59/63

+1 for bonus

# School of Dentistry

## Department of Restorative Dentistry

CORRECTED

RESTORATIVE DENTISTRY V (D553)

# Mid-Term Examination

October 8, 2009

INSTRUCTIONS

- Verify that you have an examination booklet with ten pages and sixty-three questions.
- Write your name on the computer answer sheet, as well as a nine digit personal identification number of your choosing in the field labeled "social security number", and blacken the appropriate circles with a #2 pencil. *Note: Test scores will be posted by PINs.*
- Sign and date the back of the computer answer sheet.
- For each question answered, blacken the appropriate circle on the computer answer sheet corresponding to the letter of your choice.
- Students are not permitted to ask questions of the proctors during the examination. Do your best to answer each question with the information provided.
- When you have completed the examination, turn in your computer answer sheet. You may keep the question booklet.

RDV Oct 8, 2009
Midterm (1)

***Storybook Description of the Caries Process and the Effects of Fluoride***
Provide the missing content from the choices that follow.

Dental caries is a [---1---] bacterial disease believed to be the most common disease among US children, particularly those who [---2---]. The disease is caused by a pathogenic biofilm in which [---3---] thrive. These organisms metabolize [---4---] to produce organic acids, predominantly [---5---], which dissociate and cause the pH of the plaque fluid to drop. Low molecular weight acids and hydronium ions [---6---] and cause [---7---]. Dental apatite crystals high in [---8---] are especially susceptible to dissolution. As the acid challenge intensifies [---9---] and other breakdown products of DAP, are released into the plaque fluid and an early lesion of the enamel is formed. ***Story continued next page...***

1. a. transmissible
   b. diet dependant
   c. multifactorial
   d. two of the above
   e. a, b and c above

E

2. a. have limited access to professional healthcare services
   b. live in low income and poorly educated communities
   c. have poorly monitored and regulated diets
   d. two of the above
   e. a, b and c above

E

3. a. acidogenic bacteria
   b. aciduric bacteria
   c. mutans streptococci and lactobacilli
   d. two of the above
   e. a, b and c above

E

4. a. mono- and disaccharides
   b. fermentable polysaccharides
   c. ~~sugar-alcohols, especially xylitol~~
   d. two of the above
   e. ~~a, b and c above~~

* D

5. a. lactic
   b. propionic
   c. phosphoric
   d. hydrochloric

A

A X a. diffuse into the subsurface enamel
   b. attack the outer enamel surface

* B 7. a. early breakdown and cavitation of the surface
   b. microporosities of the subsurface enamel

8. a. carbonate
   b. magnesium
   c. sodium
   d. phosphate

A

9. a. calcium ions
   b. phosphate ions
   c. a and b above
   d. neither a nor b above

C*

***Caries story continued...***
The lesion may grow to the point where it can first be detected visually, but only when the enamel is dry. (1) At this stage it is known as a(n) [---10---] and is classified an ICDAS code [---11---]. If the lesion is located on a proximal surface, it [---12---] be detected using conventional radiography. As the pH of the plaque rises, demineralization ceases and mineral repair can begin, which is hastened and catalyzed by fluoride ions. During the acid challenge, fluoride ions are released from various reservoirs, such as [---13---], and are free to react with mineral ions near the tooth surface. Fluorapatite precursor molecules are formed, which begin to repair damaged crystallites. Crystallites that are repaired in the presence of fluoride have a higher proportion of [---14---] and are more resistant to a subsequent acid challenge. This phenomenon is sometimes called [---15---]. If present in adequate concentration, free fluoride ion may also inhibit certain bacterial enzymes, notably [---16---], which reduces the virulence of these organisms. Hence, the cariostatic mechanisms of fluoride are believed to be primarily [---17---].

10. a. cavitated lesion
B (b.) white spot lesion
c. infected lesion
d. brown spot lesion

11. a. 0
(b.) 1
B c. 2
d. 3
e. 4

12. a. can
*B (b.) cannot

13. a. cell surfaces in dental plaque
b. DAP crystallite surfaces and hydration layers
*E c. calcium fluoride particles adsorbed to enamel surfaces
(d.) two of the above
e. a, b and c above

14. (a.) fluorapatite
b. hydroxyapatite
A c. carboxyapatite
d. all of the above

15. (a.) physiologic maturation
b. fluoride saturation
?A c. chemical conjugation
d. fluorapatite potentiation

16. a. ATPase
b. glucosyl transferase
E c. enolase
d. two of the above
(e.) a, b and c above

17. a. topical
b. systemic
D c. post-eruptive
(d.) two of the above
e. a, b and c above

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(3)

18. A drug manufacturer tests its new analgesic Relieva against a placebo, but it decides not to test Relieva against a competitor's established analgesic because a comparative clinical trial may show Relieva to be inferior. Which guiding principle of scientific behavior, as defined by Merton (Science and Democratic Social Structure, 1968), is violated in this example?

C
a. originality
b. universalism
c. disinterestedness
d. organized skepticism
e. makes-sense epistemology

19. Investigators A, B and C jointly design a clinical trial to test the effectiveness of an anti-inflammatory drug. Investigator A selects subjects who meet the requirements of the study and individually assigns them to the test or placebo group depending on their age. The subjects do not know to which group they have been assigned. The placebo group is given a tablet that resembles the test drug, but has no anti-inflammatory properties. During the trial period, Investigator B examines and interviews the subjects in the test group. Investigator C examines and interviews the subjects in the placebo group. They collect data for a total of six months. The reported data strongly suggest that the drug is effective against acute inflammation.

All of the following terms apply to the research method used in this example EXCEPT which one?

A
a. randomized
b. double-blind
c. controlled
d. prospective
e. in vivo

(A + B accepted later)
bc of faulty wording

20. Keeping the scientific method in mind, what could one reasonably conclude from the published results of the study described above?

D
a. the drug is effective against acute inflammation
b. the experimental design may have contributed an element of bias to the data collection
c. the drug may have a therapeutic benefit, but additional tests are needed to verify efficacy
d. two of the above
e. a, b and c above

21. Of the following steps in the practice of evidence-based dentistry, which one is regarded as the logical starting point?

C
a. identify textbooks that represent the standards of knowledge in the field
b. conduct electronic searches for available scientific papers
c. ask a clear focused clinically-relevant question
d. critically appraise the scientific evidence for validity and usefulness

22. Randomized controlled clinical trials are categorized as _____ studies.

C
~~a. *in vitro*~~
~~b. retrospective~~
c. experimental
d. two of the above
~~e. a, b and c above~~

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(4)

23. When considering serious diseases that are potentially harmful to humans, cause and effect relationships are frequently investigated using.

C
a. *in vitro* studies
b. controlled clinical trials
c. cohort and case-control studies
d. experimental studies with human subjects

(A + C accepted later)

24. *In vitro* studies that test dental materials are most useful for

B
a. predicting the behavior of materials in the oral environment
b. comparing the physical properties of one material to another
c. estimating the life expectancy of a material in the human dentition
d. making important clinical decisions about the effectiveness of a material

25. When considering clinical questions about patient interventions or therapy, which one of the following sources of scientific information is most highly regarded in the evidence hierarchy (*i.e.*, highest on the "evidence ladder")?

A
a. randomized controlled clinical trials
b. case-control studies
c. *in vitro* studies
d. cohort studies

26. All of the following are characteristics of a systematic review EXCEPT which one?

C
a. search and inclusion criteria are clearly defined
b. inclusion decisions are made by consensus of at least two reviewers
c. papers published in foreign languages are excluded from consideration
d. problems and limitations of the review are discussed openly and frankly

27. Cohort studies and case-control studies are lower on the evidence hierarchy (compared to RCTs) because

D
a. the intervention or exposure is not under the control of the investigators
d. the potential for bias is higher due to confounding variables that remain unaccounted for
e. ~~they are prospective in design~~
d. two of the above
e. a, b and c above

28. In the paper "Acquisition and transmission of mutans streptococci" (CDA Journal, 2003), Berkowitz maintains that

A
a. the earlier a child is infected with MS, the greater the caries risk later in life
b. infection with MS occurs after the age of 5 years
c. MS cannot colonize the mouth of a pre-dentate child
d. mothers should be treated to reduce caries risk 18-24 months after giving birth

29. Caries risk assessment is based on which one of the following fundamental principles?

B
a. most people in a given population have the same risk factors for dental caries
b. the disease is present before caries lesions can be detected
c. the level of mutans streptococci in the saliva alone is a valid predictor of future caries experience
d. every patient who does not exercise good oral hygiene is at high risk for dental caries

RDV Oct 8, 2009
(5)

30. When using a caries risk model to help manage a population of adult dental patients, possible consequences of false positive results include

B
a. failure to provide adequate treatment for the disease
b. unnecessary costs for preventive treatment
c. fluorosis
d. all of the above

31. A dentist does a caries risk assessment and then tells the patient that she must stop drinking sugar sweetened energy drinks. (She consumes 6 cans per day.) This advice is likely to be unsuccessful, even if the patient understands the caries risk implications, because the anticipatory guidance (TA Marshall, JADA 2009) fails to

E
a. account for the contribution of the drinks to the total caloric need of the patient
b. engage the patient in an assessment of motivation and self-determination
c. consider the caffeine reliance and potential addiction
d. two of the above
e. a, b and c above

32. According to the "Diet Assessment of Caries Risk" tool described by TA Marshall (JADA 2009), all of the following aspects of sugar-sweetened drinks should be assessed, EXCEPT which one?

E
a. timing of the exposures: with meals or between meals
b. frequency or number of exposures per day
c. length of time of the typical exposure
d. the drinking style or method straw vs sip
e. all of the above are important and included in the diet assessment tool

33. Which of the following can be considered a logical and scientifically valid reason (based on existing data) for opposing community water fluoridation in the US?

A
a. likely to result in a higher prevalence of mild to moderate dental fluorosis in children
b. causes neurological damage and severe learning disabilities
c. ~~expensive compared to other methods of cariostasis~~
d. provides a systemic dose only, not a topical exposure

34. Of the following questions concerning the cariostatic effects of fluoride, which one has *NOT* yet been answered to any *reasonable scientific certainty*?

C
a. When fluorine is incorporated into dental apatite crystals (FAP), is the solubility in acid affected? yes
b. Does systemic exposure to fluoride during tooth development provide a life-long cariostatic effect? no
c. What is the daily topical dose of fluoride required to prevent caries lesion formation?
d. Can fluoride ions present in the oral cavity influence the de- and re-mineralization kinetics of dental hard tissues?

35. In his paper, "Fluoride and social equity" (J Public Health Dent, 2002), Burt argues that fluoridation of community water is a policy that should be continued and expanded. What is the basis for his argument?

C
a. 25% of American children between the ages of 6 and 17 account for 80% of the caries experience
b. caries risk assessment can be employed to differentiate between low and high risk patients
c. disparities in caries experience exist along socioeconomic lines, which can be reduced with a widely-applied fluoridation effort
d. the cariostatic benefits of water fluoridation are derived mainly from the systemic effects

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first + ✓

+

(6)

Match the saliva component (left) with its primary function (right).

A 36. Amylase A
B 37. Histatins B
D 38. Calcium phosphate D

a. digestion
b. antibacterial/antifungal
c. lubrication
d. remineralization
e. buffering

39. A single bite-wing radiograph has diagnostic value in that it can show the *approximate* _____ of a Class II caries lesion.

D
a. location
b. axial depth
c. ~~degree of activity~~
(d.) two of the above
e. a, b and c above

↑ sensitivity (↓ false negs)
↓ specificity (↑ false positives)

40. Which of the following statements about the DIAGNOdent is/are true?

C
a. false positive diagnoses are eliminated by using the DIAGNOdent ×
b. DIAGNOdent is a "stand alone" tool that eliminates the need for conventional exam procedures ×
(c.) multiple studies have demonstrated very good inter-examiner reliability of DIAGNOdent readings —
d. numerical DIAGNOdent readings correlate very closely to the depth of caries lesions ×

~~41.~~ Which of the following caries detection tools, like the DIAGNOdent, is based on differential fluorescence?

A
a. QLF
b. DIFOTI
c. Midwest Caries I.D.?
d. two of the above
(e.) a, b and c above

2+

42. The central fissure of tooth #30 exhibits a brown discoloration that is visible when wet and slightly wider than the fissure itself, but there is no evidence of enamel breakdown. Using the ICDAS classification, this fissure is code 2

0 virgin happy tooth
1 spot when dry
2 spot when wet
3 enamel cavitation

B
a. 1
(b.) 2
c. 3
d. 4
e. 5 enamel → dentin breakdown

43. When considering the difficulties of detecting Class I enamel and early dentin caries lesions, the ICDAS procedure and radiography are similar in that

E
a. both tend to have higher specificity than sensitivity (good at excluding non disease) ✓
b. both may produce a significant number of false negative diagnoses ↓ sensitivity ✓
c. neither one is accurate enough to be considered a "stand alone" detection method —
d. two of the above
(e.) a, b and c above



—1

44. Which one of the following is a compelling reason to replace an existing amalgam restoration?

B
a. narrow ditching of occlusal margins
b. a fracture line at the isthmus of a MOD restoration
c. corrosion of the exterior surfaces of the restoration
d. a beginning caries lesion at an accessible margin of a deep MODFL restoration

45. In his narrative review *Clinical diagnosis of recurrent caries* (JADA 2005), Mjor makes several statements related to the problems of resin based composite (RBC) restorations, including these:

E
a. RBC accumulates more plaque than other types of restorations
b. the plaque that forms on RBC is more cariogenic than that seen on dental amalgam
c. the presence of marginal overhangs predisposes the tooth to secondary caries lesions
d. two of the above
e. a, b and c above

46. A 17-year-old female patient has 6 detectable caries lesions at the time of examination, including two in tooth #30: a distal E1 lesion and a mesial E2 lesion (as seen on a bitewing radiograph). Of the options presented here, the most appropriate treatment plan for tooth #30 is

E
a. conventional MOD amalgam or composite restoration
b. MO amalgam or composite restoration with extension into the occlusal fissures
c. MO amalgam or composite restoration using the "proximal slot" design
d. MO amalgam or composite restoration using the "proximal slot" design, and a conventional or invasive occlusal sealant
e. medical management to promote remineralization of the proximal lesions, and a conventional or invasive occlusal sealant

47. Minimally invasive guidelines for the treatment of Class II caries lesions are based on which one of the following principles?

B
a. caries lesions that affect dentin cannot be arrested
b. caries lesions with an intact enamel surface are amenable to remineralization
c. caries lesions that penetrate the dentin spread laterally at the DEJ
d. caries lesions are generally more extensive than they appear on radiographs
e. caries lesions should be removed in their entirety prior to restoration

48. Which of the following strategies is/are consistent with a "minimally invasive" treatment philosophy for patients with dental caries?

E
a. preserving healthy tooth structure when designing restorations
b. repairing instead of replacing restorations whenever possible
c. avoiding or postponing restorations by using potentially effective medical management approaches
d. two of the above
e. a, b and c above

49. Which one of the following is a compelling (evidence-based) reason for restoring *posterior* teeth with proximal D1 caries lesions, as opposed to managing them with a medical approach?

D
a. D1 lesions are plainly visible in most posterior teeth, so they adversely affect dental esthetics
b. teeth with D1 lesions are usually sensitive to thermal and osmotic stimuli
c. D1 lesions usually cause the marginal ridge enamel to collapse under occlusal loading
d. a significant proportion of D1 lesions will progress because of surface cavitation

RDV Oct 8, 2009
(8)

50. Delaying surgical intervention for some Class II caries lesions discovered on bitewing radiographs may be justified because

E
a. many class II lesions visible on radiographs are not associated with cavitation of the enamel surface
b. medical management may be effective in arresting and remineralizing some lesions
c. caries lesions in the enamel of proximal surfaces usually progress at a slow rate
d. two of the above
e. a, b and c above

51. CPP-ACP is a calcium phosphate remineralizing compound stabilized by a protein derived from

A
a. milk
b. egg whites
c. saliva
d. plant tissue
e. blood

52. Recent critical reviews of clinical studies have confirmed, with a reasonably high level of confidence, that some therapies are effective in arresting caries lesions and help prevent the onset of new lesions. These dependable therapies include

*A
a. fluoride varnish
b. 0.12% chlorhexidine gluconate oral rinse
c. CPP-ACP paste
d. all of the above

53. Which of the following modes of treatment represent a sensible use of xylitol for cariostasis?

D
a. xylitol gum following chlorhexidine (CHX) therapy for high risk adult patients
b. xylitol mints or candies for high risk children with a mixed dentition
c. xylitol gum for high risk mothers of young children
d. all of the above

54. All of the following are considered disadvantages of chlorhexidine (CHX) when used to suppress cariogenic oral bacteria EXCEPT which one?

A
a. CHX loses its therapeutic effect within an hour of application — ?
b. mutans streptococci tend to re-emerge weeks or months after CHX therapy —
c. the success of the therapy is dependent on many factors, and may not always be predictable ?
d. CHX is not particularly effective against lactobacillus species —

55. In their review of clinical studies related to the partial removal of caries lesions (JADA 2008), Thompson *et al* observed that teeth in which restorations were placed directly over residual carious dentin frequently exhibit all of the following outcomes EXCEPT which one?

D
a. reduced counts of viable bacteria months later —
b. hardening of the residual carious dentin and little or no evidence of lesion progression —
c. fewer incidents of pulp exposures and other pulp complications compared to complete removal of deep dentin lesions —
d. retention failure of the restorations

RDV Oct 8, 2009
(9)

56. Which of the following choices would be a reasonable application of the findings of the Mertz-Fairhurst clinical trial (*Ultraconservative and cariostatic sealed restorations: results at year 10*. JADA. 1998) to everyday restorative dental practice?

D
a. place all amalgam and composite resin restorations directly over undisturbed dentin caries lesions
b. place restorations without removing the deepest carious dentin where there is a risk of pulp exposure
c. seal new amalgam and composite resin restorations with a flowable resin, and reseal periodically
(d) two of the above
e. a, b and c above

***Storybook Description of the Symptomatology and Management of Latex Allergy***
Indicate whether the words or phrases in ***[bold italics]*** make the sentence True or False.

Adverse reactions to examination gloves and other rubber products have become a major concern for dentists because of the potential for serious outcomes, both for themselves and their patients. NRL allergy is categorized as a Type I hypersensitivity reaction and manifests as localized or remote urticaria, which usually develops ***[57--within minutes of exposure]***. Symptoms can also include rhino-conjunctivitis, asthma-like reactions, and even in rare cases ***[58--anaphylaxis]***. NRL allergy is strongly associated with a history of atopy, as well as allergies to avocado, banana, ***[59--chestnuts and kiwi]***. Patients with NRL allergy often have a history of childhood surgeries, with the highest rate demonstrated by people with ***[60--spina bifida]***. True NRL allergy must be distinguished from irritation dermatitis, a non-immunological reaction, and contact dermatitis, which is a ***[61--delayed hypersensitivity reaction]*** to other chemicals in the rubber product. The most sensitive and definitive method of diagnosing NRL allergy is the ***[62--RAST or radioallergosorbent test]***. Once the condition has been positively diagnosed, avoidance is the best management practice. Attempts to prevent allergic reactions with prophylactic antihistamines and corticosteroids ***[63--have not been affective]***. (Source: SH Wakelin and IR White. *Natural rubber latex allergy.* Clin Exper Derm. 1999; 24.)

A 57. (a.) true
b. false

A 58. (a.) true
b. false

A 59. (a.) true
b. false

A 60. (a.) true
b. false

A 61. (a.) true
b. false

B 62. a. true
(b.) false

A 63. (a.) true
b. false

**BONUS QUESTION!**
***Write your answer on the BACK of your computer answer sheet (bubble sheet).***

In the paper entitled "Caries management in the dental practice" author Graeme Miliciche proposes a caries risk assessment protocol that includes the use of the CariScreen ATP meter to assess the potential cariogenicity of the patient's plaque. Other than the fact that there is little scientific evidence to support the efficacy of the CariScreen meter, why should we be cautious about taking his advice?
(Hint: He discloses something about himself at the end of the paper.) Shareholder/stockholder