AN UPDATE ON ANTIBIOTIC PROPHYLAXIS IN DENTAL PRACTICE

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I. ANTIMICROBIAL PROPHYLAXIS: for prevention of infection pre-&postop

A. RISK FACTORS FOR POST-OPERATIVE INFECTIONS:

1. Proportional to the degree of bacterial contamination during surgery – dirty vs. clean surgeries
2. Virulence of the infective organism – HA-MRSA or CA-MRSA?
3. Host factors – immunocompromised? Type I Diabetics

B. TIMING OF PRE- & PERISURGICAL PROPHYLAXIS

IV REGIMENS: Recommend a single dose given just prior to surgery
Give follow-up dose when: drug has short $t_{1/2}$, for prolonged surgeries, ↑ blood loss
PO REGIMENS: Peak plasma concentration of antibiotic should occur when surgery begins

C. SOURCES OF BACTERIAL CONTAMINATION

EXOGENOUS: Due to poor aseptic technique, high O.R. traffic, colonized surgeons

ENDOGENOUS: Flora from patient's skin, GI, GU, or respiratory tract, dirty wounds (pus)
most common cause of post-op infections

D. ANTIMICROBIAL AGENTS-how does a single pre-procedural dose prevent distant site infection?

MECHANISM OF ACTION ??: ↓ Level of bacteremia and bacterial growth after adherence
Prevents adherence of bacteria to defect or prosthetic device

- Direct prophylaxis against the most likely infective organisms:
  - Usually normal skin flora
  - Target specific organisms

- For dental procedures: Coverage of Viridans streptococci
  - Amoxicillin preferred by A.H.A. (American Heart Association) over penicillin VK citing better absorption & more prolonged serum levels

E. PROPHYLACTIC ANTIBIOTICS PRIOR TO IMPLANT PLACEMENT AND IMPLANT FAILURE RATES

Cochrane Library Review July 31, 2013: Antibiotics at Dental Implant Placement to Prevent Complications

Authors' conclusions:

Scientific evidence suggests that, in general, antibiotics are beneficial for reducing failure of dental implants placed in ordinary conditions. Specifically 2 g or 3 g of amoxicillin given orally, as a single administration, one hour preoperatively significantly reduces failure of dental implants. No significant adverse events were reported. It might be sensible to suggest the use of a single dose of 2 g prophylactic amoxicillin prior to dental implant placement. It is still unknown whether postoperative antibiotics are beneficial, and which antibiotic is the most effective.

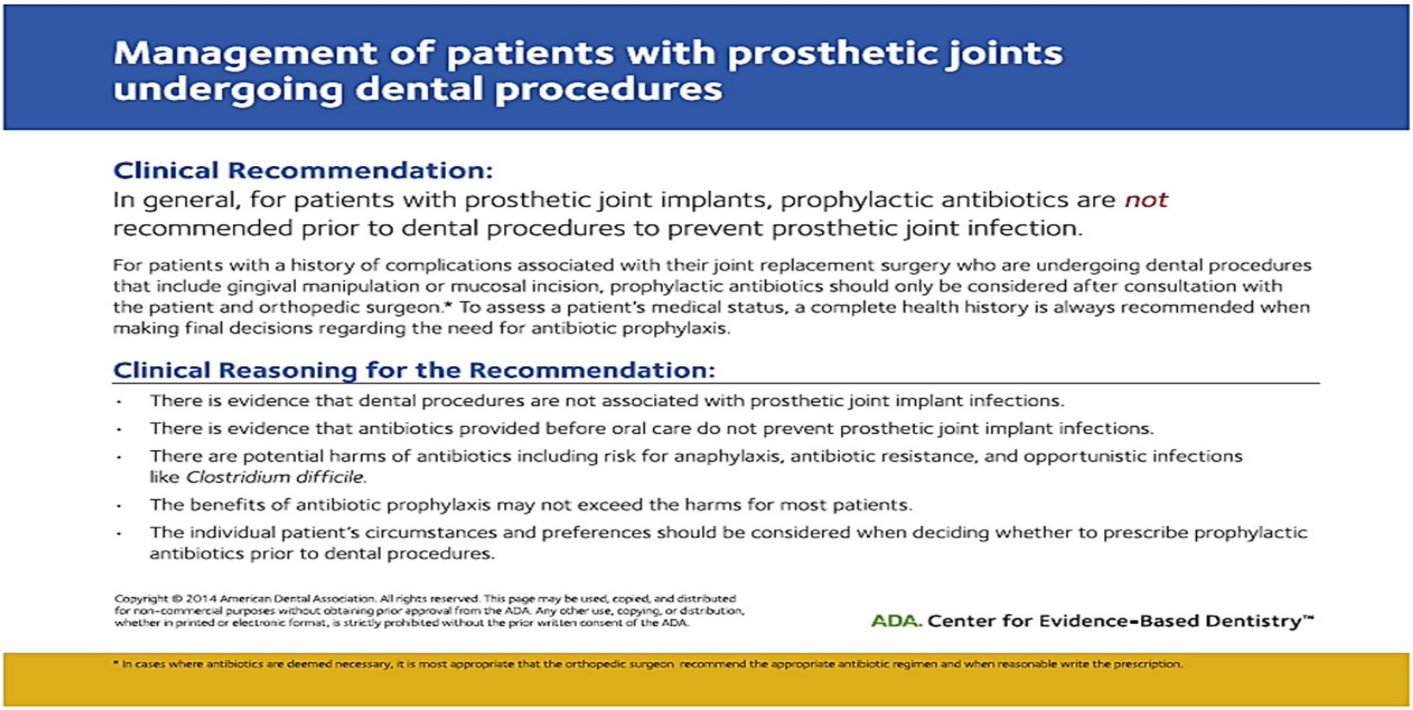
II. ANTIBIOTIC PROPHYLAXIS FOR PATIENTS WITH TOTAL JOINT REPLACEMENTS

A. GUIDELINES FOR ANTIMICROBIAL PROPHYLAXIS – TIMELINE FROM 2003 THROUGH 2016

- Advisory statement adopted by the ADA and the AAOS (American Academy of Orthopedic Surgeons), published JADA 134:895-899, July 2003. AAOS "retired" that advisory statement in February of 2009.
- February 2009 AAOS Information Statement recommends lifelong antimicrobial prophylaxis for all patients with total replacements of large weight-bearing joints even though no new evidence for the change exists.
- *Given this new "Information Statement", Orthopedic Surgeons now bear prescriptive responsibility if the dentist does not deem premedication to be appropriate. See* ***Clinical Infectious Diseases****,1/1/10 and* **JADA***;141;667-671. (Position Paper from the AAOM on Dental Treatment of Joint Patients);Also see JADA December 2011.*
- **Evidence-based recommendation issued December 18, 2012 with guideline writing committee appointed.**

This clinical practice guideline, with three recommendations, is based on a systematic review of the correlation between dental procedures and prosthetic joint infection (PJI).
• Recommendation one, which is based on limited evidence, supports that practitioners consider changing their longstanding practice of prescribing prophylactic antibiotics for patients who undergo dental procedures. Limited evidence shows that dental procedures are unrelated to PJI.
• Recommendation two addresses the use of oral topical antimicrobials (topical antibiotic administered by a dentist) in the prevention of PJI in patients undergoing dental procedures. There is no direct evidence that the use of oral topical antimicrobials before dental procedures will prevent PJI.
• Recommendation three is the only consensus recommendation in the guideline, and it supports the maintenance of good oral hygiene.

B. ADA Constitutes 2014 Committee and Publishes Clinical Recommendations in January 2015



C. AAOS Appropriate Use Criteria (AUC) for Total Hip and Knee Replacement Patients Undergoing Dental Procedures (Approved September 23, 2016 and published September 28, 2016)

We recognize that in the office setting, some specific laboratory values and other patient data are not always readily available. This also may include timely access to published scientific studies that can support clinical decision-making. Appropriate Use Criteria (AUC) specify when it is appropriate to perform a clinical procedure or service. An "appropriate" procedure is one for which the expected health benefits greatly exceed the expected health risks. Ideally, AUC are evidence-based, but in the absence of sufficient evidence, may be derived from a "consensus of expert opinion" and "accepted practice".

With this AUC, we have attempted to define clinical situations in which antibiotic prophylaxis in certain at-risk dental patients could reduce a theoretical risk of post-surgical prosthetic joint infection. This AUC was developed as a decision support tool to facilitate the treatment of defined "high risk" and "immune compromised" patients who are on the more severe end of the clinical spectrum of disease. In the absence of readily available laboratory data or suggestive clinical suspicion, it would be reasonable to assume that most patients will fall outside of these criteria and therefore lay outside the confines of our strict definitions. As always, sound judgment should guide clinical decisions about when it may be necessary or prudent to delay a dental procedure until more information is available.

Assumptions:
Planned Dental Procedures

- **The chance of oral bacteremia being related to joint infections is extremely low, with no evidence for an association.**
- **Oral bacteremia frequently occurs secondary to activities of daily living such as tooth brushing and eating.**
- **Virtually all dental office procedures have the potential to create bacteremia.**

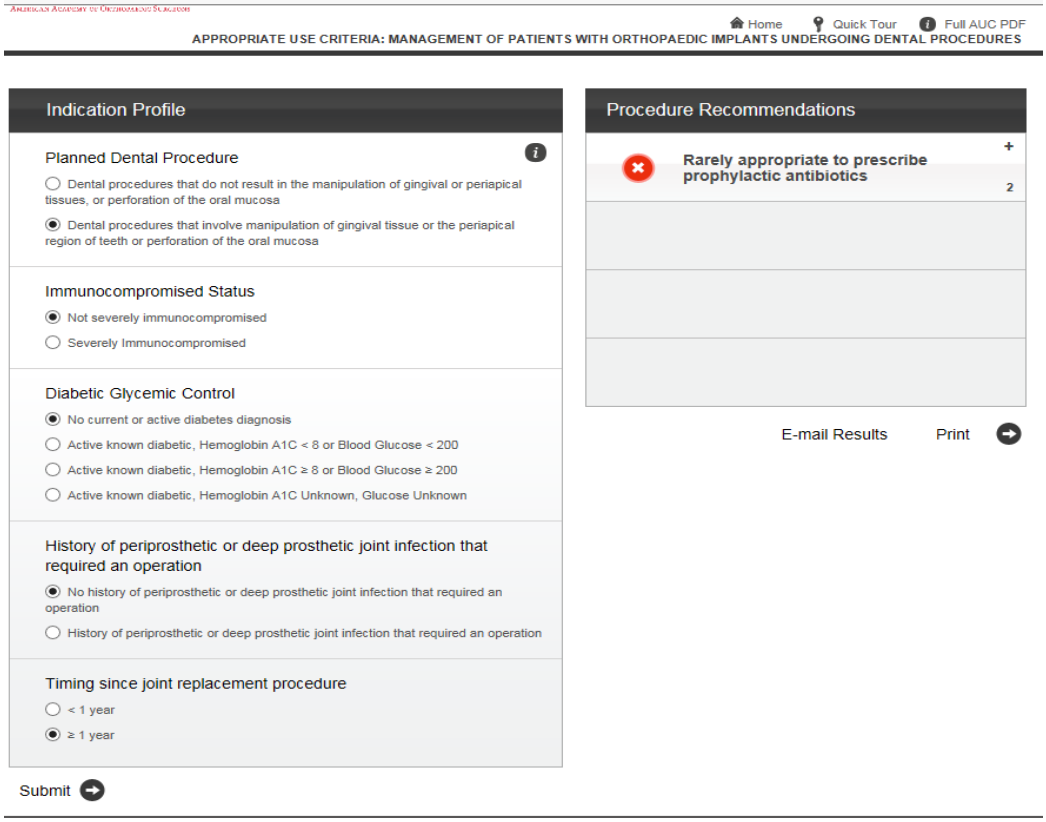
Immunocompromised Status

1. **Severely immunocompromised patients include:**
    a. **Patient with Stage 3 AIDS as defined by the Centers for Disease Control and Prevention (CDC) Guidelines when the immune system becomes severely compromised due to reduced CD4 T lymphocyte counts (<200) or opportunistic infection as defined by CDC[8] see list of diseases below.**
    b. **Cancer patient undergoing immunosuppressive chemotherapy with febrile (Celsius 39) neutropenia (ANC <2000) OR severe neutropenia irrespective of fever (ANC <500)**
    c. **Rheumatoid arthritis with use of biologic disease modifying agents including tumor necrosis factor alpha or prednisone >10 mg per day. Methotrexate, Plaquenil not considered immunocompromising agents.**
    d. **Solid organ transplant on immunosuppressants**
    e. **Inherited diseases of immunodeficiency (e.g., congenital agammaglobulinemia, congenital IgA deficiency)**
    f. **Bone marrow transplant recipient in one of the following phases of treatment:**
        i. **Pretransplantation period**
        ii. **Preengraftment period (approximately 0-30 d posttransplantation)**
        iii. **Postengraftment period (approximately 30-100 d posttransplantation)**
        iv. **Late posttransplantation period (≥100 d posttransplantation) while still on immunosuppressive medications to prevent GVHD (typically 36 months post transplantation) (see Table reference below)**

*Opportunistic illness in AIDS: (as per CDC[6])

Glycemic Control

1. **A1C scores should be recent within 3-6 months.**
2. **Acucheck spot check in dental office blood glucose level is equivalent to a patient self-report.**
3. **Blood glucose tests are assumed to be random (not necessarily fasting).**



D. PRESCRIPTIONS

Rx: Amoxicillin 500 mg capsules
or
Cephalexin 500 mg capsules
Disp: # 4
Sig: Take 4 capsules p.o. 1 hr. prior to dental appointment

- **Amox Is for patients <u>NOT</u> allergic to penicillin**
- Cephalexin is a 1st generation cephalosporin with good strep. coverage and active against staphylococcal organisms

Rx: Azithromycin 250mg tablets
Disp: # 2
Sig: Take 2 tablets p.o. 1 hr. prior to dental appointment

- For patients with penicillin allergy
- Doesn't inhibit P450 3A4
- Does prolong QT interval

Rx: Cefazolin 1 gram **<u>or</u>** Ampicillin 1 gram
Administer: I.M. or I.V.
Sig: 1 hr. prior to procedure

- For patients unable to take oral medications AND NOT allergic to penicillin

Rx: Ceftriaxone 1 gram
Administer: I.V. **or I.M.**
Sig: 1 hr. prior to procedure

- For patients unable to take oral medications AND penicillin allergic

E. DENTAL MANAGEMENT OF PATIENTS WITH TOTAL JOINT REPLACEMENTS

- Updated health history with each visit and explain why you ask at every visit
- Reinforce home-care procedures and use chemotherapeutic measures to reduce bleeding
- Immediate and aggressive treatment of acute and newly recognized chronic infections
- Avoidance of regular daily bacteremia

III. PROPHYLAXIS FOR OTHER IMPLANTS AND DEVICES

A. NO PROPHYLAXIS NECESSARY:

- Breast implants
- **Intraocular lenses**
- Dental implants
- Cochlear implants
- Cardiac Pacemakers
- **A.I.C.D. (Artificially Implanted Cardiac Defibrillators)**
- Orthopedic Plates, Pins, Screws, and Wires
- Hernia Repair Mesh, Vascular Screens

B. PENILE PROSTHESES

BACKGROUND: 30% of men over 40 yrs. have erectile problems due to:
- arteriosclerotic disease, endocrine problems
- medications (25%) e.g. antihypertensives, diuretics alcohol, tobacco

MANAGEMENT: Defer elective dental treatment until 3 months post-op
ANTIBIOTIC *PROPHYLAXIS?? Not unless immunosuppressant co-morbidities are present*

C. VASCULAR GRAFTS

BACKGROUND: 1 – 5 % incidence of infections
- varies with the site of graft placements
- organisms often originate from bowel or skin

MANAGEMENT: Antibiotic prophylaxis is indicated for grafts < 6 months old
- pseudointima (connective tissue & fibrin) forms on the inner surface of the graft
- physician consult to determine size, type and location of graft

D. INTRAVASCULAR ACCESS DEVICES

BACKGROUND:

Central (tunnel) I.V. lines

- Broviac or Hickman lines - for chemotherapy (chemo port, PICC lines)
- Uldall catheters - for hemodialysis, plasmaphoresis

- Infections primarily due to skin contamination
- Increased risk with newer grafts

MANAGEMENT: No invasive procedures within 6 weeks of graft placement or revision

- Hemodialysis patients NO LONGER REQUIRE ANTIBIOTIC PROPHYLAXIS per 2021 AHA
  - **home maintenance of oral hygiene is crucial to avoid shunt infection**

E. CEREBROSPINAL FLUID SHUNTS – NO PROPHYLAXIS RECOMMENDED PER 2021 AHA

- **Ventricluoatrial shunts (ventriculoatriostomy)– DO NOT premedicate per May 2021 AHA**
- Lumboperitoneal shunts – negligible risk, no prophylaxis needed
- Ventriculoperitoneal shunts – negligible risk, no prophylaxis needed
  - Most common procedure performed today
  - Used to treat hydrocephalus, post-stroke injury
  - Used to treat normal pressure hydrocephalus (NPH) which is a reversible cause of dementia

IV. PREVENTION OF VIRIDANS GROUP STREPTOCOCCAL INFECTIVE ENDOCARDITIS – A Scientific Statement from the American Heart Association CIRCULATION, MAY 18, 2021

2021 AHA Guidelines for the Prevention of Infective Endocarditis

A. Regimens for a Dental Procedure

Situation	Agent	Regimen – Single dose 30-60 minutes before procedure	
		Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Oral Allergic to penicillins or ampicillin	Cephalexin**† *OR* Azithromycin *OR* Doxycycline	2 g 500 mg 100 mg	50 m/kg 15 mg/kg <45kg - 4.4mg/kg
Unable to take oral medication	Ampicillin *OR* Cefazolin or ceftriaxone	2 g IM or IV* 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins & unable to take oral med	Cefazolin or ceftriaxone†	1 g IM or IV	50 mg/kg IM or IV

*IM – intramuscular; IV – intravenous.
**or other first or second generation oral cephalosporin in equivalent adult or pediatric dosage.
†Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin

B. AP for a Dental Procedure Underlying Conditions for Which AP is Suggested (Table 3.)

Prosthetic cardiac valve or material
Presence of cardiac prosthetic valve
Transcatheter implantation of prosthetic valves
Cardiac valve repair with devices, including annuloplasty, rings, or clips
Left ventricular assist devices or implantable heart
Previous, relapse, or recurrent IE

CHD
Unrepaired cyanotic congenital CHD, including palliative shunts and conduits.
Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by transcatheter during the first 6 mo after the procedure
Repaired CHD with residual defects at the site of or adjacent to the site of a prosthetic patch or prosthetic device
Surgical or transcatheter pulmonary artery valve or conduit placement such as Melody valve and Contegra conduit
Cardiac transplant recipients who develop cardiac valvulopathy

C. AP for a Dental Procedure IS NOT RECOMMENDED

Implantable electronic devices such as a pacemaker or similar devices
Septal defect closure devices when complete closure is achieved
Peripheral vascular grafts and patches, including those used for hemodialysis
Coronary artery stents or other vascular stents
CNS ventriculoatrial shunts
Vena cava filters
Pledgets

D. Dental Procedures for which Antibiotic Prophylaxis is Reccommended for Patients

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa *

***The following procedures and events do not need prophylaxis**: routine anesthetic injections through noninfected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of primary teeth and bleeding from trauma to the lips or oral mucosa.

E. SAMPLE ADULT ANTIBIOTIC PREMEDICATION PRESCRIPTIONS

RX: Amoxicillin 500 mg capsules
Disp. # 4
Sig: Take 4 capsules p.o. 1 hour before dental Appointment

- **For patients NOT penicillin allergi**c
- Pediatric dose: 50 mg/kg not to exceed adult dose!
- Amoxicillin is available in 500 and 250 mg **capsules**, and 250 mg chewable tablets and 250 mg/5 ml susp.

RX: Cefaclor 500 mg capsules
Disp. # 4
Sig: Take 4 capsules p.o. 1 hour before dental appointment

- Pediatric dose: 50 mg/kg
- Cefaclor (generic Ceclor®) is second generation ceph
- Also comes in a 250 mg/5ml suspension
- Avoid ALL cephalosporins if patients allergic reaction was either – urticarial, angioedema, anaphylaxis or unknown

RX: Azithromycin (Zithromax®) 250 mg tablets
Disp. #2
Sig: Take 2 tablets p.o. 1 hour before appointment.

- Pediatric dose: 15 mg/kg
- Less drug interactions than macrolides, low incidence of GI irritation

Oral liquids for adults who have forgotten to take AP at home:

RX: Amoxicillin 250 mg/5 ml suspension
Disp. # 40 ml
Sig: Take 40 ml one-half to one hour before dental appointment

- Suspension is a powder that must be reconstituted prior to use- tastes good
- Reconstituted suspension expires in 14 days with or without refrigeration. Tastes good!

RX: Azithromycin 200 mg/5 ml susp.
Disp. # 15 ml (pour out 12.5ml for 500mg)
Sig: Take 12.5 ml one-half hour before dental appointment

- Suspension is commercially available as 600mg/15ml
- 12.5ml is 500mg of azithromycin
- Tastes good!

V. OTHER CONDITIONS THAT MAY REQUIRE ANTIMICROBIAL PROPHYLAXIS

A. SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

BACKGROUND:

- SLE is an inflammatory autoimmune disease whereby pathogenic antigen-antibody complexes harm a variety of organs & systems including the skin, kidneys, blood vessels, joints and the heart
- 50% of SLE patients demonstrate cardiac valve abnormalities at autopsy
- SLE patients have an increased prevalence of cardiovascular abnormalities
- **Incidence of *Infective Endocarditis***: SLE = 1 - 7%
  RHD = 0.8 - 1.2%
  Prosthetic heart valve = 1.1%

MANAGEMENT: Progressive SLE patients should be regularly evaluated for the detection of new heart murmurs And should be questioned about cardiac valve disease at dental visits.

B. ASPLENIC PATIENTS

BACKGROUND (JADA: Dental Considerations in Asplenic Patients. 127:1359-1363, 1996)

- Patients who are functionally or anatomically asplenic fail to clear organisms from the bloodstream and are at an increased risk of overwhelming bacteremia
- Reasons for splenectomy
- Encapsulated organisms pose the highest risk - primary pathogens of concern are *S. pneumoniae, H. influenzae, N. meningitidis, β-* hemolytic streptococci
- Splenectomy confers life-long risk from sepsis in <u>both</u> adults and children (2 - 4%)
- Recommend dental prophylaxis with current AHA regimen when needed

C. SOLID ORGAN TRANSPLANTATION

BACKGROUND: (Clin Transplant. A Survey of Dental Care Protocols. 19: 15-18, 2005)

- Infectious Disease Rates of Patients
  - 80% have “normal” rate of infections
  - 10% chronic or progressive viral infections
  - Hepatitis B or C, cytomegalovirus, EPV etc.
- Theoretically at ⇑ risk from transient bacteremias
- 5-10% recurrent or chronic rejection
  - Increased immunosuppressive dosages (tacrolimus,mycophenolate, prednisone)
  - Most likely to develop opportunistic infections

MANAGEMENT:

- Defer elective dental treatment until at least 6 months after transplantation

D. CORONARY ARTERY STENTS

The report published in *JADA* can be summarized for the dental professional as follows:

1. Dental professionals and other healthcare providers who perform invasive or surgical procedures and are concerned about periprocedural and postoperative bleeding must be made aware of the potential catastrophic risks of premature discontinuation of antiplatelet (thienopyridine) therapy. The dental professional should contact the patient’s physician if issues regarding the patient’s antiplatelet therapy are unclear, in order to discuss optimal patient management strategy.

2. Elective procedures for which there is significant risk of perioperative or postoperative bleeding should be deferred until patients have completed an appropriate course of thienopyridine therapy. The course of this therapy is suggested as 12 months after drug-eluting stent implantation if they are not at high-risk of bleeding.

WHAT ABOUT ANTIBIOTIC PREMEDICATION??

* **According to the 2021 AHA guidelines, antibiotic prophylaxis is not indicated as stated in previously listed Table 3.**