism. There was an absence of ossification centers of the iliac creasts, ischial tuberosities and vertebrae; and bowing with thickening of the femoral shaft also occurred. These bony changes in human lathyrism have not been described before.
Source: Medline 84023104; Reprinted with permission Copyright 1983 Springer Verlag
Lathyrism/ Lathyrus sativus/ Lathyrism prevention/ Dhal/ India/ Khesari/ Lathyrism/ Lathyrus sativus/ Prevention lathyrism.
Lathyrism is a form of irreversible, non-progressive spastic paraparesis associated with poorly understood degenerative changes in spinal cord. Domestic animals, notably the horse, also develop hindlimb paralysis after prolonged feeding on Lathyrus fodder. Experimental animal models of lathyrism have been reported but none has been satisfactorily investigated, and concurrence between these experimental diseases and the human condition is unproven. The culpable agent in Lathyrus species that precipitates paralysis also is unknown. Current attention is focused on the glutamate analog, beta-(N)-oxalyl-amino-L-alanine acid (BOAA). While this compound is present in those Lathyrus species that induce spastic paraparesis and, in large doses, readily reproduced in animal models. The protease inhibitors have, over the years, been the object of much study in experimental animals where they have been observed to have an adverse effect on growth and to cause pancreatic enlargement. The relevance of these observations to human nutrition remains obscure, however, because of our lack of knowledge concerning the effect of soybean trypsin inhibitors on the human pancreas. Lectins from certain legumes such as the common bean (Phaseolus vulgaris) have been shown to be toxic to animals upon oral ingestion presumably because of the damage which they inflict upon binding to the cells lining the intestinal mucosa. Lectins may therefore be responsible for reported cases of human intoxication associated with the consumption of inadequately cooked beans. Lathyrism and favism are diseases in man which are associated with the consumption of Lathyrus sativus and Vicia faba respectively. Evidence leading to the probable identification of the causative factors of these diseases and the steps necessary for their elimination will be discussed.

Source: Medline 84023099: Reprinted with permission Copyright 1983 Springer Verlag

Favism etiology/ Lathyrism etiology/ Lectin toxicity/ Protease Inhibitors toxicity/ Diet/ Food Contamination/ Antinutritional factors/ Trypsin inhibitor/ Protease inhibitor/ Lathyrus sativus/ Contamination/ Favism/ Food/ Glycine max/ Lathyrism/ Lathyrism animal models/ Lathyrism animals/ Lathyrism nutrition/ Lathyrism toxicity/ Lectin/ Humans/ Models/ Nutrition plant/ Nutrition animal/ Nutrition/ Phaseolus vulgaris Toxicity L. sativus/ Toxicity/ Toxin/ Vicia/ Vicia faba.


Lathyrism prevention/ Lathyrus sativus/ India/ India L. sativus/ India lathyrism/ Lathyrism/ Lathyrism India/ Lathyrism nutrition/ Nutrition Paralysis/ Prevention lathyrism.


Lathyrism, one of the oldest neurotoxic diseases known to Man, results from excessive consumption of the chickling pea, Lathyrus sativus, and certain related species. Once prevalent throughout Europe, N. Africa, Middle East and parts of the Far East, the disease is presently restricted to India, Bangladesh and Ethiopia. Lathyrism is a form of irreversible, non-progressive spastic paraparesis associated with poorly understood degenerative changes in spinal cord. Domestic animals, notably the horse, also develop hindlimb paralysis after prolonged feeding on Lathyrus fodder. Experimental animal models of lathyrism have been reported but none has been satisfactorily investigated, and concurrence between these experimental diseases and the human condition is unknown. The culpable agent in Lathyrus species that precipitates paralysis also is unknown. Current attention is focused on the glutamate analog, beta-(N)-oxalyl-amino-L-alanine acid (BOAA). While this compound is present in those Lathyrus species that induce spastic paraparesis and, in large doses, reportedly causes neuropathological changes similar to glutamate neurotoxicity, there is little to compare these neuropathological changes with those found in human lathyrism. Chronic primate feeding studies utilizing BOAA need to be carried out to determine whether this agent is responsible for human lathyrism. Some species of Lathyrus, notably Lathyrus odoratus, are unable to induce human lathyrism but contain a compound, beta-aminopropionitrile (BAPN), that induces pathological changes in bone ('osteolathyrism') and blood vessels ('angiolathyrism') of experimental animals without damaging the nervous system. However, related compounds, dimethylaminopropionitrile (DAMPN) and beta, beta'-iminodipropionitrile (IDPN), are chronic neurotoxins in humans and animals, respectively. (ABSTRACT TRUNCATED AT 250 WORDS).

Source: Medline 84142544

Beta Alanine isolation and purification/ Beta Alanine toxicity/ Disease Models Animal/ Lathyrism diagnosis/ Lathyrism veterinary/ Plants Toxic analysis/ Sainini/ Lathyrism etiology/ Neurotoxins isolation and purification/ ODAP Neurology/ Forage/ Lathyrus sativus/ Lathyrus odoratus


Experimental cyanide exposure in animals causes demyelination and circumstantial clinical and laboratory evidence suggest that there are human parallels. In Leber's hereditary optic atrophy there appears to be a defect in the conversion of cyanide to thiocyanate because of deficient rhodanese activity. For transmitters of the disease smoking carries the risk of blindness and in the most severely affected patients, there is diffuse neurological disease. It is possible that other hereditary optic atrophies (dominant and recessive) may also reflect inborn errors of cyanide metabolism. In the retrobulbar neuritis and optic atrophy of vitamin B12 deficiency there may be a conditional abnormality of cyanide metabolism in smokers, and likewise in so-called tobacco-alcohol amblyopia in which there are more complex nutritional deficiencies. Epidemiological evidence (differing sex ratios, excess of smokers) indicates that defective cyanide metabolism may contribute to the development of sub-acute combined degeneration of the cord in vitamin B12 deficiency. In protein-malnourished populations consuming large amounts of cyanide or cyanogens, viz. in tropical Africa where the staple diet includes cassava containing large amounts of linamarin, similar maladies occur as acquired disorders. There may be a similar explanation for lathyrism. The known pathways of human cyanide metabolism are reviewed and evidence supporting the clinical data is presented.

Source: Medline 84058805; Reprinted with permission Copyright 1983 Academic Press

Lathyrism similarity to Cyanide toxicity/ Africa/ Cyanides/ Deficiency/ Demyelination/ Diet/ HCN/ Lathyrism/ Lathyrism animals/ Lathyrism review/ Humans/ Manihot esculenta/ Cassava/ Metabolism/ Myelin/ Optic/ Population/ Protein/ Review/ Risk/ Sex/ Thiocyanates/ Nicotiana Toxicity/ Tropical/ Vitamins.


Lathyrism India/ India lathyrism/ India/ Lathyrism/ Lathyrism nutrition/ Nutrition.


[Lathyrism, Lathyrus sativus, India].

Source: Agricola (79-84) IND 84113221 ; reprintDE

India/ Lathyrus sativus/ Grain legumes/ Pulse/ Grain legumes India/ India L. sativus/ India lathyrism/ Lathyrism/ Lathyrism India/ reprint.


Source: Medline 84255470

Central Nervous system diseases chemically induced/ Central Nervous system diseases physiopathology/ Cloquizinol/ Disease Models Animal Dogs/ Lathyrism pathology/ Paraplegia pathology/ Axons ultrastructure/ Central Nervous system diseases pathology/ Nerve Degeneration Neurology/ Axons/ Syndrome/ Central Nervous system/ Lathyrism/ Lathyrism animals/ Lathyrism nerve degeneration/ Lathyrism physiopathology/ Humans/ Models/ Nerves/ Nervous system/ Paraplegia/ Nervous system diseases.


Effect of kesari dal (Lathyrus sativus used as food by poor people in India and known to cause lathyrism) on kidney enzymes of mice was investigated by biochemical and histochemical methods in a 12 week feeding trial [10 refs, En].

Source: FSTA 17(12) 1985

Lathyrus/ Lathyrism physiopathology/ Lathyrism animal models/ Lathyrism bioassay rats/ Lathyrism pathology/ Kidneys/ Bioassay L. sativus Bioassay rodent/ Bioassays/ Biochemistry.
Experiments with Chicks
These studies demonstrate the toxicity of MSG in one-day-old chicks weighing 32-35 g. Different amounts of MSG were put into 0.5 ml of water and administered intraperitoneally. The results are presented in table 1. While a dose of 2 g/kg body weight caused only mild symptoms, toxicity became severe when the dose was raised to 2.5 g/kg.

The preventive action of AA against the toxicity of MSG at a dose of 2.5 g/kg in these chicks is presented in table 2, part A, which shows that 0.75 mg of AA given intraperitoneally 10 minutes before the administration of MSG protected all the birds.

Experiments with Guinea-pigs and Monkeys
These studies were made to demonstrate the curative action of AA against MSG toxicity in adult guinea-pigs and monkeys, which are not able to biosynthesize AA. Guinea-pigs weighing 300-350 g and monkeys weighing 2.5-3 kg were selected. They were made deficient in AA by feeding an AA-deficient diet until serum AA levels fell to 0.3-0.4 mg/dl. At this point no scorbutic symptoms were seen. A dose of 2 g/kg of MSG was administered to each animal intraperitoneally in a 0.5-ml aqueous solution. Results are shown in table 2, parts B and C. All the animals became sick, but 5 mg of AA given subcutaneously cured all of the guinea-pigs, and 50 mg cured all monkeys. These doses were arbitrary.

Studies on the preventive and curative action of ascorbic acid on the neurological toxicity of monosodium glutamate

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INTRODUCTION
Olney and Ho and others have described the toxic effect of subcutaneous administration of large doses of monosodium glutamate (MSG) in young mice (1, 2). Degenerative changes in the retina of the infant mouse after subcutaneous treatment with MSG was reported earlier by Lucas and Newhouse (3). Potts et al. also showed that MSG caused irreversible retinal pathology (4, 5). The use of MSG in infant formula diets has raised concern lest it cause any health hazard. It was suggested that MSG could also be responsible for the Chinese-restaurant syndrome (6, 7). Studies have also exonerated MSG from this incrimination (8).

In the course of their studies on neurolathyrism caused by Lathyrus sativus (LS), various neurological manifestations were reported by V. Nagarajan and C. Gopalan in one-day- old chicks when the latter were given extracts of LS seeds intraperitoneally (9). Subsequently a neuroactive amine, b-N-oxalyl-L-a,b-diaminopropionic acid (ODAP), was isolated from the seeds of LS that mimicked the neurological symptoms caused by the extract (1012). We found that such symptoms did not appear in the chicks when they were given ascorbic acid (AA) some 10 to 15 minutes before the administration of the toxic extract of LS. It was further found that adult guinea-pigs and monkeys, which need a dietary source of AA, developed paralysis of the hind legs and sometimes respiratory difficulty if an extract of LS was administered to them after they had been fed an AA-deficient diet for some weeks to lower their serum AA level to 0.2-0.4 mg/dl. At this stage of deficiency there were no scorbutic symptoms (such as subcutaneous haemorrhage). The conditions paralleled to a great extent those seen in human neurolathyrism, but no such symptoms were seen in those animals that were not made deficient in AA prior to the administration of the toxic extract. These symptoms were found to be reversible if AA was given immediately after the appearance of symptoms. It was concluded that AA counteracted the neurotoxicity of ODAP from LS (13,14). We now provide additional data.

Glutamate has been recognized to be both neuroexcitory and neurotoxic. Biological actions of ODAP and glutamate (MSG) have been correlated (15). It occurred to us that the toxic effect of MSG reported in young animals could possibly be counteracted by AA. As described below, it has been our finding that AA does protect young animals from the neurological symptoms that arise from administration of a high dose of MSG. AA can both prevent and cure the toxic effects of MSG. Therefore, the incorporation of AA with MSG in food preparations might possibly preclude toxic reactions to MSG in human subjects.
TABLE 1. Toxicity of Monosodium Glutamate in One-Day-Old Chicks Weighing 32 to 35 Grams

<table>
<thead>
<tr>
<th>Amount of MSG: g/kg of body weight</th>
<th>Number of Animals</th>
<th>Observations and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>30</td>
<td>No apparent abnormality noted.</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>All animals showed drowsiness after 20-30 minutes.</td>
</tr>
<tr>
<td>2.5</td>
<td>30</td>
<td>All developed neck drooping; 18 developed paralysis of legs, neck rigidity, and convulsions after 45-90 minutes. 25 recovered and 5 were found dead the following morning.</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>27 developed neck rigidity, extensor paralysis of legs, and convulsions; hyperextension of knee and ankle joints; the remaining 3 showed tremor and failed to walk. 15 died in the following 12 hours; all but 2 died within 48 hours.</td>
</tr>
</tbody>
</table>

MSG was administered in a 0.51-ml aqueous solution intraperitoneally.

TABLE 2. Preventive and Curative Action of Ascorbic Acid (AA) in Glutamate (MSG) Toxicity

<table>
<thead>
<tr>
<th>Number of Animals</th>
<th>Amount of MSG g/ kg Body Wt.</th>
<th>Amount of AA, mg per Animal</th>
<th>Observations and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. One-day-old chicks, 32-35 g</td>
<td>50</td>
<td>2.5</td>
<td>0.75a</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td></td>
<td>These are minimum amounts of AA needed for prevention of neurological symptoms in all animals. AA was given 10 minutes before MSG.</td>
</tr>
<tr>
<td>B. AA-deficient guinea-pigs (300-350 g); serum AA 0.3-0.5 mg/dl</td>
<td>20</td>
<td>2.0</td>
<td>5b</td>
</tr>
<tr>
<td></td>
<td>8 animals developed drowsiness and neck droop; the rest developed weakness and paralysis of hind legs, tremor, convulsions, etc. 45-60 minutes after intraperitoneal injection of MSG. Animals were cured by administration of AA subcutaneously soon after appearance of symptoms.c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. AA-deficient monkeys (2.5-3 kg); serum AA 0.3-0.5 mg/dl</td>
<td>6</td>
<td>2.0</td>
<td>50b</td>
</tr>
<tr>
<td></td>
<td>All animals developed paralysis of hind legs 11/2-3 hours after intraperitoneal administration of MSG; 4 developed respiratory distress. All animals were cured by administration of AA intramuscularly immediately after appearance of symptoms.c</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
a. Minimum preventive dose per chick
b. Administered after the symptoms appeared (arbitrary curative dose)
c. The animals were later put on a diet supplemented with ascorbic acid-guinea-pigs 5 mg/day; monkeys 50 mg/day.

EXPERIMENTS AND RESULTS

Experiments with Chicks

These studies demonstrate the toxicity of MSG in one-day-old chicks weighing 32-35 g. Different amounts of MSG were put into 0.5 ml of water and administered intraperitoneally. The results are presented in table 1. While a dose of 2 g/kg body weight caused only mild symptoms, toxicity became severe when the dose was raised to 2.5 g/kg.

The preventive action of AA against the toxicity of MSG at a dose of 2.5 g/kg in these chicks is presented in table 2, part A, which shows that 0.75 mg of AA given intraperitoneally 10 minutes before the administration of MSG protected all the birds.

Experiments with Guinea-pigs and Monkeys

These studies were made to demonstrate the curative action of AA against MSG toxicity in adult guinea-pigs and monkeys, which are not able to biosynthesize AA. Guinea-pigs weighing 300-350 g and monkeys weighing 2.5-3 kg were selected. They were made deficient in AA by feeding an AA-deficient diet until serum AA levels fell to 0.3-0.4 mg/dl. At this point no scorbutic symptoms were seen. A dose of 2 g/kg of MSG was administered to each animal intraperitoneally in a 0.5-ml aqueous solution. Results are shown in table 2, parts B and C. All the animals became sick, but 5 mg of AA given subcutaneously cured all of the guinea-pigs, and 50 mg cured all monkeys. These doses were arbitrary.

REFERENCES


Neurolathyrism/ Neurolathyrism Vit C/ Vitamin C/ Vitamin C lathyrism/ Vitamin C neurolathyrism/ Lathyrism/ Monosodium-l-glutamate/ Glutamates toxicity/ Glutamates/ Glutamate toxicity/ Glutamate.


Source: Medline 85161143

Ascorbic acid Deficiency complications/ Guinea Pigs/ Lathyrism etiology/ Ascorbic acid therapeutic use/ Lathyrism prevention and control Neurology/ Ascorbic acid/ Vitamin C/ Deficiency/ Lathyrism/ Lathyrism complications/ Lathyrism prevention/ Lathyrism vitamin C Neurolathyrism/ Prevention lathyrism/ Lathyrism prevention/ Rodents/ Vitamins.


Lathyrism Bangladesh/ Bangladesh lathyrism/ Neurology/ Bangladesh/ Lathyrism.


Lathyrism clinical/ Lathyrism.


Source: Medline 86008659

Lathyrism etiology/ Diet Fads adverse effects/ Food Poisoning etiology/ Substance Abuse/ Diet/ Food poisoning/ Food/ Lathyrism.


Source: ref ex Tekle-Haimanot (1989)

Lathyrism related/ Neurology/ Lathyrism/ Tropics.


beta-N-Oxalylamino-L-alanine (BOAA) is a dicarboxylic diamino acid present in Lathyrus sativus (chickling pea). Excessive oral intake of this legume in remote areas of the world causes humans and animals to develop a type of spastic paraparesis known as lathyrism. BOAA is one of several neuroactive glutamate analogs reported to stimulate excitatory receptors and, in high concentrations, cause neuronal vacuolation and necrosis. The present study investigates the action of BOAA in vitro on CNS high-affinity transport systems for glutamate, gamma-aminobutyric acid (GABA), aspartate, glycine, and choline and in the activity of glutamate decarboxylase (GAD), the rate-limiting enzyme in the decarboxylation of glutamate to GABA. Crude synaptosomal fractions (P2) from rat brain and spinal cord were used for all studies. [3H]Aspartate transport in brain and spinal cord synaptosomes was reduced as a function of BOAA concentration, with reductions to 40 and 30% of control values, respectively, after 15-min preincubation with 1 mM BOAA. Under similar conditions, transport of [3H]glutamate was reduced to 74% (brain) and 60% (spinal cord) of control values. High-affinity transport of [3H]GABA, [3H]glutamate, and [3H]choline, and the enzyme activity of GAD, were unaffected by 1 mM BOAA. While these data are consistent with the excitotoxic (convulsant) activity of BOAA, their relationship to the pathogenesis of lathyrism is unknown.

Source: Medline 85133654; Reprinted with permission Copyright 1989 Raven Press


Lathyrism India/ Lathyrism socioeconomics/ Lathyrus sativus socioeconomics/ Socioeconomics L. sativus/ Economics/ Lathyrus sativus Cultivation/ Dhal/ India/ India L. sativus/ India lathyrism/ Khesari/ Lathyrism/ Lathyrism economics.


Source: ref ex Haque and Mannan (1989)


Source: reprintDE

Genetics/ Lathyrus sativus genetics/ Genetics L. sativus/ Lathyrus sativus low ODAP/ Lathyrus sativus/ Breeding/ France/ Genetics ODAP ODAP/ reprint.


Source: reprintDE

Tissue culture L. sativus/ Callus sativus/ Lathyrus sativus/ Callus/ France/ Tissue culture/ reprint.


Source: Copyright CAB Abstracts (87-89) V821460

Toxic substances/ Lathyrisin/ Antidotes/ Poultry diseases/ Cattle diseases/ Horse diseases/ Poisonous plants/ Ruminants/ Lathyrus sativus/ Cattle Horses/ Agriculture/ Horses lathyrisin/ India/ India L. sativus/ India lathyrisin/ Lathyrism animals/ Lathyrism horses/ Lathyrism India Lathyrism therapy/ Lathyrism toxicity/ Plant poisoning/ Poultry/ Ruminants L. sativus/ Toxicity L. sativus/ Toxicity L. sativus poultry/ Toxicity.


Source: reprintDE

Lathyrus tuberosus chromosomes/ Chromosomes L. tuberosus/ Cytology/ Cytogenetics/ Chromosomes/ France/ Lathyrus tuberosus/ reprint.


Source: reprintDE

Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ France/ reprint.


Lathyrus sativus Bangladesh/ Socioeconomics Bangladesh/ Bangladesh socioeconomics/ Survey socioeconomic/ Lathyrism Bangladesh Bangladesh lathyrisin/ Economics/ Lathyrus sativus/ Bangladesh/ Lathyrism/ Lathyrism economics/ Surveys.


Source: reprintDE

Lathyrus latifolius/ Nectar production L. latifolius/ Lathyrus latifolius nectar production/ Entomology/ Agriculture/ Floral/ France/ Honey Insects/ Nectar/ reprint.


Source: reprintDE


Seeds of grasspea contain an unusual amino acid, B-(N)-Oxalyl-amino-L-alanine (BOAA) which is responsible for an incurable paralysis of the lower limbs of men, called lathyrisin. This study included sixteen local and seven exotic cultivars of grasspea to ascertain the variability and the relationship existing among seed size and content of protein and BOAA in the seeds. Weight of 1000 seeds varied from 40-67 gm and the
exotic germplasm had comparatively bigger seeds than the local cultivars. The protein and BOAA percent ranged from 24.54 to 34.05 and 0.22 to 2.08, respectively. A significant positive correlation was obtained only between seed size and protein content (0.775) but negative association was obtained between seed size and BOAA. There was no association between the content of protein and BOAA. Therefore, it may be feasible to develop low neurotoxin varieties by selecting for bold seed size following hybridization of bold seeded and low neurotoxin types with those having small seeds and high neurotoxin.

Source: CODIS 88-100600
Lathyrus sativus ODAP/ Lathyrus sativus protein/ Genetic resources L. sativus Bangladesh/ Seed size L. sativus Bangladesh/ Bangladesh L. sativus genetic resources/ Genetic variation L. sativus Bangladesh/ Lathyrus sativus/ Agriculture/ Genetic resources/ Amino acids/ Bangladesh Cultivars/ Genetic variation/ Lathyrism/ Lathyrism Bangladesh/ Humans/ Neurotoxins/ ODAP/ Paralysis/ Protein/ Protein content/ Seed/ Seed size/ Varieties/ Genetic resources L. sativus.

Source: reprintDE
Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ France/ reprint.

Source: reprintDE
Lathyrus sativus ODAP/ Lathyrus sativus Bangladesh/ Bangladesh L. sativus ODAP genetic variation/ Agronomy/ Lathyrus sativus Agriculture/ Genetic resources/ Bangladesh/ France/ Genetic variation/ Lathyrism Bangladesh/ Lathyrus sativus agronomy/ ODAP/ Screening reprint.

Source: reprintDE
Lathyrus/ Archaeobotany/ History/ Lathyrus sativus/ Lathyrus cicera/ France/ Lathyrism history/ Lathyrism L. cicera/ reprint.

Source: reprintDE
Isoxazolin-5-one transport L. odoratus/ Lathyrus odoratus/ Isoxazolin-5-one/ France/ reprint.

Source: reprintDE
Plant Insect Co-evolution/ Entomology/ Agriculture/ Evolution/ France/ Insects/ reprint.

Source: reprintDE
Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ France/ India/ India L. sativus/ India Madhya Pradesh/ India lathyrism/ Lathyrism/ Lathyrism India/ Madhya Pradesh/ reprint.

Source: reprintDE
NPAA Lathyrus/ NPAA Biosynthesis/ Isoxazolin-5-one/ France/ Lathyrism/ NPAA biosynthesis/ reprint.


Source: reprintDE
Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ Chromosomes/ Evolution/ France/ Heterochromatin/ reprint.


Source: reprintDE
Lathyrus sativus toxicity/ ODAP mechanism of action/ Lathyrus sativus/ France/ Lathyrism/ Lathyrism mechanisms/ Lathyrus toxicity/ Mechanisms toxicity/ ODAP/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity L. sativus mechanisms/ Toxicity mechanism ODAP/ Toxicity reprint.


Source: reprintDE
Lathyrus/ History/ Archaeobotany/ France/ Lathyrus sativus/ Lathyrus cicera/ Age/ Lathyrism France/ Lathyrism history/ Lathyrism L. cicera reprint.


Source: reprintDE
Lathyrus toxicity/ Oxalyl-amino acids neurotoxicity/ NPAA/NPAA L. sativus/ Neurology/ Lathyrus sativus/ Amino acids/ France/ Lathyrism Neurotoxicity/ Neurotoxins/ Toxicity L. sativus/ Toxicity reprint.


Source: reprintDE
Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ Chromosomes/ Differentiation/ DNA/ Evolution/ France/ reprint.


Source: reprintDE
Lathyrus sativus related spp/ Taxonomy Lathyrus spp/ Taxonomy L. sativus et al/ Lathyrus gorgonii/ Lathyrus pseudocicera/ Lathyrus sativus Taxonomy/ France/ Lathyrus spp/ Taxonomy L. sativus/ Wild species/ Wild reprint.


Source: reprintDE
Lathyrus/ ODAP/ Lathyrus sativus/ Colour/ Flower colour/ Flower colour genetics/ Flowers/ France/ Genetics/ Genetics flower colour/ Genetics ODAP/ reprint.


Source: reprintDE
Lathyrus/ Lathyrus sativus/ Lathyrus sativus/ Chromosomes/ DNA/ France/ reprint.


Source: reprintDE

Source: reprintDE


Source: reprintDE


Source: reprintDE


Source: reprintDE


Source: reprintDE


Source: reprintDE


Source: reprintDE


Lathyrism, a form of motorneuron disease induced by excessive consumption of the legume Lathyrus sativus (chickling pea), presents as signs of pyramidal tract involvement. Primate feeding studies show that beta-N-oxalylamino-L-alanine (BOAA), a potent neuroexcitatory amino acid in the chickling pea, induces corticospinal dysfunction similar to that seen in animals consuming a fortified diet of this legume. BOAA, a potent agonist of the excitatory neurotransmitter glutamate, is likely to be causally associated with lathyrism in man.

Source: Medline 87038378

Beta Alanine toxicity/ Adolescence/ Adult/ Child/ Disease Models Animal/ Lathyrism chemically induced/ Macaca fascicularis/ Alanine analogs and derivatives/ Central Nervous system drug effects/ Lathyrism physiopathology/ ODAP/ Neurology/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ Amino acids/ Amino acids toxicity/ Central Nervous system/ Diet/ Drugs/ Feeding/ Glutamates/ Lathyrism/ Lathyrism Adolescence/ Lathyrism animals/ Lathyrus toxicity/ Macaca/ Primates/ Humans/ Models/ Motor neurons/ Nervous system/ Neuroexcitatory Neurons/ Pyramidal tract/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity.

Source: reprintDE


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The Vicieae Seed Collection of Southampton University, whose recent accessions have been mainly of seed collected from wild plants or seed multiplied from such sources, includes accessions of Vicia, Lathyrus, Lens and Pisum. The collection has been used to investigate the blood-group specific lectins produced by several Vicia species. Of the 8 accessions thought to be V. graminea (a source of anti-N lectins), 7 were tentatively identified as V. epetiolaris and only one as V. graminea. The collection has also been used to investigate lathyrism, a nervous disorder caused by excess 2-amino-3-oxalylaminopropionic acid from Lathyrus sativus seeds in the diet. Other Lathyrus species containing the neurotoxin are listed.

Source: Copyright CAB Abstracts (87-89) P716729


This L. sativus germplasm line is low in the neurotoxin beta-N-oxalyl-L-alpha-beta-diamino propionic acid (ODAP), a causal agent of the neurodegenerative disorder lathyrism. It was developed from a single plant of
Pusa 24, a low-ODAP line bred in India. ODAP concentration in seed of LS8246 ranged from 259 to 401 µg/g over 3 years, compared to 2615 µg/g for Pusa 24 in a single year.

Source: Copyright CAB Abstracts (87-89) P662114
Genetic resources releases/Canadal/Plant composition/Neurotoxins/ODAP/Lathyrus sativus/Agriculture/Genetic resources/India/India L. sativus/India lathyrism/India Lathyrus genetic resources/Lathyrism/Lathyrism India/Manitoba/Neurodegenerative/Neurology/Seed.

ODAP/ Glutamates toxicity ionic influence/ ODAP toxicity ionic dependence/Lathyrism/Neurology/Glutamates/Glutamates toxicity Lathyrism ODAP toxicity/Toxicity ODAP/Toxicity.

A comprehensive review on the presence of certain important anti-nutritional and toxic factors in food legumes has been conducted. These substances include proteolytic inhibitors, phytohemagglutinins, lathyrogens, cyanogenetic compounds, compounds causing favism, factors affecting digestibility and saponins. These factors are shown to be widely present in leguminous foods which are important constituents of the diet of a large section of the world's population, and particularly, of people in the developing countries.
Source: Medline 89184239

Jha, K. (1987). Effect of boiling and decanting method of Khesari (Lathyrus sativus) detoxification, on changes in selected nutrients. Archivos Latinoamericanos De Nutricion 37 (1):101-7 (author affiliation: College of Basic Sciences and Humanities, Rajendra Agricultural University, Pusa, Samastipur, India)
It is a well-known fact that the legume Khesari (Lathyrus sativus) causes lathyrism, a disease characterised by paralysis of the lower limbs in human beings. The toxic constituent is an amino acid identified as B-Oxalyl-Amino L-Alanine (BOAA). It has been reported that if the legume is boiled for two hours and the water is then decanted, almost 85% of the toxic amino acid is eliminated. Therefore, this investigation constitutes an effort to prevent the loss of other nutrients, simultaneously to the elimination of toxicity. As has been observed, as much as half the protein content, as well as 80.36% total sugars, 63.13% reducing sugars, 86.05% amino acids, and all thiamine, riboflavin and niacin are lost from dhal (dehulled, separated cotyledons), while the respective losses from the whole seeds are 47.25%, 45.73%, 74.69% and 80.00%, and all vitamins, in just a one-hour treatment. The losses of the toxic amino acid from dhal and whole seeds are 71.46% and 68.74%, respectively. The data for losses occurring in the two-hour and three-hour treatment are also described.
Source: reprintDE

Source: CGC_95_2

Lathyrism is a toxic disease of the motor system constantly associated with primary consumption of the seed of Lathyrus sativus (chickling or grass pea). Neurological examination was performed on 38 affected subjects drawn from four regions of the Indian subcontinent endemic for lathyrism. All showed a consistent and largely symmetric pattern of neurological deficit similar to that displayed by 5 Europeans with longstanding lathyrism now living in Israel. Hallmarks of lathyrism include a pyramidal pattern of motor weakness combined with greatly increased tone in the thigh extensors and adductors and in the gastrocnemius muscles so that the more severely affected walk on the balls of their feet with a lurching scissoring gait. Extensor plantar responses are uniformly present in such cases, and the knee and ankle tendon reflexes are exaggerated and often clonic. Hoffmann signs and exaggerated biceps and/or triceps tendon jerks are also found in the most severely affected. Sensory signs are absent, although perverssations in the legs are frequently

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reported at the onset. Walking difficulties commonly begin suddenly but may also appear subacutely or insidiously. Some individuals experience partly reversible symptoms suggestive of a diffuse CNS excitation of somatic, motor and autonomic function.

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Amino acids Diamino toxicity/ Lathyrism etiology/ Amino acids/ Lathyrism/ Toxicity.


Lathyrus sativus seeds were processed for removal or destruction of their natural toxins. Partly purified concentrates from those seeds were injected intraperitoneally into 1-day-old male White Leghorn chicks as a bioassay of the effectiveness of the processing methods. When the raw seed concentrate was given to the chicks, they showed typical neurological signs such as head retraction, neck bending and stiffening followed by immediate death. Similar symptoms were observed in chicks injected with the concentrates of the seeds soaked overnight in water or in saturated calcium carbonate followed by steaming, autoclaving and fermenting at 30°C for 30 h. All chicks died within 4 h of treatment. There were 31% and 39% survivals with the concentrates of seeds soaked overnight in water followed by washing and steaming, and seeds soaked overnight in water followed by washing, steaming and fermenting at 30°C for 30 h, respectively. Results from these chick bioassays showed that washing L. sativus seeds partly removes its neurotoxins. Fermentation, steaming or autoclaving seemed to have little effect on toxin removed.

Source: Copyright CAB Abstracts (87-89) N055865 reprintDE
Lathyrus sativus toxicity/ Bioassay chicks/ Poultry diseases/ Detoxification L. sativus/ Processing L. sativus/ Lathyrus sativus detoxification Antinutritional factors/ Lathyrus sativus/ Bioassays/ Agriculture/ Bioassay L. sativus/ Lathyrus sativus bioassay/ Lathyrism symptoms/ Calcium Chicken/ Detoxification/ Evaluation/ Fermentation/ Food/ Food processing/ Food processing L. sativus/ Fowls/ Injections/ Lathyrism Lathyrus Bioassay/ Lathyrism nutrition/ Lathyrus toxicity/ Male/ Neurotoxins/ Nutrition animal/ Nutrition/ Poultry/ Processing/ Processing methods L. sativus/ Purification/ Reports/ Seed/ Symptoms lathyrism/ Toxicity L. sativus/ Toxicity L. sativus poultry/ Toxicity/ Toxin/ USA Water detoxification/ Water/ Reprint.

The L-isomer of beta-N-methylamino-L-alanine (BMAA), present in free form in seed of Cycas circinalis, elicits in spinal cord cultures a pattern of acute postsynaptic neuronal vacuolation comparable to that induced by beta-N-oxalylamino-L-alanine (BOAA), an excitotoxic amino acid of greater potency isolated from seed of Lathyrus sativus. The neuronotoxic properties of these compounds may be linked to the etiology of motor-system degenerative disorders (amyotrophic lateral sclerosis and lathyrism, respectively) found in human groups that have used these plant seeds for food.

Source: Medline 87243558; Reprinted with permission Copyright 1987 Elsevier Science B.V., Amsterdam, Netherlands

Information available on known tropical myelopathies is reviewed and their main forms and features are described. The two main forms of tropical myelopathy are tropical atactic neuropathy, a myeloneuropathy with prominent sensory ataxia, and tropical spastic paraparesis, a myelopathy with predominantly spastic paraplegia and minimal sensory deficit. These conditions arise from many causes associated with malnutrition, postinfectious tropical malabsorption, chronic cyanide intoxication from excessive cassava consumption, and lathyrism.

acids linked to motor system diseases.

antagonist (ED50 = 0.45 microgram). Taken collectively, our data indicate that the acute neuronotoxic actions (ED100 = 1,000 micrograms, i.c.v.). These responses are antagonised selectively and dose-dependently by

tremor). BMAA induces a transitory hyperexcitable state followed by a long-lasting whole-body shake/wobble glutamate receptors (ED50s; 2.8 micrograms, rigidity; 1.4 micrograms, convulsions; 2.4 micrograms, resting dicarboxylic acid (PDA), an antagonist of quisqualate (QA)-preferring (A2) and kainate (KA)-preferring (A3) amino acids present in the seeds of Cycas circinalis and Lathyrus sativus, respectively. Consumption of these seeds has been linked to Guam amyotrophic lateral sclerosis (BMAA) and lathyrism (BOAA) (a form of primary lateral sclerosis). We report that the acute neurotoxic actions of these amino acids are blocked selectively by specific glutamate receptor antagonists. Administration of BOAA and BMAA to neonatal mouse cortex explants (EC100 = 28 microM and 1.6 mM, respectively) rapidly induces postsynaptic vacuolation (PSV) and neuronal degeneration characterized by dark/shrunken (D/S) cells. BOAA-mediated neurotoxic effects are attenuated in a concentration-dependent manner by cis-2,3-piperidine dicarboxylic acid (PDA), an antagonist of quisqualate (QA)-preferring and kainate (KA)-preferring glutamate receptors. PDA maximally protected against BOAA-induced PSV by 84% at 1 mM and D/S cells by 80% at 0.5 mM. BMAA-induced cellular changes were antagonised selectively in a concentration-dependent manner by 2-amino-7-phosphono-heptanoic acid (AP7), an N-methyl-D-aspartate (NMDA) glutamate-receptor antagonist. AP7 maximally protected against BMAA-induced PSV and D/S by 88% at 1.0 and 0.5 mM, respectively. These protective actions were selective and specific since AP7 failed to attenuate BOAA-induced alterations, and PDA was ineffective in ameliorating BMAA-induced changes. Other glutamate receptor antagonists (glutamic diethyl ester and streptomycin) failed to protect the explants from the destructive action of either toxin. Taken collectively, our data indicate that the acute neurotoxic actions of BOAA and BMAA (or a metabolite) operate through different glutamate receptor species.

Ross, S. M.; Seelig, M., and Spencer, P. S. (1987). Specific antagonism of excitotoxic action of 'uncommon' amino acids assayed in organotypic mouse cortical cultures. Brain Research 425 (1):120-127 (author affiliation: Department of Neuroscience, Albert Einstein College of Medicine, Bronx, N.Y. 10461) Beta-N-Methylamino-L-alanine (BMAA) and beta-N-oxalylamino-L-alanine (BOAA) are chemically related excitant amino acids present in the seeds of Cycas circinalis and Lathyrus sativus, respectively. Consumption of these seeds has been linked to Guam amyotrophic lateral sclerosis (BMAA) and lathyrism (BOAA) (a form of primary lateral sclerosis). We report that the acute neurotoxic actions of these amino acids are blocked selectively by specific glutamate receptor antagonists. Administration of BOAA and BMAA to neonatal mouse cortex explants (EC100 = 28 microM and 1.6 mM, respectively) rapidly induces postsynaptic vacuolation (PSV) and neuronal degeneration characterized by dark/shrunken (D/S) cells. BOAA-mediated neurotoxic effects are attenuated in a concentration-dependent manner by cis-2,3-piperidine dicarboxylic acid (PDA), an antagonist of quisqualate (QA)-preferring and kainate (KA)-preferring glutamate receptors. PDA maximally protected against BOAA-induced PSV by 84% at 1 mM and D/S cells by 80% at 0.5 mM. BMAA-induced cellular changes were antagonised selectively in a concentration-dependent manner by 2-amino-7-phosphono-heptanoic acid (AP7), an N-methyl-D-aspartate (NMDA) glutamate-receptor antagonist. AP7 maximally protected against BMAA-induced PSV and D/S by 88% at 1.0 and 0.5 mM, respectively. These protective actions were selective and specific since AP7 failed to attenuate BOAA-induced alterations, and PDA was ineffective in ameliorating BMAA-induced changes. Other glutamate receptor antagonists (glutamic diethyl ester and streptomycin) failed to protect the explants from the destructive action of either toxin. Taken collectively, our data indicate that the acute neurotoxic actions of BOAA and BMAA (or a metabolite) operate through different glutamate receptor species. (ABSTRACT TRUNCATED AT 250 WORDS).

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Beta-N-methylamino-L-alanine (BMAA) and beta-N-oxalylamino-L-alanine (BOAA) are chemically related amino acids present in the seeds of Cycas circinalis and Lathyrus sativus, respectively. Consumption of these seeds has been linked to Guam amyotrophic lateral sclerosis (BMAA) and lathyrism (BOAA; a form of primary lateral sclerosis). A single large dose of BOAA or BMAA causes seizures in newborn mice and postsynaptic neuronal oedema and degeneration in CNS explants. We report that the acute neurotoxic actions of these amino acids are blocked selectively by specific glutamate-receptor antagonists (administered intracerebroventricularly) (i.c.v.) prior to the amino acid. Administration of BOAA i.c.v. to neonatal mice (ED100 = 50 micrograms) elicits a spectrum of time-dependent behavioural states including arm and leg rigidity, convulsions, and resting tremor. These are blocked in a dose-dependent manner by cis-2,3-piperidine dicarboxylic acid (PDA), an antagonist of quisqualate (QA)-preferring (A2) and kainate (KA)-preferring (A3) glutamate receptors (ED50s; 2.8 micrograms, rigidity; 1.4 micrograms, convulsions; 2.4 micrograms, resting tremor). BMAA induces a transitory hyperexcitable state followed by a long-lasting whole-body shake/wobble (ED100 = 1,000 micrograms, i.c.v.). These responses are antagonised selectively and dose-dependently by 2-amino-7-phosphonoheptanoic acid (AP7), an N-methyl-D-aspartate (NMDA) or A1 glutamate-receptor antagonist (ED50 = 0.45 microgram). Taken collectively, our data indicate that the acute neurotoxic actions
of BOAA and BMAA (or a metabolite) operate through different glutamate-receptor species. BMAA likely exerts most of its action indirectly via the A1 glutamate receptor, while BOAA acts principally at the A2 and or A3 receptor.

Source: Medline 89100770

Beta Alanine pharmacology/ Amino acids administration and dosage/ Amino acids Diamino pharmacology/ Cerebral Ventricles drug effects Dose Response Relationship Drug/ Injections Intraventricular/ Mice/ Pipecolic Acids pharmacology/ Reference Values/ Amino acids pharmacology/ Cerebral Ventricles physiology/ Motor Activity drug effects/ Rodents/ ODAP/ Neurology/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ Beta N-methylamino-L-alanine/ Amino acids/ Amyotrophic lateral sclerosis/ Antagonism amino acids/ Aspartic acid Central Nervous system/ Convolusions/ Cycas/ Drugs/ Glutamates/ Glutamates receptors/ Guam/ Injections/ Kainic acid/ Lathyrism/ Nervous system/ Neurotoxins/ NMDA/ Oedema/ Physiology not plant/ Pipecolic acid/ Receptors/ Reports/ Seed.

Spencer, P. S. (1987). Guam ALS/parkinsonism dementia: a long latency neurotoxic disorder caused by 'slow toxin(s)' in food? Canadian Journal of Neurological Sciences 14 (3 Suppl):347-357 (author affiliation: Department of Neuroscience, Albert Einstein College of Medicine, Bronx, N.Y. 10461)

Parkinsonism (P) with progressive dementia (D) of the Alzheimer type is recognized as a clinical variant of a form of amyotrophic lateral sclerosis (ALS) that has occurred in high incidence among the Chamorro people of the islands of Guam and Rota in the Marianas chain of Micronesia. The declining annual incidence, upward shifting of the age of onset, narrowing of the sex ratio, and occurrence of the disease among non-Chamorros, point to a disappearing environmental causation peculiar to the traditional culture of these islands. Evidence is presented in support of the proposal that heavy use of certain toxic plants, notably cycads, a traditional source of food and medicine for the Chamorro people, plays an important aetiological role. Clinical and epidemiological approaches are offered to test for a relationship between ALS/P-D and long-latency plant toxicity.

Source: Medline 88052270

Alzheimer's Disease etiology/ Alzheimer's Disease physiopathology/ Amyotrophic Lateral Sclerosis etiology/ Amyotrophic Lateral Sclerosis physiopathology/ Guam/ Lathyrism physiopathology/ Neurotoxins adverse effects/ Parkinson Disease Symptomatic chemically induced Parkinson Disease Symptomatic physiopathology/ Alzheimer's Disease epidemiology/ Amyotrophic Lateral Sclerosis epidemiology/ Diet Parkinson Disease Symptomatic epidemiology/ Plants Toxic/ Toxicity/ Neurology/ Age/ Amyotrophic lateral sclerosis/ Environment Epidemiology lathyrism/ Food/ Incidence/ Lathyrism/ Lathyrism epidemiology/ Lathyrism etiology/ Neurotoxins/ Sex/ Toxic plants/ Toxin.


beta-N-Oxalylamino-L-alanine (BOAA) and beta-N-methylamino-L-alanine (BMAA) are chemically related excitant amino acids isolated from the seed of Lathyrus sativus (BOAA) and Cycas circinalis (BMAA), consumption of which has been linked to lathyrism (an upper motor neuron disorder) and Guam amyotrophic lateral sclerosis (ALS), respectively. Both diseases are associated with degeneration of motor neurons. Experimentally, single doses of BOAA or BMAA induce seizures in neonatal mice and postsynaptic neuronal oedema and degeneration in explants of mouse spinal cord and frontal cortex. Preliminary studies show that these behavioural and pathological effects are differentially blocked by glutamate-receptor antagonists. In macaques, several weeks of daily oral doses of BOAA produce clinical and electrophysiological signs of corticospinal dysfunction identical to those seen in comparably well-nourished animals receiving a fortified diet based on seed of Lathyrus sativus. By contrast, comparable oral dosing with BMAA precipitates tremor and weakness, bradykinesia and behavioural changes, with conduction deficits in the principal motor pathway. BOAA and BMAA (or a metabolite thereof) are the first members of the excitotoxin family to have been shown to possess chronic motor-system toxic potential. These observations provide a rational basis for searching for comparable endogenous neurotoxins in sporadic and inherited forms of human motor neuron disease.

Source: Medline 87217798


beta Alanine pharmacology/ Beta Alanine toxicity/ Cell Survival drug effects/ Cells Cultured/ Central Nervous system drug effects/ Central Nervous system pathology/ Mice/ Neurons drug effects/ Alanine analogs and derivatives/ Central Nervous system cytology/ Lathyrism chemically induced/ Neuronomuscular Diseases chemically induced/ Neurons cytology/ Neurotoxins pharmacology/ Plants Toxic/ Rodents Antinutritional factors/ Beta Alanine analogs and derivatives/ Amino acids/ Amino acids toxicity/ Cytology/ Drugs/ Lathyrism/ Lathyrism pathology/ Nervous system/ Neurology/ Neuronomuscular/ Neurons/ Neurotoxins/ Survival/ Toxicity/ Toxin.
Source: Medline 88232059
Lathyrism/Alkaloids adverse effects/ Lathyrism etiology/ Neuromuscular Diseases/ Neuromuscular diseases Lathyris/ Toxicity/ Alkaloids Lathyris/ Lathyrus toxicity/ Lupinus/ Motor neurons/ Neuromuscular/ Neurology/ Neurons/ Seed.

Source: Medline 89138569
Afghanistan lathyrism/ Lathyrism Afghanistan/ Lathyrism Adolescence/ Adolescent lathyrism/ Afghanistan/ India/ India lathyrism/ Lathyrism Lathyrism India.

ODAP analysis/ Lathyrus sativus/ ODAP/ UK.

(author affiliation: Division of Biochemistry and Physiology, Wye College, Univ. London, Wye, Ashford, Kent TN25 5AH, UK)
The effects on poultry of the toxic constituents of legume seeds of the genus Lathyrus which give rise to lathyrism in humans and experimental animals are reviewed and discussed. The limited amount of information available indicates that the toxic effects depend mainly on the species and age of birds, the amount of toxins absorbed, the route of administration and the duration of exposure. Seeds of Lathyrus species (a low cost protein source) could be utilised to a greater extent in poultry diets provided safe inclusion levels were established and ways of improving feed value estimated and applied. With regard to safety margins, the results of a recent study using laying fowls suggest that the seeds of certain species contain sufficiently low concentrations of toxins for them to be used without any deleterious effects on egg production or egg shell quality.
Source: reprintDE
Lathyrus/ Toxicity/ Poultry/ Lathyrism/ Leguminosae/ Seed/ Poisonous plants/ Biochemistry/ Nutritional value/ Antinutritional factors Agriculture/ Age/ Diet/ Egg production/ Eggs/ Feed/ Feed value/ Fowls/ Lathyrism animals/ Lathyrism Biochemistry/ Lathyrism review Lathyrus toxicity/ Layers/ Humans/ Physiology not plant/ Protein/ Quality/ Review/ Toxin/ UK/ reprint.

Source: reprintDE
Osteolathyrogens poultry/ Egg weight beta aminopropionitrile toxicity/ Toxicity Osteolathyrism/ Osteolathyrism/ Agriculture Aminopropionitriles/ Eggs/ Lathyrism veterinary/ Layers/ Poultry/ BAPN/ Toxicity beta aminopropionitrile/ Toxicity/ reprint.

Since the beginning of this century, the concept of tropical neuromyelopathy (T. N. M.) was progressively elaborated in tropical areas. This disorder is constituted by three main clinical syndromes (e.g.: polynuropathy, spastic paraplegia, ataxia). Abnormal clinical, electrophysiological and pathological features, observed in all clinical forms argue in favor of a diffuse pathobiological process of the nervous system. The association with positive HTLV-1 serology, has recently induced a great interest for the spastic forms of T. N. M. Tropical spastic paraplegia tend to be individualised. This attitude differs from the global concept of T. N. M. which allows gathering similar clinical syndromes. This T. N. M. group should be kept intact until the discovery of new aetiology. Toxic (manioc, lathyrism) or deficiency (hypovitaminosis, malabsorption) causes are incriminated. Otherwise aetiology are unknown.
Source: Medline 88327978; Reprinted with permission Copyright 1988 Masson S.A. Paris, France
Ataxia etiology/ Muscle Spasticity/ HTLV Infections complications/ Nervous system diseases etiology/ Paraplegia etiology/ Ataxia/ Australia Deficiency/ France/ HTLV/ Infection/ Lathyris/ Lathyrism complications/ Lathyrism etiology/ Lathyrism viral infection/ Malabsorption Muscles/ Nervous system/ Neurology/ Paraplegia/ Spasticity/ Spastic paraplegia/ Syndrome/ Tropics/ Nervous system diseases.

A primate model of lathyrism has been produced in well-nourished male cynomolgus monkeys chronically fed a fortified diet composed of Lathyrus sativus (chickling or grass pea) and given daily per os an alcoholic extract of this legume. Animals given a diet of non-neurotoxic Cicer arietinum (chick pea) cross-matched with the nutritional properties of the experimental diet served as controls. Another group of animals received the same diet and oral doses of beta, beta'-iminodipropionitrile (IDPN), a reference compound that has been termed an ‘experimental neurolathyrathy.’ Monkeys fed Lathyrus developed clinical and electrophysiologic evidence of corticospinal deficits after 3 to 10 months of feeding. Animals administered IDPN showed clinical and/or electrophysiologic changes in the PNS and CNS motor and sensory pathways, and signs of cerebellar dysfunction. Since the two primate disorders are separable on clinical and electrophysiologic grounds, further use of the term ‘experimental neurolathyrathy’ to describe the neurotoxic properties of IDPN seems inappropriate. These findings demonstrate the feasibility of developing a model of early human lathyrism in adequately nourished nonhuman primates.

Source: 88157140
Electrophysiology/ Lathyrism physiopathology/ Macaca fascicularis/ Motor Activity drug effects/ Motor Activity physiology/ Muscles physiopathology/ Neuromuscular Diseases physiopathology/ Diet/ Legumes/ Motor Neurons/ Neuromuscular Diseases etiology/ Nitriles poisoning/ Pyramidal Tracts physiopathology/ Lathyrism primate model/ Neurology/ Lathyrus sativus/ Central Nervous system/ Chickens/ Cicer arietinum/ Drugs/ Feeding/ Lathyrism/ Lathyrism animals/ Lathyrism etiology/ Lathyrism motor neurons/ Macaca/ Primates/ Males/ Humans Models/ Motor neurons/ Muscles/ Nervous system/ Neuromuscular/ Neurons/ Neurotoxins/ Nitriles/ Physiology not plant/ Primate model lathyrism/ Pyramidal tract.

Lathyrus sativus chemistry/ Lathyrus sativus biochemistry/ Biochemistry L. sativus/ Chemistry L. sativus/ Phytochemistry L. sativus/ Lathyrus sativus/ Chemistry/ Lathyrism/ Lathyrism Biochemistry/ Phytochemistry.

Legumes, which contribute about 20% of the daily protein needs of an adult, contain a number antinutritional substances. The thesis deals with the effect of the antinutritional factors lectins (haemagglutinins), trypsin inhibitors and tannins on the digestibility and utilisation of proteins in legumes, especially brown beans (Phaseolus vulgaris L.) and the effect of processing e.g. soaking, heat treatment and sprouting The complementary effect of proteins from the lathyrism causing legume khesari dhal (Lathyrus sativus) in cereal-based weaning diets resulted in high true digestibility (TD). The antinutritional substances lectins and trypsin inhibitors, were inactivated when the temperature reached above 80°C during boiling as well as during slow cooking of brown beans. Soaking had no effect on the biological value (BV), TD or net protein utilisation (NPV) of yellow peas (Pisum sativum sens. ampl. (L.) Govorov), soybeans (Glycine max (L.) Merr) or brown beans when evaluated on rats. Heat treatment improved BV, TD and NPU in soybeans and brown beans but not in yellow peas. Sulphur amino acid supplementation improved the BV and NPU in raw yellow peas and soybeans The digestibility of brown bean and casein based diets decreased when lectins and hull, which contain tannins, were added Brown beans sprouted for 10 d, showed gradually decreasing haemagglutinating and trypsin inhibitor activities, to approximately 10% of the original activity. This implies that high activities remain after 4 d, which is a common sprouting time. However, sprouting of chick peas (Cicer arietinum L.) and mung beans (Vigna radiata (L.)), both containing low levels of antinutrients, did not improve BV, TD and NPU.
Antinutritional factors heat treatment/ Antinutritional factors sprouting/ Lathyrus sativus nutritive value/ Nutritive value L. sativus/ Lectin Nutritional value/ Antinutritional factors/ Trypsin inhibitor/ Protease inhibitor/ Polyphenols/ Tannins/ Lathyrus sativus/ Amino acids/ Chickens Cicer arietinum/ Cookery/ Dhal/ Diet/ Digestibility/ Glycine max/ Heat/ Heat treatment/ Khesari/ Lathyrism/ Lathyrism rats/ Vigna radiata Phaseolus vulgaris/ Pseud sativum/ Processing/ Protein/ Protein quality/ Quality/ Rats/ Rodents/ Soaking/ Sulfur/ Sulfur amino acids/ Sweden Temperature/ Uppsala/ Utilisation/ Vigna.

A house-to-house survey was carried out to determine the prevalence of poliomyelitis. During the survey 37,219 households were visited and 17,941 children 5-9 years old were found. Of 231 lame children, lameness compatible with paralytic poliomyelitis was found in 131, of these 91% had their condition before the age of 3 years. Nineteen percent needed a stick support for walking while 12% were unable to walk even with support. This problem was more common in rural populations. The prevalence of paralytic poliomyelitis was 7.3/1,000 children 5-9 years old.


Improvement of Lathyrus sativus and the eradication of Lathyrism. New York: Third World Medical Foundation, pp. 1-16.
Source: reprintDE
INILSEL/ Lathyrism epidemiology/ Lathyrism India/ India lathyrism/ Lathyrus sativus/ Epidemiology lathyrism/ India/ India L. sativus Lathyrism/ reprint.

Source: reprintDE
INILSEL/ Post harvest processing L. sativus/ Lathyrus sativus fermentation/ Lathyrus sativus/ Fermentation/ Lathyrism/ Postharvest/ Processing Vitamins/ reprint.

Source: reprintDE
INILSEL/ Lathyrism Bangladesh/ Bangladesh lathyrism/ Lathyrus sativus/ Bangladesh/ Lathyrism/ reprint.

Source: Medline 89281699
India/ Lathyrism ethnology/ Nervous system diseases ethnology/ Neurology/ India lathyrism/ Lathyrism/ India L. sativus/ Lathyrism/ reprint.

Source: reprintDE
INILSEL/ Genetic resources Lathyrus/ Lathyrus sativus germplasm/ Lathyrus sativus/ Agriculture/ Genetic resources/ Storage/ Strategy/ reprint.

Source: reprintDE
INILSEL/ Lathyrism Bangladesh/ Bangladesh lathyrism/ Lathyrism socioeconomics/ Socioeconomics Bangladesh/ Bangladesh socioeconomics Economics/ Lathyrus sativus/ Bangladesh/ Lathyrism/ Lathyrism economics/ Surveys/ reprint.

Source: Medline 89387799
Middle Age/ Anesthesia General/ Lathyrism physiopathology/ Neuromuscular Blocking Agents/ Age/ Lathyrism/ Neuromuscular.

Source: reprintDE
INILSEL/ ODAP analysis/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ HPLC/ HTLV/ Lathyrism animals/ Lathyrism viral infection/ ODAP/ Tissue/ reprint.

Source: reprintDE
INILSEL/ Lathyrus sativus production/ Lathyrus sativus cultivation/ Lathyrus sativus socioeconomics/ Socioeconomics L. sativus/ Economics Lathyrus sativus/ Cultivation/ India/ India L. sativus/ India L. sativus consumption/ India L. sativus production/ India lathyrism/ Lathyrism Lathyrism economics/ Lathyrism India/ reprint.

Source: reprintDE

INILSEL/ Lathyrus sativus toxicity/ Lathyrus sativus Isoxazolin-5-one/ Biochemistry L. sativus/ Chemistry L. sativus/ NPAA L. sativus Lathyrus sativus/ Isoxazolin-5-one/ Chemistry/ Lathyrism/ Lathyrus Biochemistry/ Lathyrus toxicity/ NPAA/ NPAA chemistry/ Toxicity L. sativus/ Toxicity/ reprint.


Source: reprintDE

INILSEL/ Lathyrus sativus toxicity/ Toxicity L. sativus/ Toxicity L. sativus mechanisms/ Mechanisms toxicity/ Review L. sativus toxicity Antinutritional factors/ Lathyrus sativus/ Lathyrism/ Lathyrism mechanisms/ Lathyrism review/ Lathyrus toxicity/ Review/ Toxicity/ Toxin reprint.


Source: reprintDE

INILSEL/ Manifesto/ Lathyrus sativus research funding/ Lathyrus sativus/ reprint.


Source: reprintDE

INILSEL/ Lathyrus sativus detoxification/ Detoxification L. sativus/ Post harvest processing L. sativus/ India L. sativus/ Lathyrus sativus India Lathyrus sativus/ Detoxification/ India/ India lathyrism/ Lathyrism/ Lathyrism India/ Postharvest/ Processing/ reprint.


Source: reprintDE

INILSEL/ Bangladesh L. sativus research/ Lathyrus sativus Bangladesh/ Lathyrus sativus/ Bangladesh/ Lathyrism Bangladesh/ reprint.


Source: reprintDE

INILSEL/ India L. sativus/ Lathyrus sativus India/ Lathyrus sativus Madhya Pradesh/ Madhya Pradesh L. sativus/ Lathyrus sativus/ India India Madhya Pradesh/ India lathyrism/ Lathyrism/ Lathyrism India/ Madhya Pradesh/ reprint.


Source: reprintDE

INILSEL/ Lathyrus sativus research funding/ Lathyrus sativus/ reprint.


Source: reprintDE
INILSEL/ ODAP toxicity/ ODAP toxicity mechanism/ Toxicity L. sativus mechanisms/ Neurology/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ Lathyrism/ Lathyrism mechanisms/ Lathyrism ODAP toxicity/ Lathyrus toxicity/ Mechanisms toxicity/ Neurotoxicity/ ODAP Toxicity ODAP/ Toxicity L. sativus/ Toxicity/ reprint.


Source: reprintDE

INILSEL/ Lathyrus sativus toxicity/ ODAP toxicity/ Amino acid composition L. sativus/ Lathyrus sativus/ Amino acids/ Amino acid composition/ Lathyrism/ Lathyrism ODAP toxicity/ Lathyrus toxicity/ Neurotoxins/ ODAP/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity reprint.


Source: reprintDE

INILSEL/ Lathyrus sativus/ reprint.


Source: reprintDE

INILSEL/ Lathyrism Ethiopia/ Ethiopia lathyrism/ Lathyrus sativus/ Ethiopia/ Lathyrism/ reprint.


Recent studies have implicated the ingestion of the structurally related plant excitotoxins, beta-N-methylamino-L-alanine (BMAA), and beta-N-oxalylamino-L-alanine (BOAA), in the pathogenesis of two human motor system diseases, the amyotrophic lateral sclerosis-Parkinsonism-dementia complex of Guam (Guam ALS-PD), and lathyrism, respectively. We have investigated the toxicity of these amino acids on cultured mouse cortical neurons in the presence of physiological concentrations of bicarbonate (a required toxic cofactor for BMAA neurotoxicity). A 24 h exposure to 10 microM - 3 mM BMAA, or to 300 nM - 100 microM BOAA, induced, concentration-dependent neuronal degeneration without glial damage; the neurotoxic EC50 for BMAA was about 1 mM, and the EC50 for BOAA was about 20 microM. At high concentrations, both compounds destroyed essentially the entire neuronal population. Neurotoxicity also depended on exposure duration, with reduced injury at an exposure time of 1 h, and increased injury at an exposure time of 3 days. Despite the fact that ingestion of BMAA and BOAA both lead to motor system damage, previous studies have suggested that the two excitotoxins act primarily on different glutamate receptor subtypes: BMAA on N-methyl-D-aspartate (NMDA) receptors, and BOAA on non-NMDA receptors. Consistent with these studies, the neurotoxicity of high concentrations of BMAA was substantially attenuated by 1 mM D-amino-5-phosphonovalerate (D-APV), whereas BOAA neurotoxicity was less sensitive to D-APV but was attenuated by 2 mM kynurenicate. (ABSTRACT TRUNCATED AT 250 WORDS).

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Source: Copyright Biological Abstracts (91)

Lathyrism/ Nepal L sativus/ Lathyrus sativus/ Cultivation/ Nepal.


Source: ref ex Roy (pers. comm.)
Lathyrism is a disorder of the central motor system, induced by heavy consumption of the grass-pea, Lathyrus sativus (khesari) grown in different regions of Bangladesh (from Chittagong to Dinajpur and from Sylhet to Khulna) were measured by a standardized calorimetric method. The major varieties grown in Barisal, Charbadna, Jamalpur and Pahartali contained 486, 837, 540 and 527 mg BOAA per 100 g dried seed. Other values ranged from 552 mg/100 g at Bola and 570 mg/100 g at Khulna to 905 mg/100 g at Dinajpur and 973 mg/100 g at Rangpur. However, in Faridpur, the neighbouring district of Barisal or Khulna, the seed had a rather high value of 848 mg/100 g; on the other hand, in the Northern district of Bogra, which is near to Rangpur, the BOAA content was only 628 mg/100 g. In Rajshahi and Kushtia (regions known as the lathyrism pocket), the BOAA contents were 686 and 636 mg/100 g, respectively, values intermediate between those observed in seeds grown in Bola and Khulna, or Rangpur and Dinajpur. The data thus indicate that there is no clear-cut correlation between BOAA content of seeds grown in different regions of Bangladesh, nor does there exist any positive correlation between toxin content of Lathyrus seeds and the prevalence of lathyrism.

Source: CODIS 91-056470

ODAP L. sativus/ Lathyrus sativus ODAP/ Lathyrus sativus ODAP/ Lathyrus sativus Bangladesh/ Bangladesh L. sativus/ Lathyrism epidemiology/ Epidemiology lathyrism/ Biochemistry/ Lathyrus sativus/ Agriculture/ Genetic resources/ Beta Alanine analogs and derivatives Bangladesh/ Khesari/ Lathyrism/ Lathyrism Bangladesh/ Lathyrism Biochemistry/ ODAP/ Prevalence/ Seed/ Toxin/ Varieties/ Varieties L. sativus/ Lathyrus sativus varieties/ Genetic resources L. sativus.


Lathyrism Ethiopia/ Ethiopia lathyrism/ Lathyrism epidemiology/ Epidemiology lathyrism/ Ethiopia/ Lathyrism/ Rural.


Lathyrism is a disorder of the central motor system, induced by heavy consumption of the grass-pea, Lathyrus sativus, an environmentally tolerant legume containing a neurotoxic excitatory amino acid. A complete door-to-door resurvey of the Dembia and Fogera regions of northwestern Ethiopia, areas endemic for lathyrism, revealed an estimated mean disease prevalence of 0.6%-2.9%. Most patients developed the disease in the epidemic of 1976/77, although new cases appear to have occurred with an estimated mean annual incidence of 1.7:10 000. Production and consumption of grass-pea is increasing in Ethiopia, making attempts to develop special strains to prevent lathyrism increasingly important.

Source: Copyright CAB Abstracts (90-91) R848142

East Africa/ Grain legumes/ Food consumption/ Ethiopia lathyrism/ Nervous system diseases/ Neurology/ Lathyrus sativus/ Africa/ Amino acids Endemic/ Epidemiology lathyrism/ Excitatory amino acid/ Food/ Pulses/ Lathyrism Ethiopia/ Incidence/ Lathyrism/ Lathyrism epidemiology Humans/ Nervous system/ Neurotoxins/ Prevalence/ Rural/ Strains/ Tolerance.


Brain excitatory neuroreceptors/ Lathyrism/ ODAP receptors/ Neurology/ Amino acids/ Brain/ Excitatory amino acid/ Membranes/ ODAP Receptors.
beta-N-Oxalyl-L-alpha,beta-diaminopropionic acid (beta-L-ODAP) is an excitatory amino acid agonist found in the seeds of Lathyrus sativus that is believed to be the major causative agent in the pathology of human lathyrism. We have found that in addition to its previously recognized neurotoxic properties, beta-L-ODAP is also gliotoxic. When added to cultures of neonatal rat astrocytes, beta-L-ODAP induced a series of morphological changes (e.g., extensive vacuole formation, pale and swollen nuclei with obvious nucleoli, and cellular swelling) that led to the eventual lysis of the glial cells. If the beta-L-ODAP was removed prior to the lysis of the astrocytes, many of the early morphological changes appeared to be reversible. When quantitated by a loss of the lactate dehydrogenase activity, beta-L-ODAP lysed the astrocytes with an LD50 of 2.1 +/- 0.2 mM following 48 h of exposure. Lower concentrations of beta-L-ODAP were found to be more toxic if the duration of the exposure was increased. The results suggest that the overall impact of the toxin on the CNS may represent the cumulative action of beta-L-ODAP at a number of distinct points on both neurons and astrocytes. The potential that these multiple sites of action may affect the normal regulation of extracellular glutamate and, consequently, disturb the balance between its normal and pathological roles is discussed.


Naturally occurring antinutritional and toxic factors from important plant food sources are discussed. No attempt has been made to cover all known natural toxic substances from plants, and this review covers certain evolutionary, structural, biochemical, technological, nutritional and toxicological aspects of the most important antinutritional factors occurring in the human food chain. The main headings are: carbohydrates, proteins and amino acids, lipids and fatty acids, minerals, vitamins, antivitamins, proteinase inhibitors, amylase inhibitors, lipase inhibitors, lectins (phytohaemagglutinins), phytate, tannins (polyphenols), cyanogenic glycosides, glucosinolates, favism, lathyrism, toxic amino acids, saponins, steroidal alkaloids of potato, allergens, gossypol, safrole, oestrogens, oxalates, removal of antinutrients.


The search should continue for low-toxin lines with high seed yield, and for easy, effective procedures to remove the toxin before the seeds are consumed. Studies on the relationship between drought and salinity resistance and the -N-axalyl aminoalaminie (BOAA) content may be carried out.

Source: P292937 ; reprintDE

Grain legumes/ Evaluation/ Bangladesh/ Composition/ ODAP/ Agronomy/ Forage/ Salinity/ Lathyrus sativus/ Isoxazolin-5-one/ Agriculture
Amino acids/ Ascorbic acid/ Vitamin C/ Climate/ Cultivars/ Cultivation/ Drought/ Drought resistance/ Forage/ Pulses/ Grain legumes
Bangladesh/ Grain legumes India/ Human consumption/ Incidence/ India/ India L. sativus/ India L. sativus consumption/ India lathyrism
Khesari/ Lathyrism/ Lathyrism Bangladesh/ Lathyrism India/ Lathyrism vitamin C/ Lathyrus sativus agronomy/ Lime/ Males/ Humans
Processing/ Protein/ Resistance/ Seed/ Seed yield/ Toxicin/ Vitamins/ Water/ Yield/ Yield fodder/ Yield L. sativus/ reprint.


Titarro is the Spanish name for Lathyrus cicera. This publication is based on a study (1984 -1989) for a doctoral dissertation with the title 'Iniciacion a la seleccion de Lathyrus cicera L. en la provincia de Palencia' (1990) and provides a comprehensive treatise of Lathyrus spp. in the regions of Castilla and Leon, Spain, with particular emphasis on crop development of L. cicera, incl. botany, agronomy, genetic resources and their evaluation, breeding. It is interesting to note that cultivated L. cicera is frequently a mixture (semilla de comuna) of Vicia ervilia (yeros, ca 10%), V. sativa (vezas ca 3 %), barley (ca 21%) and other impurities (ca 13%). Date is not given in the publication.

Source: DE_96_9; reprintDE

Monograph L. cicera/ Lathyrus cicera monograph/ Lathyrus cicera Spain/ Spain L. cicera/ Spain Lathyrus ssp/ Lathyrus ssp Spain/ Vicia ervilia
Vicia sativa/ Legume mixtures/ Lathyrism Spain/ Spain Lathyrism/ Mixtures communal/ Communal mixtures/ Semillas de comun/ Traditional
names/ Cultivation L. cicera/ Lathyrus cicera agronomy/ Lathyrus cicera climatic factors/ Lathyrus cicera cultivation/ Lathyrus cicera
distribution/ Lathyrus cicera fodder value/ Lathyrus cicera feeding/ Lathyrus cicera intercropping/ Lathyrus cicera L./ Lathyrus cicera
phenology/ Forage/ Lathyrus sativus/ Lathyrus cicera/ Agriculture/ Genetic resources/ Agronomy mixtures/ Hordeum/ Climate/ Cultivation/
Dissertations/ Distribution plants/ Evaluation genetic resources/ Feeding/ Fodder/ Intercropping/ Lathyrism/ Lathyrus L. cicera/ Lathyrus
sativus agronomy/ Lathyrus ssp/ Mixtures crop/ Monograph/ Phenology/ Landrace mixtures/ Spain/ Spain L. sativus/ Traditional names/ Vicia/ Genetic resources evaluation/ reprint.


Source: Medline 91306771

beta Alanine analogs and derivatives/ Amyotrophic Lateral Sclerosis chemically induced/ Amyotrophic Lateral Sclerosis physiopathology
Lathyrism chemically induced/ Lathyrism physiopathology/ Nerve Degeneration/ Nervous system diseases chemically induced/ Nervous system
diseases physiopathology/ Neurornuscular Diseases chemically induced/ Neurornuscular Diseases physiopathology/ Neurons drug effects/ Plants
Toxicity/ Amyotrophic Lateral Sclerosis etiology/ Lathyrism etiology/ Neurornuscular Diseases etiology/ Neurology/ Beta Alanine analogs and
derivatives/ Amyotrophic lateral sclerosis/ Drugs/ Environment/ Lathyrism/ Lathyrism nerve degeneration/ Nerves/ Nervous system
Neurornuscular/ Neurons/ Oregon/ Toxicity/ Nervous system diseases.


Malnutrition and its effect on the nervous system and toxicity caused by consuming the legume Lathyrus sativus, leading to lathyrism, as seen in India is reviewed.

Source: Copyright CAB Abstracts (94-94.6) N583292

Deficiency diseases/ Lathyrus sativus malnutrition/ Malnutrition deficiency diseases/ Nervous system diseases malnutrition/ Malnutrition India
Lathyrism/ Toxicity/ Famine/ Malnutrition/ Lathyrus sativus/ Deficiency/ Environment/ India/ India L. sativus/ India malnutrition/ India
lathyrism/ Lathyrism India/ Lathyrus toxicity/ Humans/ Nervous system/ Neurology/ Toxicity L. sativus/ Nervous system diseases.


Source: reprintDE

Lathyrus sativus genetics/ Genetics L. sativus/ Breeding/ ODAP genetics/ Genetics ODAP/ Lathyrus sativus/ Genetics/ Neurotoxins/ ODAP
reprint.


Neurolathyrism is a toxic nutritional disorder induced by the ingestion of the chick-pea 'Lathyrus sativus' and characterised by a pure motor spastic paraparesis. Eight patients with long-standing disease underwent nerve
conduction and electromyographic studies. Two of them (25%) showed electrophysiological signs of lower motor neuron disease in their lower limbs. Subclinical affection of the anterior horn cells occurs probably more frequently than expected in chronic neurолathyrism.

Source: Medline 9351736; Reprinted with permission Copyright 1992 Munksgaard Publishers, Copenhagen

- Optimisation of its isolation and purification.
- Spasticity/ Spastic paraparesis/ Toxicity
- ODAP/ Toxicity L. sativus/ Toxicity.
- Dietary/ Intake/ Kainic acid/ Lathyrism etiology/ Lathyrism review/ Lathyrus toxicity/ Metals/ Neurotoxicity/ Neurotoxins/ NMDA/ Receptors
- Aspartic acid/ Diet/ Dietary intake/ Domoic acid/ Drugs/ Excitatory amino acid/ Food/ Glutamates/ Heavy metals/ Ibotenic acid drug effects/ Review/ Neurotoxicity review/ ODAP/ Chemistry/ Neurology/ Lathyrus sativus/ Alpha/ Anterior horn/ Chickens Diagnosis/ Food poisoning/ Food/H Reflex/ Lathyrism/ Lathyrism Aged/ Lathyrism electromyography/ Lathyrism motor neurons/ Lathyrus toxicity/ Motor neurons/ Muscles/ Nerves/ Neural/ Neurotoxins/ Neurons/ Peripheral/ Physiology not plant/ Reflexes/ Spasticity/ Spastic paraparesis/ Toxicity L. sativus/ Toxicity/ Transmission.


Since diseases directly related to undernutrition are the major public health problems of India, nutrition research in the country has been largely directed towards elucidating their causes and identifying the most feasible methods for their prevention and control. This effort is an interdisciplinary exercise carried out in the laboratory, the clinic, and the field, with close interaction among biochemists, clinicians, and epidemiologists. Some of the identified solutions have found practical application; but, as in other areas of scientific endeavour, a gap exists between the acquisition of knowledge in the laboratories and its application in the field. Today, thanks to research efforts of the last few decades, we have the knowledge with which most diseases related to undernutrition can be prevented. Unfortunately, however, we do not always have the means of applying this knowledge under real-life conditions in the field. Even so, nutrition research during the last few decades has contributed significantly to the amelioration of undernutrition among poor communities in India.

Source: Medline 92368694

India/ Lathyrism prevention and control/ Nutrition Disorders aetiology/ Pellagra prevention and control/ Protein Energy Malnutrition prevention and control/ Vitamin A Malnutrition prevention and control/ Review Nutrition Disorders prevention and control/ Review malnutrition

The central excitatory neurotransmitter (S)-glutamic acid (Glu) activates at least three types of receptors the NMDA, AMPA, and kainic acid (KAIN) receptors. These receptors mediate the neurotoxicity of a number of naturally-occurring Glu analogues. Thus, domoic acid, a KAIN receptor agonist, has probably been the cause of severe neurologic illness in people who consumed domoic acid poisoned food. beta-N-oxalylaminoalanine (beta-ODAP), an AMPA receptor agonist, has been associated with lathyrism, a spastic paraparesis caused by dietary intake of Lathyrus sativus. The neurotoxic Amanita muscaria constituent ibotenic acid, a nonselective NMDA receptor agonist, has been used as a lead structure for the development of the specific NMDA receptor agonist AMAA, AMPA, and a number of therapeutically interesting AMPA and KAIN receptor agonists.


Krogsgaard, L. P. and Hansen, J. J. (1992). Naturally occurring excitatory amino acids as neurotoxins and leads in drug design. Toxicology Letters (Amsterdam) 64-65 sec No:409-416 (author affiliation: Department of Organic Chemistry, Royal Danish School of Pharmacy, Copenhagen)

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Ruminal metabolism of nervalathyrogens may be an important factor in the adaptation of ruminants to the legume flatpea. Initial studies indicated that flatpea lathyrogens were rapidly released after consumption and that animals consuming this legume were at risk of intoxication. Further studies indicated that 17- and 38-day stepwise adaptation periods inadequately protected sheep from flatpea intoxication. Symptoms of intoxication when consumption approached 75% dietary flatpea included muscular tremors, incoordination, seizures and death. Only after prolonged consumption (<4 months) of a nonlethal diet consisting of 50% flatpea did sheep successfully adapt to 100% dietary flatpea which they consumed with no complications. The exchange of rumen contents between alfalfa [lucerne]-fed and flatpea-fed sheep resulted in the formerly tolerant, flatpea-fed animal developing symptoms of lathyrysm within 48 h. In contrast, the formerly naive, alfalfa-fed animal subsisted on 100% flatpea for 15 days with no indication of lathyrysm. This evidence suggests that adaptation to flatpea is due to alterations in rumen metabolism. The rate of 2,4-diaminobutyric acid (DABA) degradation in rumen contents obtained from both unadapted and adapted sheep ranged between 0.2-0.3 µmol ml/h. The similarity of these degradation rates suggests that although DABA is the predominant lathyrogen in flatpea, other lathyrogenic compounds may be of greater importance in the aetiology of flatpea intoxication and protective adaptation.

Source: Copyright CAB Abstracts (94-94.6) V894450

Leguminosae/ Nervous system diseases/ Rumen microorganisms/ Poisonous plants/ Lathyrus/ Lathyrus sylvestris/ Toxicity/ Sheep/ Ruminants Antinutritional factors/ Adaptation/ Lathyrus tingitanus/ DABA/ Agriculture/ Lathyrism symptoms/ Medicago sativa/ Degradation Detoxification/ Diet/ Dietary/ Lathyrysm/ Lathyrism animals/ Lathyrism complications/ Lathyrins/ Lathyrus sylvestris/ Lathyrus toxicity/ Medicago/ Metabolism/ Microorganisms/ Muscles/ Nervous system/ Neurology/ Risk/ Rumens/ Symptoms lathyrrism/ Tolerance/ Toxicity/ L. sylvestris/ Toxicity/ USA/ USDA.


L. sylvestris seeds imbibed in media containing polyethylene glycol 8000 (PEG) at concentrations of 0 (water), 25, 35 or 50% (w/v). Imbibition solutions were aerated continuously with ambient air, bubbled with pure oxygen for 3 min every 12 h or were not provided with supplemental oxygen. Seeds were imbibed for 0.5, 1.0, 1.5, 2.5 or 3 d. Germination percentages were determined for all treatments, and seedling vigour was determined for aeration treatments. In seeds imbibed in PEG-free media, germination was better when air was supplied during imbibition. However, seeds imbibed in PEG-free media aerated with oxygen exhibited symptoms of toxicity, and seedlings derived from this treatment exhibited the greatest reduction in shoot and root growth. PEG diminished the adverse effects of oxygen on germination. That 50% PEG was less effective in this respect suggested the contribution of an osmotic effect that was confirmed by the reduced germination rate of seeds imbibed in air-aerated and non-aerated 25% PEG media. Root growth appeared to be the most sensitive response to oxygen and osmotic treatments of seeds. It was concluded that osmoconditioning was of little value as a means of improving germination of L. sylvestris seeds and performance of seedlings.

Source: Copyright CAB Abstracts (94-94.6) G650736

Lathyrus sylvestris/ Seed germination/ Osmotic pretreatment/ Oxygen/ Aeration/ Germination/ Seed treatment/ Osmotic priming/ water relations Imbibition/ Seed/ Toxicity/ Seedling/ Plant physiology/ Lathyrism symptoms/ Lathyrism/ Lathyrus sylvestris/ Lathyrus toxicity/ Osmotic/ Polyethylene/ Pretreatment/ Roots/ Root growth/ Seedling germination/ Seedling growth/ Seedling vigour/ Shoot/ Symptoms lathyrrism/ Toxicity L. sylvestris/ USA/ Virginia/ Water/ Weed.


Source: reprintDE


Source: Agricola (92-94.6) IND 93027976

ODAP analysis/ Method/ Lathyrism/ Neurotoxins/ HPLC/ Lathyrus sativus/ Chromatography/ ODAP.

Neuropathological assessments of central motor pathways were conducted of 11 Spanish subjects with varying degrees of spastic paraparesis (lathyrism). The disease has been induced more than 40 years ago by subsistence on the neurototoxic chick pea Lathyrus sativus. Patient evolution was carried out by magnetic cortical and electric spinal stimulations and recordings of the contralateral muscle responses. Central motor conduction times corresponding to lower limbs were clearly more prolonged in those severely affected patients with marked difficulty walking (Stages 4 and 3). Central conduction times corresponding to upper limbs were delayed in only 1 patient. Taken together with clinical and published neuropathological data, these findings suggest that established lathyrism is essentially a central motor system disorder primarily affecting corticospinal tracts regulating the lower limbs. [References: 26].

Source: Copyright Current Contents

Lathyrism/ Spastic paraplegia/ Motor evoked potentials/ Clinical neurophysiology/ Human-brain/ Responses/ Sclerosis/ Cortex.


Neuropathological assessments of central motor pathways were conducted of 11 Spanish subjects with varying degrees of spastic paraparesis (lathyrism). The disease has been induced more than 40 years ago by subsistence on the neurototoxic chick pea Lathyrus sativus. Patient evolution was carried out by magnetic cortical and electric spinal stimulations and recordings of the contralateral muscle responses. Central motor conduction times corresponding to lower limbs were clearly more prolonged in those severely affected patients with marked difficulty walking (Stages 4 and 3). Central conduction times corresponding to upper limbs were delayed in only 1 patient. Taken together with clinical and published neuropathological data, these findings suggest that established lathyrism is essentially a central motor system disorder primarily affecting corticospinal tracts regulating the lower limbs. [References: 26].

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Neurolathyrism is a neurological condition seen among people who eat the seeds of Lathyrus sativus (LS) as a principal source of food energy for 2 months or more. It is characterised by severe muscular rigidity and paralysis of the lower limbs. beta-N-Oxalyl-L-alpha,beta-diaminopropionic acid is the principal toxin found in the seed. No experimental animal model for neurolathyrism could be produced by feeding either the seeds or the toxin, although the condition has been known for centuries. We discovered that experimental neurolathyrism could be produced in guinea pigs and primates that needed an external supply of ascorbic acid by making them subclinically deficient in ascorbic acid and feeding them the seeds of LS or extracts thereof. Autoclaving the seeds of LS with lime removes the toxin.

Source: Medline 93231097; Reprinted with permission Copyright 1993 Academic Press


Activation of glutamate receptors by excitatory amino acids is believed to play a role in the pathogenesis of neurologic diseases. The concentration of amino acids in cerebrospinal fluid differs between neurolathyrism patients and controls. The concentration of the inhibitory neurotransmitter, glycine, shows a clear correlation with the duration of the disease, which resembles sporadic upper motor neurone diseases. Glutamate, zinc and glycine affect activity at the N-methyl-D-aspartate (NMDA) class of glutamate receptor. Zinc in mossy fibre axon is dynamically linked to neural signalling processes. It is proposed that alpha-ODAP, being a strong
zinc-chelator, can make metal ion complexes within CNS that may lead to the expression of toxicity. A role for zinc deficiency in the susceptibility for neurolathyrism is postulated.

Source: reprintDE
Lathyrus sativus toxicity/ NPAA/ ODAP/ Lathyrism zine/ Zinc lathyrism/ Zinc/ Metals/ Neurology/ Lathyrus sativus/ Amino acids/ Amino acids reviews/ Aspartic acid/ Axons/ Bangladesh/ Central Nervous system/ Cerebrospinal fluid/ Deficiency/ Excitatory amino acid/ Fibre Glutamates/ Glutamates receptors/ Glycine/ Heavy metals/ Lathyrism/ Lathyrism Bangladesh/ Lathyrism cerebrospinal fluid/ Lathyrism review Lathyrus sativus zine/ Lathyrus toxicity/ Motor neurons/ Nervous system/ Neural/ Neurolathyrism/ Neurons/ NMDA/ NPAA review/ ODAP Zinc/ Receptors/ Review/ Susceptibility/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity/ Trace elements/ Zinc deficiency/ reprint.


Advocates that Lathyrus sativus is safe to eat and ignores malnutrition and poverty as being causally linked to lathyrism.

Source: reprintDE
Pampheleerog L. sativus/ India L. sativus consumption/ Lathyrus sativus India/ Human consumption L. sativus India/ Famine/ Malnutrition Poverty/ Economics/ Lathyrus sativus/ Dhal/ Human consumption/ India L. sativus/ India malnutrition/ India lathyrism/ Khesari Lathyrism/ Lathyrism economics/ Lathyrism India/ Lathyrism nutrition/ Humans/ Nutrition/ reprint.

Source: reprintDE
Flower colour genetics L. sativus/ Lathyrus sativus flower colour genetics/ Genetics flower colour L. sativus/ Breeding/ Genetics/ Lathyrus sativus/ Colour/ Flower colour/ Flower colour genetics/ Flowers/ Genetics flower colour/ reprint.

beta-N-Oxalyl-L-alpha,beta-diaminopropionic acid (beta-L-ODAP) is thought to be the causative agent in lathyrism due to its neuroexcitatory and neurotoxic properties. We have recently reported that beta-L-ODAP is also gliotoxic at high concentrations (Bridges et al.: Brain Res 561:262, 1991). Evidence is now presented that low, subgliotoxic concentrations of beta-L-ODAP may alter the ability of astrocytes to regulate glutamate concentrations in the CNS by increasing astrocyte glutamine synthetase activity. When astrocytes cultured from rat cortex were exposed to 100 microM beta-L-ODAP for 24 h, the resulting glutamine synthetase activity was 155% of control levels. This effect was enantiomer- and isomer-specific, dose-dependent, and required protein translation as the induction was blocked with cycloheximide. The effect of beta-L-ODAP on glutamine synthetase was not mimicked by alpha-amino-3-hydroxy-5-methyl-isoxazole-4-propionate (AMPA) or kainate, suggesting that the induction was not transduced solely through activation of cell surface non-N-methyl-D-aspartate (NMDA) glutamate receptors. An intracellular site of action of beta-L-ODAP is proposed because its effect on glutamine synthetase activity could be blocked by the amino acid uptake blocker dihydrokainate.

Source: Medline 93307820
Animals Newborn/ Astrocytes cytology/ Astrocytes drug effects/ Cell Death drug effects/ Cells Cultured/ Cerebral Cortex cytology/ Cerebral Cortex enzymology/ Cycloheximide pharmacology/ Dactinomycin pharmacology/ Dose Response Relationship Drug/ Enzyme Induction Glutamine Synthetase metabolism/ Ibotoxenic Acid analogs and derivatives/ Ibotoxenic Acid pharmacology/ Kainic Acid pharmacology/ Lactate Dehydrogenase analysis/ N Methylaopartate pharmacology/ Rats/ Rats Sprague Dawley/ Structure Activity Relationship/ Amino acids Diamino pharmacology/ Astrocytes enzymology/ Glutamate Synthetase biosynthesis/ Neurotoxins pharmacology/ Rodents/ ODAP/ Neurology/ Amino acids/ AMPA receptors/ Aspartic acid/ Astrocytes/ Biosynthesis/ Brain/ California/ Central Nervous system/ Cerebral Cortex/ Cycloheximide Cytology/ Drugs/ Enzymes/ Glutamates/ Glutamine/ Glutamates receptors/ Ibotoxic acid/ Intracellular/ Isomerism ODAP/ Isomerism/ Kainic acid/ Lactate/ Lathyrism/ Lathyrism animals/ Lathyrism enzymology/ Lathyrism rats/ Metabolism plant/ Nervous system/ Neuroexcitatory Neurotoxins/ NMDA/ ODAP biosynthesis/ ODAP isomerism/ Protein/ Receptors/ Toxin/ Toxin biosynthesis.

To study the clinical picture of lathyrism in Unnao, India and compare it with that reported from other endemic areas, 41 patients from Unnao were studied. Their mean age was 42.9 years (range 22-85) and the mean duration of the illness was 17.1 years (range 2-30). They had been regularly consuming Lathyrus sativus (LS). The patients complained of walking difficulty due to weakness and leg stiffness (32 each), and of frequency of micturition (4). Gait abnormalities included spastic gait (24), toe walking (18) and the necessary use of walking sticks (13). Weakness was mild to moderate, and was less prominent than was spasticity. In 8 patients the physical signs were asymmetrical. Peripheronal neuropathy was present in only one patient, but muscle atrophy and widespread fasciculations were not found. A higher frequency of peripheral neuropathy and lower motor neuron involvement has been reported from Bangladesh and Israel. Severe spasticity in the
Plant amino acids beta-N-oxalylamino-L-alanine (L-BOAA, present in Lathyrus sativus) and beta-N-methylamino-L-alanine (L-BMAA, present in Cycas circinalis) have been implicated in the pathogenesis of human neurological disorders lathyrism and amyotrophic lateral sclerosis-Parkinson's dementia complex of Guam (ALS-PD), respectively. In view of the conflicting reports that have emerged on the role of L-BMAA in ALS-PD, we reinvestigated the comparative toxicity of L-BMAA and L-BOAA. We report here the potent toxicity of L-BOAA as examined in an in vitro model consisting of sagittal slices of mouse brain. Incubation of sagittal slices of mouse brain with L-BOAA resulted in dose and time-dependent inhibition of mitochondrial NADH-dehydrogenase (NADH-DH). Significant inhibition of NADH-DH was seen following incubation of brain slices with very low concentration of L-BOAA (0.1 pM). L-BOAA also induced lactate dehydrogenase (LDH) leakage from the slice into the medium in dose-dependent manner. The inhibition of NADH-DH preceded LDH leakage from the slices into the medium. L-BOAA had no effect on other mitochondrial enzymes, namely, isocitrate dehydrogenase or cytochrome c oxidase. Incubation of isolated mouse brain mitochondria with L-BOAA also resulted in inhibition of NADH-DH. L-BOAA-induced inhibition of NADH-DH was prevented by non-N-methyl-D-aspartate (non-NMDA) glutamate receptor antagonists in general and alpha-amino-3-hydroxy-5-methylisoxazole-4-propionate (AMPA) receptor antagonist (NBQX) in particular. Other glutamate agonists examined namely, N-methyl-D-aspartate, beta-N-methylamino-L-alanine (L-BMAA), L-glutamic acid, N-acetylaspartylglutamate (NAAG), quisqualic acid, kainic acid or AMPA did not have any effect on NADH-DH activity in slices although they induced LDH leakage from the slice into the medium. Incubation of brain slices with L-BOAA did not induce lipid peroxidation or changes in glutathione levels. Prior incubation of slices with glutathione (GSH) or GSH-isopropyl ester did not prevent L-BOAA-induced inhibition of NADH-DH. However, incubation of isolated mitochondria with L-BOAA in the presence of GSH-isopropyl ester prevented L-BOAA-induced inhibition of NADH-DH, indicating the protective effect of mitochondrial glutathione in the prevention of L-BOAA-induced toxicity. [References: 41].

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Quinolxalinediones/ Glutamates Receptor/ ODAP toxicity/ ODAP brain NADH-dehydrogenase/ NADH-dehydrogenase ODAP/ Lathyrus sativus toxicity/ Toxicity mechanism ODAP/ Neurology/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ Beta N-methylamino-L-alanine/ Amino acids/ AMPA receptors/ Aspartic acid/ Brain/ Enzymes/ Excitatory amino acid/ Glutamates/ Glutamates receptors/ Glutathione/ India/ India L. sativus/ India L. sativus consumption/ India lathyrism/ Isoxurate dehydrogenase/ Kainic acid/ Lactate dehydrogenase/ Lactate/ Lathyrism/ Lathyrism India/ Lathyrism mechanisms/ Lathyrism ODAP toxicity/ Lathyrism prevention/ Lathyrism toxicity/ Lipids/ Humans/ Mechanisms toxicity/ Mental/ Mouse/ Mitochondria/ NADH/ NBQX/ NMDA/ ODAP/ Prevention lathyrism Lathyrism prevention/ Receptors/ Rodents/ Sulfur amino acids/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity L. sativus mechanisms/ Toxicity Toxin.

Pai, K. S.; Shankar, S. K., and Ravindranath, V. (1993). **Billionfold difference in the toxic properties of the two excitatory amino acids, L-BOAA and L-BMAA: biochemical and morphological studies using mouse brain slices.** Neuroscience Research 17 (3):241-248 (author affiliation: Ravindranath V Natl Inst Mental Hlth & Neurosci Dept Neurochem Hosur Rd Bangalore 560029 Karnataka India) Plant amino acids beta-N-oxalylamino-L-alanine (L-BOAA, present in Lathyrus sativus) and beta-N-methylamino-L-alanine (L-BMAA, present in Cycas circinalis) have been implicated in the pathogenesis of human neurological disorders lathyrism and amyotrophic lateral sclerosis-Parkinson's dementia complex of Guam (ALS-PD), respectively. In view of the conflicting reports that have emerged on the role of L-BMAA in ALS-PD, we reinvestigated the comparative toxicity of L-BMAA and L-BOAA. We report here the potent toxicity of L-BOAA as examined in an in vitro model consisting of sagittal slices of mouse brain. Incubation of sagittal slices of mouse brain with L-BOAA (1 pM) resulted in significant leakage of lactate dehydrogenase (LDH) and potassium from the slices into the medium. Under similar conditions, L-BMAA-induced LDH leakage from the slices into the medium was observed only at very high concentration of the toxin, namely 1 mM. N-Methyl-D-aspartate (NMDA) receptor antagonists ameliorated the toxic effects of L-BMAA, while non-NMDA receptor antagonists (quinolxalinediones) protected against the toxicity of L-BOAA. Incubation of slices with L-BOAA for 1 h resulted in extensive vacuolation and degeneration of neurons in the thalamus and brain stem, and to a lesser extent in the hippocampus and cerebellar nuclei. The large sized neurons appeared to be affected to a greater extent than the smaller ones. The neurons in other

absence of prominent weakness in lathyrism may be due to the involvement of certain specific groups of corticospinal fibres. 

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Adult/ Aged/ Aged 80 and over/ Diet/ Gait/ India/ Lathyrism therapy/ Middle Age/ Muscle Spasticity physiopathology/ Lathyrism physiopathology/ Neurology/ Lathyrus sativus/ PAst/ Bangladesh/ Enzime/ Fibre/ India Dietay/ Dietary/ India L. sativus/ India lathyrism/ Lathyrism/ Lathyrism Aged/ Lathyrism Bangladesh/ Lathyrism India/ Lathyrism motor neurons/ Motor neurons/ Muscles/ Muscle spasticity/ Neurolathyrism/ Neurons/ Paraplegia/ Peripheral/ Physical/ Spasticity.

Pai, K. S. and Ravindranath, V. (1993). **L-BOAA induces selective inhibition of brain mitochondrial enzyme NADH-dehydrogenase.** *Brain Research* 621 (2):215-221 (author affiliation: Ravindranath V Natl Inst Mental Hlth & Neurosci Dept Neurochem Hosur Rd Bangalore 560029 Karnataka India) Lathyrism, a human neurological disorder has been linked to the excessive consumption of a plant toxin, beta-oxalylamino-L-alanine L-B present in Lathyrus sativus. The present study was carried out to elucidate the biochemical mechanisms underlying L-BOAA-induced toxic insult. Incubation of sagittal slices of mouse brain with L-BOAA resulted in dose and time-dependent inhibition of mitochondrial NADH-dehydrogenase (NADH-DH). Significant inhibition of NADH-DH was seen following incubation of brain slices with very low concentration of L-BOAA (0.1 pM). L-BOAA also induced lactate dehydrogenase (LDH) leakage from the slice into the medium in dose-dependent manner. The inhibition of NADH-DH preceded LDH leakage from the slices into the medium. L-BOAA had no effect on other mitochondrial enzymes, namely, isocitrate dehydrogenase or cytochrome c oxidase. Incubation of isolated mouse brain mitochondria with L-BOAA also resulted in inhibition of NADH-DH. L-BOAA-induced inhibition of NADH-DH was prevented by non-N-methyl-D-aspartate (non-NMDA) glutamate receptor antagonists in general and alpha-amino-3-hydroxy-5-methylisoxazole-4-propionate (AMPA) receptor antagonist (NBQX) in particular. Other glutamate agonists examined namely, N-methyl-D-aspartate, beta-N-methylamino-L-alanine (L-BMAA), L-glutamic acid, N-acetylaspartylglutamate (NAAG), quisqualic acid, kainic acid or AMPA did not have any effect on NADH-DH activity in slices although they induced LDH leakage from the slice into the medium. Incubation of brain slices with L-BOAA did not induce lipid peroxidation or changes in glutathione levels. Prior incubation of slices with glutathione (GSH) or GSH-isopropyl ester did not prevent L-BOAA-induced inhibition of NADH-DH. However, incubation of isolated mitochondria with L-BOAA in the presence of GSH-isopropyl ester prevented L-BOAA-induced inhibition of NADH-DH, indicating the protective effect of mitochondrial glutathione in the prevention of L-BOAA-induced toxicity. [References: 41]. 

Source: Medline 93261714; Reprinted with permission. Copyright (1993) Stockton Press
areas of the brain also revealed variable degree of degeneration with swelling of axons and dendrites. Thus, the present study demonstrates the potent toxicity of L-BOAA and elucidates for the first time, the billion-fold difference in the concentration of L-BOAA and L-BMAA required to elicit similar toxic response in vitro, using mouse brain slices. The study also demonstrates the selective vulnerability of certain regions of the brain to toxic insult by L-BOAA. [References: 19].

Source: ref ex Roy (pers. comm.)

Neurotoxicity/Excitatory Amino Acid/Quinolinediones/NMDA receptor/ Glutamates Receptor/ ODA/ Toxoplasmosis/ Beta N-methylamino-L-alanine toxicity/ Toxicity/ ODA/ NMDA receptor/ Brain slice bioassay/ Brain bioassay/ Rodents bioassay/ Bioassay rodent/ Neurology/ Lathyrus sativus/ Bioassay/ Beta Alanine analogs and derivatives/ Beta N-methylamino-L-alanine/ Bioassay L. sativus

Lathyrus sativus bioassay/ Axons/ Amino acids/ Amyotrophic lateral sclerosis/ Aspartic acid/ Brain/ Cytos/ Dendrites/ Glutamates/ Glutamates receptors/ Guam/ Hippocampus/ In vitro/ India/ India L. sativus/ India lathyrism/ Lactate dehydrogenase/ Lactate/ Lathyrism/ Lathyrism Bioassay/ Lathyrism hippocampus/ Lathyrism India/ Lathyrism ODA toxicity/ Lathyrism toxicity/ Humans/ Mental/ Mice/ Models/ Neurons/ NMDA/ NPA/ ODA/ Potassium/ Receptors/ Reports/ Rodents/ Toxicity L. sativus/ Toxicity rodents bioassay/ Toxin.


In a series of experiments lambs were adapted to feeding with pellets containing seed-bearing flatpea (*Lathyrus sylvestris L.*) by increasing flatpea content from 50% to 100% in steps of 10% for periods of 7 days at each level. The rumen contents of some adapted lambs were exchanged with the rumen contents of lambs fed alfalfa. All exchanged lambs were fed flatpea in hay at 2200 g/day. In a third experiment lambs adapted to flatpea at 60% for 7 days were fed 100% flatpea for 62 days. These lambs were then fed monensin (30 mg/kg daily). Signs of intoxication included seizure, muscular trembling and spasmotic torticollis, and were similar to those seen in ammonia toxicity in ruminants. Accumulation of ammonia may be a direct consequence of flatpea ingestion since 2,4-diaminobutyric acid (DABA), a toxic constituent, is known to inhibit hepatic urea synthesis. Other modes of toxicity for DABA and other flatpea toxins may contribute to this process of intoxication. The results suggest that ruminal microbes are responsible for flatpea detoxification and protection. The adaptation of sheep to flatpea may be due to increased ruminal detoxification. Ruminal protective functions can be disrupted through abrupt monensin feeding or the replacement of non-adapted for adapted rumen contents. This disruption temporarily suppresses mechanisms of ruminal detoxification and the sheep can reacquire vulnerability to flatpea intoxication.

Source: Agricola (92-94.6) IND 20380600, Reprinted with permission Copyright (1993) American College of Veterinary Toxicologists

**Animal experiments/ Poisoning/ Rumen microorganisms/ Monensin/ Lathyrus/ Sheep/ Poisonous plants/ Lathyrus sylvestris/ Toxicity Detoxification/ Rumnants/ Anti-nutritional factors/ Adaptation/ DABA/ Hay/ Agriculture/ Lathyrism symptoms/ Medicago sativa/ Ammonia Feeding/ Feed rumnants/ Feed Lathyrus ochrus/ Feed Lathyrus sylvestris/ Lambs/ Lathyrisms/ Lathyrism animals/ Lathyrism mechanisms Lathyrism veterinary/ Lathyrus ochrus/ Lathyrus sylvestris/ Lathyrus toxicity/ Liver/ Humans/ Mechanisms toxicity/ Medicago/ Microorganisms Muscles/ Rumen/ Ruminant feed/ Seed/ Sheep feed/ Symptoms lathyrism/ Toxicity L. sylvestris/ Toxin/ Urea.


Groups of 5 adult ewes, assigned by weight and reproductive status (barren or in last 10 weeks of pregnancy), were fed pelleted diets containing mature, seed-bearing flatpea at 0, 35.0, 52.5 or 70.0% for 42 days, or at increasing levels of 17.5, 35.0, 52.5 and 70.0% over 42 days. The dose-related responses to the diets included a fluctuating reduction in feed intake for diets containing 35% and above of flatpea, potentially fatal acute central nervous signs at levels as low as 35%, and reduced weight gains at levels of 52.5% and over. A wasting condition developed in one ewe fed at 52.5%. Four of 5 ewes and one lamb fed increasing levels developed acute signs of poisoning. One of these ewes developed acute neurotoxicosis when fed at the 52.5% level; 3 other ewes and one orphaned lamb (40 days old) developed neurotoxicosis at the 70.0% level. 18 lambs were born to 16 flatpea-fed ewes in this study; there was no evidence that flatpea feeding adversely affected late pregnancy, parturition, lactation or lamb health.

Source: Reprinted with permission Copyright (1993) American College of Veterinary Toxicologists

**Animal experiments/ Wasting diseases/ Lathyrus spp sheep poisoning/ Poisonous plants sheep/ Lathyrus sylvestris toxicity/ Ewes/ Reproduction Intake/ Rumnants/ Agriculture/ Lathyrism symptoms/ Diet/ Dietary intake/ Feed/ Feeding/ Feed rumnants/ Feed intake/ Feed Lathyrus ochrus Feed Lathyrus sylvestris/ Food/ Dietary/ Lambs/ Lathyrisms/ Lathyrism animals/ Lathyrism veterinary/ Lathyrus ochrus/ Lathyrus sylvestris Lathyrus spp/ Lathyrus toxicity/ Humans/ Poisonous plants/ Pregnancy/ Ruminant feed/ Seed/ Sheep/ Sheep feed/ Symptoms lathyrism/ Toxicity L. sylvestris/ Toxicity Lathyrus spp/ Toxicity/ USA/ USDA.

Epidemics of neurotoxic disease in developing regions of the world are often associated with dietary dependence on plant components with inherent toxic potential or which have spoiled and become contaminated with mycotoxins. Diseases triggered by plant toxins include lathyrism and cassavism, types of irreversible spastic parapareses associated with staple diets of grass pea and bitter cassava root, respectively. Mildewed sugarcane poisoning, an encephalopathy and tardive dystonia, illustrates the neurotoxic effects of a widely distributed plant and fungal toxin. Food and medicinal use of the neurotoxic cydad plant is thought to have a role in the etiology of western Pacific amyotrophic lateral sclerosis and parkinsonism-dementia. Plant-associated neurotoxicity is a significant and preventable cause of morbidity in certain regions of Africa, Asia, and Oceania.

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Plants Toxic chemistry/ Nervous system diseases chemically induced/ Plants Toxic/ Neurology/ Antinutritional factors/ Mycotoxins/ Africa

Amyotrophic lateral sclerosis/ Asia/ Chemistry/ Diet/ Environment/ Food/ Fungi/ Mycology/ Dietary/ Lathyrism etiology/ Lathyrism

mycotoxins/ Manihot esculenta/ Cassava/ Medicinal/ Microbiology/ Nervous system/ Neurotoxicity/ Neurotoxins/ Oregon/ Phytochemistry

Prevention lathyrism/ Lathyrism prevention/ Roots/ Spasticity/ Toxin/ Nervous system diseases.


Grass pea, a legume whose consumption is associated with human lathyrism, is an important food crop among the poorer sectors of society in many parts of Ethiopia. A nutritional survey, focussing on the preparation and consumption of grass pea, in 224 families of two villages of a lathyrism endemic area in northwestern Ethiopia has been undertaken. Grass pea is grown in one only of the two villages. Raw as well as cooked food samples were collected and the levels of beta-ODAP determined by the OPT-method. Grass pea foods were also prepared in the laboratory following methods used in the villages and analysed for their toxin level to derive information if certain procedures were capable of reducing the level of toxin. Steeping grass pea in excess water leaches out ca 30% of the beta-ODAP. Grass pea bread (kitta) and roasted seeds (kollo) showed elevated levels of beta-ODAP as compared to the seeds used in the preparation of these foods. Lower levels of beta-ODAP were found in cooked snacks (nifro) and the flour form (shiro).

Source: Lambein_95_5

Lathyrism Ethiopia/ Ethiopia lathyrism/ Ethiopia nutritional survey/ Lathyrus sativus food preparation/ ODAP L. sativus food/ Human

consumption L. sativus/ Lathyrus sativus/ Agriculture/ Bread/ Endemic/ Ethiopian/ Flour/ Food L. sativus/ Food preparation/ Food/ Human

consumption/ Lathyrism/ Lathyrism nutrition/ Humans/ Nutrition/ Nutrition surveys/ ODAP/ Seed/ Surveys/ Toxin/ Water.


Lathyrism is a neurotoxic disorder caused by excessive, prolonged consumption of the hardy, environmentally tolerant legume, the grass-pea, Lathyrus sativus, which contains the neurotoxic amino acid beta-N-oxalylamino-L-alanine acid (BOAA). The disease develops after heavy consumption of grass-pea for over two months. It is uniformly manifested by a predominantly motor spastic paraparesis with varying degrees of disability. A door-to-door epidemiological survey for the disease using trained lay health workers was carried out in the major areas of northwest and central Ethiopia where L. sativus is grown. For security reasons, some of the other endemic areas were not accessible for the survey. The survey involved a population of 1,011,272. A total of 3,026 affected persons were identified. The disease was found to be widespread in the northwest and central highland areas of the country. The prevalence rates ranged from 1/10,000 to 7.5/1,000. The highest prevalences were in North and South Gonder, and East and West Gojam. The male:female ratio of cases was 2.6:1; the females exhibited a milder form of the disease. The cultivation of L. sativus is increasing in Ethiopia, which makes the development of low-BOAA strains very important in order to control the high incidence of lathyrism, a crippling disease which affects the productive young members of the society.

Source: Medline 93170259 ; reprintDE, reprinted with permission Copyright 1993 Ethiopian Medical Journal


Adolescence/ Lathyrism Ethiopia/ Lathyrism prevention/ Males/ Humans/ Neurotoxins/ Population/ Prevention lathyrism/ Lathyrism prevention

Rural/ Spasticity/ Spastic paraparesis/ Stains/ Surveys/ Tolerance/ reprint.

Willis, C. L.; Meldrum, B. S.; Nunn, P. B.; Anderton, B. H., and Leigh, P. N. (1993). Neuronal damage induced by beta-N-oxalylamino-L-alanine, in the rat hippocampus, can be prevented by a non-NMDA antagonist, 2,3-dihydroxy-6-nitro-7-sulfamoyl-benzo(f)quinoxaline. Brain Research 627 (1):55-62 (author
The neurotoxin beta-N-oxalylamino-L-alanine (BOAA), found in Lathyrus sativus seeds, is thought to be the causative agent of neurolathyrism. We have investigated the in vivo mechanism of action of BOAA by focal injection (1 nmol) in the dorsal hippocampus of male Wistar rats and comparing the pathological outcome with the effects of injections (1 nmol) of a-amino-3-hydroxy-5-methyl-isoxazole-4-propionate (AMPA), kainate (KA) or N-methyl-D-aspartate (NMDA). Cellular damage induced by the excitatory amino acids in the pyramidal (CA1-CA4) and dentate granule neurones (DG) was assessed histologically 24 h after the injection. The study shows that BOAA (50 nmol) induces hippocampal toxicity with a highly selective pattern of regional cellular damage. The CA1, CA4 and DG subfields show 70-90% neuronal injury whereas CA2 and CA3 show only minimal damage. This pattern of cellular damage is similar to that induced by AMPA (1 nmol) and NMDA (25 nmol) but not KA (0.5 nmol). BOAA-induced neurotoxicity is prevented in a dose-dependent manner by focal co-injection of the non-NMDA receptor antagonist 2,3-dihydroxy-6-nitro-7-sulfamoyl-benzo(F)quinoxaline (NBQX) (1-25 nmol) but not by a dose of MK-801 (3 mg/kg i.p.) which is neuroprotective against an injection of NMDA. Delayed focal injections of NBQX (25 nmol) up to 2 h after the BOAA injection result in a significant protection of all pyramidal and granular cell regions. These results indicate that the in vivo hippocampal toxicity of BOAA is mediated by AMPA receptors rather than by KA or NMDA receptors. Neurons in the rat hippocampus do not die immediately when exposed to BOAA but via a delayed process involving sustained AMPA receptor activation. Excitotoxic processes acting via AMPA receptors may play a role in the chronic loss of motor neurones seen in amyotrophic lateral sclerosis. [References: 39].

Source: Reprinted with permission Copyright 1993 Elsevier Science B.V., Amsterdam, Netherlands ODAP/ NBQX/ Neurotoxicity/ Neolathyrism/ Motor neuron disorder/ Excitatory amino acid/ ODAP toxicity prevention/ Lathyrism/ Bioassay rodents/ KA receptors/ NMDA receptors/ Neurology/ Biochemistry/ Lathyrus sativus/ Bioassay/ Beta Alanine analogs and derivatives Bioassay L. sativus/ Lathyrus sativus bioassays/ Amino acids/ Amino acids toxicity/ AMPA receptors/ Amyotrophic lateral sclerosis/ Aspartic acid/ Brain/ Denmark/ England/ Hippocampus/ Injections/ Kainic acid/ Lathyrism Bioassay/ Lathyrism Biochemistry/ Lathyrism hippocampus Lathyrism mechanism/ Lathyrism ODAP toxicity/ Lathyrism prevention/ Lathyrism rats/ Lathyrism toxicity/ Males/ Mechanisms toxicity/ Motor neurones/ Neurons/ Neurotoxins/ NMDA/ Prevention lathyrism/ Lathyrism prevention/ Receptors/ Rodents/ Seed/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity L. sativus mechanisms/ Toxicity mechanism ODAP/ Toxicity rodents bioassay/ Toxicity/ UK.


NPA/ NPA chemistry/ ODAP chemistry/ Chemistry/ Ethiopia/ Lathyrism Ethiopia/ ODAP/ ODAP isomerism/ Isomerism ODAP Temperature/ reprint.


Addis, G. and Narayan, R. K. J. (1994). *Quantitative variation in the amount of neurotoxin, beta-N-oxalyl-alpha,beta-diamino-propionic acid, in Lathyrus sativus during ontogeny*. In: Abegaz, B. M.; Tekle Haimanot, R.; Palmer, V. S., and Spencer, P. S. (Eds). *The grass pea and lathyrism. Proceedings of the second international Lathyrus/lathyrism conference in Ethiopia*, New York: Third World Medical Research Foundation, pp. 83-88. Species of Lathyrus accumulate a variety of secondary metabolites in their seeds, many of which are potentially toxic to man and animals. beta-N-oxalyl-L-alpha,beta-diaminopropionic acid (ODAP) assumes the greatest significance. It is a non-protein amino acid which causes both human and animal lathyrism. A study was conducted to assess variations in the amount of ODAP between Lathyrus species, between varieties of Lathyrus sativus and between tissues and organs in L. sativus during different developmental stages. High-voltage electrophoresis, thin-layer chromatography and chemical analysis were used during the investigation. Significant variations in the amount of ODAP between Lathyrus species and between varieties of L. sativus were observed. Results further established that during ontogeny, the biosynthesis and accumulation of ODAP was tissue specific and developmentally regulated. The reproductive organ tissues accumulated more ODAP than vegetative parts during development. Source: reprintDE

Low neurotoxic lines of grass pea supplied by Dr. Campbell, Manitoba Research Station, Canada, were tested out at Adet Research Center, Ethiopia in 1991/92. The tests were carried out in a Cambisol soil type. The materials were planted on Oct. 3, 1991 in a single-rowed non-replicated nursery. Objectives were (i) to test, under Adet conditions, the adaptability of introduced low neurotoxin lines from Canada, and (ii) to identify genes or characters from low neurotoxin lines that could be incorporated into local genotypes. Data collected included days to flowering, days to maturity, powdery mildew (0-9 scale), height (cm), pods/plant, flower color, and growth habit. The yield was not measured because of conditions during the test period were beyond control; however, yield components were determined. The results showed that the local check had the highest number of pods/plant comparatively. NC8a-95 and NC8a-97/1 had the highest pods/plant of the low neurotoxin lines; NC8a-97/1 also had the highest number of seeds/pod (3 seeds/pod). None of the low neurotoxin lines were free of powdery mildew attack. Promising lines, which included NC8a-97/1, NC8a-157, NC8a-84, LS 8246, and NC8a-95, should be tested further in variety and verification trials to determine their performance or to incorporate the low neurotoxin character from the germplasm into promising local genotypes.

Source: reprintDE


One of the solutions for the problem of lathyrism is the identification and utilisation of low-ODAP lines of grass pea. A a total of 20 grass pea varieties was tested at Adet Research Center, Ethiopia for a period of two years in 1989/90 and 1990/91. The test was done in a randomised complete block design with four replications. The data collected included number of days to flowering, maturity, height (cm), pods/plant, seeds pod, 1000 grain weight, grain yield, and ODAP content. There was no significant yield difference among the varieties in 1990/1991. When averaged over the two years, PGRCE 46066 was the highest yielding variety with a yield level of 3426 kg ha-1. The ODAP level of the varieties varied in different seasons; however, there were varieties where the variation was negligible. When averaged over the two years, PGRCE 201538 had a minimum ODAP level of 0.35%. PGRCE 201513, one of the best yielding varieties of those tested, had the lowest ODAP levels. More elaborate studies on the relationship between ODAP content and environment interaction are required.

Source: reprintDE


Source: reprintDE


Grass pea (Lathyrus sativus) occupies 8.7 % of the total area and 7.6 % of the total production of food legumes in Ethiopia. It is produced in areas with adverse agricultural conditions. It performs well on heavy
black soils which promote waterlogging. Grass pea production is mainly concentrated in the northwest zone (58.0%), the central zone (16.3%), the north-east (12.8%), and the northern as well as the southeast region of Ethiopia (12.9). Like most crops in Ethiopia, grass pea grain is used for human consumption and the straw as animal feed. One of the ways to utilise the crop properly is through the identification of grass pea varieties with low ODAP toxin and reasonable yield. A total of 177 grass pea germplasm accessions has been identified and varieties with a ODAP content of 0.2-0.5 % advanced to the next stages. The seed yield data of the variety trials conducted in 1989 and 1991 revealed that the overall mean yields were 2856 kg/ha and 3297 kg/ha, respectively. PGRC/E46066 gave the highest yield of 3385 kg/ha in 1989, whereas PGRC/E46066 gave the highest yield of 3661 kg/ha in 1991. There was no correlation between ODAP content and yield components.

Finally, the clinical presentation and pattern of neurological deficit in Spanish peasants with lathyrism closely resembles that of Bangladesh, Ethiopian, Indian, and Israeli patients, but was clearly different from the rapidly progressive disease seen in sporadic amyotrophic lateral sclerosis.

Source: reprintDE

Lathyrus sativus research Ethiopia/ Ethiopia L. sativus research/ ODAP/ Agronomy/ Farming systems/ Waterlogging/ Phytopathology/ Soil Lathyrus sativus/ Entomology/ Straw/ Agriculture/ Genetic resources/ Animal feed/ Aphids/ Erysiphe/ Ethiopia/ Feed/ Feed Lathyrus sativus Flooding/ Food/ Fungi/ Mycology/ Guizotia/ Human consumption/ Insects/ Lathyrism/ Lathyrism animals/ Lathyrism Ethiopia/ Lathyrus sativus agronomy/ Human/ Microbiology/ Nitrogen/ Nodulation/ Pests/ Powder mildew/ Rust/ Seed/ Seed yield/ Soil microbiology/ Surveys/ Toxin Varieties/ Variety trials/ Varieties L. odoratus/ Varieties L. sativus/ Lathyrus sativus varieties/ Lathyrus odoratus varieties/ Water/ Weed/ Yield Yield components L. sativus/ Yield L. sativus/ Diseases plant/ reprint.


During the famine following the Spanish Civil war (1936-1939), outbreaks of human lathyrism occurred in the Spanish provinces of Catalonia and Castillia because of heavy consumption of food containing Lathyrus spp. seed, a neurotoxic legume. In June 1988, we studied 14 male subjects, aged 49-70 years, who developed lathyrism during childhood or adolescence, for evidence of recent clinical deterioration. Each patient displayed a characteristic pattern of neurological deficit, and 10 complained of deterioration of motor performance (increased leg stiffness, shortening of steps and a tendency to scrape the floor with toes) which had developed over the previous 2-10 years. This was reportedly accompanied by the appearance, or by an increase of severity and frequency, of painful nocturnal calf-muscle cramping. Five of the 10 no longer consumed Lathyrus, while 3 or 4 with seemingly static illness reported continued occasional intake. However, 8 of 9 patients showed measurable levels of the Lathyrus neurotoxin, alpha-N-oxalyl-L-alpha,beta-diaminopropionic acid (ODAP). Age, disease duration, clinical severity at onset, and continued consumption of Lathyrus spp., could not be associated with susceptibility to deterioration. Finally, the clinical presentation and pattern of neurological deficit in Spanish peasants with lathyrism closely resembles that of Bangladesh, Ethiopian, Indian, and Israeli patients, but was clearly different from the rapidly progressive disease seen in sporadic amyotrophic lateral sclerosis.

Source: reprintDE

Lathyrism Spain/ Spain lathyrism/ Ruminants/ ODAP/ Neurology/ Famine/ Malnutrition/ Cattle/ Agriculture/ Age/ Amyotrophic lateral sclerosis/ Bangladesh/ Calves/ Central Nervous system/ Ethiopian/ Food/ India/ India malnutrition/ India lathyrism/ Intake/ Lathyrism/ Lathyrism Adolescence/ Lathyrism Aged/ Lathyrism Bangladesh/ Lathyrism Ethiopia/ Lathyrism India/ Lathyrus spp/ Males/ Humans/ Muscles/ Nervous system/ Neurotoxins/ Poultry/ Seed/ Spain/ Susceptibility/ reprint.


Neurolathyrism is a form of spastic paraparesis caused by the neuroexcitatory amino acid 3-N-oxalyl-L-2,3-diaminopropionic acid (_-ODAP) present in the seeds and foliage of Lathyrus sativus. Tolperisone HCl, a centrally acting muscle relaxant, has been shown to reduce significantly the spasticity in neurolathyrism patients. Sporadic occurrence of HTLV-1 infection (0.9%) and of osteolathyrism was found among the neurolathyrism patients. Osteolathyrism is linked to the consumption of the green shoots of Lathyrus sativus.

Source: reprintDE; reprinted with permission. Copyright (1994) Stockton Press
Lathyrism neuronal function and metabotropic glutamate receptors: Spence, P. S. (Eds). Bangladesh-Belgium Inter-University Project Vertisols/ Soil vertisol/ Water/ reprint. Lathyrus sativus/ Amino acids/ Bangladesh/ HTLV/ Infection/ Lathyrism/ Lathyrism motor neurons/ Lathyrism treatment Motor neurons/ Muscles/ Neuroexcitatory/ Neurotoxicity/ Neurotoxins/ ODAP/ Paraplegia/ Seed/ Shoots/ Spasticity/ Spastic paraparesis/ reprint.

Lambein, F.; Haque, R.; Khan, J. K.; Kebede, N., and Kuo, Y.-H. (1994). From soil to brain: Zinc deficiency increases the neurotoxicity of Lathyrus sativus and may affect the susceptibility for the motoneurone disease neuralathyrism. Toxicon 32 (4):461-466 (author affiliation: Laboratory of Physiological Chemistry, Faculty of Medicine, University of Ghent, Ledeganckstraat 35, B-9000 Gent, Belgium) Zinc deficiency and oversupply of iron to the roots of grass pea (Lathyrus sativus) induce increases in the content of the neurotoxin beta-L-ODAP (3-oxalyl-L-2,3-diaminopropanoic acid) in the ripe seeds. The transport of zinc to the shoots is enhanced by the addition of beta-L-ODAP. The neurotoxin of Lathyrus sativus is proposed to function as a carrier molecule for zinc ions. Soils, depleted in micronutrients from flooding by monsoon rains (Indian subcontinent) or otherwise poor in available zinc and with high iron content (Ethiopian vertisols), may be responsible for higher incidence of human lathyrism, one of the oldest neurotoxic diseases known to man. A role for brain zinc deficiency in the susceptibility for lathyrism is postulated. Source: reprintDE Lathyrus sativus Zinc/ Zinc deficiency/ Nutrient manipulation Zinc/ Lathyrism susceptibility/ ODAP Zinc/ Soil Zinc/ Brain Zinc/ Neurology Lathyrus zinc/ Zinc lathyrism/ Zinc/ Waterlogging/ Soil/ Lathyrus sativus Brain/ Chemistry/ Deficiency/ Ethiopia/ Flooding/ Belgium/ Heavy metals/ Incidence/ India/ India L. sativus/ India lathyrism/ Iron/ Lathyrism/ Lathyrism Ethiopia/ Lathyrism India/ Human/ Metals/ Motor neurons/ Neurotoxicity/ Neurons/ Neurotoxicity/ Neurotoxins/ ODAP/ Roots/ Shoots/ Susceptibility/ Trace elements Vertisols/ Soil vertisol/ Water/ reprint.


Miller, S. E. (1994) Aspects of glutamatergic function in astrocytes: glutamine synthetase regulation and metabotropic glutamate receptors [PhD thesis]: University of California, Irvine, 157 pp. The traditional view that astrocytes are passive support cells has begun to give way to a new consensus that these cells have dynamic roles in development, in the response to injury and disease, and in chemical and electrical signalling. In this context, this dissertation examines two aspects of astrocyte glutamatergic function using cultured cortical astrocytes as the model system. First, the effects were examined of exogenously applied excitatory amino acids on glutamine synthetase (GS), a key enzyme in glutamate metabolism. Two excitatory amino acids were identified which induced GS activity: $\beta$-N-Oxalyl-L-$\alpha$/beta-aminopropionic acid ($\beta$-L-ODAP), the putative Lathyrus toxin, and the metabotropic glutamate receptor (mGluR) agonist 1-aminoacyclohexanone-trans-1,3-dicarboxylic acid (trans-ACPD). The abilities of these compounds to induce GS activity were concentration-dependent, stereoselective, and could be reduced by the protein translation inhibitor cycloheximide. The possible significance of these alterations in GS activity for the regulation of glutamate homeostasis is discussed. The ability of the mGluR agonist trans-ACPD to increase GS activity suggested that mGluRs might have important roles in astrocyte function and led to the second series of studies which examined mGluR signal transduction and its regulation in astrocytes. The presence of two metabotropic signal transduction pathways for glutamate was demonstrated: stimulation of phosphoinositide hydrolysis and inhibition of cyclic AMP accumulation. The antagonist $\alpha$-methyl-4-carboxyphenylglycine was shown to block stimulation of phosphoinositide hydrolysis but not inhibition of cyclic AMP accumulation, providing a means to pharmacologically dissociate these two pathways. The glutamate transport inhibitor, L-trans-2,4-pyrrolidine dicarboxylic acid, was shown to also be an mGluR agonist in astrocytes and was particularly effective at reducing cyclic AMP accumulation. The phosphoinositide pathway was modifiable according to the chemical conditions of the culture environment. When astrocytes were cultured in a serum-free defined medium, trans-ACPD produced much larger stimulations of phosphoinositide hydrolysis than had been estimated in previous studies using conventional culture techniques. This increased stimulation appeared to be selective for mGluR agonists and was accompanied by a large increase in the expression of the mGluR5 subtype, as determined by Western immunoblotting. Further studies in serum-free culture revealed that both trans-ACPD-stimulated...
phosphoinositide hydrolysis and mGluR5 expression could be increased by previous exposure of the astrocytes to basic fibroblast growth factor, epidermal growth factor, or transforming growth factor-β/α.

Lathyrism/ODAP toxicity mechanism in Glutamates receptors/ Glutamine synthetase regulation/ Biochemistry/ Neurology/ Nerve cells

Astrocytes/ Amino acids/ California/ cAMP/ Cycloheximide/ Dissertations/ Distribution plants/ Environment/ Enzymes/ Epidermis/ Excitatory amino acid/ Glutamatens/ Glutamine/ Hydrolysis/ Lathyrism Biochemistry/ Lathyrism mechanisms/ Lathyrism ODAP toxicity/ Lathyrism serum

Lathyrus toxicity/ Mechanisms toxicity/ Metabolism plant/ Models/ Nerves/ ODAP/ Protein/ Receptors/ Regulation/ Toxicity ODAP/ Toxicity mechanism ODAP/ Toxicity/ Toxin.


A successful program of eradicating lathyrism depends primarily on the reliability of measuring ODAP, a neurotoxin found in the seeds of Lathyrus sativus. The present methods of assay for ODAP are slow and do not distinguish the beta-isomer from the nontoxic alpha-form. One approach towards specificity in analysis is to use appropriate enzymes that catalyse the reactions of biomolecules. This presentation examines enzymes that may be used to catalyse the reactions of ODAP and its products, with emphasis on analytical potentials. Rapid assays can be developed by using immobilised (insolubilised) enzyme reactors in flow-injection analysis (FIA) and in post-column detections for high performance liquid chromatography (HPLC). Some FIA results
in measuring pyruvate and ammonia (products of a two-step reaction of ODAP) with immobilised L-lactate dehydrogenase (LDH) and L-glutamate dehydrogenase (GluDH) reactors are discussed.

Source: reprintDE

Enzyme catalysis/ Flow injection analysis/ ODAP/ Enzyme based assay ODAP/ ODAP enzyme assay/ ODAP analysis/ Lathyrus sativus Ammonia/ Bioassay/ Chromatography/ Enzymes/ Ethopia/ Glutamates/ HPLC/ HTLV/ Injections/ Isomerism ODAP/ Isomerism/ Lactate dehydrogenase/ Lactate/ Lathyrism Bioassay/ Lathyrism Ethiopia/ Lathyrism viral infection/ Neurotoxins/ ODAP isomerism/ Seed/ reprint.


Source: reprintDE

Lathyrus sativus production Ethiopia/ Ethiopia L. sativus production/ Lathyrus sativus/ Ethiopia/ Lathyrism/ Lathyrism Ethiopia/ reprint.


Source: reprintDE

Lathyrism mechanisms?/ Neurology/ Lathyrism symptoms/ Ethiopia/ Lathyrism/ Lathyrism Ethiopia/ Lathyrism mechanism/ Mechanism Molecular/ Neurolathyrism/ Symptoms lathyrism/ reprint.


[German] Many substances may cause both toxic lesions and clinical syndromes related to the central nervous system. In this paper some aspects of pathogenesis as well as diagnostic problems are reviewed. In particular intoxications with some metals and metalloids, gases and organic compounds including solvents are considered. [References: 21].

Source: Copyright Current Contents

Neurotoxicology/ Encephalopathies/ Pathogenesis/ Diagnostic problems/ Nervous-system/ Lathyrism/ Disease/ Lead/ Review.


Source: reprintDE

Ethiopia L. sativus genetic resources/ Genetic resources L. sativus Ethiopia/ Lathyrus sativus/ Agriculture/ Genetic resources/ Conservation Ethiopia/ Lathyrism Ethiopia/ Genetic resources L. sativus/ reprint.


Source: reprintDE

Lathyrism Ethiopia/ Ethiopia lathyrism/ Lathyrism epidemiology/ Epidemiology lathyrism/ Ethiopia/ Lathyrism/ reprint.


Excellent study and comprehensive review, well worth reading. F2 progeny segregated over entire parental range. ODAP biosynthesis is inherited quantitatively. Cytoplasmic factors appear to be involved. Low x low ODAP crosses resulted in low ODAP progeny. Young seeds contain higher ODAP levels than fully matured seeds! Grass pea (Lathyrus sativus L.) is an important food, feed and fodder legume drought resistant crop. A strong epidemiological association is known to exist between consumption of grass pea and lathyrism. A neurotoxin, $\beta$-N-Oxalyl-L-$\alpha$, $\beta$-diaminopropionic acid (ODAP) has been identified to be the causative principle. This study was undertaken to investigate the mode of inheritance of the neurotoxin, a prerequisite for the development of neurotoxin free or low neurotoxin lines. Five grass pea lines with low to high ODAP concentration were inter-crossed in all possible combinations (both crosses and reciprocals). Parents, FS/sb1S and FS/sb2S progenies were evaluated under field condition and ODAP analyzed by ortho-pthalaldehyde spectrophotometric method. Many of the progenies of low x low ODAP crosses were found to be low in ODAP concentration which indicated that the low ODAP lines shared some genes in common for seed ODAP content. However, wider variation of ODAP in FS/sb2S progenies as compared to
parental and FS/sh1$ progenies, suggested the presence of different modifier genes between lines. The FS/sh1$ progenies of the low ODAP x high ODAP crosses were intermediate in ODAP concentration which indicated lack of complete dominance either by low or high ODAP. The FS/sh2$ progenies segregated covering the entire parental range. The continuous variation, together with very close to normal distribution of the FS/sh2$ population both of low x low and low x high ODAP, crosses indicated ODAP to be quantitatively inherited. Reciprocal crosses produced different results in some cases indicating a maternal effect on ODAP concentration. Broad sense heritability of ODAP concentration was estimated to be in the range of 17 to 93%.

Source: reprintDE.

**Vascular amine oxidase activities during synergistic vasculotoxicity.** Toxicology 89 (1):67-77 (author affiliation: Boor Pj Univ Texas Med Branch Dept Pathol F-05 Galveston, Tx 77555 Usa)

Allylamine (AA) and beta-aminopropionitrile (beta APN) are well known vascular toxins with a demonstrated synergistic toxic effect, i.e. given together they cause extensive smooth muscle cell necrosis of the aortic media. In this study, we investigated the possibility that the enzymes involved in the separate toxicity of AA (semicarbazide-sensitive amine oxidase, or SSAO) and beta APN (lysyl oxidase, or LyO), could be the target(s) of their synergistic toxicity. Adult male Sprague-Dawley rats were given AA alone (AA), 100 mg/kg day, beta APN alone (beta APN), 1 g/kg/day, or both chemicals (AA + beta APN) by gavage for 1, 2, 5 or 10 days. SSAO and LyO were assayed in aorta, lung, and bone. SSAO activity in aortas of rats treated with AA + beta APN showed a maximal decrease (40%) at 10 days; more moderate depression of SSAO was seen in lung and bone. LyO changes were most marked in aorta, where activities were consistently and markedly depressed in all rats receiving beta APN (either alone or in combined treatment). Similarly, the lung and bone LyO activity was depressed at all time points in rats receiving beta APN, but to an apparently lesser degree than in aorta. The most striking changes in in vivo enzyme activities were seen in the aorta, the major target organ in this model. No synergistic effect of the two toxins was seen in the depression of LyO enzyme activity, since there was no difference in the degree of enzyme inhibition present between rats given beta APN alone or AA + beta APN, indicating that inhibition of this enzyme is mainly due to the effect of beta APN. We suggest that AA is the primary toxin in this synergistic vasculotoxic effect. It is likely that some effect of beta APN on AA metabolism or detoxification mechanisms results in synergism. [References: 26].

Source: Copyright Current Contents

Semcarbazide-sensitive amine oxidase/ Lysyl oxidase/ Allylamine/ Beta-aminopropionitrile/ Aorta/ Vascular toxicity/ Smooth-muscle cells

Benzylamine oxidase/ Lysyl oxidase/ Allylamine/ Beta-aminopropionitrile/ Aorta/ Vascular toxicity/ Smooth-muscle cells


Source: reprintDE

Lathyrism chronic Cassava toxicity/ Lathyrus/ Konzo/ Pathogenic mechanism/ Cassava toxicity lathyrism similarities/ Neurology Cassava toxicity/ Child/ Ethiopia/ Lathyrism Ethiopian/ Lathyrism mechanism/ Lathyrus toxicity/ Humans/ Manihot esculenta/ Cassava Mechanisms toxicity/ Sweden/ Toxicity/ Uppsala/ reprint.


A simple and convenient procedure has been developed for the preparation of quick-cooking grass pea seeds. When cooked in boiling water, salt solution and wood ash filtrate, pre-soaked grass pea seeds tenderised within 20 and 40 min, respectively. This corresponds to a reduction of 96 % and 84%, respectively, of the time required to cook untreated grass pea seeds. The process also resulted in leaching of solids to the soaking solutions; these increased with the hydration time. During cooking, leaching of solids to the cooking water decreased with the drop in cooking time. Hydration of grass pea seeds prior to cooking also gave a higher drained weight than without hydration. The process also resulted in loss of minerals, protein, phytate and ODAP. The cooked, quick-cooking seeds, however, had a smooth uniform texture, excellent whole-seed appearance, and a pleasing and acceptable flavour. The quick-cooking process thus should find applications in
parts of Ethiopia which are usually fuel-deficient and where dry grass pea seeds are produced as a stable and high protein food commodity.

Source: reprintDE

Lathyrus sativus processing/ Lathyrus sativus cooking/ ODAP/ Lathyrus sativus/ Ash/ Cookery/ Ethiopia/ Flavour/ Food/ Food processing Food processing L. sativus/ Fuel/ Lathyrism/ Lathyrism Ethiopia/ Mineral/ Phytates/ Processing/ Processing methods L. sativus/ Protein/ Quality Seed/ Soaking/ Water/ reprint.


The neurotoxin beta-N-oxalylamino-L-alanine (BOAA), found in Lathyrus sativus seeds, is thought to be the causative agent of neurolathyrism. We have investigated the neuroprotective effects of free radical scavengers on BOAA-induced toxicity following focal injection (1 mu l) of BOAA and comparing the pathological outcome with the effects of injections of alpha-amino-3-hydroxy-5-methyl-isoxazole-4-propionate (AMPA), kainate (KA) or N-methyl-D-aspartate (NMDA) into the dorsal hippocampus of male Wistar rats. Cellular damage was assessed histologically. BOAA (50 nmol) induced a highly selective pattern of hippocampal damage identical with that seen with AMPA (1 nmol). BOAA-induced neurotoxicity, but not AMPA, KA (0.5 nmol) or NMDA (25 nmol)-induced neurotoxicity, was prevented in a dose-dependent manner by focal co-injection of four potential free radical scavengers; dimethyl sulfoxide (DMSO) (1750-7000 nmol), dimethylthiourea (DMTU) (8000 nmol), dimethylformamide (DMF) (7000 nmol) and mannitol(1000 nmol).

These findings suggest that hippocampal damage induced by BOAA involves an interaction between AMPA receptors and free radicals. [References: 28].


ODAP/ DMSO/ Free Radical/ Neurotoxicity/ Neurolathyrism/ Motor neuron disorder/ Excitatory Amino Acid/ Hippocampus/ ODAP toxicity mechanisms/ Toxicity ODAP/ Free radical scavengers/ Lathyrus sativus/ Neurology/ Biochemistry/ Lathyrus sativus/ Beta Alanine analogs and derivatives/ Amino acids/ Amino acids toxicity/ AMPA receptors/ Aspartic acid/ England/ Injections/ Kainic acid/ Lathyrism/ Biochemistry Lathyrus hippocampus/ Lathyrism mechanisms/ Lathyrism ODAP toxicity/ Lathyrism rats/ Lathyrus toxicity/ LD50/ Mechanisms toxicity Motor neurons/ Neurons/ Neurotoxins/ NMDA/ Prevention lathyrism/ Lathyrism prevention/ Rats/ Receptors/ Rodents/ Seed/ Toxicity L. sativus/ Toxicity L. sativus mechanisms/ Toxicity mechanism ODAP/ Toxicity/ UK.


Ethiopian Nutrition Institute, Addis Ababa, Ethiopia; and Faculty of Medicine, Addis Ababa University Addis Ababa, Ethiopia (RTH & TA)Grass pea is a leguminous crop widely consumed in the central highlands of Ethiopia. It is known to have a toxic effect that can manifest as a medico-social problem in a large number of the population. A comprehensive study under the title of 'The Improvement of Lathyrus sativus and the Eradication of Lathyrism' has been conducted by the medico-nutrition group. As part of this study, a household survey on grass pea preparation and general dietary study has been conducted in Dembia and Fogera sub-districts in Gondar administrative region in 1989. The main purpose of the survey was to study methods used in preparation of grass pea for consumption and at the same time, to assess feeding patterns and food intake of the communities. Two farmers associations were selected, namely Shina (grass pea growing) and Muntura (non-grass pea producing). Random samples of 110 and 114 households from Shina and Muntura Farmers' Associations were respectively selected. Information was collected using a pre-tested questionnaire. Standard dietary survey procedure was followed for the dietary study. Information was collected by 10 trained female enumerators under close supervision. Processed data indicate that grass pea is prepared into shiro, nifro, kollo and kitta for consumption. The grass pea is washed whole or split and heat treated in one way or another before preparing into the desired dish. Approximately 80% of the households surveyed have two main meals during the day. The main dishes are thin leavened bread, injera, and sauce, wot. The injera is prepared from finger millet alone or mixed with teff, corn and sorghum. The sauce is prepared from grass pea alone or grass pea mixed with chickpeas.

Source: Lambein_95_5; reprintDE


Vascular pathology is characterized by important alterations of some vessel macromolecular constituents, such as fibrous proteins, collagens and elastin. The purpose of our study was to establish the activity of benzquercin treatment on such alterations of the vascular wall. As experimental model we used lathyrism induced in mice by chronic administration of beta-amino-propionitril (beta-APN). This compound prevents crosslink-formation in elastin and collagen and provokes a disorganisation of the structure and an alteration of the physiological functions of the vascular wall. The connective tissue of the skin is also impaired simultaneously with that of the blood vessels. We compared by optical and transmission electron microscopy the morphological structure of the aorta and the skin of 3 groups of mice : a normal control group, an other which only received the beta-APN alone and a third one which received the beta-APN and the benzquercin treatment. The second group, injected with beta-APN without treatment, showed important alterations of the structure of the aorta as well as of the skin. Both fibrous proteins, collagen and elastin were concerned by these alterations, the consequence of which was an increase of the permeability of the aorta wall demonstrated with the horse-radish peroxydase as a tracer. The third group, injected with beta-APN and treated with the benzquercin, showed much less morphological disorders than the untreated group and the vascular permeability was also close to normal controls. These results are in favour of a corrective effect of benzquercin treatment on fibrous proteins of connective tissue and may represent one of the components of the therapeutic effects observed in the clinical trials of this drug. [References: 19]. Source: Copyright Current Contents


Briggs, C. J.; Campbell, C. G., and Castell, A. G. (1995). Analysis of grass pea, Lathyrus sativus, and its evaluation as a component of animal feed. In: Yusuf, H. K. M. and Lambein, F. (Eds). Lathyrus sativus and Human Lathyrism: Progress and Prospects, Dhaka: University of Dhaka, pp. 81-84. Use of Lathyrus sativus (L) seed as a component of pig feed was evaluated. Effects on growth, carcass quality and major organs were assessed. There was some reduction in rate of weight gain, but results with up to 20% lathyrus in feed were acceptable for commercial use. Source: reprintDE


Cohn, D. F. (1995). Are other systems apart from the nervous system involved in human lathyrism? In : Yusuf, H. K. M. and Lambein, F. (Eds). Lathyrus sativus and Human Lathyrism: Progress and Prospects, Dhaka: University of Dhaka, pp. 101-102. Twenty five years of following lathyrism patients, who were exposed in 1942 to the grass pea (Lathyrus sativus), point to the fact that not only the central nervous system is involved, but the skeleton, the peripheral nerves and the cornea may also be affected in some patients. It is therefore suggested that the term Human Lathyrism Syndrome (HULAS) be coined for the condition in man. Source: reprintDE Osteolathyrism/ Neurolathyrism/ Skeleton/ Ukraine/ Israel/ Lathyrism/ Cornea/ Peripheral nervous system/ Human Lathyrism Syndrome Lathyrus sativus/ reprint.


Vicia sativa, V. narbonensis, V. ervilia and V. articulata (syn. V. monantha) are well suited for Mediterranean dryland agriculture. The use of these species as grain legumes has been largely restricted to the supplemental feeding of ruminants and draft animals, and in times of famine, this use has sometimes been extended to human consumption. We have studied the unpalatability of V. villosa and V. narbonensis grain, using a porcine feed-intake bioassay. Two different antifeedant principles were isolated. The seed of V. villosa contains the toxic arginine analogue, canavanine1 and that of V. narbonensis the dipeptide gamma glutamyl S-ethyl-cysteine2. Under alkaline conditions, canavanine degrades to deamino-canavanine which is inactive in the bioassay1. Thus, in principle, the major undesirable non protein amino acids in Vicia spp. seeds, can be inactivated by either acidic or alkaline chemical processes. In view of the biological functions for these factors in the ecology of Vicia spp., it appears that post-harvest detoxification could well be the best long-term option for the sustainable development of these crops. Traditional utilisation practices and preparative methods for Vicia grain should now be assessed in detail for their effectiveness in minimising the ingestion of these factors whilst preserving their nutritive properties. Innovative application of this knowledge can reasonably be expected to provide the basis for the wider utilisation of Vicia spp. as grain legumes. 1.

Enneking, D., Giles, L. C., Tate, M. E., Davies, R. L. (1993). L-canavanine: a natural feed-intake inhibitor for pigs (isolation, identification and significance) *J. Sci. Food Agric.* 61, 315-325 2. Enneking, D. 1994, The toxicity of Vicia species and their utilisation as grain legumes. PhD thesis. University of Adelaide, South Australia 3. Mattikala, E J. & Virtanen, A. I. (1962). A new g-glutamylpeptide, g-L-glutamyl-S-(prop-1-enyl)-L-cysteine present in chives (Allium schoenoprasum)3. V. villosa is not a grain legume, but a forage crop. Other species, such as V. articulata and V. ervilia which do also contain canavanine in their seeds are used as grain legumes for supplemental feeding of ruminants. Their use as food for monogastric animals and humans is limited by the presence of canavanine. V. sativa contains the favisin toxin, vicine, as well as the neurotoxic and antinutritional cyanoamino acids, β-cyanoalalnine and gamma glutamyl β-cyanoalanine. The antinutritional non-protein amino acids in V. sativa and V. narbonensis can be inactivated by mild acid hydrolysisis2. Under alkaline conditions, canavanine degrades to deamino-canavanine which is inactive in the bioassay1. Thus, in principle, the major undesirable non protein amino acids in Vicia spp. seeds, can be inactivated by either acidic or alkaline chemical processes. In view of the biological functions for these factors in the ecology of Vicia spp., it appears that post-harvest detoxification could well be the best long-term option for the sustainable development of these crops. Traditional utilisation practices and preparative methods for Vicia grain should now be assessed in detail for their effectiveness in minimising the ingestion of these factors whilst preserving their nutritive properties. Innovative application of this knowledge can reasonably be expected to provide the basis for the wider utilisation of Vicia spp. as grain legumes. 1.


60 of 500 neurolathyrism patients complained of bone pain and showed skeletal deformities. 2 of these were found to have skeletal damage (failure of fusion in both vertebral and iliac epiphyses). Of the 60, all were familiar with the consumption of seeds and green parts of Lathyrus sativus, the latter of which contain 2-cyanoethyl-isoxazolin-5-one, a compound that chemically and metabolically can osteolathyrogen beta-aminopropionitrile.

Source: reprintDE

Osteolathyrism/Neurolathyrism/Bangladesh/BAPN/Isoxazolin-5-one/Isoxazolin-5-one toxicity/Beta aminopropionitrile/Beta aminopropionitrile toxicity/Lathyrus sativus/reprint/2 Cyanoethylisoxazolin 5 one/ NPAA 2-(2-cyanoethyl)-3-isoxazolin-5-one.


Source: reprintDE

Bangladesh economics/Bangladesh L. sativus/Bangladesh lathyrism/Bangladesh nutrition/Bangladesh poverty/Bangladesh socioeconomics/Socioeconomics Bangladesh/Socioeconomics L. sativus/Socioeconomic constraints/Socioeconomic Factors/Socioeconomics Socioeconomics Bangladesh/Lathyrus sativus/reprint.


Source: reprintDE


Source: reprintDE

Neurolathyrism/HTLV/HTLV 1/HTLV-1 lathyrism/Bangladesh/lathyrism/Lathyrus sativus/reprint.


Neurolathyrism is a form of human spastic paraparesis related to the overconsumption of the legume Lathyrus sativus or grass pea (Khesari in Bangladesh) containing the neurotoxin 3-N-oxalyl-2,3-diaminopropanoic acid (beta-ODAP). The clinical symptoms of neurolathyrism are similar to those of Tropical Spastic Paraparesis. In order to eliminate the proposed causative agent of TSP (HTLV-I) as a potential cause of the symptoms ascribed to neurolathyrism, a total of 444 diagnosed lathyrism patients were screened for HTLV-I antibodies. 50 CSF and 394 serum samples were collected from male (415) and female (29) patients. Only 4 serum samples were found sere-positive for HTLV-I. This agrees with the assumption that overconsumption of beta-ODAP containing Lathyrus seeds, and not HTLV infection, is the causative agent for neurolathyrism.

Source: Reprinted with permission of the authors

Neurolathyrism/Tropical Spastic Paraparesis/HTLV 1/Cerebrospinal Fluid/ODAP/Bangladesh lathyrism/Neurology/Lathyrus sativus Lathyrism symptoms/Antibodies/Bangladesh/Female/Belgium/HTLV/Immunology/Infection/Khesari/Lathyrism/Lathyrism Bangladesh Lathyrism cerebrospinal fluid/Lathyrism serum/Lathyrism viral infection/Males/Humans/Neurotoxins/Seed/Spasticity/Spastic paraparesis Symptoms lathyrism/Tropics.


Fe 2+ and Zn 2+ ions can modulate the biosynthesis of ODAP.

Source: reprintDE

ODAP/ODAP Zinc/Tissue culture/Callus/Callus culture/Zinc/Iron/Lathyrus sativus/Lathyrus sativus biochemistry/Biochemistry Biosynthesis ODAP/Biosynthesis/ODAP biosynthesis/reprint.


Source: reprintDE
Environmental effects/ Environment x genotype/ Salinity/ Water stress/ ODAP/ ODAP environmental variation/ Fertiliser/ Micronutrients/ Trace elements/ Water/ Water relations/ Lathyrus sativus/ reprint.

Source: reprintDE
Lathyrus sativus/ NPAA biosynthesis/ In vitro/ Biosynthesis/ Isoxazolin-5-one/ Biochemistry L. sativus/ Toxin/ Toxin biosynthesis/ reprint.

Source: reprintDE
Synapses/ Synaptic Membranes metabolism/ ODAP receptors/ Neurology/ Biochemistry/ Lathyrus sativus/ reprint.

Source: reprintDE
Strategy/ Recommendations/ Lathyrus sativus/ reprint.

Source: reprintDE
Environmental effects/ Environment x genotype/ Sulfur/ Cysteine Synthase/ ODAP environmental variation/ Belgium/ Lathyrus sativus/ Toxicity L. sativus/ Toxicity ODAP/ Toxicity/ reprint.

Source: reprintDE
NPAA analysis/ NPAA chemistry/ Isoxazolin-5-one/ HPLC/ ODAP/ Lathyrus sativus chemistry/ Chemistry/ Toxin/ Lathyrus sativus/ reprint.

Data are presented which suggest a disturbance of amino acid metabolism caused through the consumption of L. sativus/ and associated factors. Glu, Tau, Gly were higher in lathyrism patients.
Source: reprintDE
reprinted with permission Copyright 1995 Munksgaard Publishers, Copenhagen
Cerebrospinal fluid amino acid analysis/ Lathyrism/ CSF aa profile/ Lathyrism patients/ Neurology/ Lathyrus sativus/ Amino acids/ Amino acids analysis/ Cerebrospinal fluid/ Excitatory amino acid/ Lathyrism/ Lathyrism cerebrospinal fluid/ Metabolism plant/ Motor neurons/ Neurotoxins/ Neurons/ Prevalence/ reprint.

Source: reprintDE
Cerebrospinal fluid/ Cerebrospinal fluid amino acid analysis/ Human consumption L. sativus/ Neurotoxins/ Neurology Examination/ Neurotoxins/ Neurotoxins analysis/ Glutamates/ Glycin/ Lathyrus sativus/ reprint.

Source: reprintDE
Pakistan/ Pakistan L. sativus/ Lathyrism epidemiology/ Lathyrism Pakistan/ Lathyrus sativus production/ ODAP/ Surveys/ Socioeconomics/ Lathyrus sativus/ reprint.

Source: reprintDE
Fermentation/ Fermentation L. sativus/ Fermentation L. sativus detoxification/ Aspergillus oryzae/ Rhizopus oligosporus/ SDS PAGE/ Protein Protein electrophoresis/ ODAP/ ODAP analysis/ Nutrition/ Nutritive value/ Processing/ Processing L. sativus/ Processing methods L. sativus Tempel/ Post harvest processing L. sativus/ Postharvest detoxification/ Detoxification/ Detoxification L. sativus/ Detoxification L. sativus fermentation/ Lathyrus sativus/ reprint.

Source: reprintDE
Lathyrus sativus/ NPAA biosynthesis/ In vivo/ Biosynthesis/ ODAP biosynthesis/ Biochemistry L. sativus/ Biosynthesis ODAP/ ODAP Biochemistry/ reprint.

Source: reprintDE
Lathyrus sativus/ ODAP biosynthesis/ Biosynthesis ODAP/ Biochemistry/ reprint.

Source: reprintDE
BIA/ ODAP/ Lathyrus sativus low ODAP/ NATO/ EEC/ Isoxazolin-5-one/ Bangladesh/ Belgium/ ODAP/ Biosynthesis/ Biochemistry

Source: reprintDE
Genetic resources/ Genetics/ Genetics flower colour/ Polymorphism L. sativus/ Polymorphisms/ Flower colour polymorphism/ Flower colour ODAP L. sativus ODAP screening/ India/ Genetic resources L. sativus/ Lathyrus sativus/ reprint.

Source: reprintDE
Somaclones/ Somaclones L. sativus/ ODAP/ Lathyrus sativus low ODAP/ India/ Lathyrus sativus/ reprint.

Source: reprintDE
ODAP/ Molecular biology/ Genetics/ Lathyrus sativus/ ODAP biosynthesis/ Phenology/ Tissue culture/ Callus culture/ reprint.

Source: reprintDE
Human consumption L. sativus/ Human metabolism ODAP/ ODAP/ ODAP bioassay/ ODAP metabolism/ Volunteers/ Lathyrus sativus/ reprint.


absorbance of the nitrile group (-CN) near 2250 cm\(^{-1}\) provides a useful method for monitoring its presence in food or feed samples and also its loss during in situ acid catalysed hydrolysis of the seeds. It will also be important for screening germplasm.

Source: reprintDE

Vicia spp toxicity/ Postharvest detoxification/ Vicia sativa/ Poultry bioassay/ Layers/ Feed intake/ Egg production/ Poultry bioassay/ Lathyrus sativus/ Bioassay/ NPAA gamma glutamyl peptides/ Agriculture/ Genetic resources/ Beta cyanoaalanine/ Beta Alanine analogs and derivatives Colour/ Cotyledons/ Cultivars/ Detoxification/ Dietary intake/ Dispersion/ Eggs/ Favism/ Feed/ Feed Vicia sativa/ Feed Lathyrus sativus/ Food Gamma glutamyl beta cyanoaalanine/ Gamma glutamyl peptides/ Glycosides/ HCN/ Human consumption/ Hydrolysis/ Diet/ Dietary/ Intake Lathyrism Bioassay/ Lathyrus toxicity/ Layers/ Lens culinaris/ Humans/ Nitriles/ NPAA/ Peptides/ Postharvest/ Poultry/ Reports/ Screening Seed/ Toxicity L. sativus/ Toxicity/ Toxin/ Vicia spp/ Vicina/ Vicine/ reprint.


Source: reprintDE

Socioeconomics/ Socioeconomics L. sativus/ Processing/ Processing methods L. sativus/ Production L. sativus/ Ethiopia/ Ethiopia L. sativus Ethiopia lathyrism/ Ethiopia food/ Ethiopia nutritional survey/ Lathyrus sativus/ reprint.


Results indicate that the acute in vivo hippocampal toxicity if beta-ODAP in the rat is mediated by AMPA receptors, rather than by KA or NMDA receptors. Neurones in the rat hippocampus did not die immediately on exposure to beta-ODAP, but via a process involving sustained AMPA receptor activation. It is proposed that excitotoxic processes acting via AMPA receptors may play a role in the loss of upper motor neurones that occurs in neuralathyrism.

Source: reprintDE

ODAP/ ODAP toxicity mechanism/ NMDA/ NMDA receptors/ AMPA receptors/ KA receptors/ Neurology/ Neurons/ Neurotoxicity/ Rats Rodents/ Neurotoxicism/ NBQX/ Lathyrus sativus/ reprint.


Source: reprintDE

Lathyrus sativus/ Bangladesh/ Belgium/ HTLV-1/ Osteolathyrism/ Epidemiology lathyrism/ Lathyrism epidemiology/ Demography Socioeconomics/ ODAP analysis/ Poultry bioassay/ Zinc/ Environmental effects/ Trace elements/ reprint.


Source: reprintDE

Lathyrus sativus/ Lathyrus sativus breeding/ Nepal/ Nepal L. sativus/ reprint.


Our results show that the grass pea (Lathyrus sativus L.) is tolerant to drought and barren land, and that it is resistant to pea weevil. About 20,000 ha of grass pea were grown in North Shaanxi in recent years, with a stable yield 20% higher than pea (Pisum sativum L.). Human lathyrism was a serious problem in the Chinese province of Gansu in the seventies. The same varieties grown in different localities produced seeds with the same content of ODAP. From 50 varieties of L. sativus (with 0.03 to 0.87% ODAP) we selected six varieties with toxin content of 10.2%, giving virtually no visible symptoms in young chicks. One species of Lathyrus was found to be free of ODAP. Different varieties of grass pea or different species of Lathyrus have different compositions of esterase isozymes. This variability may be useful as a method to identify grass pea varieties, to select the parents for cross-breeding as a strategy for developing lower toxin varieties of Lathyrus sativus.

Source: reprintDE

Lathyrus sativus/ Lathyrus cicera/ Lathyrus latifolius/ Lathyrus odoratus/ Lathyrus sativus China/ Lathyrus sativus low ODAP/ Lathyrus sativus ODAP/ Lathyrus sativus ODAP screening/ Lathyrus sylvestris/ China/ China Shaanxi/ China Gansu/ Shaanxi/ Gansu/ China L. sativus


Source: Lambein_95_5; reprintDE

Lathyrus sativus toxicity/ Lathyrism/ Chick bioassay-ODAP antagonism/ Antagonism ODAP-homoarginine/ ODAP-homoarginine antagonism ODAP toxicity/ Biochemistry/ Lathyrus sativus/ Bioassay/ Bioassay L. sativus/ Lathyrus sativus bioassay/ Antagonism amino acids Bangladesh/ Chemistry/ Chickens/ Belgium/ Homoarginine/ Lathyrism Bangladesh/ Lathyrism Bioassay/ Lathyrism Biochemistry/ Lathyrism nutrition/ Lathyrism ODAP toxicity/ Lathyrus toxicity/ Humans/ Nutrition/ ODAP/ Physiology not plant/ Phytochemistry/ Poultry/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity L. sativus poultry/ Toxicity/ Toxicin reprint.


Source: reprintDE

Post harvest processing L. sativus/ Protein isolates/ Protein L. sativus/ Protein quality L. sativus/ Protein quality/ Digestibility/ Amino acid composition/ Nutritive value/ Lathyrus sativus/ Bangladesh/ Toxicin/ reprint.


Source: reprintDE

ODAP/ ODAP toxicity ions/ ODAP/Zinc/ Zinc/ Zinc lathyrism/ Poultry/ Chick bioassay/ Chickens/ Bangladesh/ Bangladesh lathyrism Bangladesh nutrition/ Lathyrus sativus/ reprint.


Two northwestern districts of Bangladesh with a population of 629,752 were surveyed from June 1991 to March 1993 to detect and follow up lathyrism patients. Out of 2,567 neurological patients, 882 were diagnosed as having lathyrism, giving a prevalence rate of 14.0/10,000. This prevalence was higher among young males: only 12.9% of the patients were female, and only 19.3% of the patients were over 30 years of age at onset of the disease. The average family size was 4.6 members. In the surveyed area, 730 families were evaluated: 622 families had only 1 affected member, and 108 families had 2-8 affected members. Most of the patients were working, while only 4% were not. The majority of the patients had a very low intake of animal protein. A few cases of human T-lymphotropic virus infection and osteolathyrism were found during this study. [References: 28].

Source: reprintDE

Animal Protein Intake/ Bangladesh lathyrism/ Lathyrism Epidemiology/ Human nutrition animal protein/ HTLV/ Ostolathyrism Bangladesh Osteolathyrism human/ Virology/ Osteolathyrism/ Age/ Bangladesh/ Epidemiology lathyrism/ Female/ Belgium/ Infection/ Intake/ Lathyrism Lathyrism animals/ Lathyrism Bangladesh/ Lathyrism nutrition/ Lathyrism viral infection/ Males/ Humans/ Nutrition animal/ Nutrition Population/ Prevalence/ Protein/ Reprint.


A superoxide dismutase 1 (SOD-1) genetic defect has been identified in familial amyotrophic lateral sclerosis (ALS) and motor neuron degeneration has been described in SOD-1 transgenic mice. Because an excitotoxic mechanism has been implicated in ALS, we undertook studies to provide a description of excitotoxic degeneration of spinal motor neurons for comparison with the degenerative process observed in SOD-1 transgenic mice. Excitotoxin agonists selective for each of the three major types of ionotropic glutamate receptors were applied directly onto the lumbar spinal cord of 21-day-old rats following posterior laminectomy. N-methyl-D-aspartate (NMDA) preferentially affected dorsal horn neurons, whereas the non-NMDA agonist, kainic acid, preferentially affected motor neurons. Cytopathological changes in motor neurons closely resembled those described in SOD-1 mice. These changes consist of massively swollen neurons...
dendritic processes in the presence of well-preserved presynaptic axon terminals; cell bodies of motor neurons
tilled with vacuoles that originate both from endoplasmic reticulum and mitochondria; pleomorphic changes
in mitochondria; axons of motor neurons becoming swollen proximally with accumulation of vacuoles,
organelles, filaments, and degeneration products in the swollen segment. The observed changes in motor
axons resemble changes described in the spinal cord of ALS patients. These findings are consistent with the
proposal that motor neuron degeneration in ALS may be mediated by an excitotoxic process involving
hyperactivation of non-NMDA glutamate receptors. [References: 55].

Source: Copyright Current Contents
AMPA/ Amyotrophic lateral sclerosis/ DI-homocysteic acid/ Excitotoxicity/ Kainic acid/ Nmnd/ Sod-l/ Rat spinal-cord/ Abnormal glutamate
metabolism/ Amino-acids Parkinsonism-dementia/ Axonal swellings/ Cell-culture/ Kainic acid Brain/ Neurotoxicity/ Lathyism.

and its biosynthetic precursor on the electrophysiological activity of cloned glutamate receptors.
Environmental Toxicology and Pharmacology 2 (4):339-342
3-N-Oxalyl-L-2,3-diaminopropanoic acid (beta-ODAP) induces neurolathyrism, a motor neuron disease.
To elucidate the pathogenic mechanism of this process, the action of beta-ODAP on the excitatory amino acid
(EAA) receptor-mediated currents was examined using cloned EAA receptors expressed in Xenopus oocytes.
On the voltage-clamp recordings of an AMPA receptor(alpha(1)/alpha(2) heterooligomer), beta-ODAP was a
strong agonist on this receptor, the potency being almost the same as L-glutamate. On the other hand,
beta-ODAP had little effect on the glutamate-evoked currents through the expressed NMDA receptor (NR1(A)
NR2A), but showed a weak inhibitory effect on the glycine-modulatory site. beta-ODAP may cause the
neurodegenerative disease, neurolathyism, mainly through the excitotoxic interaction with AMPA receptors.
[References: 16].

Source: Reprinted with permission of the authors
AMPA receptor/ NMDA receptors/ Neurology/ ODAP/ Xenopus oocyte/ Neurolathyism/ Lathyrus sativus toxicity/ Lathyrus sativus/ Toxicity
Lathyism.

Neurological Sciences 139 (Suppl S):53-59 (author affiliation: Ludolph Ac Humboldt Univ Berlin Dept
Neurol Schumannstr 20-21 D-10098 Berlin GermanyOreg Hlth Sci Univ Dept Neurol Portland, Or 97201
UsaOreg Hlth Sci Univ Ctr Res Occupat & Environm Toxicol Portland, Or 97201 Usa)
Although neurotoxic models for progressive degeneration of both the anterior horn cell and the Betz cell do
not exist, (neuro)lathyrism and neurocassavaism (konzo) are examples of self-limiting neurotoxic disorders that
predominantly target the Betz cell. Both disorders are caused by the continuous intake of neurotoxic plant
products (Lathyrus sativus and Manihot esculenta, respectively) which result in a virtually identical clinical
picture of spastic paraparesis. A neurotoxic excitatory amino acid and AMPA agonist
(beta-N-oxalylamino-L-alanine, BOAA) is held largely responsible for lathyrism. Epidemics of konzo are
strongly associated with increased intake of the cyanide-liberating glycoside linamarin by protein-poor
subjects. Whereas an animal model for neurocassavism does not exist, macaques fed Lathyrus sativus or
BOAA develop central motor deficits with corticospinal tract involvement. Estimated dosages of Lathyrus
sativus used to induce beginning lathyrism in well-nourished primates are 10-20 fold greater than those
implicated in the origin of the outbreaks and infection was found on seed of three of 14 cultivars tested. In
neurodegenerative disease, neurolathyism, mainly through the excitotoxic interaction with AMPA receptors.
[References: 58].

Source: Copyright Current Contents
Motor neuron disease/ Neurolathyism/ Neurocassavaism/ Konzo/ Free Radical/ ODAP/ Neurology/ Antinutritional factors/ Lathyrus sativus
Beta Alanine analogs and derivatives/ Amino acids/ AMPA receptors/ Anterior horn/ Blood brain barrier/ Blood/ Brain/ Cyanides/ Energy
metabolism/ Excitatory amino acid/ Glycosides/ HCN/ Intake/ Lathyism/ Lathyism animal models/ Lathyism animals/ Lathyism
chronic Cassava toxicity/ Lathyism motor neurons/ Lathyism toxicity/ Primates/ Humans/ Manihot esculenta/ Cassava/ Metabolism/ Models
Motor neurons/ Neurons/ Neurotoxins/ Proteins/ Receptors/ Spasticity/ Spastic paraparesis/ Toxicity ODAP/ Toxicity L. sativus/ Toxicity
Lathyism.

Reed, P. J.; Dickens, J. S. W., and Oneill, T. M. (1996). Occurrence of anthracnose (Colletotrichum
acutatum) on ornamental lupin in the united kingdom. Plant Pathology 45 (2):245-248 (author affiliation:
Reed Pj Maff Cent Sci Lab Hatching Green Harpenden Al5 2bd Herts EnglandAdas Hort Cambridge Cb2 2bl
England)
The first recorded outbreak of anthracnose (Colletotrichum acutatum) on ornamental lupin in the
United Kingdom occurred in 1989. Seedborne infection by Colletotrichum acutatum was investigated after seed
was implicated in the origin of the outbreaks and infection was found on seed of three of 14 cultivars tested. In
pathogenicity tests, typical anthracnose symptoms developed only on plants of Lupinus spp; there were slight
symptoms on Pisum sativum, Vicia sativa and Lathyrus odoratus, but none on Vicia faba, Phaseolus coccineus, P. vulgaris and Onobrychis viciaefolia. [References: 9].

Source: Copyright Current Contents


The germplasm collections at ICARDA of faba bean, chickpea, lentil and forage legumes have been exploited by breeding programmes in the West Asia and North Africa region for production of improved cultivars. The first lines distributed were taken directly from the germplasm collections after initial evaluation. This formed the first flush of releases by national programmes, with 56 of 105 cultivars emanating from germplasm. A systematic evaluation of the food legumes for a wide range of morpho-agronomical characters based on the IBPGR/ICARDA descriptors has led to publication and widespread distribution of catalogues which, in turn, have led to an extensive use of the germplasm by national breeding programmes. In the period of 1990-1994, more than 5000 accessions of food legumes and more than 1900 accessions of forage legumes have been distributed per year. The most important use made of the germplasm collections has been their exploitation as a source for resistances and tolerances to biotic and abiotic stresses. These legumes often suffer severe yield loss due to disease and environmental stress; consequently, screening procedures were developed for the major biotic and abiotic stresses and were successfully applied in selecting sources of resistances and tolerances. The germplasm collections have also been used to improve the nutritional quality of these crops, both for human and animal consumption. Most of the food legume collections have been screened for protein content. The Lathyrus spp. collections have yielded lines with low levels of the neurotoxin ODAP (beta-N-Oxalyl-L-alpha,beta-Diaminopropionic Acid), which causes Lathyrism in humans and animals. These lines are being used extensively in the breeding programme. In addition to maintaining collections of the cultigens, ICARDA has also assembled large collections of wild relatives and progenitors of lentil and chickpea; and wild and weedy forms of the forage legume species. In the past five years the wild Lens and Cicer collections have been evaluated for resistances to biotic and abiotic stresses. These have been useful in providing sources of new, improved or multiple-stress resistance. They have also been useful in increasing yield potential and adaptation of the cultigens. [References: 71].

Source: reprintDE


A strong epidemiological association is known to exist between the consumption of grass pea and lathyrism. A neurotoxin, beta-N-Oxalyl-L-alpha, beta-diaminopropanoic acid (ODAP) (ODAP) has been identified as the causative principle. This study was undertaken to investigate the mode of inheritance of the neurotoxin ODAP, flower and seed coat colour in grass pea. Five grass pea lines with low to high ODAP concentration were inter-crossed in all possible combinations to study the inheritance of the neurotoxin. Parents, F-1 and F-2 progenies were evaluated under field condition and ODAP analyzed by an o-phthalaldehyde spectrophotometric method. Many of the progenies of low x low ODAP crosses were found to be low in ODAP concentration indicating the low ODAP lines shared some genes in common for seed ODAP content. The F-1 progenies of the low ODAP x high ODAP crosses were intermediate in ODAP concentration and the F-2 progenies segregated covering the entire parental range. This continuous variation, together with very close to normal distribution of the F-2 population both of low x low and low x high ODAP crosses indicated that ODAP content was quantitatively inherited. Reciprocal crosses, in some cases, produced different results indicating a maternal effect on ODAP concentration. Blue and white flower coloured lines of grass pea were inter-crossed to study the inheritance of flower colour. Blue flower colour was dominant over the white. The F-2 progenies segregated in a 13:3 ratio indicating involvement of two genes with inhibiting gene
interactions. The gene symbol LB for blue flower colour and LW for white flower colour is proposed.

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In a study of 500 patients suffering from neurolathyrism in Bangladesh it was found that 60 (all male) complained of bone pain and showed skeletal deformities suggestive of osteolathyrism. On X-ray examination a failure of fusion in both vertebral and iliac epiphyses was found in two patients. At the age of these patients (30 and 37 years) such failure was considered a clear evidence of osteolathyrism. All 60 patients were accustomed to eating the green parts of Lathyrus sativus, which contain 2-cyanoethyl-isoxazolin-5-one, a compound that chemically and metabolically can produce the osteolathyrigen beta-aminoproponitrile (BAPN), as well as foods made from the seeds of the same plant which contain the neurotoxin 3-N-oxalyl-2,3-diaminopropanoic acid (beta-ODAP).

Source: reprintDE


Excitatory amino acid (EAA) transporters are of physiological importance in the regulation of the extracellular concentration of excitatory amino acids and the neuroexcitation in CNS. Among four identified transporters, the Na+-dependent high-affinity L-glutamate/L-aspartate transporter (GLAST) is highly expressed in glial cells. Here, we report a naturally occurring inhibitor of GLAST, derived from bovine retina, using the Xenopus oocyte expression system. beta-(Isoxazolin-5-on-4-yl)-L-alanine (TAN), an antifungal antibiotic, inhibited [C-14]L-glutamate (L-Glu) transport into GLAST-expressing oocytes. TAN also served as a substrate for this transporter in voltage-clamp experiments measuring the current coupled to the EAA transport. The maximum current of TAN itself was approximate to 1/3 of that of L-glutamate, and its apparent affinity was almost the same as L-Glu. In combination with L-Glu, TAN antagonized L-glutamate transport. In radioisotope experiments, the inhibitory potency of this compound against [C-14]L-Glu uptake into oocytes was approximate to 1/6 of that of L-glutamate, and its apparent affinity was almost the same as L-Glu. In combination with L-Glu, TAN antagonized L-glutamate transport. In radioisotope experiments, the inhibitory potency of this compound against [C-14]L-Glu uptake into oocytes was approximate to 1/6 of that of L-glutamate, and its apparent affinity was almost the same as L-Glu. In combination with L-Glu, TAN antagonized L-glutamate transport. In radioisotope experiments, the inhibitory potency of this compound against [C-14]L-Glu uptake into oocytes was approximate to 1/6 of that of L-glutamate, and its apparent affinity was almost the same as L-Glu. In combination with L-Glu, TAN antagonized L-glutamate transport. In radioisotope experiments, the inhibitory potency of this compound against [C-14]L-Glu uptake into oocytes was approximate to 1/6 of that of L-glutamate, and its apparent affinity was almost the same as L-Glu. In combination with L-Glu, TAN antagonized L-glutamate transport.

Source: reprintDE


The efficacy and safety of oral Tolperisone HCL was evaluated in double blind, placebo-controlled, randomized trial in 72 patients with neurolathyrism in stages I, II, and III of the disease at Kolla Duba Health Centre of Dembia District of North Gondar between January and April 1995. Taken orally daily for 12 weeks, tolperisone: HCL (Mydocalm) in a dose of 150 milligrams (mgs) twice daily significantly improved subjective complaints such as muscle cramps.; heaviness of the legs, startle attacks, flexor spasms and repeated falls.; An overall subjective improvement was observed in 75% of the patients on tolperisone HCL and 39% of the placebo group (P=0.002). When-objectively assessed spastic muscle tone in the abductors, stiffness of Achilles and spontaneous ankle clonus were significantly reduced in tolperisone HCL group (P values = 0.001 0.04, and 0.0001, respectively). Walking ability and speed of walking was also significantly improved. The drug is most effective in relieving symptoms of stage I and stage II disease. Some adverse effects like muscle pain, generalized body-weakness and, dizziness were recorded in patients taking the drug but all were minor and self limited, none requiring discontinuation of treatment. It is concluded that tolperisone is a well tolerated and efficacious drug for symptomatic treatment of neurolathyrism. [References: 17].

References: 18.

Source: reprintDE

The naturally occurring beta-form of N-oxalyl diaminopropionic acid (beta-ODAP) present in Lathyrus sativus is the main neurotoxic principle implicated in neuro-lathyrism. The alpha-form of ODAP has been shown to be less toxic to experimental animals. Therefore, the extent of isomerisation of the toxin from the beta-form to the alpha-form during cooking might determine the toxicity of L. sativus seed. The results of the present study reveal that there is a temperature- and time-dependent isomerisation of the beta-form to the alpha-form. The extent of conversion of beta-ODAP to its alpha-form was determined in some common Indian cooking preparations and was found not to exceed 40%. It seems likely that the toxicity of L. sativus seed due to beta-ODAP is only partially removed during cooking and that a significant proportion of the toxin (about 60%) remains as the toxic beta-form. (C) 1997 Elsevier Science Ltd. All rights reserved. [References: 21].

ODAP isomerism/ Isomerism ODAP/Lathyrus sativus processing/ Processing L. sativus.


Lathyrus sativus/ Lathyrus sativus review/ Review L. sativus/ Lathyrism/ Lathyrism review/ Review lathyrism.


In the present study we describe changes in aorta at the protein level associated with allylamine (AA) and beta-aminopropionitrile (beta APN) induced vascular toxicity in a rat model. This model represents a remarkable synergistic, necrotizing toxic effect of these combined toxins, and our rationale was to examine protein expression in order to shed light on the mechanisms underlying this synergism. Rats were given AA (100 mg/kg body weight/day) and beta APN (1 g/kg body weight/day) by gavage for 10 d; this protocol has been shown to result in smooth-muscle necrosis, but no visible connective tissue changes. Soluble and insoluble fractions from AA + beta APN-or from beta APN-treated aorta showed enhanced expression of three high-molecular-weight protein bands (ranges between approximately 120 and 95 kD). The time course of induction of proteins showed the appearance of AA + beta APN-induced specific proteins at d 3 of AA + beta APN treatment. Partial purification and characterization suggested that AA + beta APN specific proteins are likely to be collagen proteins (type I). Thus, the data presented in this article help in understanding the vascular toxicity induced by AA + beta APN or by beta APN, in that we have described an altered phenotypic expression of collagenous proteins indicative of selective medial vascular toxicity. [References: 28].

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Smooth-muscle cells/ Sensitive amine oxidase/ Gel-electrophoresis Toxicity/ Collagen/ Rat/ Lathyrism/ Coronary/ Disease Invitro.


Collagen and elastin fibres are of major importance in providing the aorta with tensile strength and elasticity. The presence of cross-links in collagen and elastin is essential for the mechanical stability of collagen and elastin fibres. beta-aminopropionitrile (BAPN) reduces the formation of cross-links by inhibiting the enzyme lysyl oxidase. Young rats were injected with BAPN to inhibit the formation of cross-links, and the changes in the biomechanical and biochemical properties of the thoracic aorta were studied. The biomechanical analyses of aortic samples from BAPN-treated rats showed a significantly increased diameter (1.64 +/- 0.02 mm), a significantly reduced maximum load (1.08 +/- 0.08 N), and a significantly reduced maximum stiffness (3.34 +/- 0.10 N) compared with controls (1.57 +/- 0.02 mm, 1.55 +/- 0.04 N and 4.49 +/- 0.14 N, respectively). No changes in the concentrations of collagen and elastin were found. The content of pyridinoline? a mature collagen cross-link, was significantly decreased by 49% in the BAPN-treated group compared with controls. No changes in the concentration of desmosine+ isodesmosine, the major cross-links of elastin, were found. The present study shows that cross-links are essential in providing mechanical stability of the aorta. Even a partial inhibition of the cross-linking processes results in a destabilisation of the aortic wall with increased diameter and reduced strength and stiffness. (C) 1998 Elsevier Science Ireland Ltd. All rights reserved. [References: 60].

Three hundred and thirty three patients in the lathyrism endemic rural Estie district of Northern Ethiopia were interviewed and examined to assess the psychosocial impacts of neurolathyrism. The majority of the affected were in the age group of 11-20 years (43%) followed by 21-30 years (29%). Males were more affected than females (4.8:1). Peak 1 occurrences of neurolathyrism was observed at time of mobilization of the population in villagization and land diversification schemes. Females were affected to lesser extent and at an earlier age than males. Neurolathyrism affected matrimony among the rural farming population where marriage is considered as the most significant social achievement of any young member of the society. Divorce rate due to paralysis was 28%. It also influenced the choice of occupation among the afflicted rural people. Many males went into ecclesiastical professions. A significant number of males also took up occupations which traditionally were considered to be exclusively for women like basketry and embroidery. More females, not withstanding their age, were engaged in cattle-keeping. During the study, the rural communities were made aware of the association of neurolathyrism and consumptions of grass pea seed. It is believed that this step will enable communities to use home-based detoxifying methods and resort to alternate crops during times of food shortage. [References: 11].

Source: Copyright Current Contents

Lathyrism/ Ethiopia/ Epidemiology.