Inoculation theory: motivation mechanism vs. attack credibility as mediators of resistance to persuasion

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INOCULATION THEORY: MOTIVATION MECHANISM VS. ATTACK CREDIBILITY AS MEDIATORS OF RESISTANCE TO PERSUASION

BY

PETER F. CRANIS
B.A., University of Central Florida, 1984

THESIS
Submitted in partial fulfillment of the requirements for the Master of Arts degree in Communication in the Graduate Studies Program of the College of Arts and Sciences University of Central Florida Orlando, Florida

Fall Term
1988
With thanks to my family for their support during the pursuit of my degree and the completion of this thesis. Also, special thanks to Dr. Burt Pryor for his hard work in editing this thesis.
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INTRODUCTION

Through the ages, much thought has been given to methods of persuading individuals in order to gain a desired response. The Greeks engaged in rhetoric, while other cultures used more violent means of "persuasion." As the power to persuade someone nonviolently took precedence in the free world, the use of communication became of utmost importance. Persuasive messages that could be used effectively in advertising, by political parties, or even by religious factions, were of great value. Not until soon after World War II, however, did anyone report on how one might create a resistance to these persuasive attacks.

Early efforts to study resistance to persuasion consisted of analyzing the effects of both one-sided and two-sided communications. One-sided communications present arguments for one point of view, without ever mentioning the opposing point of view. Two-sided communications present arguments for one point of view and then go on to mention and refute the opposing point of view.
During World War II, Hovland, Lumsdaine and Sheffield (1949) reported the first investigation of one-sided and two-sided communications. The two-sided message was more persuasive for all subgroups except a group which had less than a high school education who initially agreed with the message. Lumsdaine and Janis (1953) continued the area of study and found that subjects who received one-sided communications were more susceptible to counter messages than subjects who received two-sided communications. The authors of this study concluded that when subjects were given a two-sided message, even if arguments from the opposing point of view were mentioned, they became "inoculated" against the opposing side.

This early research led to an important series of studies on resistance to persuasion. William J. McGuire (1961) and his associates performed a series of systematic experiments to investigate message strategies for inducing resistance to persuasion. The research led to development of the inoculation theory.

McGuire and Papageorgis (1961) argued that people often avoid exposure to opinions other than their own. This selective exposure can make them more susceptible
to persuasive attacks when these attacks contain arguments against which they have heard no prior defense. With little practice and motivation to develop arguments supporting their own position, the individuals is left vulnerable to persuasive attacks.

McGuire's inoculation theory draws on a medical analogy. McGuire and Papageorgis (1962) stated that people who are brought up in a germ-free environment often fail to develop the needed resistance to infection. While seemingly healthy, these individuals are extremely vulnerable when exposed to an infectious virus. The authors stated two ways to help prevent this vulnerability. One way is by using preventive medicine such as prescribing a good diet, vitamins and exercise. This can help in creating strength, but may not necessarily guarantee a strong resistance to certain diseases. The second way is through inoculations where a weakened form of the virus is injected into the individual so that his defenses are activated, but not overcome.

McGuire and Papageorgis felt that this principle could be applied to persuasive attacks as well as viral attacks. McGuire chose what he labeled "cultural
truisms" as topics. These were widely accepted beliefs that individuals would probably have given little thought to on a regular basis. Since subjects would not previously have been exposed to massive attacks on these beliefs, it would still be possible to "inoculate" them against belief change. The four cultural truisms used in this initial study were health related: 1) Everyone should get a yearly chest X-ray to detect tuberculosis symptoms at an early stage; 2) The effects of penicillin have almost without exception been of benefit to mankind; 3) Everyone should have a yearly medical exam; and 4) Everyone should brush his teeth after every meal.

McGuire used all four of these topics by rotating them among subjects so that each topic was alternated across treatment and control conditions. McGuire demonstrated that subjects receiving refutational defenses were better able to resist persuasion than those who received only a supportive message (consisting of an essay listing positive points about the topics) (Papageorgis and McGuire, 1961). McGuire reasoned that the refutational defense threatened individuals' beliefs, causing them to actively seek supportive
arguments for their beliefs, thus creating resistance to subsequent attacking messages. McGuire conducted many other studies, analyzing a variety of factors concerning resistance to persuasion. For example, an earlier study showed that having a subject become actively involved, by writing his own defense arguments, failed to induce resistance to persuasion. It was hypothesized that this was because the subjects did not have sufficient information about the topic to create a strong essay, thus causing them to question their beliefs (McGuire and Papageorgis, 1961).

McGuire (1961) also showed that the supportive defense made an "appreciable contribution" when used in conjunction with the refutational defense. He further demonstrated that adding the supportive defense to the refutational defense helped subjects resist persuasive attacks when the attacking message had arguments different from those in the pretreatment messages.

Another study showed that a defense which refuted arguments different from the ones that subjects received in the attack message also induced resistance to persuasion. This defense, however, was only effective when the attack message was administered two days after
subjects read the defense message. McGuire suggested that while the threat of a potential attack on beliefs motivated subjects to build a defense for their beliefs, time was needed to process this belief-supporting information (McGuire and Papageorgis, 1962).

McGuire (1962) examined the effects of time intervals between defense and attack on the effectiveness of the defenses. The refutational same (RS) defense peaked in effectiveness when the attack followed immediately after the defense, but deteriorated significantly in effectiveness when the attack was given one week after the defense. The refutational different (RD) defense increased in effectiveness with a two day defense-attack interval (catching up with the effectiveness of the RS defense) and then dropped off after one week. The supportive defense produced no resistance to persuasion under any of the conditions. The overall results showed the impact of all defenses was lost when the attack was delayed until one week after reception of the defenses. McGuire speculated that forgetting of information contributed to this result (McGuire, 1962).

There have been a great many variations and replications of McGuire's inoculation theory studies.
Some of these include: Infante (1975), who studied the effects of opinionated and non-opinionated language in creating resistance to persuasion; Cronen and LaFleur (1977), who unsuccessfully attempted to examine explanations as to why the refutational defenses induce resistance to persuasion; and Pryor and Steinfatt (1978), who used nontruisms topics and reported significant levels of resistance to persuasion with both refutational and supportive defenses.

Yet neither McGuire nor those who followed him in studying resistance to persuasion have empirically supported McGuire's basic explanation for the effectiveness of the refutational defenses. McGuire argues that refutational defenses threaten beliefs, and thereby motivate receivers to generate support for their beliefs.

While the concept of messages motivating people to generate reasons to support a belief seems reasonable, statistical support has been unimpressive. Even though McGuire's inoculation theory is based on the assumption that subjects who receive refutational defenses will be motivated to seek additional support for the threatened beliefs, McGuire attempted to measure
this "motivation mechanism" in only one of his studies (Papageorgis and McGuire, 1961). The study called for subjects to list all arguments that came to mind in favor of a cultural truism after reading a defense and attack on that truism. There was no significant difference in the number of arguments listed by subjects in the pretreated conditions and those in the control conditions, though the results were in the predicted direction.

Pilot studies done prior to the present study also failed to support this motivation mechanism. In one study (Cranis, 1985), subjects were asked to list both positive and negative thoughts regarding an issue following the pretreatment messages. The subjects receiving a refutational defense could state no more positive thoughts than the control group which received a defense on a different topic. In addition, there was no difference in the number of negative thoughts listed between the two groups. This means that those who received an attack message about the topic listed as many positive thoughts about the issue as those who read an essay refuting the negative message.
A problem with the Papageorgis and McGuire (1961) study is that listing of the positive thoughts was requested after subjects had read the attacking message and one week after reading the defense. It is possible that reading the attack message may have induced individuals to think of belief-supportive thoughts about the issue without any help from pretreatment messages. Therefore, a second pilot study was designed with no attacking message. The subjects either received a pretreatment message or not, and then were given a questionnaire. The individuals not receiving the pretreatment listed an approximately equal number of positive thoughts regarding the topic ($x = 1.57$) as those who did receive the pretreatment ($x = 1.67$). The results of these studies suggest the need for an alternative explanation for the effectiveness of McGuire's refutational defense. Papageorgis and McGuire (1961) tested the perceived credibility of the attack messages as a possible mediator of resistance to attack. Subjects were asked ten questions regarding the credibility of the attack messages. Subjects receiving the pretreatment messages gave significantly lower ratings to the attack messages than the control group.
subjects. It seems the attacking message lost credibility after an earlier message had already refuted the position the attack message took. This was the case even when the earlier message refuted different arguments from those in the attack. It appears that this message credibility factor may better explain the effectiveness of the refutational pretreatments.

The purpose of the present study was to test the credibility and motivation explanations in order to explain the effectiveness of the refutational defense in producing resistance to persuasion. The procedures were designed so as to circumvent the possible confounding inherent in the McGuire and Papageorgis (1961) study. Based upon the findings reviewed above, the following hypotheses were formulated:

Hypothesis 1: Subjects exposed to refutational defenses will not list more positive thoughts regarding a topic than subjects receiving no pretreatments.

Hypothesis 2: Subjects exposed to refutational defenses will rate the attack messages as less credible than those
Hypothesis 3: Subjects receiving McGuire's refutational defenses will show more resistance to persuasive attacks than subjects not receiving the defenses.
METHODOLOGY

Subjects

Forty-five students in general education classes at the University of Central Florida participated as subjects. Nineteen subjects were randomly placed in two refutational same groups (nine in the antibiotic topic group and ten in the toothbrushing topic group), eighteen subjects were placed in refutational different groups (nine in both the antibiotic and toothbrushing groups) and eight subjects were in the control group. The basic methodology followed Papageorgis and McGuire's (1961) study, with some variations.

Procedure

Subjects were randomly assigned to one of three conditions. Each subject received either two refutational same defenses (RS) and the corresponding attacking message two days later; two refutational different (RD) defenses and attacking messages two days later; or two attack only (AO) essays two days after reading unrelated essays (the two-day time delay was
used due to the success McGuire (1962) had with both the RS and RD defenses at this time interval). The refutational same defenses refuted arguments that were the same as those used in the attacking messages. The refutational different defenses refuted arguments different from those contained in the attacking messages. In order to generalize, two issues were used to form the RS and RD conditions. Approximately half the subjects in the RS and RD conditions received messages on toothbrushing, while the remaining subjects read essays on antibiotics.

Subjects in the attack only condition (AO) read only the two defense messages on X-rays and medical exams. These issues were unrelated to the attack messages. The AO condition facilitated comparisons of differences in persuasion levels between those who received defenses and those who did not. Experimental group subjects also read two defenses. One defense was an essay on the topic that was later attacked, while the second defense was used solely to identify whether the subject participated in the RS or RD condition (subjects in the RS condition read an irrelevant essay
on medical exams and RD subjects read an irrelevant essay about X-rays).

Subjects were told that the purpose of the task was to examine reading comprehension for the communication department. They were asked to underline the main, or most important, sentence in each paragraph of the essays.

Two days later, the experimenter returned with a packet for the subjects containing questionnaires and attacking messages (all subjects received the same material in the packet). The first page of the packet contained a questionnaire asking the subjects to check which two essays they had read two days earlier. Next subjects were requested to list all positive thoughts that came to mind regarding toothbrushing, and then all positive thoughts that came to mind regarding antibiotics.

The next two pages in the packet were the attacking messages. The two essays attacked the practice of toothbrushing and the use of antibiotics. The following page in the packet contained a questionnaire to determine the subjects' attitudes on: 1) toothbrushing,
2) antibiotics, 3) annual medical exams, and 4) the use of X-rays to detect tuberculosis.

The final page was a questionnaire designed to determine subjects' ratings of the credibility of the two attacking messages. Table 1 depicts the experimental conditions in a 2 (defense type) x 2 (topic) design.

**TABLE 1**  
**DESIGN**

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>DEFENSE MESSAGE CONDITION</th>
<th>RS</th>
<th>RD</th>
<th>n = 9</th>
<th>n = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toothbrushing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INSTRUMENTS

The four refutational defense essays used in the present study were taken from McGuire’s research (McGuire and Papageorgis, 1962). Each message contained three paragraphs and was approximately 600 words in length. Minor changes were made in the body of the essays (penicillin was changed to antibiotics), but they were essentially the same essays used in earlier McGuire studies. The four topics were: toothbrushing helps prevent tooth decay; antibiotics are beneficial to mankind; annual medical check-ups are important; and X-rays should be used for the early detection of tuberculosis. Each essay identified two arguments against the truism topic in the first paragraph, then refuted each argument in the following two paragraphs (see Appendix A).

The first questionnaire administered listed all four essay topics and asked subjects to check which ones they had read two days earlier. The next items on the
page required subjects to list all the positive thoughts that came to mind regarding toothbrushing and then antibiotics. Five lines were given for thought listing and subjects were instructed to use the back if necessary.

The two attack messages were also approximately 600 words in length and consisted of three paragraphs each. The essays identified two arguments against the truism in the first paragraph and then supported each argument in the remaining two paragraphs.

The attitude questionnaire consisted of eight positive statements regarding the four topics (two statements each) followed by a 15-point scale ranging from disagree to agree. Scores were obtained on topics by summing the two scores for the topic. Total agreement for a topic would yield a score of 30.

The credibility questionnaires consisted of five positive statements regarding the credibility of each attack message. The statements were followed by 10-point scales ranging from disagree to agree. Scores were obtained by summing the scores of the five statements on each attack essay. A perception that the
attack essay was totally credible would yield a score of 50. A total of 20 minutes was allowed to complete the entire packet.
RESULTS

Hypothesis One was confirmed. Subjects who had read refutational defenses were not able to list more positive thoughts regarding antibiotics and tooth-brushing than subjects who did not receive pretreatments. In fact, the attack only (AO) group actually listed more positive thoughts on antibiotics than any of the four experimental groups. A one-way analysis of variance indicated that no differences existed in the number of positive thoughts produced among the five comparison groups ($F = .24$). Table 2 contains the means for the analysis on both topics.

TABLE 2

<table>
<thead>
<tr>
<th>POS. THOUGHTS/ANTIBIOTICS</th>
<th>POS. THOUGHTS/TOOTHBRUSHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotics</td>
<td>2.55</td>
</tr>
<tr>
<td>Toothbrushing</td>
<td>.70</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>2.44</td>
</tr>
<tr>
<td>Toothbrushing</td>
<td>.78</td>
</tr>
<tr>
<td>Attack only</td>
<td>2.63</td>
</tr>
</tbody>
</table>
Hypothesis Two was not confirmed. The prediction that the perceived credibility of the attacking message would determine the amount of persuasion taking place was not supported in the present study. That is, exposure to refutational defenses did not lower the perceived credibility of the attack messages. By dividing the total possible score on the credibility questionnaire by the mean that the subjects scored, the percentage of agreement was determined (the total number of possible points was 50). In the present study, both groups were slightly more than 50% in agreement with positive statements about the attacking message's credibility and believability (see Table 3). In Papageorgis and McGuire (1961), subjects who received pretreatments were 66% in agreement with positive statements about the same attacking messages. Subjects who received no pretreatments were 77% in agreement with the positive statements. The difference between the means in that study was determined to be significant beyond the .01 level. The two means in the present study were 53% for those receiving no pretreatment and 52% for those receiving pretreatment. The data indicate that the same attacking messages used over 25 years ago
are today no longer seen as believable, or credible. The possible reasons for this will be addressed later.

TABLE 3

PERCENT OF AGREEMENT WITH POSITIVE STATEMENTS REGARDING THE ATTACKING MESSAGE

<table>
<thead>
<tr>
<th>PRETREATMENT</th>
<th>NO PRETREATMENT</th>
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</thead>
<tbody>
<tr>
<td>McGuire</td>
<td>66%</td>
</tr>
<tr>
<td>Cranis</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>52%</td>
</tr>
</tbody>
</table>

As shown in Table 4, Hypothesis Three was also not confirmed. There was no support for the replication prediction that subjects who received McGuire's refutational defenses would show more resistance against persuasive attacks than subjects who did not receive the defenses. This result indicates that no resistance to persuasion took place in any of the conditions.
**TABLE 4**

PERCENT OF AGREEMENT WITH POSITIVE STATEMENTS REGARDING THE CULTURAL TRUISMS (ON A SCALE OF 1 - 30)*:

<table>
<thead>
<tr>
<th></th>
<th>ANTIBIOTICS</th>
<th>TOOTH BRUSHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA</td>
<td>26.25</td>
<td>23.11</td>
</tr>
<tr>
<td>RST</td>
<td>23.50</td>
<td>23.22</td>
</tr>
<tr>
<td>RDA</td>
<td>23.27</td>
<td>18.77</td>
</tr>
<tr>
<td>RDT</td>
<td>23.55</td>
<td>23.44</td>
</tr>
<tr>
<td>AO</td>
<td>23.25</td>
<td>21.50</td>
</tr>
<tr>
<td>NN</td>
<td>26.75</td>
<td>26.80</td>
</tr>
</tbody>
</table>

*All within-column comparisons are nonsignificant.
DISCUSSION

A study was developed to examine why McGuire found that certain pretreatments to persuasive messages that attacked strongly held beliefs were effective in minimizing persuasion. McGuire had assumed the effect was due to subjects being motivated to generate positive thoughts they developed about a topic when reading the pretreatments, thus rendering the subsequent attack ineffective. He did this without ever adequately measuring the positive thoughts subjects had about the topic. If McGuire's explanation were true, then subjects receiving a pretreatment should, in fact, be able to list more positive thoughts regarding the topic than subjects receiving no pretreatment.

As stated previously, McGuire's research and several pilot studies showed this not to be the case. An alternative explanation was proposed using results from a study Papageorgis and McGuire conducted in 1961. The study demonstrated that subjects who had received no pretreatments found the attacking message more credible.
than subjects who had received refutational defense pretreatments. Given the strength of the credibility factor in persuasion research, it was hypothesized that this factor, not the "motivation mechanism" McGuire cited, was the cause of McGuire's results. This hypothesis would not disturb the concept that the pretreatments acted as inoculations to the attacking message. However, instead of subjects bolstering their defense systems through thinking of positive thoughts about the topic, the pretreatments merely give subjects fuel to deny the validity of any attacking message.

The present study failed to demonstrate the above hypothesis. Yet, McGuire's own study lends support to it. In Table 5, it can be seen that in McGuire's study, subjects receiving pretreatments agreed significantly less with positive statements about the attacking messages (66%) than subjects receiving no pretreatment (77%). This finding is more conclusive than any other explanation offered by McGuire for the effectiveness of the refutational defenses.

By examining more closely what happened in the present study, explanations and additional hypotheses can be generated. It was found that the percentage of
agreement with positive statements about the attacking message was extremely low, indicating the attacking messages were not perceived as believable, or credible, for subjects receiving and not receiving pretreatments (53% and 52%, respectively). It must be noted that the methodology of the present study very closely followed McGuire's, and the essays used were essentially the same as McGuire's. Ruling out possible internal validity problems, it must be considered that McGuire's attacking messages on truisms no longer have the impact they had on subjects in the 1960's.

It can further be determined that because Hypotheses Two and Three were not confirmed, the pretreatment messages did not motivate subjects to counter-argue about the attacking message. Thus, the pretreatments appear ineffective. Since subjects were not impressed by the attacking arguments, it was not possible to measure the effectiveness of the refutational defenses in inducing resistance to attack. Put more simply, there did not appear to be any persuasion to resist. Subjects in the present study did not find the attacking message credible, or believable.
Perhaps the major variable that has changed between the current research and McGuire's work is the era in which the studies were performed. It is possible that the education level of the subjects in the present study caused this skepticism toward these once persuasive attacks. Today's young adults have been bombarded by information on health care. They learn a great deal about health-related topics through the media. In the 1960's, when information on these cultural truisms was not as prevalent and the media was not as active, it was possible to instill some doubt into subjects' minds regarding these cultural truisms.

A logical extension of this reasoning might lead to a replication experiment using cultural truisms that are not widely publicized in the media. It may be quite difficult to do this, as our society has become much more sophisticated regarding any such truisms. The media has caused people to be more skeptical about accepting anything blindly and usually provides the facts for them to decide on their own. This cynicism makes it hard to find any mass truism that people do not have the facts about.
While it may be difficult to discover if the informed public is the specific cause of the results in the present study, it must be remembered that the overall importance of understanding human motivation is being discussed. Further research in the area of persuasion and resistance to it could extend to the important topics of smoking, drug use, and drunk driving. The advancement of other issues such as pro-education, or the use of birth control devices in third world countries, could also benefit from the findings. The continued study of information processing, human persuasibility, and what motivates humans to make the decisions and hold the beliefs they do is critical to better understanding of human behavior.
APPENDIX

DEFENSES AND QUESTIONNAIRES
INSTRUCTIONS

1. DO NOT TURN THIS PAGE UNTIL TOLD TO DO SO.

2. When instructed, read the following essays. Please underline the sentences you feel are most important in each paragraph. You will be given 15 minutes to complete the reading.

3. When you finish, please turn the essays over and put your pen or pencil down. Thank you for your cooperation.
THE MISGUIDED ATTACKS ON ANTI-BIOTICS

Medical researchers and physicians are generally agreed that the discovery and use of anti-biotics has been one of the greatest steps in the history of medicine's long fight against disease and death. It is unfortunate, therefore, that the press has seen fit to print some well intentioned, but misguided stories which attack the use of this miracle of modern science. These stories have harped on the alleged dangers of anti-biotics when administered to "allergic" patients, or on the idea that anti-biotics cause the development of stronger breeds of bacteria. Since it is so important that we do not deprive ourselves of the benefits derived from anti-biotic treatment, it will pay us to look briefly at these unfortunate attacks in order to see the fallacies involved in them.

One of the most distorted arguments against anti-biotics is that they have produced bad effects on some people who were allergic to them. And while it is true that such detrimental affects have been produced upon allergic patients, it should be noted that such allergies are extremely rare. Further, the detrimental effects were produced in the days when anti-biotics were just beginning to be used by physicians, and it was not yet recognized that a few rare individuals were allergic to them. Actually, a few people can always be found who are allergic to nearly any substance known. What critics of anti-biotics fail to mention is that a simple test is available which detects anti-biotic allergy and, of course, they are no longer given to people who are allergic to them. Initially, the allergy danger of antibiotics was very small, but now with the use of this simple test, even this small danger has been eliminated, making anti-biotics one of the safest drugs to use.

Another example of a misleading argument against antibiotics is that they have caused the development of stronger breeds of bacteria against which anti-biotics have effect. This argument goes further to say that after prolonged use of anti-biotics, the patient becomes "adapted" to them and they no longer can be used for that patient. It is true that when any drug is used on a patient over a prolonged period of time, the effect of
that drug will not be as great as it was originally. To a very minor extent, this is also true of anti-biotics. However, one of antibiotics' greatest advantages is that they remain effective with continued use for a far greater period of time than does almost any other known drug. As for the claim that anti-biotics have produced stronger, more virile strains of bacteria, one should recognize the fact that since the beginning of time, organisms have tended to develop strains which survive better under changing conditions. To argue that anti-biotics are the cause for this development of these stronger strains is unwarranted and an unfair statement. While we should realize that anti-biotics are not perfect, that they do not kill all germs, we should realize that they are the nearest approach we have made so far to a perfect answer to all medical problems.
THE MISGUIDED ATTACKS ON ANTI-BIOTICS

Medical researchers and physicians the world over are generally agreed that the discovery and use of anti-biotics has been one of the greatest steps in the history of medical science's long fight against disease. It is unfortunate, therefore, that the press has seen fit to print some well intentioned, but misguided stories which attack the use of this miracle of modern science. These stories have harped on the claim that anti-biotics' effectiveness against superficial symptoms has caused some doctors to neglect the underlying disease, or on the claim that exaggerated faith in anti-biotics has slowed down research on other drugs. Since it is important that we are not deprived of the benefits of anti-biotics, it will pay for us to look briefly at these misguided attacks in order to see the fallacies in them.

One distorted argument against the use of anti-biotics is that they are used often by doctors who are only interested in quick, superficial results and not in the ultimate cure of the patient. The argument is based on the fallacy that anti-biotics are like aspirin and used to get rid of the symptoms, but not the disease itself. All medical evidence, however, is to the contrary. Anti-biotics actually attack the underlying disease bacteria like no other known drugs. Some critics even go so far to say that antibiotics are used by lazy doctors. Once again, all research seems to point in the opposite direction. A study undertaken by the U. S. Public Health Service in 1977 proves that the best doctors (as rated by the recovery rate of their patients) in the finest hospitals are the ones that use antibiotics most frequently. The use of anti-biotics in the treatment of many diseases is the treatment preferred by the most respected members of the medical profession.

A further mistaken argument has been presented by the critics of anti-biotics. They seem to infer that since physicians and medical researchers have an exaggerated idea about the effectiveness of antibiotics, research on other drugs has been dangerously slowed down. Let us first repeat that the effectiveness of
anti-biotics has not been exaggerated. No other drugs known to us today can successfully combat as wide a variety of diseases as can anti-biotics. As for the erroneous claim that the wide use of anti-biotics have caused a slowdown in research to discover additional drugs, one only need look at the present research to see that the discovery and use of anti-biotics has only increased the amount of research being done to discover new and better drugs. We should realize that while anti-biotics are not perfect and that they do not kill all germs, we should also realize that they are the nearest approach we have made so far to finding the perfect answer to all medical problems.
A

SOME DRAWBACKS INVOLVED IN THE USE OF ANTI-BIOTICS

The discussions of anti-biotics in the popular press mention repeatedly their beneficial effects. A rather different evaluation is seen when we study the discussions of this drug in the professional journals of the medical, biochemical, and pharmaceutical professions. While the beneficial effects of anti-biotics are not, of course, denied in the professional journals, the scientists who engage in continuing research on its effects are expressing increasing concern over some of the drugs' highly undesirable effects. For example, some people are allergic to anti-biotics. Also, its widespread use has resulted in the elimination of weaker strains of bacteria with the resulting production of new and more deadly strains against which they are ineffective. Because the problem is so serious and the use of anti-biotics so widespread, it will be wise to look into some of these harmful effects of anti-biotics in more detail.

One trouble with anti-biotics is that, as with almost all other powerful pharmaceutical drugs, there are some people who are allergic to them and suffer adverse effects ranging from minor rashes to death. There are many cases reported in the medical journals in which injections of antibiotics, given for relatively minor infections, resulted in the death of the patient who happened to have a serious allergic reaction. This allergy problem is particularly serious in the case of anti-biotics for two reasons. First, it is serious because of its unpredictability. Anti-biotic allergies are hard to detect and doctors do not, as a rule, test for the allergies before administering anti-biotics. A second reason why medical scientists and public health officials are becoming worried about anti-biotic allergies is that they are on the increase. The national medical statistics indicate that in the first years of anti-biotic use, anti-biotic allergies were extremely rare, but ever since have been increasing at an accelerating rate. One of the theories for this increase is that there is an accumulative effect of anti-biotics in the system and that the first few times a person gets treatments, he shows no adverse effects, but by the time he has gotten continued
treatments during life, enough of the drug accumulates to bring out the allergies.

The increased reliance on anti-biotics has produced yet another tragic consequence. Several hospitals in Houston, Detroit, London, and Tokyo have recently reported epidemics of deaths among new-born babies from staphylococcus infections against which anti-biotics have no effect. And yet anti-biotics used to be able to fight this particular form of bacteria successfully. Here we see another case of an increasingly serious effect of anti-biotics. Their use tends to result in the development of more resistant strains of germs, so strong that antibiotics have no effect against them. Furthermore, since this drug works by stimulating the patient's system to produce antibodies, continual use makes the patient used to it, thus making anti-biotics ineffective. While anti-biotics obviously have conferred many benefits, one should not overlook that they have had some harmful effects as well.
SOME FALSE CHARGES AGAINST TOOTH BRUSHING PRACTICES

We are, no doubt, all aware that one should brush his teeth after every meal. Yet, from time to time, stories by well-intentioned, but misguided, reporters are published claiming that this healthful practice is unwise. Often, these stories seem to be reasonable, but a close look shows us that they are based on distortions of the facts. While no one would claim that brushing one's teeth after every meal will positively prevent tooth decay, it is easy to demonstrate by scientific facts that this practice does reduce the amount of decay and that the practice is in general a very important health practice. Because it is so important, and because these distorted arguments against it may seem convincing on the basis of a brief reading, it will be useful to review some of these misleading arguments and show where their errors lie.

Many times the opponents of tooth brushing will quote incomplete and unreliable statistics which indicate that groups who brush their teeth frequently have a higher incidence of tooth decay than those who do little or no brushing. This is a misleading statement based on a statistical fallacy. If we go to the source of such statements based on such statements, we shall find that they rely on comparisons of western populations with small, primitive societies, or between high and low income groups in our own population. It is true that people in these primitive cultures have less tooth decay than we do, but it would be foolish to say that this is so because we happen to brush our teeth. The higher rate of tooth decay in advanced societies and especially in high income groups is due, not to tooth brushing, but to our richer diet that contains large amounts of citrus fruits, sugars, and other substances known to cause tooth decay. Tooth brushing is not a cause for tooth decay in these groups, but actually helps prevent our rich diet from causing even more decay than it does.

Another faulty argument that one sometimes hears is the claim that tooth decay occurs mostly while food is in the mouth and that, therefore, brushing the teeth after the meal fights decay when it is already too late
to do much good. Even though tooth decay does occur mainly while the food is in the mouth, we must recognize that when the meal is over, many food particles remain in the mouth, lodged between the teeth for long periods unless they are removed by brushing. This, in fact, is why it is so important to brush our teeth after each meal. Hence, while it is true that decay occurs, for the most part, while food is in the mouth, this fact is a good reason for, not against, frequent tooth brushing. When we fail to brush our teeth after each meal, food particles remain in our mouths indefinitely, causing tooth decay to occur continuously. It is important that such misleading arguments as those which we saw here do not cause us to neglect the simple and highly effective health practice of brushing our teeth after every meal.
We are all aware that one should brush his teeth after every meal. Yet, from time to time, stories by well-intentioned, but misguided reporters are published claiming that this healthful practice is unwise. Often these stories seem to be reasonable, but a closer look shows us that they are based on distortions of the facts and are misleading. While no one would claim that brushing one's teeth after every meal will positively prevent tooth decay, it is easy to demonstrate by scientific facts and figures that this practice does reduce the amount of decay and that the practice is, in general, a very important health measure. Because it is so important and because these distorted arguments against the practice may sometimes sound convincing, it will be useful to review some of these misleading arguments and show where their errors lie.

One of the misleading arguments is based on the false claim that brushing the teeth tends to cause gum injuries and pushes the gums back, exposing the more vulnerable part of the teeth to decay. Actually, brushing the teeth causes less damage to the gums than does eating itself. It would be as ridiculous to suggest that we give up eating as that we should give up brushing our teeth because of the minimal amount of gum damage involved. In the long run, frequent brushing improves the health of the gums as well as that of the teeth. For example, bleeding of the gums is most common when the person brushes his teeth after a long period of neglect. Bleeding indicates weakness of the gums from lack of such stimulation as brushing gives them. The gums are among the strongest tissues in the body. The stimulating gum-massage involved in vigorous brushing after each meal has been shown to strengthen these gum tissues rather than weaken them.

Another misleading argument against tooth brushing is that tooth pastes contain harsh abrasives which pit the enamel of the teeth, leaving them open to bacterial damage. Such tooth pastes did indeed exist fifty years ago in this country, and are still used in some parts of the world. But all tooth pastes sold in this country are free from such defects. Since the advent of the
Pure Food and Drug Act, all tooth pastes, before they are made available to the public, must be thoroughly tested, and all abrasive (plus any other questionable contents) must be eliminated before the dentifrice is put on the market. By the time a tooth paste reaches the public in this country, it has been thoroughly analyzed and tested and has been approved by both the United States Public Health Service and the American Dental Association as perfectly harmless for the public to use. It is important that such misleading arguments as those which we saw here do not cause us to neglect this simple and highly effective health practice of brushing our teeth after every meal.
SOME DANGERS OF EXCESSIVE TOOTH BRUSHING

Many people brush their teeth more or less automatically after each meal without realizing that of late, medical reports have been calling this procedure into question. Recent medical and biological studies indicate that the beneficial effects of constant tooth brushing have been exaggerated. Furthermore, it has been demonstrated that a number of bad effects can result from brushing teeth so often. In fact, statistical studies usually show higher rates of tooth decay among those brushing after every meal than those who seldom or never brush their teeth. Biochemical studies also indicate that most tooth decay occurs while the food is still in one's mouth, so that the brushing comes too late to do much good. Hence, medical authorities are beginning to urge that instead of brushing our teeth so frequently, we take other measures to improve dental health, such as a better diet. Let us review some of this evidence demonstrating that constant tooth brushing does not do any great amount of good.

It can be demonstrated by medical statistics, that constant tooth brushing after every meal can cause more harm than good as far as dental decay is concerned. Medical statistics show that groups who brush their teeth this frequently tend to suffer from the highest rate of tooth decay. For example, statistical studies show that the rate of tooth decay is higher in the high income segment of the population - which does the greatest amount of tooth brushing - than in the low income segment where this practice is more likely to be neglected. Also, when we compare the rate of dental problems in various countries, we find an almost perfect relationship between the amount of dental troubles and the amount of tooth brushing. Of course, not all the people who brush their teeth have dental troubles, but these statistics suggest that, on the whole, constant brushing does more harm than good.

Furthermore, it has been conclusively shown (Columbia Dental School, 1967) that almost all tooth decay occurs while the food is still in the mouth. By the time the meal is over and one has a chance to brush his teeth, it is already too late for the brushing to do
much good. The decay producing activity of the bacteria depends on certain digestive enzymes which are liberated only while the food is actually in the mouth. Hence, when we stop eating and these enzymes are no longer secreted, the bacteria can no longer produce decay. Since we do not, of course, brush our teeth until after we have finished eating, this measure is, so to speak, like closing the barn door after the horse has already escaped. It would be wiser to utilize safer and more effective ways of preventing dental disease, such as a better diet or more frequent visits to the dentist. Since tooth brushing after every meal can do so little good and, as we have just seen, has so many harmful effects, it seems unwise to recommend this constant brushing as a general health measure.
THE FALSE CHARGES AGAINST CHEST X-RAY EXAMINATIONS FOR TB

After centuries of brilliant and painstaking research by some of the world's finest scientists, we are finally in a position to control TB (tuberculosis), a disease which has plagued humanity since Biblical times. The major weapon in this successful fight against TB has been the widespread adoption of the practice of getting an annual chest X-ray as a means of detecting TB symptoms in their earliest stages. Unfortunately, there have been occasional articles in the press which argue that we should not take annual chest X-ray examinations for the detection of TB. Since it is so vital that the progress which we have made (TB was America's No. 1 killer before X-rays became available) should not be undone, we should review some of these misleading and distorted arguments. It has been occasionally claimed, for example, that chest X-rays can cause cancer. An equally misleading claim is that X-ray examinations can cause sterility and defective children. By seeing the flaws in these arguments, we can recognize why the practice of getting an annual chest X-ray examination is so important in the fight to keep TB under control.

The evidence that prolonged exposure to strong radiation can produce cancer has been erroneously interpreted by some laypersons to mean that chest X-rays for TB are dangerous. It goes without saying that prolonged exposure to radiation of any kind (even the kind that comes from the sun) can be dangerous. But these critics fail to realize that the amount of radiation from a chest X-ray is so insignificant and lasts for such a short period of time, that the possibility of any harm being done is almost nonexistent. The amount of radiation which comes from one chest X-ray a year is almost as much as the amount we are exposed to during the same period by wearing a wrist watch with a luminous dial. Radios, TV sets and other household appliances emit comparable amounts of radiation. While it is indeed wise to avoid prolonged exposure to dangerous amounts of radiation, one chest X-ray a year is harmless, and, on the other hand, insures the early detection of any TB symptoms.
Another misleading and distorted argument against the use of chest X-ray examinations for the detection of TB is that the radiation produced can damage the reproductive tissue and produce sterility in humans or mutations of the genes. This argument is unwarranted for two reasons. While reproductive tissue can be damaged by radiation, the amount coming from a chest X-ray is absolutely insignificant in comparison to the amount needed to damage the reproductive tissue. Secondly, practically no radiation reaches the reproductive tissue during X-ray examinations because only the chest is X-rayed. X-ray machines are shielded to avoid exposure of any part of the body other than the part being examined. So it is important to understand that these above arguments are misleading and that annual chest X-rays are the best way to detect for possible TB symptoms at their earliest stages.
SOME FALLACIOUS ARGUMENTS AGAINST ROUTINE MEDICAL EXAMINATIONS

We have probably all heard how important it is for the general welfare and the individual's own happiness that he safeguard his health by visiting his physician at least once a year for a thorough medical check-up even when he is not being bothered by any specific symptoms. It is therefore particularly unfortunate that one occasionally hears arguments calling this practice into question. These arguments generally come from well-meaning, but misguided individuals who are mislead by a too superficial analysis of the effects of such a practice. Because these annual general check-ups can be of such value for the individual's health, it would be wise to look into some of these misleading arguments against the practice to see wherein the error lies.

It has been argued that if everyone were to get annual medical examinations, physicians would soon be swamped and have to spend most of their time doing nothing but giving routine physical examinations. Such an argument involves some serious fallacies and, on the contrary, the practice of paying one's physician an annual visit would actually save a great deal of the physician's time and allow him to spend more time treating the seriously ill. Much of the physician's time is currently wasted simply because he is unfamiliar with his patient's record, or the patient has no record. If that patient had visited him each year, the accumulated record would show where the causes of any illnesses might be. Furthermore, the physician currently spends his time mainly on the time consuming task of curing illness rather than on the more efficient procedure of preventing illness. Annual check-ups would allow the physician to devote his time to prevention rather than cure. So, we see that the practice of an annual routine thorough examination would leave the physician with more time for effective service to his patients.

Another argument sometimes made against this practice of a routine medical check-up is that such a practice would interfere with specialization within the
medical profession, specialization that has contributed so much to the medical advances of recent years. A study of how such routine medical check-up programs have operated in communities where they have been adopted shows that this argument is quite incorrect and that, in fact, the practice has allowed a higher degree of specialization and a greater accessibility to specialists for the average patient. The famous Mayo Clinic, for example, where such check-ups are routine, has developed the procedure of having the patient go from specialist to specialist for his thorough medical check-up where he receives special attention from specialists in the area where his need is greatest. Since there are so many positive reasons in favor of this practice of visiting one's doctor for a routine check-up once a year, it is particularly convincing to find that even the reasons used to argue against the practice upon examination are found to be arguments in its favor.
INSTRUCTIONS

Please complete the first question, checking the essays you read. Complete questions B and C to the best of your ability. When you have completed the questionnaire, turn the page and read both essays. There are then two more questionnaires. Please answer all questions in both questionnaires. Put your pen or pencil down and turn the questionnaire over. You have 20 minutes to complete the entire questionnaire. Thank you for your cooperation.
PLEASE ANSWER ALL QUESTIONS

A.
Two days ago, I read essays on (please check two):

Anti-biotics  
Toothbrushing  
X-rays  
Medical exams

B. Please list all positive thoughts that come to mind in favor of the use of anti-biotics.

1. 
2. 
3. 
4. 
5. (you may use the back if necessary)

C. Please list all the positive thoughts that come to mind in favor of tooth brushing.

1. 
2. 
3. 
4. 
5. (you may use the back if necessary)
OPINION SURVEY

Please respond to all of the 8 statements on this page by indicating your own personal opinion of the statement's truth regardless of whether your opinion agrees or disagrees with the material read in this exercise. Answer the questions in the order presented and do not skip any question. Notice that the larger the number, the more true the statement is judged; the smaller the number, the more false it is judged. Circle the number that you feel is appropriate.

1. Everyone should get a chest X-ray each year in order to detect any possible TB (tuberculosis) symptoms at an early stage.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree

2. The effects of anti-biotics have been, almost without exception, of great benefit to mankind.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree

3. Everyone should brush his teeth after every meal if at all possible.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree

4. Everyone should see his doctor at least once a year.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree

5. Chest X-ray examinations for TB should be taken regularly and often.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree

6. The benefits to mankind from using anti-biotics have far outweighed any disadvantages.

   /1 /2 /3 /4 /5 /6 /7 /8 /9 /10 /11 /12 /13 /14 /15
   disagree agree
7. The best way to prevent tooth decay is to brush one's teeth frequently.

agree disagree

8. We should all have medical check-ups, not only when we feel ill, but even when we feel well.

agree disagree
QUESTIONNAIRE

Please circle the answer to the following questions regarding the two essays you read today. Answer all questions on this page. Please note that the higher the number, the more agreement there is with the statement.

I
1. The message I read today regarding anti-biotics reached a valid conclusion.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
2. The essay I read today on anti-biotics is believable.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
3. The message I read today regarding anti-biotics is factual.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
4. The essay I read today on anti-biotics is supported by valid evidence.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
5. The essay I read today regarding anti-biotics is credible.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree

II
1. The message I read today regarding tooth brushing reached a valid conclusion.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
2. The essay I read today on tooth brushing is believable.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
3. The message I read today regarding tooth brushing is factual.
   / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / disagree agree
4. The essay I read today on tooth brushing is supported by valid evidence.

/ 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 /
disagree agree

5. The essay I read today regarding tooth brushing is credible.

/ 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 /
disagree agree
REFERENCES


