Metronidazole is effective against anaerobes; it is a lipophilic first order pharmacokinetic drug with Type 1 pharmacodynamics. As tissue concentration increases with dose, a prolonged bactericidal effect is achieved through metabolic breakage of bacterial DNA. Protein binding is low and bioavailability high, with 60% excreted as active faecal metabolites while 20% remains unchanged in urine.⁴

Metronidazole resistance has been reported, and its use in dentistry now questioned, as oro-facial infections are polymicrobial containing facultative anaerobes, strict anaerobes and aerobes. Treatment should begin not with a medical intervention but with a surgical correction: incision and drainage, penicillin or amoxicillin before metronidazole.

In the wake of bacterial resistance comes an advent of antibiotic stewardship. Public Health England (PHE 2016–2019) recommends increasing metronidazole from 200 mg to 400 mg (tds/5 days). PHE cites scientific research modelled on *Bacteroides fragilis* (a ubiquitous GI tract commensal) and *Trichomonas vaginalis* (restricted to the GU tract). However, PHE also cites a wealth of clinical evidence demonstrating the efficacy of metronidazole at lower doses of 200 mg.⁵

Reconciling the pharmacology of metronidazole with clinical science is complex, as *Tr. vaginalis* never occurs orally, while experimentally *B. fragilis*, displaying mutualism, only becomes pathogenic, if displaced or disrupted, following trauma or high antibiotic doses. Its resistance genes (nim A-F) being expressed like pack rats, shuffling, escaping and then clearing commensals from the GI tract, altering immune defences and metabolic controls allowing pathogens such as *Clostridium difficile* to thrive.

The researchers upon whose data the PHE depend now lend caution to their difficulty and impossibility in correlating *in vitro* susceptibility with clinical bacteriological responses.⁴

The 2019 PHE guidelines from clinical knowledge summaries are not mandatory and they encourage:

1. Professional judgement involving patients in management decisions
2. Therapy being optimised for individual patients
3. A lower threshold for antibiotics in patients with co-morbidities

4. Prevention of antibiotic over-dose and over-use
5. Minimising resistance on all levels: Our failure in the face of a tenacious enemy adapting with impenetrable defences could result in a metronidazole moratorium, but not before tonnes of wasted antibiotics have created resistant pathogens destroying the limbs and lives of our patients. Antibiotic stewardship goes beyond blind prescribing; it demands an adaptive response, exceeding our enemy with leadership from many clinically active specialist oral microbiologists. Until then we are grateful for the opportunity to share our concerns, working within the PHE guidelines.

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<https://doi.org/10.1038/s41415-020-1211-9>

Antibiotics in India

Sir, antibiotic abuse in India has raised the issue of resistant bacterial strains.^{1,2}

Antibiotics are a virtual part of our routine diet because poultry and cattle are injected with antibiotics and steroids to enhance growth and keep them healthy.^{3,4} I believe this is a greater cause of bacterial resistance.

In routine dental practice, antibiotic use is common and widespread. Routine cases of exodontia, deep scaling and minor surgical procedures are done under antibiotic cover to prevent secondary infections of the surgical site. The post extraction instruction list of

dental undergraduate trainees includes a five-day course of amoxicillin for all cases. Strict adherence to sterilisation protocols can, however, reduce the need for antibiotics.

Lack of optimal sterilisation, poor fumigation of dental operatories and pollution are other reasons for routine antibiotic use. *Staph aureus* and the infamous superbug named after New Delhi (*New Delhi metallo-beta-lactamase-1*) also give us a sneak peek on how infection prone our healthcare centres are.⁵ The atmosphere is suspended with bacteria like *tubercle bacilli* and *pseudomonas aeruginosa* owing to population density and tropical climate. One should also not ignore the rampant use of antibiotics like amoxicillin due to their 'over the counter' availability. The layman with the local pharmacist's advice, due to poor understanding of the doctor's prescription or resorting to self-medication, tends to not complete the prescribed antibiotic regimen, which causes antibiotic resistance. Minimum inhibitory concentration of drugs (difficult to detect) is on the rise, and therefore is an alarming trend. The extent of antibiotic abuse is very high in India and antibiotic stewardship programmes should be actively developed to improve the situation.

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Paediatric dentistry

Sedation evidence

Sir, through your pages can I ask what is the evidence for the latest guidelines on paediatric sedation for dentistry? Or is this another example of 'evidence based' only applying to dentists in practice?

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<https://doi.org/10.1038/s41415-020-1209-3>