International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

In-Vitro Evaluation of the Antibacterial Activity of Iodium and Its Potencies (30 and 200) Against Escherichia Coli

Parvathy B Menon[1] Bismil John Jacob[2] C. R. Krishnakumari Amma[3], Winston Vargheese V[4]

[1,2]PG Scholar, Department of Materia Medica, Sarada Krishna Homoeopathic Medical College, (Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai), Kulasekharam, Kanyakumari District, Tamil Nadu, India
[3]Professor & Research Guide, Department of Materia Medica, Sarada Krishna Homoeopathic Medical College, (Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai), Kulasekharam, Kanyakumari District, Tamil Nadu, India
[4]HOD &Ph.D. guide, Department of Materia Medica, Sarada Krishna Homoeopathic Medical College (Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai), Kulasekharam, Kanyakumari District, Tamil Nadu, India

Abstract
Escherichia coli (E. coli), a gram-negative bacillus typically found as a harmless component of the intestinal microbiota, can under certain conditions give rise to significant intestinal and extraintestinal infections. The global rise of antimicrobial resistance—particularly among multidrug-resistant E. coli strains—poses a major threat to biomedical practice, with reported resistance rates ranging from 51.1% to 91.2% for most antibiotics, except nitrofurantoin (7.3%). In this context, homoeopathy has long explored the potential therapeutic effects of highly diluted medicines. The present study investigates the in-vitro antibacterial activity of the homoeopathic drug Iodium in 30CH and 200CH potencies against E. coli. Antibacterial susceptibility testing was performed using the Kirby–Bauer disc diffusion method on Mueller–Hinton agar, the standard medium for routine bacterial sensitivity assessments. Iodium 30CH and 200CH were tested alongside positive and negative controls. The findings indicate that Iodium 200CH produced measurable zones of inhibition, demonstrating antibacterial activity comparable to that of standard antibiotics under the experimental conditions. These results suggest that highly potentized Iodium may exert observable effects on E. coli in vitro, supporting further investigation into its potential antimicrobial properties.

Keywords: In vitro, E. coli, Iodium, Kirby–Bauer method, Mueller–Hinton agar

Introduction

Escherichia coli (E. coli) is a Gram-negative bacillus known to be a part of the normal intestinal flora but can also be the cause of intestinal and extraintestinal illness in humans [1]. There are hundreds of identified E. coli strains, resulting in a spectrum of disease from mild, self-limited gastroenteritis to renal failure and

septic shock. Its virulence lends to E. coli's ability to evade host defences and develop resistance to common antibiotics [2,3]. Intestinal illnesses will be described by the causative E. coli subtypes, including enterotoxigenic Escherichia coli (ETEC), enterohemorrhagic Escherichia coli (EHEC) — also known as Shiga toxin–producing Escherichia coli (STEC) — enteroinvasive Escherichia coli (EIEC), enteropathogenic Escherichia coli (EPEC), and enteroaggregative Escherichia coli (EAEC) [2,3]. Most strains of E. coli are harmless; however, some strains such as STEC can cause severe foodborne disease, transmitted to humans primarily through consumption of contaminated foods — such as raw or undercooked ground meat, raw milk, and raw vegetables and sprouts [4,5]. In addition to intestinal disease, other kinds of E. coli can cause urinary tract infections, respiratory illness, pneumonia, and other systemic infections [2,6]. Some in vitro studies have examined homeopathic medications against E. coli, but their results generally do not support a strong direct antibacterial effect [7]. Iodium (iodine) is proposed in homeopathy as a remedy that "arouses the defensive apparatus … by assembling the mononuclear leukocytes whose phagocytic action is marked," and is often described as a powerful but tolerable microbicide; to evaluate this claim, the present study assesses the antibacterial activity of Iodium in various potencies against E. coli.

Materials and Methods

Study Setting: The study was conducted in the Microbiology Research Laboratory of Sarada Krishna Homoeopathic Medical College, Kulasekharam.

Study Design: An experimental in-vitro study was undertaken to evaluate the antibacterial activity of Iodium in different potencies against Escherichia coli.

Materials

Microbial Strain and Reagents

- Escherichia coli strain obtained from MTCC.
- Homoeopathic medicines Iodium 30CH and 200CH procured from a reputable homoeopathic pharmaceutical manufacturer.
- Mueller–Hinton (MH) agar (Hi-Media), used as the culture medium.
- Sensitivity discs prepared from Whatman No. 1 filter paper, 6 mm in diameter.
- Ciprofloxacin used as the positive control.

Study Groups

The materials were divided into the following groups:

Table: 1 samples and group

Group I	Positive Control: Ciprofloxacin (5 mg dissolved in 5 ml distilled water)
Group II	Negative Control: Ethanol
Group III	Iodium 30CH
Group IV	Iodium 200CH

Methods

1. Preparation of Media

Mueller–Hinton (MH) agar was selected for antibacterial susceptibility testing.

- 38 g of MH agar was dissolved in 1000 ml distilled water.
- The medium was sterilized by autoclaving at 121°C and 15 lbs pressure for 15 minutes (pH 7.3).
- After cooling, the medium was mixed thoroughly and poured into sterile Petri plates (approximately 25 ml per plate) and allowed to solidify.

2. Inoculation of MH Plates

A sterile cotton swab dipped in the E. coli inoculum was used to streak the MH agar plates in a back-and-forth motion to ensure even bacterial lawn formation.

3. Placement of Discs and Loading of Test Substances

Four sterile Whatman filter paper discs (6 mm) were placed on each inoculated plate. The discs were loaded as follows:

- Positive Control (PC): 10 µl of Ciprofloxacin solution (15 mg in 300 µl sterile water; 5 µg/µl).
- Negative Control (NC): 10 µl of Ethanol.
- Test Remedies: 10 µl each of Iodium 30CH and Iodium 200CH on separate discs.

4. Incubation and Measurement

- The plates were incubated at 37°C for 24 hours.
- After incubation, the zones of inhibition around each disc were observed.
- The diameter of each zone (including the disc) was measured in millimeters using a transparent ruler.
- Absence of a clear zone was interpreted as no antibacterial activity.

Observation and Results

After 24 and 48 hours of incubation, both potencies of Iodium exhibited inhibitory activity against Escherichia coli. Among the two, Iodium 200C demonstrated a greater antibacterial effect, producing a zone of inhibition measuring 6 mm, which approached the inhibitory activity shown by the standard antibacterial drug, ciprofloxacin. In comparison, Iodium 30C produced a 3 mm zone of inhibition, similar to that observed with ethanol (3 mm). These findings indicate that Iodium 200C possesses higher efficacy in suppressing the growth of E. coli compared to Iodium 30C. The results provide evidence that Iodium 200C has the potential to act against Escherichia coli, displaying a notable inhibitory activity comparable to a conventional antibacterial agent.

Table: 2 Antibacterial activities of Iodum. against *E. coli* after 24h and 48hrs of incubation

SL.NO	GROUP	PLATE (mm) in 24 hrs
1	Ciprofloxacin	11
2	Ethanol	3
3	Iodum 30	3
4	Iodum 200	6

Fig.1: After suspending medications

Fig.2: The inhibitory activity of 30 and 200C of Iodium against Escherichia coli after 48hrs of activity

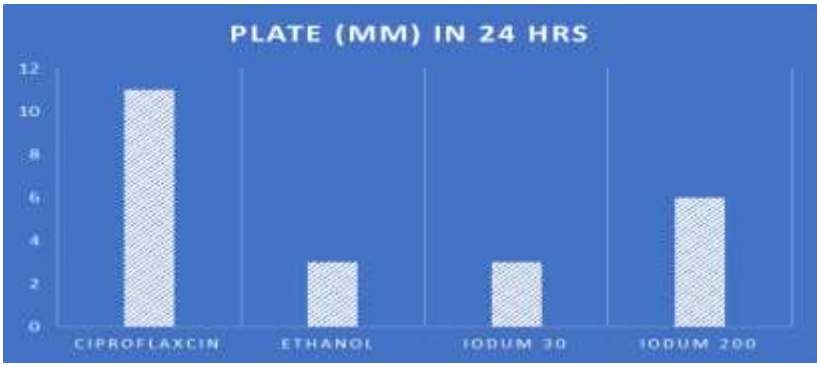

Fig 3: Graphic representation of the zone inhibition against E coli against 24hrs of incubation

Discussion

Homoeopathic philosophy holds that disease begins with a disturbance of the vital force caused by miasmatic influences, with functional changes preceding structural pathology. Thus, pathological symptoms and disease labels are seen as secondary effects of deeper miasmatic disruption, as described by Hahnemann in Aphorism 81 regarding psora.

In this study, Iodium 200C showed clear inhibitory activity against Escherichia coli, supporting the homoeopathic principle that a single potentized remedy can influence overall disease expression. The

variation in bacterial response to different potencies suggests that potency selection may be important in therapeutic effectiveness. These findings provide supportive evidence for the action of homoeopathic medicines beyond placebo, demonstrating observable effects under laboratory conditions. They also emphasize the value of laboratory-based drug standardization. However, the study did not identify the active components in the potentized preparation or explain the mechanism through which Iodium 200C inhibits bacterial growth. Further research is required to clarify the biochemical or biophysical basis of these effects.

Conclusion

The study demonstrated that Iodium 200C exhibits measurable inhibitory activity against Escherichia coli in vitro, supporting the potential therapeutic role of this homoeopathic preparation. The findings align with homoeopathic principles regarding the action of potentized medicines and provide preliminary evidence countering the notion that homoeopathic remedies act solely as placebos. While the results encourage further exploration and contribute to drug standardization efforts, additional research is required to identify active components and clarify the mechanisms by which homoeopathic medicines may exert antimicrobial effects.

Bibliography:

1. Pakbin B, Brück WM, Rossen JWA. Virulence factors of enteric pathogenic Escherichia coli: a review. Int J Mol Sci. 2021;22(18):9922. doi:10.3390/ijms22189922.
2. Crawford S, Goodwin L, Mayberry L, Tomson K. Presence, pathogenicity, antibiotic resistance, and virulence factors of Escherichia coli: a review. Microorganisms. 2023;4(1):16. doi:10.3390/microorganisms4010016.
3. Kademane A, Dixit M, Vasundhara. A comprehensive review of the pathogenesis and virulence factors of Escherichia coli. Salud Cienc Tecnol. 2023;3:411. doi:10.56294/saludcyt2023411.
4. World Health Organization (WHO). E. coli – Fact Sheet. Geneva: WHO; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/e-coli
5. Scallan E, Hoekstra RM, Mahon BE, Jones TF, Griffin PM. An assessment of sporadic Shiga-toxin producing Escherichia coli transmission through contaminated food: a systematic review and meta-analysis. Epidemiol Infect. 2016;144(16):3536–3545. doi:10.1017/S0950268816000720.
6. Poolman JT, Wacker M. Extraintestinal pathogenic Escherichia coli, a common human pathogen: review of epidemiology, virulence, and prevention. Clin Microbiol Rev. 2015;28(1):1–35. doi:10.1128/CMR.00022-14.
7. Pannek J, Leichtle A, Kuemmel C, Stohrer M, Pannek-Rademacher S. In vitro effects of homeopathic drugs on cultured Escherichia coli. Homeopathy. 2018;107(2):142–146. doi:10.1055/s-0043-123590.