Antibiotic Interference with Oral Contraceptives: Can a Dental Visit Make you Pregnant?

A Peer-Reviewed Publication
Written by Michael Wahl, DDS

Abstract

Oral contraceptives are a safe and effective form of birth control used by millions of women in the United States and around the world. There have been anecdotal reports of unintended pregnancies after antibiotics were prescribed to women on oral contraceptives. Dentists and physicians have therefore been advised to warn female patients on oral contraceptives of a potential interaction and to advise additional forms of contraception when prescribing antibiotics. This issue has caused consternation among dentists, physicians, and patients, coming to a climax in the lay media with the headline “A Dentist Visit Can Make You Pregnant” in a supermarket tabloid. Fortunately, scientific studies have failed to show any decrease in oral contraceptive efficacy with any antibiotics except for one: rifampin, which is not typically used in dentistry. It is therefore not necessary to warn patients of a potential interaction between antibiotics used in dentistry and oral contraceptives when scientific evidence has consistently and repeatedly failed to support such an interaction.

Educational Objectives:

At the conclusion of this educational activity participants will be able to:
1. Describe the difference between anecdotal reports and scientific studies on the interaction of antibiotics and oral contraceptives
2. Discuss the legal implications of the interaction between antibiotics and oral contraceptives
3. Describe the difference in how rifampin and non-rifampin antibiotics affect contraceptive efficacy
4. Discuss international and national medical and dental group statements on the issue of antibiotic interference with oral contraceptives

Author Profile

Michael Wahl, DDS practices general dentistry in Wilmington, Delaware and received his undergraduate and dental degrees from Case Western Reserve University. He has published over 50 articles in many dental and medical journals and lectured at many major national and international meetings on dental treatment of medically compromised patients, amalgam and composite, and practice management, among other topics. He is a part-time assistant attending dentist at Christiana Care Health System. He can be reached at WahlDentistry@aol.com.

Author Disclosure

Michael Wahl, DDS has no commercial ties with the sponsors or providers of the unrestricted educational grant for this course.
Educational Objectives
At the conclusion of this educational activity participants will be able to:
1. Describe the difference between anecdotal reports and scientific studies on the interaction of antibiotics and oral contraceptives
2. Discuss the legal implications of the interaction between antibiotics and oral contraceptives
3. Describe the difference in how rifampin and non-rifampin antibiotics affect contraceptive efficacy
4. Discuss international and national medical and dental group statements on the issue of antibiotic interference with oral contraceptives

Abstract
Oral contraceptives are a safe and effective form of birth control used by millions of women in the United States and around the world. There have been anecdotal reports of unintended pregnancies after antibiotics were prescribed to women on oral contraceptives. Dentists and physicians have therefore been advised to warn female patients on oral contraceptives of a potential interaction and to advise additional forms of contraception when prescribing antibiotics. This issue has caused consternation among dentists, physicians, and patients, coming to a climax in the lay media with the headline “A Dentist Visit Can Make You Pregnant” in a supermarket tabloid. Fortunately, scientific studies have failed to show any decrease in oral contraceptive efficacy with any antibiotics except for one: rifampin, which is not typically used in dentistry. It is therefore not necessary to warn patients of a potential interaction between antibiotics used in dentistry and oral contraceptives when scientific evidence has consistently and repeatedly failed to support such an interaction.

The history of modern birth control can be traced back to 3000 BC, when condoms were made out of fish bladders, linen sheaths, or animal intestines. By 1838, condoms and diaphragms were made out of vulcanized rubber. Margaret Sanger was a birth control activist who helped reproductive physiologist Gregory Pincus obtain a small grant to begin contraceptive research in 1951. In 1957, the United States Food and Drug Administration (FDA) approved an oral contraceptive (Enovid) for menstrual disorders. In 1960, the FDA approved the first hormonal oral contraceptive for birth control. The pill was not available to married women in all states until a Supreme Court ruling in 1965. It became available to unmarried women in all states after another Supreme Court ruling in 1972. Today there are more than 100 million women using birth control pills globally, with more than 11 million in the United States. Modern oral contraceptives typically contain two hormones, estrogen and progestin.

It is possible for various medications to impact oral contraceptive efficacy, causing unintended pregnancies. There have been many classes of drugs implicated in oral contraceptive failure, including antibiotics, anticonvulsants, antidepressants, antihistamines, thyroid hormones, diuretics, vitamins, and antiulcer medications [Table 1]. In the 1970s, the potent enzyme-inducer rifampin, an antibiotic used for tuberculosis treatment, was first implicated in oral contraceptive failure due to its interaction with the oral contraceptive, rendering them less effective. Since then, many other antibiotics have also been blamed for unwanted pregnancies and their interaction. As a result, dentists and physicians have been indoctrinated with the fear of “wrongful birth”: an unwanted pregnancy due to a possible interaction of which the woman was not informed. A manufacturer’s warning of a possible interaction is included in many package inserts of antibiotics and oral contraceptive formulations. It is alleged that if the dentist or physician does not warn of a possible interaction and advise additional birth control methods when on the antibiotic, then he or she can be legally liable for this “wrongful birth,” including child support payments until the child is 18 years of age.

Table 1. Drugs implicated in oral contraceptive failure.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Anticonvulsants</th>
<th>Antidepressants</th>
<th>Antihistamines</th>
<th>Thyroid hormone</th>
<th>Diuretics</th>
<th>Vitamins</th>
<th>Antiulcer medications</th>
</tr>
</thead>
</table>

Fortunately for dentists and their patients, scientific studies of the antibiotics used in dentistry have failed to show an interaction with oral contraceptives. Moreover, legal cases do not support the idea that a dentist who prescribes antibiotics has a legal duty to warn patients of a potential interaction with oral contraceptives. Finally, current statements by the World Health Organization, the Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists concur that there is no scientific evidence for an interaction between non-rifampin antibiotics and oral contraceptives; however, the American Dental Association and the American Medical Association advise a cautious approach, recommending that physicians and dentists advise women of a possible interaction.

Like any medication, birth control pills are not 100% effective, even if taken perfectly. The failure rate is less than 1% (less than 1 pregnancy per 100 women per year of use) when used perfectly, without missing any pills, but the typical use failure rate is about 9%. [Table 2.] The most common cause
of contraceptive failure is non-use, and the average teenager misses 3 pills a cycle. If a patient on oral contraceptives experiences diarrhea or vomiting, regardless of whether it is caused by an additional medication, it is possible that the contraceptive will be less effective, and these women should use additional contraceptive measures. Antibiotics used in dentistry have been alleged to interact with oral contraceptives, causing decreased efficacy. The oral contraceptive efficacy is reduced theoretically by a decrease in normal gut flora that would otherwise increase bioavailability.5

Table 2. Oral contraceptive typical use failure rate:57

<table>
<thead>
<tr>
<th>Method</th>
<th>Typical use failure rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUD</td>
<td>0.2 – 0.8%</td>
</tr>
<tr>
<td>Implant</td>
<td>0.05%</td>
</tr>
<tr>
<td>Injection</td>
<td>6%</td>
</tr>
<tr>
<td>Combined (estrogen and progestin)</td>
<td>9%</td>
</tr>
<tr>
<td>Progestin only contraceptive</td>
<td>9%</td>
</tr>
<tr>
<td>Patch</td>
<td>9%</td>
</tr>
<tr>
<td>Vaginal ring</td>
<td>9%</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>12%</td>
</tr>
<tr>
<td>Condom</td>
<td>18%</td>
</tr>
<tr>
<td>Female condom</td>
<td>21%</td>
</tr>
<tr>
<td>Spermicides</td>
<td>28%</td>
</tr>
<tr>
<td>Rhythm method</td>
<td>24%</td>
</tr>
</tbody>
</table>

Anecdotal reports and interaction warnings

There have been many anecdotal reports of pregnancies after interactions between antibiotics and oral contraceptives. The following antibiotics have been alleged to contribute to oral contraceptive failure: penicillin, tetracyclines, sulfonamides, erythromycins, metronidazole, griseofulvin, cephalosporin, cotrimoxazole, fluoroquinolones, and rifampin (Table 3).6 Many authors have issued warnings as a result of such reports, but many of the anecdotal reports included women taking antibiotics, with additional medications. Some of the pregnancies might have been within the normal failure rate of the oral contraceptive.

Table 3. Antibiotics and oral contraceptive failure.

<table>
<thead>
<tr>
<th>Antibiotics alleged to contribute to oral contraceptive failure</th>
<th>Antibiotics shown to cause oral contraceptive failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>Rifampin</td>
</tr>
<tr>
<td>Tetracyclines</td>
<td></td>
</tr>
<tr>
<td>Sulfonamides</td>
<td></td>
</tr>
<tr>
<td>Erythromycins</td>
<td></td>
</tr>
<tr>
<td>Metronidazole</td>
<td></td>
</tr>
<tr>
<td>Griseofulvin</td>
<td></td>
</tr>
<tr>
<td>Cephalosporin</td>
<td></td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td></td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td></td>
</tr>
</tbody>
</table>

In 1975, Dossetor reported seeing three cases of pregnancy in her patients who were prescribed ampicillin while on oral contraceptives. No details were provided, including whether any doses of contraceptive were missed or if the patients were also on other medications that may have interacted with the oral contraceptive.7

In an anecdotal report from 1980, Bacon and Shenfield reported a case of pregnancy in a woman who had been taking Microgynon 30® (ethinyloestradiol 30 μg, D-norgestrol 150 μg) for two years and had recently taken a course of tetracycline 500 mg every six hours for three days and 250 mg every six hours for another two days. She claimed not to have missed any doses of oral contraceptive and had no diarrhea, vomiting, or breakthrough bleeding. The authors concluded that women taking oral contraceptives should use additional birth control methods when tetracycline is also administered.8

In 1987, Sándor and Uffen cited many case reports implicating penicillin, ampicillin, metronidazole, and tetracycline in oral contraceptive failure and recommended warning dental patients of a potential interaction when prescribing such antibiotics.9 In 1993, Harvey recommended that dentists should be aware of a potential interaction between oral contraceptives and antibiotics and “advise their patients accordingly.”10

In 1993, Pyle et al. asserted, “Commonly used antibiotics [including penicillins, cephalosporins, and fluoroquinolones] interact with oral contraceptives reducing the contraceptive’s effectiveness. [Warn patients.]”11

After citing scientific studies that seem to rule out the potential interaction of antibiotics with oral contraceptives in 1993, Shenfield nevertheless recommended counseling patients to use additional contraceptive measures when antibiotics are prescribed for medicolegal reasons.12

In 1994, Porterfield described a hypothetical case of an unwanted pregnancy after root canal therapy in which ampicillin was prescribed. Without citing any sources, she asserted, “Like several other penicillins and tetracyclines, ampicillin can decrease the effectiveness of oral contraceptives when the drugs are taken concurrently. The patient should have been advised to use additional contraception during the time she was also taking ampicillin.”13

Also in 1994, Gibson and McGowan recommended giving an informational leaflet to all female dental patients for whom antibiotics are prescribed, warning of a potential interaction with oral contraceptives and that additional birth control measures should be used.14

In 1999, Weisberg asserted rifampin and possibly griseofulvin reduce the efficacy of oral contraceptives, but there was a possibility other antibiotics may also reduce oral contraceptive efficacy in a few women. She stated, “There are no scientific data to support the anecdotal evidence that the concomitant use of combined oral contraceptives and antimicrobials reduces contraceptive efficacy in the majority of women.” She concluded that since some small subset of
women may be affected, all women should be advised of the potential interaction and advised to use additional contraceptive methods.

Wynn stated in 2001 that antibiotics used in dentistry could interfere with oral contraceptives, including penicillin V, amoxicillin, cephalexin, tetracyclines, and erythromycins, but no scientific studies were cited to support this claim. When prescribing such antibiotics, he asserted that dentists should recommend additional contraceptive methods. This author wrote a letter challenging these assertions, citing many scientific studies failing to show any interaction between such antibiotics and oral contraceptives. Wynn’s response was to quote warnings about a potential interaction from the United States Pharmacopeia Drug Information (USPDI) database and manufacturers’ statements from the Physician’s Desk Reference. Again, however, no scientific studies were referenced.

In 2009, Lomaestro recommended advising all female patients of the potential interaction, even if the incidence is rare.

Scientific studies of interactions with various antibiotics and contraceptives

**Rifampin.** Although traditionally used as an antituberculosis treatment, rifampin is sometimes used to treat other infections, including AIDS, bacterial meningitis, and metacin-resistant staphylococcal infections. In a 1979 study of 8 women on norethisterone, the norethisterone plasma levels and half-life were significantly reduced after rifampicin treatment. In 1980, while taking rifampicin 450-600 mg per day, seven women were given a single dose of Minovlar® (50 μg ethinyl estradiol and 1 μg norethindrone acetate) and another single dose one month after stopping rifampicin. The ethinyl estradiol plasma levels and the terminal plasma half-life were significantly increased after stopping rifampicin. The authors concluded, “The data show that women taking oral contraceptive steroids and rifampicin at the same time are likely to suffer a decrease in the effectiveness of the contraceptive steroid. We suggest that in most women taking rifampicin it is unwise to use oral contraceptive steroids as the sole method of contraception.”

One study has shown that 600 mg daily rifampin significantly decreased the plasma levels of ethinyl estradiol and norethindrone and increased levels of follicle-stimulating hormone in women taking oral contraceptive (35 μg ethinyl estradiol/1 mg norethindrone), but not enough to reverse ovulation suppression. Unlike other antibiotics, rifampin is an enzyme-inducer, and that may explain how it decreases contraceptive efficacy.

**Fluoroquinolones.** A 1991 study of trovafloxacin administered to 12 women on oral contraceptive steroids with ethinyl estradiol and levonorgestrel for at least 6 months failed to show a decrease in plasma progesterone concentration. There was also no significant increase in plasma FSH (follicle stimulating hormone) or LH (luteinizing hormone) concentrations. The authors concluded that there was no evidence of any interaction between trovafloxacin and oral contraceptive steroids.

**Penicillins and metronidazole.** In a study of 11 women in 1980 during two consecutive menstrual cycles, the women were given oral contraceptives along with a placebo or ampicillin, and levels of serum estradiol, progesterone, luteinizing hormone, and follicle stimulating hormone were evaluated. Testosterone binding globulin capacity was shown to be unaffected by ampicillin administration. The authors concluded, “Ampicillin appears unlikely to diminish the effectiveness of the oral contraceptive studied.”

In 1980, Joshi et al. studied 16 women who were taking low-dose oral contraceptive combination pills (norethisterone acetate 1 mg and ethinyl estradiol 30 μg). These women were given either ampicillin or metronidazole, neither of which affected the peak levels of norethisterone or ethinyl estradiol. The authors concluded that neither ampicillin nor metronidazole decreased oral contraceptive efficacy.

In a 1982 study of 13 women taking long-term oral contraceptive steroids, there were no significant changes in plasma concentrations of ethinyl estradiol, levonorgestrel, follicle stimulating hormone, or progesterone after administering ampicillin. The authors concluded that “women taking oral contraceptive steroids do not need to take alternative contraceptive precautions when prescribed ampicillin.”

**Sulfa drugs.** In 9 women taking long-term oral contraceptive steroids, concomitant cotrimoxazole was actually shown to increase plasma levels of ethinyl estradiol, but did not affect plasma levels of levonorgestrel or progesterone. The authors concluded, “Short courses of cotrimoxazole are unlikely to cause any adverse effects on contraceptive control when given to women taking long-term oral contraceptive steroids.”

**Antifungals.** In 1990, ten healthy women on oral contraceptives (150 μg ethinyl estradiol and 300 μg norgestrel) were also given fluconazole. There were no clinically or statistically significant effects on the plasma levels of ethinyl estradiol or norgestrel before or after fluconazole administration. The authors concluded that there is no increased risk of pregnancy in oral contraceptive users who are also prescribed fluconazole.

In 1994, London and Lookingbill conducted a mail questionnaire and survey in patients on oral contraceptives and antibiotics of a dermatology clinic and showed no significant difference between the calculated contraceptive failure rate and the normal contraceptive failure rate, but did not rule out the possibility of an interaction in some patients.

**Macrolide antibiotics (erythromycin).** Meyer et al. studied twenty-two healthy women over four menstrual cycles. In the first cycle, there were no medications and normal ovulation. In the second cycle, triphasic oral contraceptives were taken and ovulation was suppressed. In the third
cycle, oral contraceptives and roxithromycin, 300 mg daily was given, and in the fourth cycle oral contraceptives and rifampin, 300 mg a day was given. All women ovulated in the first cycle, and ovulation was suppressed in the second and third cycles in all women, demonstrating that roxithromycin did not interfere with the oral contraceptive. In the fourth cycle, 11 women ovulated when rifampin and the oral contraceptive were given, demonstrating that rifampin does interfere with oral contraceptives.31

Griseofulvin. In a 1984 letter, Dijke and Weber reported on 20 women on oral contraceptives who experienced bleeding or amenorrhea. Two became pregnant after taking concomitant griseofulvin.32 The two pregnant women were also taking other medications. The authors cited studies in mice, showing a modification of hepatic enzyme activity in mice on griseofulvin and warned of an interaction between oral contraceptives and griseofulvin, possibly decreasing the effectiveness of oral contraception in women. Back disagreed, however, stating, “Although griseofulvin has been shown to modify hepatic enzyme activity in mice, there is no good evidence of a major enzyme-inducing effect in humans.”33

Tetracyclines. Murphy et al. studied the effect of tetracycline on oral contraceptive levels in 1991 in seven women on oral contraceptive containing ethinyl estradiol 35 μg and norethindrone 1mg. Tetracycline 500 mg every six hours was given for up to ten days while continuing the oral contraceptive. There was no significant decrease in the plasma ethinyl estradiol or norethindrone levels at 1 day or 5 to 10 days. The authors concluded that tetracycline does not affect low-dose oral contraceptive levels.34

In a 1991 study of 24 women on low-dose oral contraceptive, 100 mg doxycycline was administered twice daily. There were no statistically significant differences in plasma levels of ethinyl estradiol, norethindrone, or endogenous progesterone before and after doxycycline was administered. The authors concluded that pregnancies blamed on an interaction between tetracyclines and oral contraceptives may occur for other reasons or could be due to an interaction in a small proportion of women who are at risk.35

In two randomized studies of women on NuvaRing® contraceptive in 2005, serum etonogestrel and ethinyl estradiol levels were measured before and after amoxicillin or doxycycline ingestion and were found to be unchanged. The authors concluded that there was no interaction between the antibiotics amoxicillin or doxycycline and the contraceptive and that contraceptive efficacy would not be affected by concomitant antibiotic usage.36

In a 2011 case-crossover study of 1,330 oral contraceptive failure cases in 17,721 women, there was no relationship between antibiotic usage and the risk of breakthrough pregnancies although because of the study’s limited power, the authors cautioned that they could not rule out a greater risk of oral contraceptive failure in those who ingest antibiotics.37

Archer and Archer conducted a comprehensive review of the available studies on antibiotic interference with oral contraceptives in 2002 and concluded, “Clinical reports of contraceptive failure with antibiotic use are retrospective, have multiple potential biases, and are not supported by pharmacokinetic data. Available scientific and pharmacokinetic data do not support the hypothesis that antibiotics (with the exception of rifampin) lower the contraceptive efficacy of oral contraceptives.” They went on to state that backup contraception in women on antibiotics and oral contraceptives is unnecessary.38

From 1973 through 1984, there were over 300,000,000 prescriptions for antibiotics not including rifampin in England, but there were only 63 pregnancies during a similar period (1968 through 1984) in England among women on oral contraceptives and antibiotics not including rifampin.39 The fact that there were so few pregnancies in these women shows that many or all of these pregnancies may not be from any interaction at all between the two medications, but rather that they may have been part of the normal expected failure rate of the oral contraceptives. Similarly large numbers of non-rifampin antibiotic prescriptions and few unintended pregnancies in women on contraceptives receiving these antibiotics have been reported in the United States.40

Legal liability and malpractice exposure. Most dentists are aware of the possibility of “wrongful death” lawsuits, in which the practitioner could be legally liable for negligence in dental treatment, after which a dental patient dies. For example, an overdose of a local anesthetic could possibly result in the death of a patient, and the patient’s survivors could sue the dentist for negligence and “wrongful death”. Lawyers are very creative, and there are now “wrongful birth” lawsuits in which a practitioner could be accused of negligence in failing to warn of a potential interaction between a prescribed medication that interacts with oral contraceptives, rendering the contraceptive ineffective in preventing pregnancy. As previously mentioned, the interaction, it is alleged, contributes to an unwanted pregnancy after which a child is born, and the dentist is sued for liability for child support until the child is 18 years of age. This issue has caused consternation among dentists, physicians, and patients, culminating in the lay media with the headline “A Dentist Visit Can Make You Pregnant” in a supermarket tabloid.6

Many physicians and dentists have changed their prescribing protocol based on this alleged interaction. A dermatologist stated in 1981, “I for one have discontinued giving oral antibiotics to patients taking oral contraceptives.”41 When one considers how commonly antibiotics are used in dermatology and that women on oral contraceptives probably make up a significant segment of most dermatologists’ practices, then this statement was very bold indeed.

Writing in The Dental Law Digest in 1992, Frank Recker, DDS, JD, stated, “[T]here is no legal evidence that
A “wrongful life” legal case
The case of Karen T. Jones and Chris Jones v. United States of America was tried in the United States District Court in the Northern District of California in 1996. A woman and her husband sued her gynecologist and oral surgeon for wrongful birth and lost. The woman alleged that she became pregnant after the gynecologist prescribed oral contraceptives and the oral surgeon prescribed penicillin for oral surgery but neither doctor had warned of a potential interaction between the drugs, rendering the contraception less effective. The court ruled in the doctors’ favor for several reasons. There was no scientific evidence of an interaction between the antibiotic and the contraceptive. Although the plaintiffs’ experts cited articles blaming pregnancies on the decreased efficacy of oral contraception after antibiotics were prescribed, the articles were simply anecdotal reports and not scientific studies. The court held that anecdotal reports are not evidence, and these experts were unable to show scientific studies that documented a significant interaction or that she became pregnant while taking penicillin. Under California law, practitioners are not required to discuss risks of very low incidences. The failure rate would have to exceed double the expected failure rate for a practitioner to be required to discuss the potential risk. The plaintiffs also argued that the package label for the oral contraceptive proved that an interaction occurs between antibiotics and oral contraceptives. The court held, however, that the label simply warns that such an interaction is possible. “Furthermore, the inclusion of a boilerplate warning on a drug package insert may reflect no more than an overly cautious response to possible liability, not scientific proof of causation.” This case was later affirmed by the Ninth Circuit Court of Appeals.

Some argue that it is “better safe than sorry”; that is, why not advise female patients of a potential interaction between the antibiotic and the oral contraceptive so that alternate methods of contraception can be used? At a minimum, so this line of thinking goes, the dentist would be protected from legal liability by dispensing this advice. But in the United States, lawsuits can be initiated for virtually any reason. It is fairly easy to imagine the following hypothetical case possibly happening: A 24-year-old woman on oral contraceptives comes to the dentist with pain and swelling in tooth 31. The dentist diagnoses a carious molar requiring root canal therapy or an extraction. The patient chooses root canal therapy to save the tooth so the dentist prescribes amoxicillin and schedules the root canal treatment in one week. Since the patient is on oral contraceptives, the dentist warns of a potential interaction that could render the oral contraceptive ineffective and strongly urges additional contraception while on amoxicillin. The woman is extremely apprehensive and does not want an unintended pregnancy. Rather than use additional contraception or even abstaining, she chooses not to take the prescribed antibiotic at all. The swelling gets worse, turning into osteomyelitis and eventually fatally obstructs the airway. The woman’s surviving family members sue the dentist for negligently advising the woman of an interaction without scientific evidence for such an interaction. In court, the dentist claims in his defense, “I was just playing it safe” or “better safe than sorry,” but the judge could reject these as invalid defenses. The dentist, in this case, was doing what was best for the dentist. Although this case is hypothetical, it is also plausible, and it shows that when it comes to legal liability, the safest course of action is to try to do what is best for the patient, not necessarily what is best for the doctor.

National dental and medical group statements
In 2000, the American College of Obstetricians and Gynecologists stated that in addition to rifampin, griseofulvin also decreased oral contraceptive steroid levels in women but tetracycline, doxycycline, ampicillin, metronidazole and quinolone antibiotics did not decrease such levels. In 2006 and 2008, the American College of Obstetricians and Gynecologists stated that tetracycline, doxycycline, ampicillin, metronidazole, miconazole, fluconazole, and fluoroquinolones do not decrease oral contraceptive steroid levels in women taking combination oral contraceptives. Additional forms of contraception are not necessary unless rifampin is co-administered with oral contraceptives.

In 2002, the American Dental Association Council on Scientific Affairs concluded that even though the interaction between non-rifampin antibiotics and oral contraceptives could not be classified as “established, probable, or even suspected,” it still seemed prudent for practitioners to warn women of a potential interaction and to use additional methods of birth control while taking antibiotics. In 2006, the American Dental Association Council on Access, Prevention and Interprofessional Relations addressed the issue of antibiotic interference with oral and other (implant or transdermal patch) contraceptives and concluded that when antibiotics are prescribed, women on oral contraceptives should be warned of a potential interaction, rendering the contraceptive less effective.

The Council of Scientific Affairs of the American Medical Association conducted a comprehensive review of 199 studies relating to antibiotic interference with oral contraceptives in 2001. The oral contraceptive failure rate in women taking non-rifampin antibiotics corresponded to the usual failure rate of oral contraceptives without concomitant antibiotic usage. The authors concluded that rifampin can impair oral contraceptive efficacy, but studies of other antibiotics have not shown any interaction between the antibiotics and oral contraceptives. They added, “However,
individual patients do show large decreases in the plasma concentrations of ethinyl estradiol when they take certain other antibiotics, notably tetracycline and penicillin derivatives. Because it is not possible to identify these women in advance, a cautious approach is advised.\textsuperscript{50}

The World Health Organization concluded in 2010 that there is no evidence that antibiotics other than rifampin interact with oral contraceptive efficacy.\textsuperscript{51} These findings were endorsed by the CDC in 2010.\textsuperscript{52}

The package insert of an oral contraceptive states, “drugs such as rifampin and some antibiotics may decrease oral contraceptive effectiveness.”\textsuperscript{53} The popular website WebMD\textsuperscript{6} states that there may be an interaction between the penicillins and oral contraceptives but also states that there is consensus that additional backup contraception need not be used when penicillins are taken.\textsuperscript{54}

In 2012, Taylor and Pemberton reviewed the evidence and concluded that unlike previous recommendations, “When prescribing non-enzyme-inducing antibiotics [i.e., non-rifampin antibiotics] to patients using combined hormonal contraception, the current guidance is that there is now no need to tell patients that they should use additional contraceptive methods while they take the antibiotics [unless they are suffering from diarrhea or vomiting].”\textsuperscript{55}

Helms et al. examined the effect of antibiotics that were commonly prescribed in dermatologic practice (tetracyclines, penicillins, cephalosporins) on the oral contraceptive (OC) failure rate by retrospectively studying the records of 356 patients who were on combined antibiotic and oral contraceptives. Of these patients, 263 served as controls along with an additional 162 patients. There was no significant difference between the failure rate of oral contraceptives when taken concurrently with antibiotics (1.6% per year failure rate) and the failure rate of the oral contraceptives alone (0.96% per year failure rate). The authors concluded, “The difference in failure rates of OCs when taken concurrently with antibiotics commonly used in dermatology versus OC use alone suggests that these antibiotics do not increase the risk of pregnancy. Physicians and patients need to recognize that the expected OC failure rate, regardless of antibiotic use, is at least 1% per year and it is not yet possible to predict in whom OCs may fail.”\textsuperscript{56}

In a 2011 review article, Becker concluded, “There is no sound evidence to support the contention that antibiotics, other than rifampin, reduce the effectiveness of oral contraceptives.”\textsuperscript{57}

In 2002, DeRossi and Hersh reviewed studies on the interaction between antibiotics and oral contraceptives and made the following observations: 1) Other than rifampin and rifabutin, no clinical study has shown any antibiotic reducing the efficacy of oral contraceptives, 2) as with all drugs, oral contraceptives are not 100% effective and their failure rate may be why pregnancies sometimes occur in women on antibiotics other than rifampin, and 3) medicolegal experts advise warning patients of a potential interaction, but actual legal proceedings do not necessarily support this. DeRossi and Hersh concluded, “With the exception of rifampin-like drugs, there is a lack of scientific evidence supporting the ability of commonly prescribed antibiotics, including all those routinely employed in outpatient dentistry, to either reduce blood levels and/or the effectiveness of oral contraceptives.”\textsuperscript{58}

References
13. Porterfield LM. Don’t assume the patient was noncompliant. RN 1994;57(5):83.
Questions

1. The history of modern birth control can be traced back to 3000 BC, when condoms were made out of which of the following materials?
   a. Fish bladders
   b. linen sheaths
   c. Animal intestines
   d. All of the above

2. Who was a birth control activist who helped reproductive physiologist Gregory Pincus obtain a grant to begin contraceptive research in 1951?
   a. Eleanor Roosevelt
   b. Gloria Steinem
   c. Margaret Sanger
   d. None of the above

3. In 1951, the Food and Drug Administration approved an oral contraceptive for which of the following?
   a. Morning after pill
   b. Menstrual disorders
   c. Birth control
   d. None of the above

4. In 1960, the Food and Drug Administration approved an oral contraceptive for which of the following?
   a. Morning after pill
   b. Menstrual disorders
   c. Birth control
   d. None of the above

5. When first approved by the Food and Drug Administration, the pill was available to
   a. Unmarried women in all states
   b. Married women in all states
   c. All women in all states
   d. None of the above

6. The theoretical mechanism for decreased contraceptive efficacy with antibiotic interaction is which of the following?
   a. Decrease in normal gut flora that normally increase bioavailability
   b. Increase in normal gut flora that normally decrease bioavailability
   c. Decrease in normal gut flora that normally decrease bioavailability
   d. Increase in normal gut flora that normally increase bioavailability

7. How many women worldwide use birth control pills?
   a. Between 1 million and 2 million
   b. Between 10 million and 20 million
   c. Between 50 million and 100 million
   d. More than 100 million

8. Which of the following ingredients are usually found in modern oral contraceptives?
   a. Estrogen
   b. Progestin
   c. Both of the above
   d. None of the above

9. Which of the following classes of drugs have been implicated in oral contraceptive failure due to drug interactions?
   a. Anticonvulsants
   b. Antidepressants
   c. Vitamins
   d. All of the above

10. Unlike other antibiotics, rifampin is a potent
   a. Enzyme inductor
   b. Macrolide
   c. Fluoroquinolone
   d. None of the above

11. When a lawsuit occurs because of failure to warn of a possible interaction between an antibiotic and oral contraceptive, rendering the contraceptive less efficacious, what is a common legal theory for such a case?
   a. Wrongful death
   b. Wrongful birth
   c. Res ipsa loquitur
   d. None of the above

12. Which of the following international or national health organizations assert that there is no scientific evidence supporting an interaction between non-rifampin antibiotics and oral contraceptives?
   a. World Health Organization
   b. Centers for Disease Control
   c. American College of Obstetricians and Gynecologists
   d. All of the above

13. The typical use failure rate of oral contraceptives is about
   a. Less than 1%
   b. 1%
   c. 4%
   d. 9%

14. The average teenager who uses oral contraceptives misses how many pills a cycle?
   a. 1
   b. 2
   c. 3
   d. 4

15. Regardless of drug interactions, which of the following causes decreased efficacy of oral contraceptives?
   a. Vomiting
   b. Diarrhea
   c. Both a & b
   d. None of the above

16. For which of the following conditions is rifampin prescribed?
   a. Tuberculosis
   b. AIDS
   c. Methicillin-resistant staphylococcal infections
   d. All of the above

17. Which of the following antibiotics has been scientifically shown to lower oral contraceptive efficacy?
   a. Rifampin
   b. Penicillin
   c. Tetracycline
   d. All of the above

18. Scientific studies have failed to show lowered contraceptive efficacy when which of the following antibiotics are also given?
   a. Fluoroquinolones
   b. Penicillins
   c. Sulfur drugs
   d. All of the above

19. Scientific studies have failed to show lowered contraceptive efficacy when which of the following antibiotics are also given?
   a. Antifungals
   b. Macrolide antibiotics
   c. Griesenfulvin
   d. All of the above

20. Scientific studies have failed to show lowered contraceptive efficacy when which of the following antibiotics are also given?
   a. Rifampin
   b. Tetracycline
   c. Both a & b
   d. None of the above

21. A problem with anecdotal reports of unintended pregnancies due antibiotic interaction with oral contraceptives can be which of the following?
   a. Some patients were taking other medications concomitantly
   b. No information on whether any doses of contraceptives were missed
   c. The pregnancies may have been within the normal failure rate of the contraceptive
   d. All of the above

22. To support his assertion that dentists should recommend additional contraceptive methods when prescribing antibiotics for women on oral contraceptives, how many scientific studies did Dr. Wynn cite in his 2001 article and response to a letter challenging the assertion?
   a. None
   b. One
   c. Two
   d. Three

23. Which of the following is a valid legal defense for a dentist sued in a malpractice suit?
   a. Playing it safe
   b. Doing what’s best for the dentist
   c. Doing what’s best for the patient
   d. All of the above

24. From 1973 to 1984, how many prescriptions for antibiotics not including rifampin were there in England?
   a. 3 million
   b. 30 million
   c. 300 million
   d. Over 300 million
25. From 1968 to 1984, how many pregnancies in women on oral contraceptives and antibiotics not including rifampin were there in England?
   a. 63
   b. 163
   c. 630
   d. 1630

26. In both England and the United States, comparing the numbers of non-rifampin antibiotic prescriptions versus the numbers of pregnancies on women on oral contraceptives and non-rifampin antibiotics leads to what conclusion?
   a. The pregnancy rate suggests it was the result of the normal expected failure rate of oral contraceptives
   b. The pregnancy rate suggests unintended pregnancies are a frequent result of non-rifampin antibiotic interaction with oral contraceptives
   c. The pregnancy rate suggests that rifampin does not interact with oral contraceptive efficacy
   d. None of the above

27. In Karen T. Jones and Chris Jones v. United States of America, the judge ruled in favor of the oral surgeon and gynecologist because
   a. The plaintiff’s experts cited anecdotal reports and not scientific studies to support the theory that penicillin interfere with antibiotics
   b. Under California law, practitioners are not required to discuss risks of very low incidences
   c. Anecdotal reports are not evidence
   d. All of the above

28. In Karen T. Jones and Chris Jones v. United States of America, the plaintiff asserted that the oral contraceptive package insert proved that an interaction would occur if penicillin were prescribed. What was the judge’s response to this assertion?
   a. “The inclusion of a boilerplate warning on a drug package insert is scientific proof of causation.”
   b. “The inclusion of a boilerplate warning on a drug package insert may reflect no more than an overly cautious response to possible liability, not scientific proof of causation.”
   c. “The inclusion of a boilerplate warning on a drug package insert carries the same weight as a scientific study published in a peer-reviewed journal.”
   d. All of the above

29. What was the subsequent disposition of Karen T. Jones and Chris Jones v. United States of America?
   a. Affirmed by the US Supreme Court
   b. Affirmed by the Ninth Circuit Court of Appeals
   c. Overturned by the US Supreme Court
   d. Overturned by the Ninth Circuit Court of Appeals

30. What is the possible legal liability for a dentist who warns a patient being of a potential interaction with oral contraceptives when an antibiotic is prescribed?
   a. The dentist is immunized from a malpractice lawsuit
   b. It is possible that the patient could sue the dentist if the patient relies on the warning to stop taking the antibiotic and an infection gets worse
   c. The patient could sue the dentist for an unwanted pregnancy
   d. None of the above

Notes
**Antibiotic Interference with Oral Contraceptives: Can a Dental Visit Make you Pregnant?**

### Educational Objectives

1. Describe the difference between anecdotal reports and scientific studies on the interaction of antibiotics and oral contraceptives.
2. Discuss the legal implications of the interaction between antibiotics and oral contraceptives.
3. Describe the difference in how rifampin and non-rifampin antibiotics affect contraceptive efficacy.
4. Discuss international and national medical and dental group statements on the issue of antibiotic interference with oral contraceptives.

### Course Evaluation

1. Were the individual course objectives met?
   - Objective #1: Yes No
   - Objective #2: Yes No
   - Objective #3: Yes No
   - Objective #4: Yes No

2. To what extent were the course objectives accomplished overall?
   - Scale: 1 = Poor, 5 = Excellent

3. Please rate your personal mastery of the course objectives.
   - Scale: 1 = Poor, 5 = Excellent

4. How would you rate the objectives and educational methods?
   - Scale: 1 = Poor, 5 = Excellent

5. How do you rate the author’s grasp of the topic?
   - Scale: 1 = Poor, 5 = Excellent

6. Please rate the instructor’s effectiveness.
   - Scale: 1 = Poor, 5 = Excellent

7. Was the overall administration of the course effective?
   - Scale: 1 = Poor, 5 = Excellent

8. Please rate the usefulness and clinical applicability of this course.
   - Scale: 1 = Poor, 5 = Excellent

9. Please rate the usefulness of the supplemental webography.
   - Scale: 1 = Poor, 5 = Excellent

10. Do you feel that the references were adequate?
    - Yes No

11. Would you participate in a similar program on a different topic?
    - Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

**Requirements for successful completion of the course and to obtain dental continuing education credits:**

1. Read the entire course.
2. Complete all information above.
3. Complete answer sheets in either pen or pencil.
4. Mark only one answer for each question.
5. A score of 70% on this test will earn you 2 CE credits.
6. Complete the Course Evaluation below.
7. Make check payable to PennWell Corp.

**For Questions Call 216.398.7822**

For IMMEDIATE results, go to www.ineedce.com to take tests online. Answer sheets can be faxed with credit card payment to (440) 845-3447, (216) 398-7922, or (216) 255-6619.

- Payment of $49.00 is enclosed.
- Checks and credit cards are accepted.

If paying by credit card, please complete the following:

- MC  Visa  AmEx  Discover
- Acct. Number: ____________________________________________
- Exp. Date: ______________________
- Charge your statement will show up as PennWell

**CANCELLATION/REFUND POLICY**

Any participant who is not 100% satisfied with this course can request a full refund by contacting PennWell in writing.

© 2014 by the Academy of Dental Therapeutics and Stomatology, a division of PennWell

---

**Educational Objectives**

- **1.** The difference between anecdotal reports and scientific studies on the interaction of antibiotics and oral contraceptives.
- **2.** The legal implications of the interaction between antibiotics and oral contraceptives.
- **3.** The difference in how rifampin and non-rifampin antibiotics affect contraceptive efficacy.
- **4.** International and national medical and dental group statements on the issue of antibiotic interference with oral contraceptives.

---

**Course Evaluation**

1. Were the individual course objectives met?
   - Objective #1: Yes No
   - Objective #2: Yes No
   - Objective #3: Yes No
   - Objective #4: Yes No

2. To what extent were the course objectives accomplished overall?
   - Scale: 1 = Poor, 5 = Excellent

3. Please rate your personal mastery of the course objectives.
   - Scale: 1 = Poor, 5 = Excellent

4. How would you rate the objectives and educational methods?
   - Scale: 1 = Poor, 5 = Excellent

5. How do you rate the author’s grasp of the topic?
   - Scale: 1 = Poor, 5 = Excellent

6. Please rate the instructor’s effectiveness.
   - Scale: 1 = Poor, 5 = Excellent

7. Was the overall administration of the course effective?
   - Scale: 1 = Poor, 5 = Excellent

8. Please rate the usefulness and clinical applicability of this course.
   - Scale: 1 = Poor, 5 = Excellent

9. Please rate the usefulness of the supplemental webography.
   - Scale: 1 = Poor, 5 = Excellent

10. Do you feel that the references were adequate?
    - Yes No

11. Would you participate in a similar program on a different topic?
    - Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

---

**PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.**