Leading Published Medical Research Regarding Natural Clinoptilolite Zeolite

Meta-Analyses/Literature Reviews/Safety Review

Critical Review on Zeolite Clinoptilolite Safety and Medical Applications in vivo.
Kraljević Pavelić S, Simović Medica J, Gumbarević D, Filošević A, Pržulj N, Pavelić K.
https://pubmed.ncbi.nlm.nih.gov/30538633/

Commentary: This analysis is published in the Official NIH Records.

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Zeolite: "The Magic Stone"; Main Nutritional, Environmental, Experimental and Clinical Fields of Application.
Carmen Laurino and Beniamino Palmieri.
https://pubmed.ncbi.nlm.nih.gov/26268084/

—

La roca magica: uses of natural zeolites in agriculture and industry.
Mumpton FA.
https://pubmed.ncbi.nlm.nih.gov/10097058/

—

Clinoptilotite-heulandite: applications and basic research.
Thomas Armbruster
https://www.sciencedirect.com/science/article/abs/pii/S0167299101811836

—

The application of natural zeolites for mercury removal: from laboratory tests to industrial scale.
A. Chojnacki, K. Chojnacka, J. Hoffmann, H. Górecki,
https://www.sciencedirect.com/science/article/abs/pii/S0892687504000585

—

Modification of natural zeolites and their applications for heavy metal removal from polluted environments: Challenges, recent advances, and perspectives.
Marin Senila, Oana Cadar
https://pubmed.ncbi.nlm.nih.gov/38352776/

—

Scientific Opinion on the safety and efficacy of clinoptilolite of sedimentary origin for all animal species
EFSA Panel on Additives and Products or Substances used in Animal Feed (FEEDAP)
https://scholar.google.com/scholar_lookup?journal=EFSA+J.&title=Scientific+Opinion+on+the+safety+and+efficacy+of+clinoptilolite+of+sedimentary+origin+for+all+animal+species.&volume=11&publication_year=2013&pages=1-14&

Poison Binding with Clinoptilolite Zeolite

Heavy Metals

In Living Organisms

Clinical evidence supporting the use of an activated clinoptilolite suspension as an agent to increase urinary excretion of toxic heavy metals. (in humans)
Flowers J, Lonky SA, Deitsch EJ
https://www.dovepress.com/clinical-evidence-supporting-the-use-of-an-activated-clinoptilolite-su-peer-reviewed-fulltext-article-NDS

—

Novel, oxygenated clinoptilolite material efficiently removes aluminium from aluminium chloride-intoxicated rats in vivo.

https://www.sciencedirect.com/science/article/pii/S1387181117303116?via%3Dihub

> Highlight:
> -“Our results add knowledge on toxicology and safety properties of clinoptilolite materials as no aluminium leakage was observed from clinoptilolite materials into the blood or organs of tested animals. Presented results therefore, prove for the first time the efficiency of clinoptilolite in detoxification of aluminium in vivo, provide scientific data on clinoptilolite safety issues and usage for detoxification purposes."

—

The Impact of Long-Term Clinoptilolite Administration on the Concentration Profile of Metals in Rodent Organisms.

Ivan Dolanc, Lejla Ferhatović Hamzić, Tatjana Orct, Vedran Micek, Iva Šunić, Antonija Jonjić, Jasna Jurasović, Saša Missoni, Miran Čoklo, Sandra Kraljević Pavelić

https://pubmed.ncbi.nlm.nih.gov/36829471/

—

Protective Effect of Microporous Natural Clinoptilolite on Lead-Induced Learning and Memory Impairment in Rats.

Nikpey, Ahmad & Kazemian, Hossein & Safari-Varyani, Ali & Rezaie, Marjan & Sirati-Sabet, Majid.

https://www.researchgate.net/publication/290217829_Protective_Effect_of_Microporous_Natural_Clinoptilolite_on_Lead-Induced_Learning_and_Memory_Impairment_in_Rats

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Modified natural clinoptilolite detoxifies small mammal's organism loaded with lead I. Lead disposition and kinetic model for lead bioaccumulation.

Michaela Beltcheva, Roumiana Metcheva, Nikolay Popov, Svetla E Teodorova, J Antonio Heredia-Rojas, Abraham O Rodríguez-de la Fuente, Laura E Rodríguez-Flores, Margarita Topashka-Ancheva

https://pubmed.ncbi.nlm.nih.gov/22147334/

—

Protection by clinoptilolite or zeolite NaA against cadmium-induced anemia in growing swine.

W G Pond, J T Yen

https://pubmed.ncbi.nlm.nih.gov/6306673/

In Water/Environmental Treatment

Simultaneous removal of Cu, Mn and Zn from drinking water with the use of clinoptilolite and its Fe-modified form.

Maria K Doula

https://pubmed.ncbi.nlm.nih.gov/19576609/

—

Sorption hysteresis of Cd(II) and Pb(II) on natural zeolite and bentonite.

Mohsen Hamidpour, Mahmoud Kalbasi, Majid Afyuni, Hossein Shariatmadari, Peter E Holm, Hans Christian Brunn Hansen

https://pubmed.ncbi.nlm.nih.gov/20638963/

—

Heavy metal removal with mexican clinoptilolite: multi-component ionic exchange.

Mabel Vaca Mier, Raymundo López Callejas, Ronald Gehr, Blanca E Jiménez Cisneros, Pedro J.J Alvarez,

https://pubmed.ncbi.nlm.nih.gov/11228988/
—
The removal of heavy metal cations by natural zeolites.
Erdem E, Karapinar N, Donat R. J
https://pubmed.ncbi.nlm.nih.gov/15533402/
—
Evaluation the feasibility of using clinoptilolite as a gravel pack in water wells for removal of lead from contaminated groundwater.
Mohammad Nakhaei, Mohammad Hassan Heidarian, Vahid Vatanpour, Khalil Rezaei
https://pubmed.ncbi.nlm.nih.gov/35974266/
—
Arsenic removal from groundwater by MnO2-modified natural clinoptilolite zeolite: effects of pH and initial feed concentration.
Lucy M Camacho 1, Ramona R Parra, Shuguang Deng
https://pubmed.ncbi.nlm.nih.gov/21398033/
—
Use of Natural Clinoptilolite for the Removal of Lead (II) from Wastewater in Batch Experiment. Yongbut, Phetcharat & Phattarasirichot, Kittiya & Buasri, Achanai & Chaiyut, Nattawut & Nammueng, Lalita.
https://www.researchgate.net/publication/238572246_Use_of_Natural_Clinoptilolite_for_the_Removal_of_Lead_II_from_Wastewater_in_Batch_Experiment
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Lead sorption by a Mexican, clinoptilolite-rich tuff.
Marlene M Llanes-Monter 1, María T Olguín, Marcos J Solache-Ríos
https://pubmed.ncbi.nlm.nih.gov/17993223/
—
Influence of zeolite transformation in a homoionic form on the removal of some heavy metal ions from wastewater.
M Panayotova, B Velikov
https://pubmed.ncbi.nlm.nih.gov/12680582/
—
Heavy metal removal from industrial wastewater by clinoptilolite.
Günay Kocasoy 1, Vicdan Sahin
https://pubmed.ncbi.nlm.nih.gov/18074286/
—
Adsorption of cadmium, nickel and lead ions: equilibrium, kinetic and selectivity studies on modified clinoptilolites from the USA and RSA.
Joshua Gorimbo, Blessing Taenzana, Adolph A Muleja, Alex T Kuvarega, Linda L Jewell
https://pubmed.ncbi.nlm.nih.gov/30182313/
—
Removal of zinc, copper and lead by natural zeolite-a comparison of adsorption isotherms.
J Perić 1, M Trgo, N Vukojević Medvidović
https://pubmed.ncbi.nlm.nih.gov/15026244/
—
Removal of cadmium from aqueous solutions using clinoptilolite: influence of pretreatment and regeneration.

Kadir Gedik 1, Ipek Imamoglu
https://pubmed.ncbi.nlm.nih.gov/18262351/
—
Heavy metal removal by clinoptilolite. An equilibrium study in multi-component systems.
Roman Petrus 1, Jolanta K Warchoł
https://pubmed.ncbi.nlm.nih.gov/15743627/
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Adsorption of toxic metals by natural and modified clinoptilolite.
Yüksel Orhan 1, Sevgi Kocaoba
https://pubmed.ncbi.nlm.nih.gov/17899890/
—
Study of the selection mechanism of heavy metal (Pb2+, Cu2+, Ni2+, and Cd2+) adsorption on clinoptilolite.
Myroslav Sprynskyy 1, Bogusław Buszewski, Artur P Terzyk, Jacek Namieśnik
https://pubmed.ncbi.nlm.nih.gov/16989853/
—
Simultaneous removal of Pb and MTBE by mixed zeolites in fixed-bed column tests.
Yunhui Zhang, Fei Wang, Benyi Cao, Hailong Yin, Abir Al-Tabbaa
https://pubmed.ncbi.nlm.nih.gov/35717089/
—
Trapping the lead ion in multi-components aqueous solution by natural clinoptilolite.
Yu Fei Tao 1, Yue Qiu, Shu Yu Fang, Zhu Yun Liu, Ying Wang, Jian Hua Zhu
https://pubmed.ncbi.nlm.nih.gov/20434835/
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Particle size effects on uptake of heavy metals from sewage sludge compost using natural zeolite clinoptilolite.
Antonis A Zorpas 1, Inglezakis Vassilis, Maria Loizidou, Helen Grigoropoulou
https://pubmed.ncbi.nlm.nih.gov/16290628/
—
Reducing toxic element leaching in mine tailings with natural zeolite clinoptilolite.
Rosalinda Ferrel-Luna, Maria Elena García-Arreola, Luis Mario González-Rodríguez, Margarita Loredo-Cancino, Carlos Enrique Escárcega-González, David Alejandro De Haro-Del Río
https://pubmed.ncbi.nlm.nih.gov/37277584/
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Competitive adsorption of dyes and heavy metals on zeolitic structures.
V Hernández-Montoya 1, M A Pérez-Cruz, D I Mendoza-Castillo, M R Moreno-Virgen, A Bonilla-Petriciolet
https://pubmed.ncbi.nlm.nih.gov/23321372/
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Removal of arsenic from water using Fe-exchanged natural zeolite.
Zhaohui Li, Jiin-Shuh Jean, Wei-Teh Jiang, Po-Hsiang Chang, Chun-Jung Chen, Libing Liao
https://pubmed.ncbi.nlm.nih.gov/21315510/
—
A statistical approach for arsenic adsorption onto Turkey clinoptilolite.
E Bilgin Simsek 1, A O Avcı Tuna, U Beker
https://pubmed.ncbi.nlm.nih.gov/24788935/
—
Removal of heavy metals from waters by means of natural zeolites.

Author links open overlay panel
G Blanchard, M Maunaye, G Martin
https://www.sciencedirect.com/science/article/abs/pii/0043135484901246?via%3Dihub

Radioactive Compounds

Living Organisms

The effect of natural zeolite on the excretion and distribution of radiocesium in rats.
P Mizik, J Hrusovský, M Tokosová
https://pubmed.ncbi.nlm.nih.gov/2552638/

Water/Environmental Treatment

Ultra-effective modified clinoptilolite adsorbent for selective thorium removal from radioactive residue.
Abdulrahman Masoud Alotaibi, Aznan Fazli Ismail, Eli Syafiqah Aziman
https://pubmed.ncbi.nlm.nih.gov/37291241/

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The removal of caesium ions using supported clinoptilolite.
D.A. De Haro-Del Rio, S. Al-Joubori, O. Kontogiannis, D. Papadatos-Gigantes, O. Ajayi, C. Li, S.M. Holmes
https://www.sciencedirect.com/science/article/abs/pii/S0304389415001211?via%3Dihub

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Modification of Clinoptilolite as a Robust Adsorbent for Highly-Efficient Removal of Thorium (IV) from Aqueous Solutions.
Abdulrahman Masoud Alotaibi, Aznan Fazli Ismail
https://pubmed.ncbi.nlm.nih.gov/36360653/

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Uranium removal from groundwater by natural clinoptilolite zeolite: effects of pH and initial feed concentration.
Lucy Mar Camacho, Shuguang Deng, Ramona R Parra
https://pubmed.ncbi.nlm.nih.gov/19892465/

—

Treatment of radioactive liquid waste by sorption on natural zeolite in Turkey.
Ahmet Erdal Osmanlioglu
https://pubmed.ncbi.nlm.nih.gov/16563616/

—

Removal of Cesium and Strontium Ions from Aqueous Solutions by Thermally Treated Natural Zeolite.
Marin Șenilă, Emilia Neag, Claudiu Tănăselia, Lacrimioara Șenilă
https://pubmed.ncbi.nlm.nih.gov/37109801/

Forever Chemicals (PFOS PFOA)

Zeolite Composite Materials for the Simultaneous Removal of Pharmaceuticals, Personal Care Products, and Perfluorinated Alkyl Substances in Water Treatment.
James J. Licato, Gregory D. Foster, and Thomas B. Huff
https://pubs.acs.org/doi/abs/10.1021/acsestwater.2c00024

Commentary: “Treatment with the zeolite composites resulted in a 72% average mass reduction of PFASs.”

—

Removal of perfluoroalkyl acids from aqueous media by surfactant-modified clinoptilolites.
Monireh S Hedayati, Nina Ricci Nicomel, Otman Abida, Loretta Y Li
https://pubmed.ncbi.nlm.nih.gov/38329667/

Commentary: The purpose of surfactants from the perspective of nano-technology seems to be the increasing of the zeta potential or at least reducing the amount of agglomeration/clumping that occurs over time with the nano solution. Surfactants are added to industrial nanotech solutions for this purpose of increased particle distribution.

Plastics

Photocatalytic degradation of bisphenol A in aqueous solution using TiO2/clinoptilolite hybrid photocatalyst.
Srna Stojanović, Vladislav Rac, Kristina Mojsilović, Rastko Vasilić, Smilja Marković, Ljiljana Damjanović-Vasilić
https://pubmed.ncbi.nlm.nih.gov/37354298/

Flouride

The adsorption of fluoride from aqueous solutions by Fe. Mn. and Fe/Mn modified natural clinoptilolite and optimization using response surface methodology.
by M. B. Basken, A.R. Biyiki.
https://onlinelibrary.wiley.com/doi/10.1002/wer.1464

Parabins

Acid natural clinoptilolite: structural properties against adsorption/separation of n-paraffins.
Aramis Rivera 1, Tania Farías, Louis Charles de Ménorval, Giselle Autié-Castro, Hernany Yee-Madeira, José Luis Contreras, Miguel Autié-Pérez
https://pubmed.ncbi.nlm.nih.gov/21555133/

Gluten

Purified Clinoptilolite-Tuff as an Efficient Sorbent for Gluten Derived from Food.
Carmen Ranftler, Andreas Röhrich, Andreas Sparer, Cornelius Tschegg, Dietmar Nagl
https://pubmed.ncbi.nlm.nih.gov/35563533/

Polycyclic Aromatic Hydrocarbons

Removal of polycyclic aromatic hydrocarbons from aqueous media using modified clinoptilolite.
Monireh S Hedayati, Loretta Y Li
https://pubmed.ncbi.nlm.nih.gov/32734893/

Ethanol/Alcohol/Drinking

A pilot study on the ability of clinoptilolite to absorb ethanol in vivo in healthy drinkers: effect of gender.
A Federico, M Dallio, A G Gravina, C Iannotta, M Romano, G Rossetti, F Somalvico, C Tuccillo, C Loguercio
https://pubmed.ncbi.nlm.nih.gov/26084226/

Asbestos

Zeolites ameliorate asbestos toxicity in a transgenic model of malignant mesothelioma.
Fan X, McLaughlin C, Robinson C, Ravasini J, Schelch K, Johnson T, van Zandwijk N, Reid G, George AM.
https://pubmed.ncbi.nlm.nih.gov/32123850/

Herbicides and Insecticides

Distribution of dichlorvos in the rat and the effect of clinoptilolite on poisoning.
F Nistiar, J Hrusovský, J Mojzis, P Mizik
https://pubmed.ncbi.nlm.nih.gov/6098064/

—

Modification of natural zeolite clinoptilolite and ITS application in the adsorption of herbicides.
Henrique Straioto, Paula Valéria Viotti, Alexandre Amado de Moura, Alexandre Diório, Mara Heloisa Neves Olsen Scaliante, Wardleison Martins Moreira, Marcelo Fernandes Vieira, Rosângela Bergamasco
https://pubmed.ncbi.nlm.nih.gov/35546108/

C Difficile

Binding and neutralization of C. difficile toxins A and B by purified clinoptilolite-tuff.
Carmen Ranftler, Dietmar Nagl, Andreas Sparer, Andreas Röhrich, Michael Freissmuth, Ali El-Kasaby, Shahrooz Nasrollahi Shirazi, Florian Koban, Cornelius Tschegg, Stephane Nizet
https://pubmed.ncbi.nlm.nih.gov/34043688/

Acetaminophen and Caffeine

Clinoptilolite and palygorskite as sorbents of neutral emerging organic contaminants in treated wastewater: Sorption-desorption studies.
María Leal, Virtudes Martínez-Hernández, Raffaella Meffe, Javier Lillo, Irene de Bustamante
https://pubmed.ncbi.nlm.nih.gov/28254718/

Synthetic NSAIDs

Removal of non-steroidal anti-inflammatory drugs from water by zeolite-rich composites: The interference of inorganic anions on the ibuprofen and naproxen adsorption.
Danijela Smiljanić, Bruno de Gennaro, Aleksandra Daković, Barbara Galzerano, Chiara Germinario, Francesco Izzo, George E Rottinghaus, Alessio Langella
https://pubmed.ncbi.nlm.nih.gov/33636624/

—

Removal of ibuprofen from synthetic wastewater using photocatalytic method in the presence of FeO photocatalyst supported on modified Iranian clinoptilolite.
Majid Mohadesi, Ashkan Gouran, Kiarash Seifi
https://pubmed.ncbi.nlm.nih.gov/35038093/

MycoToxins

Adsorption of mycotoxins by organozeolites.
Aleksandra Daković, Magdalena Tomasević-Canović, Vera Dondur, George E Rottinghaus, Vesna Medaković, Snezana Zarić
https://pubmed.ncbi.nlm.nih.gov/16198090/

—

Efficacy of a Modified Clinoptilolite Based Adsorbent in Reducing Detrimental Effects of Ochratoxin A in Laying Hens.
Marko Vasiljević 1, Darko Marinković 2, Dragan Milićević 3, Jelka Pleadin 4, Srđan Stefanović 3, Saša Trialović 5, Jog Raj 6, Branko Petrujkić 7, Jelena Nedejković Trialović 7
https://pubmed.ncbi.nlm.nih.gov/34357941/

Ammonium

Application of Natural Clinoptilolite for Ammonium Removal from Sludge Water.
Stephan Wasielewski, Eduard Rott, Ralf Minke, Heidrun Steinmetz
https://pubmed.ncbi.nlm.nih.gov/33383775/

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Improving ammonium and nitrate release from urea using clinoptilolite zeolite and compost produced from agricultural wastes.
Omar L, Ahmed OH, Ab Majid NM. Improving ammonium and nitrate release from urea using clinoptilolite zeolite and compost produced from agricultural wastes. ScientificWorldJournal. 2015;2015:574201. doi: 10.1155/2015/574201. Epub 2015 Feb 22. PMID: 25793220; PMCID: PMC4352482.
https://pubmed.ncbi.nlm.nih.gov/25793220/

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Ammonium removal from aqueous solution by ion-exchange using packed bed natural zeolite.
Ahmet Demir Ahmet Gunay Eyyup Debik
https://www.ajol.info/index.php/wsa/article/view/4903

Blood Tests and Other Such Health Markers

Clinoptilolite for Treatment of Dyslipidemia: Preliminary Efficacy Study.
by M. Cutovic. M. Lazovic, V. Vukovic-Dejanovic, D. Nikolic, I. Petronic-Markovic. D. Cirovic. Journal of Alternative and Complementary Medicine. 2017 Sep:23 (9):738-744. doi: 10. 1089/acm.2016.0414.
https://pubmed.ncbi.nlm.nih.gov/28605233/

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The Effects of Natural Clinoptilolite and Nano-Sized Clinopilolite Supplementation on Glucose Levels and Oxidative Stress in Rats With Type 1 Diabetes.
by B.H. Nia. D. Khorran, H. Rezazadeh, A. Safaiyan 4, A. Tarighat-Esfanjani. Canadian Journal of Diabetes, 2018 Feb; 32(1):31-35. doi: 10.1016/j.jcjd.2017.01.010. PMID: 28506813
https://pubmed.ncbi.nlm.nih.gov/28506813/

—

Study of zeolite clinoptilolite d-glucose adsorption properties in vitro and in vivo.
Rumenka Markoska, Ranko Stojković, Marko Filipović, Mladenka Jurin, Vedrana Špada, Ivna Kavre Piltaver, Krešimir Pavelić, Dean Marković, Sandra Kraljević Pavelić
https://pubmed.ncbi.nlm.nih.gov/37482210/

—

Effects of separate and concurrent supplementation of Nano-sized clinoptilolite and Nigella sativa on oxidative stress, anti-oxidative parameters and body weight in rats with type 2 diabetes.
Hossein Omidi, Sirus Khorram, Mehran Mesgari, Mohammad Asghari-Jafarabadi, Ali Tarighat-Esfanjani
https://pubmed.ncbi.nlm.nih.gov/29169727/

—

The evaluation of the effects of natural zeolite (Clinoptilolite) in diabetic rats on bone healing in dental extracting socket.
İstemihan Çelikbaş, Esra Mavi, Ceylan Hepokur
https://pubmed.ncbi.nlm.nih.gov/36353678/

Regarding Ortho-Silicic Acid and Clinoptilolite

(Clinoptilolite Zeolite Releases Ortho-Silicic Acid, The Bio-Available form of Silica)

Biological and therapeutic effects of ortho-silicic acid and some ortho-silicic acid-releasing compounds: New perspectives for therapy.
Jurkić LM, Cepanec I, Pavelić SK, Pavelić K.
https://pubmed.ncbi.nlm.nih.gov/23298332/

—

Treatment of osteoporosis with a modified zeolite shows beneficial effects in an osteoporotic rat model and a human clinical trial.
Sandra Kraljević Pavelić, Vedran Micek, Dragica Bobinac, Edo Bazdulj, Alessandra Gianoncelli, Dalibor Krpan, Marta Žuvić, Sandra Eisenwagen, Peter J Stambrook and Krešimir Pavelić
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7930600/

—

Clinical Parameters in Osteoporosis Patients Supplemented With PMA-Zeolite at the End of 5-Year Double-Blinded Clinical Trial.
Sandra Kraljević Pavelić, Dalibor Krpan, Marta Žuvić, Sandra Eisenwagen, Krešimir Pavelić
https://pubmed.ncbi.nlm.nih.gov/35833103/

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Ortho-silicic Acid Plays a Protective Role in Glucocorticoid-Induced Osteoporosis via the Akt/Bad Signal Pathway In Vitro and In Vivo.
Guanghui Gu, Dehui Hou, Guangjun Jiao, Wenliang Wu, Hongming Zhou, Hongliang Wang, Yunzhen Chen
https://pubmed.ncbi.nlm.nih.gov/35314965/

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Silicic acid in drinking water prevents age-related alterations in the endothelium-dependent vascular relaxation modulating eNOS and AQP1 expression in experimental mice: an immunohistochemical study.
Barbara Buffoli 1, Eleonora Foglio, Elisa Borsani, Christopher Exley, Rita Rezzani, Luigi Fabrizio Rodella
https://pubmed.ncbi.nlm.nih.gov/23177919/

Anti-Viral

Skipping the "antiviral" studies, since viruses don't exist. Although those studies are quite complimentary of clinoptilolite zeolite. They simply demonstrate the causes and byproducts of diseased tissues being neutralized by the zeolite and improving outcomes. You can search for these articles with relevant keywords pubmed.com.

Immune/Detoxification Systems

Dietary supplementation with the tribomechanically activated zeolite clinoptilolite in immunodeficiency: effects on the immune system.
Slavko Ivkovic, Ulrich Deutsch, Angelika Silberbach, Erwin Walraph, Marcus Mannel
https://pubmed.ncbi.nlm.nih.gov/15310086/

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Immunostimulatory effect of natural clinoptilolite as a possible mechanism of its antimetastatic ability.
K Pavelic 1, M Katic, V Sverko, T Marotti, B Bosnjak, T Balog, R Stojkovic, M Radacic, M Colic, M Poljak-Blazi
https://pubmed.ncbi.nlm.nih.gov/11862470/

Cancer

Natural zeolite clinoptilolite: new adjuvant in anticancer therapy.
Pavelić K, Hadzija M, Bedrica L, Pavelić J, Dikić I, Katić M, Kralj M, Bosnar MH, Kapitanović S, Poljak-Blazi M, Krizanac S, Stojković R, Jurin M, Subotić B, Colić M.
https://pubmed.ncbi.nlm.nih.gov/11434724/

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Randomized Control Study in Humans
ZeOxaNMulti Trial: A Randomized, Double-Blinded, Placebo-Controlled Trial of Oral PMA-zeolite to prevent Chemotherapy-Induced Side Effects, in particular, Peripheral Neuropathy.
Maria Giuseppa Vitale, Carmela Barbato, Anna Crispo, Francesco Habetswallner, Bernardo Maria De Martino, Ferdinando Riccardi , Angela Maione, Sandra Eisenwagen, Giovanna Vitale, Giacomo Cartenì
https://pubmed.ncbi.nlm.nih.gov/32414185/

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A clinoptilolite effect on cell media and the consequent effects on tumor cells in vitro.
Katic M, Bosnjak B, Gall-Troselj K, Dikic I, Pavelic K.
https://pubmed.ncbi.nlm.nih.gov/16368551/

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Anticancer and antioxidative effects of micronized zeolite clinoptilolite.
Zarkovic N, Zarkovic K, Kralj M, Borovic S, Sabolovic S, Blazi MP, Cipak A, Pavelic K.
https://pubmed.ncbi.nlm.nih.gov/12820427/

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Immunostimulatory effect of natural clinoptilolite as a possible mechanism of its anti-metastatic ability.
K Pavelic, M Katic, V Sverko, T Marotti, B Bosnjak, T Balog, R Stojkovic, M Radacic, M Colic, M Poljak-Blazi
https://pubmed.ncbi.nlm.nih.gov/11862470/

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The effect of natural clinoptilolite on the serotonergic receptors in the brain of mice with mammary carcinoma.
Dorotea Mück-Seler, Nela Pivac
https://pubmed.ncbi.nlm.nih.gov/12899929/

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Anticancer and antioxidative effects of micronized zeolite clinoptilolite.

Neven Zarkovic 1, Kamelija Zarkovic, Marijeta Kralj, Suzana Borovic, Senka Sabolovic, Marija Poljak Blazi, Ana Cipak, Kresimir Pavelic
https://pubmed.ncbi.nlm.nih.gov/12820427/

Neurological

Dietary zeolite supplementation reduces oxidative damage and plaque generation in the brain of an Alzheimer's disease mouse model.
Mery Montinaro 1, Daniela Uberti, Giuseppina Maccarinelli, Sara Anna Bonini, Giulia Ferrari-Toninelli, Maurizio Memo
https://pubmed.ncbi.nlm.nih.gov/23562853/

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Silicon-rich mineral water as a non-invasive test of the 'aluminum hypothesis' in Alzheimer's disease.
Samantha Davenward 1, Peter Bentham, Jan Wright, Peter Crome, Deborah Job, Anthony Polwart, Christopher Exley
https://pubmed.ncbi.nlm.nih.gov/22976072/

ADHD and Mood

Increasing performance in children with ADHD by trapping lead with a nano-zeolite.
Mona Delavarian, Ali Hassanvand, Shahriar Gharibzadeh
https://pubmed.ncbi.nlm.nih.gov/23487215/

—

Geophagy (rock eating), experimental stress and cognitive idiosyncrasy.
Kirill Golokhvast, Alexander Sergievich, Nikolay Grigoriev
https://pubmed.ncbi.nlm.nih.gov/25182720/

Intestinal

Randomized Control Study in Humans
Safety and efficacy of purified clinoptilolite-tuff treatment in patients with irritable bowel syndrome with diarrhea: Randomized controlled trial.
Karolina Anderle 1, Michael Wolzt 2, Gabriele Moser 3, Bettina Keip 3, Johannes Peter 3, Claudia Meisslitzer 4, Ghazaleh Gouya 5, Michael Freissmuth 6, Cornelius Tschegg 4
https://pubmed.ncbi.nlm.nih.gov/36569277/

—

Effects of zeolite supplementation on parameters of intestinal barrier integrity, inflammation, redoxbiology and performance in aerobically trained subjects.
Manfred Lamprecht, Simon Bogner, Kurt Steinbauer, Burkhard Schuetz, Joachim F. Greilberger, Bettina Leber, Bernhard Wagner, Erwin Zinser, Thomas Petek, Sandra Wallner-Liebmann, Tanja Oberwinkler, Norbert Bachl, and Gert Schippinger
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4617723/

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Clinoptilolite in Dextran Sulphate Sodium-Induced Murine Colitis: Efficacy and Safety of a Microparticulate Preparation.

Stéphane Nizet, PhD, Eduardo Muñoz, MD, Bernd L Fiebich, PhD, Peter M Abuja, PhD, Karl Kashofer, PhD, Kurt Zatloukal, MD, Simone Tangermann, DVM, Lukas Kenner, MD, Dr. Cornelius Tschegg, Dietmar Nagl, Mag, Laurenz Scheichl, DI, Dr. Claudia Meisslitzer-Ruppitsch, Michael Freissmuth, MD, and Dr. Thomas Berger

Highlight

-Conclusion

Our observations confirm that a microparticulate preparation of clinoptilolite is safe and effective in a murine model of inflammatory bowel disease and supports the hypothesis that the adsorptive capacity of clinoptilolite is of potential therapeutic relevance.

Excess Iron

Zeolite protects mice from iron-induced damage in a mouse model trial.
Xiyong Fan, Chris McLaughlin, Jason Ravasini, Cleo Robinson, Anthony M George
https://pubmed.ncbi.nlm.nih.gov/30410857/

Enzyme Systems

(Enzyme mimetics, metaloenzyme mimicry)

Herron N. (1989). Zeolite catalysts as enzyme mimics. in: biocatalysis and biomimetics. Chapter 11, toward silicon-based life? ACS Symp. Ser. 392 141–154
https://www.semanticscholar.org/paper/Zeolite-catalysts-as-enzyme-mimics%3A-toward-life-Herron/722bf7939827787c5427e1534f7d9f2d31f8b97a

Farm Animals

Effects of dietary clinoptilolite on reproductive performance, serum progesterone and insulin-like growth factor-1 concentrations in dairy cows during pregnancy and lactation.
D Đuričić, S Vince, M Lojkić, S Jelušić, R Turk, H Valpotić, D Gračner, N Maćešić, I Folnožić, Z Šostar, M Samardžija
https://pubmed.ncbi.nlm.nih.gov/32233302/

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Effects of long-term feeding of a diet supplemented with clinoptilolite to dairy cows on the incidence of ketosis, milk yield and liver function.
P D Katsoulos 1, N Panousis, N Roubies, E Christaki, G Arsenos, H Karatzias
https://pubmed.ncbi.nlm.nih.gov/16997998/

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Clays as dietary supplements for swine: A review.
Mohana Devi Subramaniam 1, In Ho Kim 1
https://pubmed.ncbi.nlm.nih.gov/26301092/

—

Effect of Clinoptilolite Zeolite on Cattle Performance and Nitrogen Volatilization Loss.
by D.M. Sherwood, G.E. Erickson, T.J. Klopfenstein, (2005) Nebraska Beef Cattle Reports. Paper 177.
http://digitalcommons.unl.edu/animalscinbcr/177

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Zeolite food supplementation reduces abundance of enterobacteria.

Tanka P. Prasai, Kerry B. Walsh, Surya P. Bhattarai, David J. Midmore, Thi T.H. Van, Robert J. Moore, Dragana Stanley
https://pubmed.ncbi.nlm.nih.gov/28024523/

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Effects of a modified clinoptilolite zeolite on growth performance, health status and detoxification of aflatoxin B1 and ochratoxin A in male broiler chickens.
J Raj, M Vasiljević, P Tassis, H Farkaš, J Bošnjak-Neumüller, K Männer,
https://www.tandfonline.com/doi/full/10.1080/00071668.2021.1891522
https://pubmed.ncbi.nlm.nih.gov/33595390/

—

Preventive efficacy of clinoptilolite in broilers during chronic aflatoxin (50 and 100 ppb) exposure.
H Oğuz 1, V Kurtoğlu, B Coşkun
https://pubmed.ncbi.nlm.nih.gov/11020375/

—

Effect of zinc-bearing zeolite clinoptilolite on growth performance, nutrient retention, digestive enzyme activities, and intestinal function of broiler chickens.
Zhigang Tang 1, Chao Wen, Ping Li, Tian Wang, Yanmin Zhou
https://pubmed.ncbi.nlm.nih.gov/24515449/

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Effect of feeding clinoptilolite (zeolite) to three strains of laying hens.
M D Olver 1
https://pubmed.ncbi.nlm.nih.gov/2545313/

—

Effects of short-term supplementation of clinoptilolite in colostrum and milk on hematology, serum proteins, performance, and health in neonatal dairy calves
M Mohri 1, H A Seifi, F Dare
https://pubmed.ncbi.nlm.nih.gov/18343011/

—

The effect of feed supplementation with Transcarpathian zeolite (clinoptilolite) on the concentrations of acute phase proteins and cytokines in the serum and hepatic tissue of chickens.
Zbigniew Grądzki, Łukasz Jarosz, Dagmara Stępień-Pyśniak, Agnieszka Marek
https://pubmed.ncbi.nlm.nih.gov/32359577/

—

Effects of zeolite a or clinoptilolite in diets of growing swine
G C Shurson, P K Ku, E R Miller, M T Yokoyama
https://pubmed.ncbi.nlm.nih.gov/6098574/

—

Effect of zinc-bearing zeolite clinoptilolite on growth performance, nutrient retention, digestive enzyme activities, and intestinal function of broiler chickens.
Zhigang Tang 1, Chao Wen, Ping Li, Tian Wang, Yanmin Zhou
https://pubmed.ncbi.nlm.nih.gov/24515449/

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Effect of in-feed inclusion of a natural zeolite (clinoptilolite) on certain vitamin, macro and trace element concentrations in the blood, liver and kidney tissues of sows.
D S Papaioannou 1, S C Kyriakis, A Papasteriadis, N Roumbies, A Yannakopoulos, C Alexopoulos
https://pubmed.ncbi.nlm.nih.gov/12002639/

—

Effects of clinoptilolite on growth performance and antioxidant status in broilers.

Yanan Wu 1, Qiujue Wu, Yanmin Zhou, Hussain Ahmad, Tian Wang
https://pubmed.ncbi.nlm.nih.gov/23949793/

—

Effects of oral supplementation with organically modified clinoptilolite during prepartum period on colostrum quality in primiparous dairy cows.
Milica Stojić, Vesna Ilić, Marijana Kovačić, Dragan Gvozdić, Silvana Stajković, Branislav Vejnović, Olivera Savić, Natalija Fratrić
https://pubmed.ncbi.nlm.nih.gov/33261672/

—

Effects of prolonged consumption of water with elevated nitrate levels on certain metabolic parameters of dairy cattle and use of clinoptilolite for their amelioration.
P D Katsoulos, M A Karatzia, Z Polizopoulou, P Florou-Paneri, H Karatzias
https://pubmed.ncbi.nlm.nih.gov/25874417/

—

Serum Protein Electrophoretic Pattern in Neonatal Calves Treated with Clinoptilolite.
Simona Marc, Danijela Kirovski, Călin Mircu, Ioan Hutu, Gabriel Otavă, Cristina Paul, Oana Maria Boldura, Camelia Tulcan
https://pubmed.ncbi.nlm.nih.gov/29861463/

—

Effects of short-term supplementation of clinoptilolite in colostrum and milk on the concentration of some serum minerals in neonatal dairy calves.
M Mohri 1, H A Seifi, M Maleki
https://pubmed.ncbi.nlm.nih.gov/18317705/

—

The effects of feeding clinoptilolite on hematology, performance, and health of newborn lambs.
M A Norouzian 1, R Valizadeh, A A Khadem, A Afzalzadeh, A Nabipour
https://pubmed.ncbi.nlm.nih.gov/20013357/

—

Influence of Butyrate Loaded Clinoptilolite Dietary Supplementation on Growth Performance, Development of Intestine and Antioxidant Capacity in Broiler Chickens.
Yanan Wu 1, Yanmin Zhou 1, Changhui Lu 1, Hussain Ahmad 1, Hao Zhang 1, Jintian He 1, Lili Zhang 1, Tian Wang 1
https://pubmed.ncbi.nlm.nih.gov/27104860/

—

Effects of Dietary Vibroactivated Clinoptilolite Supplementation on the Intramammary Microbiological Findings in Dairy Cows.
Dražen Đuričić 1, Tomislav Sukalić 2, Franjo Marković 3, Predrag Kočila 4, Ivona Žura Žaja 5, Sven Menčik 5, Tomislav Dobranić 5, Miroslav Benić 6, Marko Samardžija 5
https://pubmed.ncbi.nlm.nih.gov/31991715/

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Integrated Metabolomics and Proteomics Dynamics of Serum Samples Reveals Dietary Zeolite Clinoptilolite Supplementation Restores Energy Balance in High Yielding Dairy Cows.
Sudipa Maity, Ivana Rubić, Josipa Kuleš, Anita Horvatić, Dražen Đuričić, Marko Samardžija, Blanka Beer Ljubić, Romana Turk, Damjan Gračner, Nino Maćešić, Hrvoje Valpotić, Vladimir Mrljak
https://pubmed.ncbi.nlm.nih.gov/34940600/

—

The Use of Activated Micronized Zeolite Clinoptilolite as a Possible Alternative to Antibiotics and Chestnut Extract for the Control of Undifferentiated Calf Diarrhea: An In Vitro and In Vivo Study.
Constantin Cerbu, Vlad Alexandru Ilaș, Michał Czopowicz, Adrian Valentin Potârniche, Elisa-Paz Bodart-Nieva 1, Elena Andruța Mureșan, Jarosław Kaba, Marina Spinu, Emoke Pall
https://pubmed.ncbi.nlm.nih.gov/33287303/

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Selenium and Natural Zeolite Clinoptilolite Supplementation Increases Antioxidative Status and Immune Response in Growing Pigs.
Tomislav Šperanda, Valentina Pavić, Zdenko Lončarić, Marcela Šperanda, Maja Popović, Vesna Gantner, Mislav Đidara
https://pubmed.ncbi.nlm.nih.gov/34395572/

Soil and Plants

Potassium-enriched clinoptilolite zeolite mitigates the adverse impacts of salinity stress in perennial ryegrass (Lolium perenne L.) by increasing silicon absorption and improving the K/Na ratio.
Ebrahim Rahimi 1, Farzad Nazari 2, Taimoor Javadi 3, Saadi Samadi 4, Jaime A Teixeira da Silva 5
https://pubmed.ncbi.nlm.nih.gov/33581457/

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Zeolite application increases grain yield and mitigates greenhouse gas emissions under alternate wetting and drying rice system.
Yan Sha, Daocai Chi, Taotao Chen, Shu Wang, Qing Zhao, Yinghao Li, Yidi Sun, Ji Chen, Poul Erik Lærke
https://pubmed.ncbi.nlm.nih.gov/35605853/

—

Using natural clinoptilolite zeolite as an amendment in vermicomposting of food waste.
Mansur Zarrabi 1, Ali Akbar Mohammadi 2, Tariq J Al-Musawi 3 4, Hossein Najafi Saleh 5
https://pubmed.ncbi.nlm.nih.gov/29860684/

—

Influences of clinoptilolite and surfactant-modified clinoptilolite zeolite on nitrate leaching and plant growth.
Raheleh Malekian 1, Jahangir Abedi-Koupai, Sayed Saeid Eslamian
https://pubmed.ncbi.nlm.nih.gov/21051140/

—

Effects of clinoptilolite zeolite on phosphorus dynamics and yield of Zea Mays L. cultivated on an acid soil.
Hasbullah Nur Aainaa 1 2, Osumanu Haruna Ahmed 2 3, Nik Muhamad Ab Majid 4
https://pubmed.ncbi.nlm.nih.gov/30261005/

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The role of clinoptilolite in organo-zeolitic-soil systems used for phytoremediation.
Peter J Leggo 1, Béatrice Ledésert, Graham Christie
https://pubmed.ncbi.nlm.nih.gov/16236347/

—

Investigation of microorganisms colonizing activated zeolites during anaerobic biogas production from grass silage.

S Weiss 1, A Zankel, M Lebuhn, S Petrak, W Somitsch, G M Guebitz
https://pubmed.ncbi.nlm.nih.gov/21277767/

—

Influence of zeolite, apatite and Fe-oxide on Cd and Pb uptake by crops.
A Chlopecka 1, D C Adriano
https://pubmed.ncbi.nlm.nih.gov/9447748/

—

The role of tailored biochar in increasing plant growth, and reducing bioavailability, phytotoxicity, and uptake of heavy metals in contaminated soil.
Badr A Mohamed, Naoko Ellis, Chang Soo Kim, Xiaotao Bi
https://pubmed.ncbi.nlm.nih.gov/28668594/

—

Effect of Low Zeolite Doses on Plants and Soil Physicochemical Properties
Alicja Szatanik-Kloc, Justyna Szerement, Agnieszka Adamczuk, Grzegorz Józefaciuk
https://pubmed.ncbi.nlm.nih.gov/34067914/

No Evidence that Natural Clinoptilolite Causes Mineral Gapping

Critical Review on Zeolite Clinoptilolite Safety and Medical Applications in vivo.
Kraljević Pavelić S, Simović Medica J, Gumbarević D, Filošević A, Pržulj N, Pavelić K.
https://pubmed.ncbi.nlm.nih.gov/30538633/

> Commentary: This analysis is published in the Official NIH Records.
> Highlight:
> -"Importantly, while great danger exists in removing the physiologically important electrolytes from the serum in a classical detoxification process, this has not been observed in clinoptilolite trials both in humans and animals, where **no substantial changes in physiologically relevant trace elements or vitamins were observed even after long-term administration** (Papaioannou et al., 2002; Katsoulos et al., 2005b; Flowers et al., 2009)."

—

Clinical evidence supporting the use of an activated clinoptilolite suspension as an agent to increase urinary excretion of toxic heavy metals. (Human Study).
Flowers J, Lonky SA, Deitsch EJ
https://www.dovepress.com/clinical-evidence-supporting-the-use-of-an-activated-clinoptilolite-su-peer-reviewed-fulltext-article-NDS

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Effects of long-term dietary supplementation with clinoptilolite on incidence of parturient paresis and serum concentrations of total calcium, phosphate, magnesium, potassium, and sodium in dairy cows.
Panagiotis-Dimitrios Katsoulos, Nikolaos Roubies, Nikolaos Panousis, Georgios Arsenos, Efterpi Christaki, Harilaos Karatzias
https://pubmed.ncbi.nlm.nih.gov/16379650/

> Commentary:
> -Questions about Mineral Gapping from Zeolite supplementation arise but if that was true wouldn't mineral imbalances show up in cows who get it in their feed for the long term?
> -Other papers find the same conclusion. But here's one with a short to the point abstract.

-Parturient Paresis is a disease of very *low* calcium in cattle. The highest intake of natural clinoptilolite group of cows had the best results with *improving this low calcium condition* in these cows. And it was just paired with their food not fulvic minerals or marine plasma.
-Parturient Paresis: https://www.britannica.com/science/parturient-paresis

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Effect of in-feed inclusion of a natural zeolite (clinoptilolite) on certain vitamin, macro and trace element concentrations in the blood, liver and kidney tissues of sows.
D S Papaioannou 1, S C Kyriakis, A Papasteriadis, N Roumbies, A Yannakopoulos, C Alexopoulos
https://pubmed.ncbi.nlm.nih.gov/12002639/

—

Effect of long-term dietary supplementation with clinoptilolite on performance and selected serum biochemical values in dairy goats.
Panagiotis D Katsoulos 1, Sotirios Zarogiannis, Nikolaos Roubies, Georgios Christodoulopoulos
https://pubmed.ncbi.nlm.nih.gov/19254146/

—

Effects of long-term feeding dairy cows on a diet supplemented with clinoptilolite on certain serum trace elements.
P D Katsoulos 1, N Roubies, N Panousis, H Karatzias
https://pubmed.ncbi.nlm.nih.gov/16327067/

Highlight:
-"Blood samples were collected from each animal at the starting day of the experiment, at the day of calving, and at monthly intervals thereafter. All samples were tested for serum Cu, Zn, and Fe concentrations. The results showed that the 1.25 and 2.5% supplementation of clinoptilolite did not have any adverse effects on serum concentrations of Cu, Zn, and Fe."

—

The effect of the zeolite clinoptilolite on serum chemistry and hematopoiesis in mice.
I Martin-Kleiner, Z Flegar-Mestric, R Zadro, D Breljak, S Stanovic Janda, R Stojkovic, M Marusic, M Radacic, M Boranic
https://pubmed.ncbi.nlm.nih.gov/11397518/

Clinoptilolite Binding To Methylene Blue and derivative Hydroxychloroquin.

(Methylene Blue is the Parent Compound of Hydroxychloroquin, both of which are man-made.)

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Adsorption of Methylene Blue and Tetracycline by Zeolites Immobilized on a PBAT Electrospun Membrane.
David Picón, Alicia Vergara-Rubio, Santiago Estevez-Areco, Silvina Cerveny , Silvia Goyanes
https://pubmed.ncbi.nlm.nih.gov/36615274/

—

Natural Zeolite Clinoptilolite Application in Wastewater Treatment: Methylene Blue, Zinc and Cadmium Abatement Tests and Kinetic Studies.
Melodj Dosa, Nadia Grifasi, Camilla Galletti, Debora Fino, Marco Piumetti
https://pubmed.ncbi.nlm.nih.gov/36431678/

Commentary:
-"Clinoptilolite exhibited the best adsorption capacities at 100 ppm: the abatement reached 98% (t = 15 min). Both Clinoptilolite and Activated Charcoal, at 250 ppm, exhibited the same

adsorption capacities, namely, 96%. Finally, at 250 ppm **MB (Methylene Blue)**, the adsorption capacity of Clinoptilolite was analyzed with the copresence of Zn2+ and Cd2+ (10 ppm), and the adsorption capacities were compared with those of Activated Charcoal. The results showed that both adsorbents achieved 100% MB abatement (t = 40 min)."

-the 2nd half of this quote shows a general trend investigated in studies with clinoptilolite zeolite, that Clinoptilolite improves its binding capacity when paired with other nontoxic minerals.

—

Metachromasy as an indicator of photostabilization of methylene blue adsorbed to clays and minerals.

Maya Samuels, Omer Mor, Giora Rytwo

https://pubmed.ncbi.nlm.nih.gov/23474529/

Commentary:

-“The influence of methylene blue adsorption to different clays on its photodegradation was studied. Methylene blue in solution was decomposed by sunlight in a *zero-order process. Adsorption to some clay minerals (sepiolite and vermiculite) and a zeolite (clinoptilolite) accelerated the degradation process, and converted it to a *first-order reaction. On the other hand, adsorption to other clay minerals (palygorskite and montmorillonite) stabilized the dye and prevented its degradation."

-*Zero order: a constant amount of drug is eliminated per unit time.

-*First order kinetics occur when a constant proportion of the drug is eliminated per unit time. So in first order reactions, or kinetics, more is eliminated or degraded per unit of time if more of the substance is in solution or in an organism.

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Hydroxychloroquine Adsorption in Aqueous Medium Using Clinoptilolite Zeolite

https://pubmed.ncbi.nlm.nih.gov/35875406/

Commentary:

-“The ecotoxicological tests with Artemia salina and Lactuca Sativa proved that the final effluent did not show toxicity after the adsorption treatment. Based on the results obtained in this work, clinoptilolite zeolite is a potential adsorbent for reducing HCQ toxicity in aquatic matrices.”