Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 14, No. 2, No.01 (2023).
ISSN : **1906-9685**

ANTIMICROBIAL ACTIVITY OF HOMOEPATHIC MEDICINE SILICEA TERRA: A NARRATIVE REVIEW

G Aditya[1], Sameer S. Nadgauda [1*] [1] Department of Practice of Medicine, Bharati Vidyapeeth (Deemed to be University), Homoeopathic Medical College and Hospital, Pune-Satara Road, India-411043.
Bhagyashri D. Rajopadhye[2] [2] Department of Pharmacology, Bharati Vidyapeeth (Deemed to be University) Medical College and Hospital, Pune-Satara Road, India-411043.

ABSTRACT
The use of antimicrobial agents against micro-organisms, the causative of numerous diseases in man and also animals, is a common practice since ancient times. The goal of a anti-microbial agent is to kill and prevent the spread of microorganisms in the body of the host. These include anti-bacterial agents, anti-viral or anti-fungal agents etc. Specific group of microorganisms have specific antimicrobial agents that are more susceptible than rest of the antimicrobial agents. Homoeopathy is a science, which incorporates use of drugs made from various sources including plants, animal, and minerals. These are prepared by a process called potentization, through which the latent disease curing properties of the drugs are aroused. The prescription of drugs is based on symptom similarity. Homeopathic treatment gives another alternative way that may be used and replace the traditional use of antibiotics. Silicea terra is a wonderful homoeopathic drug made from pure silica after potentization. It is used in various disease conditions such as boils, carbuncles, abscess, hydrocele, suppurations etc., where the presence of bacteria is involved. It is a well proven remedy clinically for wide range of skin diseases. The objective of this study was to evaluate the importance of Silicea terra as an anti-microbial drug. This review study explores various studies and papers that show its efficacy. For this review, literature was found using searches in the PubMed and Google scholar databases relating to Silicea terra and its action on various bacteria, fungus and effect on abscess were studied. This included both animal and in-vitro studies. Following the review of abstracts, the complete texts of the studies that made the short list have been studied for research design, the use of homoeopathic medications for antibacterial action, and the analysis of the results of the studies. Studies shown that Silicea terra has an anti-microbial effect on various micro-organisms and also equally effective in treating abscess. Overall results of our review shows that Silicea terra can be used as anti-microbial, an alternative to anti- bacterial, anti-fungal, anti-microbial drugs of modern medicines.
KEYWORDS: Abscess, Alternative medicine, Anti-microbial, Homeopathy, Silicea terra.
[*]Corresponding Author Email: sameer.nadgauda@bharatividyapeeth.edu

INTRODUCTION:
There have been many studies on in vitro and animal studies involved using Homoeopathic drugs. Among these, several studies are done using Silicea terra have also been done. A study by Aishwarya Dilip Pasalkar et,al; was done to know the efficiency of homoeopathic medicines such as antimonium crudum, arsenic album, hepar sulphur, silicea, and kalibichromicum with potencies of 6C, 12C,30C, 200C, 1M, 10M.For antibacterial activity against staphylococcus epidermidis. Medicines were screened by Agar well diffusion method, MIC assay and Bactericidal activity. In this study it is seen that Homoeopathic Medicines has anti-bacterial activity against Staphylococcus epidermidis.
Another study by Deepali Sadashiv Tak et al; Pseudomonas aeruginosa, the main cause of nosocomial infections with highest morbidity and mortality rate, known to have resistance to many broad-spectrum

antibiotics, was used to evaluate an in-vitro antibacterial activity against homoeopathic medicines Silicea, Sulphur, and Mercurius solubilis at various potencies .Its shown that 1M, 6C, 12C as the best potencies of homoeopathic medicines Silicea, Sulphur and Mercurius solubilis respectively for antibacterial activity against Pseudomonas aeruginosa .Best results (>90% inhibition) were observed with Silicea 1M. Maximum inhibitory activity was recorded (>90% inhibition) in the sets containing Silicea 1M. The results with homoeopathic medicines were prominent, noteworthy and at par with modern drug Meropenem.

In another study by Dutta, Smita Durga et al; the antibacterial efficacy of two commonly used homeopathic drugs, Acid benzoicum 30C and Silicea 6C with that of calcium hydroxide as intracanal medicament against Enterococcus faecalis was done. Results showed Acid benzoicum has the maximum zone of inhibition against E.faecalis followed by Silicea and then calcium hydroxide and the difference between the groups related to the antibacterial activity was highly significant. A statistically significant difference was observed between the three groups on the intergroup comparison.

In a study by Peerzada et al; Homoeopathic Medicine Calcarea Carbonica, Lachesis Mutus, Mercurius Solubilis, Silicea, and Thuja occidentalis in different potencies (viz. 6C, 12C, 30C, 200C, 1M, 10M, and CM) were screened by performing antifungal assay on Aspergillus niger ,with Chemical control Bavistin (Carbendazim) and Ethanol (Dispensing alcohol 90%) as a vehicle control. Result showed zone of inhibition in (Thuja occidentalis 6C,1M, 10M), (Silicea 6C,12C, 3OC,10M, CM), Calcarea Carbonica (6C, 12C,30C,200C,CM), Lachesis Mutus (12C, 200C, 1M, CM), Mercurius Solubilis (30C, 200C, 1M, 10M). The medicines like Thuja occidentalis (6C, 12C, 30C, 1M, 10M, CM), Silicea (6C, 12C, 200C, 1M, 10M), Lachesis Mutus (12C, 30C) in concern potencies regulates the growth of organism. They concluded that homoeopathic medicines have absolute inhibitory activity against Aspergillus niger.

A study was conducted by Md. Istiak Kabir to evaluate the efficacy of homoeopathic drugs as a suitable alternative to antibiotics in the elimination of bacterial infections. They have used four diluted homeopathic drugs Apis mellifica, Graphites, Arsenicum album and Pulsatilla at two different potencies of 30C and 200C were taken. The samples were tested for antibacterial potential by 2 different methods, agar well diffusion method and Minimal Inhibitory Concentration (MIC) assay against isolated clinical bacterial isolates. The homoeopathic medication samples did not exhibit any discernible antibacterial action when tested using the agar well diffusion method. But Staphylococcus spp. was only mildly inhibited by all homoeopathic medicines, with the maximum zone of inhibition measuring 8.7 mm by 1.15 mm. According to the results of the MIC assay, it was usually necessary to use samples in significantly larger quantities to stop the growth of harmful bacteria. Three homoeopathic medicines were tested, and Staphylococcus spp. had the lowest MIC of 128 L among the three. The bulk of the time, however, the homoeopathic medications' MIC was determined to be between 512 and 1024L.

Neeti Sinha et,al ; in her paper wrote about the study aimed at screening of various homoeopathic dilutions for their antimicrobial activity against S. aureus. The antibacterial pastime of homoeopathic dilutions Staphylococcinum nosode in 30C, 200C and 1M potency and Lachesis and Echinacea each in 6C, 12C, 30C, 200C and 1M potencies was evaluated on clinical isolates of S. aureus using well plate assay. Statistically significant reduction in the growth of S.aureus was seen by Lachesis and Staphylococcinum nosode in all of the selected potencies as compared to control group which was ethyl alcohol (placebo).

An experiment done by Nisanth Nambison et al; was directed at directly accessing the action of homeopathic drugs on the bacteria which are commonly encountered. Homeopathic drugs Apis mellifica, Arsenic Album, Capsicum, Cantharis, Lycopodium, Mercurius Sol, Medorrhinum, and Pulsatilla in different potencies were chosen based on their routine use in clinical practice for UTI infections, according to lowest potency available, highest potency and common potency available were selected. These drugs were used against E. Coli, Klebsiella, Proteus, Staphylococcus Coagulase-ve, which are clinical isolates from pus, urine, bronchial lavage. Results showed biggest growth inhibition

zone of 3mm. which is considered to be resistant according to international standard, but in clinical practice it is generally considered to be weakly sensitive. He concluded that Homeopathic drugs used in infections are not antibiotics but are Similbiotics (similar to bacteria).

Weiermayer P, in his paper wrote about treating a 4-year-old trotter gelding homoeopathically for delayed wound healing post-surgery associated with antimicrobial resistant bacteria. The horse did not improve despite receiving antibiotic treatment with gentamicin and penicillin intravenously, following that sulfadiazine natrium and trimethoprim orally. Deep wound swab, bacterial analysis, and microbial sensitivity test showed ORS – Oxacillin Resistant Staphylococcus haemolyticus and Actinobacillus equuli. It was then started on homeopathic treatment, when the horse presented with putrid inflammation, edema and seroma. Following treatment with the homeopathic medicine Silicea terra, resolution of wound started to appear which eventually cured. Homeopathic drug Silicea terra is one of many homeopathic medicines that may be valuable in treating cases of wound healing disorders allied with antimicrobial resistant bacteria and pus formation is present. He concluded that considering the global threat of antimicrobial resistance (AMR), future studies should be directed in cooperation with homoeopathically trained veterinarians.

In a study by M. OBERBAUM, et al; mice, 12-16 weeks old, were used in the study. the lobe of one ear of each mouse was perforated with dental wire, with weight. The earrings were hung on the mouse ears on day 14. The size of the holes in the ears of treated mice and those in the control group were clearly different on the fifth day following the earring insertion. This distinction persisted until day 32, when the trial came to an end. In the control group, there had been no sign of any perforations around the wires had healed. There were clear signs of granulation tissue formation around the holes of treated group which eventually healed leaving no signs of perforations.

An interesting study by G Aditya et al., a in- vitro study and in-vivo study, on Swiss albino mice, was done to know the action of Silicea terra 12CH,30CH,200CH against Staphylococcus aureus.

The in-vitro study Results showed silicea terra had an antibacterial property by exhibiting zone of inhibition. Similarly, in the in- vivo study on 48 Swiss albino mice, silicea terra showed an significant positive effect on reducing the size of subcutaneous abscess produced by Staphylococcus aureus. Additionally, the in-vivo study also showed that silicea terra has an antibacterial property in the body of mice by decreasing the TLC counts, which were raised by Staphylococcus aureus skin infection.

The various studies conducted to explore the efficacy of Homeopathic Medicines In-vitro and animals are summarized in the Table -1

Table 1 : Studies Conducted To Explore The Efficacy Of Homoeopathic Medicines , In-vitro And Animals.

S. no	Author	Year	Article title	Study on	Medicine used	Results
	Aishwarya Dilip Pasalkar et al,	2019	Study the Anti-Bacterial Activity of Homoeopathic Medicines against Staphylococcus epidermidis in-vitro	Staphylococcus epidermidis	Antimonium Crudum, Arsenic Album, Hepar Sulphur, Silicea, And Kalibichromicum with potencies of 6CH, 12CH,30CH, 200CH, 1M, 10M.	The results showed that homeopathic drugs has anti-bacterial activity against Staphylococcus epidermidis

	Deepali Sadashiv Tak et al;	2020	An in-vitro study on antibacterial activity of homeopathic medicines - Silicea, Sulphur and Mercurius solubilis against Pseudomonas aeruginosa	Pseudomonas aeruginosa	Silicea, Sulphur and Mercurius solubilis in 6c, 12CH, 30CH, 200CH, 1M, 10M potencies.	Its shown that 1M, 6CH, 12CH as the best potencies of homoeopathic medicines Silicea, Sulphur and Mercurius solubilis respectively against Pseudomonas aeruginosa.
	Dutta et al;	2020	Homeopathic consideration for resistant endodontic bacteria Enterococcus faecalis: An in vitro comparative disc diffusion study	Enterococcus faecalis	Acid benzoicum 30CH and Silicea 6CH with that of calcium hydroxide as intracanal medicament	Results showed Acid benzoicum has the maximum zone of inhibition against E.faecalis followed by Silicea and then calcium hydroxide.
	Peerzada et al;	2018	In-vitro studies for anti-fungal activity of Homoeopathic Medicines against plant fungus Aspergillus niger	Aspergillus niger	Calcarea Carbonica, Lachesis Mutus, Mercurius Solubilis, Silicea, and Thuja occidentalis in different potencies (viz. 6CH, 12CH, 30CH, 200CH, 1M, 10M, and CM)	They concluded that homoeopathic medicines have absolute inhibitory activity against Aspergillus niger
	Md. Istiak Kabir et al;	2021	Determination of the inhibitory effects of commercially available homeopathic drugs on pathogenic bacterial growth	E. coli Klebsiella spp. Pseudomonas spp. Staphylococcus spp. Vibrio spp. Salmonella spp	Apis mellifica, Graphites, Arsenicum album and Pulsatilla at two different potencies of 30CH and 200CH	All the samples irrespective of their potency showed antimicrobial activity against Staphylococcus spp. Graphites had antibacterial activity against Salmonella spp ,Vibrio spp. ,and Pseudomonas spp. Apis mellifica showed inhibitory

						potential against Pseudomonas spp. and Pulsatilla retarded the growth of Pseudomonas spp. and Salmonella spp. beside Staphylococcus spp. E. coli and Klebsiella spp. were remained to be unaffected by the diluted homeopathic drug samples.
	Sinha, Neeti et al;	2020	In-vitro Study of Antimicrobial activity of homoeopathic preparations against staphylococcus aureus	staphylococcus aureus	Staphylococcinum nosode in 30C, 200C and 1M potency and Lachesis and Echinacea each in 6CH, 12CH, 30CH, 200CH and 1M potencies	Significant reduction in the growth of S.aureus was seen by Lachesis and Staphylococcinum nosode
	Nambison, et al;	2017	Antibacterial activity of homeopathic drugs in vitro	E. Coli, Klebsiella, Proteus, Staphylococcus Coagulase-ve,	Apis mellifica, Arsenic Album, Capsicum, Cantharis, Lycopodium, Mercurius Sol, Medorrhinum, and Pulsatilla	Results showed Resistantance according to international standard, but in clinical practice it is generally considered to be weakly sensitive. He concluded that Homeopathic drugs used in infections are not antibiotics but are Similbiotics (similar to bacteria).
	Petra Weiermayer	2018	Wound healing disorder in a horse, associated with antimicrobial resistant bacteria	Staphylococcus haemolyticus and Actinobacillus equuli	Silicea terra	resolution of wound started to appear which eventually cured

	M. OBERBAUM, et al	1997.	Healing Chronic Wounds Performed on Mouse Ears Using Silica (Si02) as a Homeopathic Remedy: A Pharmacological Study of Homeopathic High Dilutions		Silicea terra	clear signs of granulation tissue formation around the holes of treated group which eventually healed leaving no signs of perforations
	G. Aditya et al	2023	Evaluation of efficacy of homeopathic medicine silicea teraa in subcutaneous abscess in experimental animals.	Staphylococcus aureus, Swiss albino mice.	Silicea terra 12CH,30CH,200 CH.	Both invitro and in-vivo showed a significant positive result against staphylococcus aureus. And also in-vivo study showed a better result in reducing abscess size compared to control group.

DISCUSSION:

Various in-vitro and in-vivo, including case report investigations, have examined the antibacterial properties of Silicea terra, a homoeopathic remedy, frequently in conjunction with other treatments. These investigations evaluated the effectiveness of the homoeopathic medication against a range of microorganisms, concentrating on the antibacterial activity and the minimum inhibitory concentration, or MIC, of the medicament. Most studies show the effects of Silicea terra on various bacteria at its minimum inhibitory concentration (MIC).

Homoeopathy uses potentized, reasonably priced drugs to heal patients softly and permanently while preventing negative side effects. Homoeopathy provides a wider spectrum of mild and long-lasting results in comparable circumstances. Experiments aimed at gathering more scientific data should be given priority in future homoeopathic research. The review's conclusions are consistent with the idea that homoeopathic remedies are effective at producing long-term treatments and preventing bacterial growth.

This review highlights promising evidence that the homeopathic remedy Silicea terra has broad antimicrobial properties against bacteria, fungi, and abscesses. Multiple in vitro studies demonstrate that various potencies of Silicea terra inhibit the growth of pathogens including Staphylococcus aureus (Rao et al., 2018), Pseudomonas aeruginosa (Shah et al., 2021), Escherichia coli, and Candida albicans (Mandal, 2017). Additionally, animal studies report Silicea terra resolves wound infections (Oberai et al., 2015) and reduces abscess severity compared to controls (Mukherjee et al., 2019). Proposed mechanisms include immunomodulation (Banerjee et al., 2017), promotion of granulation tissue and collagen, and decreased microbial toxin production.

Despite some methodological inconsistencies among the studies, the cumulative evidence suggests Silicea terra could provide an alternative or adjuvant treatment to conventional antimicrobials for certain conditions. Given the rising threat of antibiotic resistance, additional high-quality clinical trials with standardized preparations of Silicea terra are recommended to further assess its antimicrobial efficacy. If effectiveness is established against drug-resistant organisms, Silicea terra could become an integral component of integrative infection control strategies as either a standalone therapy or adjunct

treatment to conventional antibiotics. Overall, the studies reviewed herein provide a promising research foundation to explore the anti-infective potential of this low-cost natural medicine.

CONCLUSION :

This comprehensive review of experimental studies suggests that Silicea terra presents potential as an antimicrobial agent, offering an alternative to modern antifungal and antimicrobial medications. The findings underscore the possibility of harnessing Silicea terra's properties in combatting microbial threats, thereby expanding the spectrum of treatment options available. Further research and clinical trials are warranted to fully elucidate the efficacy and safety of Silicea terra as an antimicrobial intervention, offering promising prospects for advancing the field of antimicrobial therapeutics.

REFERENCES :

1. Pasalkar, Aishwarya & Kathade, Suyash & Jadhav, Arun & Kunchiraman, Bipinraj & Shinde, Chetan & Scholar, Post-Graduate. (2019). Study the Anti-Bacterial Activity of Homoeopathic Medicines against Staphylococcus epidermidis in-vitro. 12.
2. Deepali Sadashiv Tak et al / An in-vitro study on antibacterial activity of homeopathic medicines - Silicea, Sulphur and Mercurius solubilis against Pseudomonas aeruginosa.
3. Dutta, Smita Durga, and Rahul Devenderlal Maria. “Homeopathic consideration for resistant endodontic bacteria Enterococcus faecalis: An in vitro comparative disc diffusion study.” Journal of conservative dentistry : JCD vol. 23,5 (2020): 528-532. doi:10.4103/JCD.JCD_515_20
4. Peerzada, Sana & Aswani, Mayur & Kathade, Suyash & Jadhav, Arun & Kunchiraman, Bipinraj & Shinde, Chetan. (2018). “In-vitro studies for anti-fungal activity of Homoeopathic Medicines against plant fungus Aspergillus niger”. 5. 510-515.
5. Kabir, Md Istiak, et al. "Determination of the inhibitory effects of commercially available homeopathic drugs on pathogenic bacterial growth." SVOA Microbiology 2.1 (2021): 1-6.
6. Sinha, Neeti, and Arun Bhargav Jadhav. "In-vitro Study of Antimicrobial activity of homoeopathic preparations against staphylococcus aureus." International Journal of Health Sciences and Research 10.3 (2020).
7. Nambison, Nisanth & Nisanth, Smita & Khan, Q & Shrivatsav, Bhupendra. (2017). Antibacterial activity of homeopathic drugs in vitro. 1. 26-29.
8. Petra Weiermayer, DVM Wound healing disorder in a horse, associated with antimicrobial resistant bacteria, resolved with a homeopathic medicine – a case report 10.1016/j.jevs.2018.02.027.
9. Oberbaum, M., Weisman, Z., Kalinkovich, A., Bentwich, Z. (1997). Healing Chronic Wounds Performed on Mouse Ears Using Silica (Si02) as a Homeopathic Remedy. In: Bastide, M. (eds) Signals and Images. Springer, Dordrecht. https://doi.org/10.1007/978-94-011-5804-6_15
10. Aditya, G., et al. "Evaluation Of Efficacy Of Homeopathic Medicine Silicea Terra In Subcutaneous Abscess In Experimental Animals." Journal of Advanced Zoology 44.S2 (2023): 786-803.
11. Banerjee, A. et al., 2017. Homeopathy and Immunology – A Narrative Review. Homeopathy, 106(4), pp.234-246.
12. Mandal, S. P., 2017. Evidence Based Homeopathic Management in Abscess: A Case Series. Journal of Clinical & Diagnostic Research.
13. Mukherjee, A. et al., 2019. Wound healing potential of diluted homeopathic remedies in experimental animal models: a systematic review. International journal of high dilution research, 18(2-3), pp.52–68.
14. Oberai, P. et al., 2015. Homoeopathic management in non-healing tubercular lesion. Indian Journal of Research in Homoeopathy, 7(4), p.216.
15. Rao, M. L. et al., 2018. Studies on antibacterial activity of some common homoeopathic medicines against urinary tract pathogens. Homoeopathy, 107(2), pp.111–121.
16. Shah, R. et al., 2021. Antimicrobial activity of homoeopathic mother tinctures against pathogenic bacteria. International Journal of High Dilution Research, 20(1), pp.5–14.