

THE EFFECTIVENESS OF CASE STUDIES
AS AN INDEPENDENT STUDY AID FOR MEDICAL
LABORATORY TECHNOLOGY STUDENTS

A THESIS

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BY

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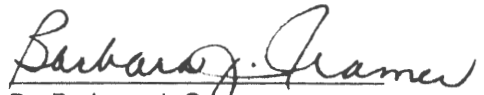
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Date

To the Dean of Graduate Studies and Research:

I am submitting herewith a thesis written by Jodi L. Hillier entitled, "The Effectiveness of Case Studies as an Independent Study Aid for Medical Laboratory Technology Students." I have examined the final copy of this thesis and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Health Science Instruction.



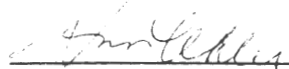
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We have read this thesis
and recommend its acceptance.



Chair, Department of Health Studies

Accepted:-



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DEDICATION

This work is very, very gratefully dedicated to
my Mom for keeping her end of the bargain!

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This project explored the effectiveness of case studies as an independent study aid for medical laboratory technology students. Eighty students enrolled in MLT 137: Immunohematology at El Centro College Dallas, Texas participated in this study. The research questions investigated focused on the student preference, the effectiveness, and the perceived student satisfaction for this method. A case study booklet containing 10 case studies was designed to cover the objectives for the course. The test group composed of 40 students utilized the booklet as an independent study aid. When pretest and posttest gain scores were compared between the test group and the control group, a significant difference in performance was determined by the t test. In addition to

the improved performance, the student preference and satisfaction with this method were affirmed.

TABLE OF CONTENTS

DEDICATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT	vi
LIST OF TABLES	x
Chapter	
I. THE PROBLEM AND ITS BACKGROUND	1
Statement of the Problem	2
Statement of the Purpose	2
Research Questions	3
Definition of Terms	3
Assumptions	4
Limitations	5
Significance of Study	5
II. REVIEW OF RELATED LITERATURE	6
Expanding role of MLT	6
Comprehension and Retention	8
Learning Style Preferences	9
Simulation/Case Studies	10
Case Studies in Related Fields	12
Evaluating Case Study Effectiveness	14
Summary	15
III. METHODOLOGY	17
Setting	17
Population and Sample	17
Protection of Human Subjects	18
Instrument	18
Data Collection	21
Treatment of Data	22
IV. FINDINGS OF THE STUDY	23

Chapter

Description of Participants	23
Findings by Research Question	24
Summary	29
V. SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS	31
Summary	31
Conclusions	32
Discussion	33
Recommendations	34
REFERENCES	37
APPENDIXES	
A. Agency Consent Form	40
B. MLT 137 Course Outline and Objectives	42
C. Case Studies for Immunohematology	46
D. Evaluation Form for Case Studies	73
E. Pretest Examination	75
F. MLT 137 Final Examination	84
G. Student Satisfaction Survey	97

LIST OF TABLES

Table

1.	MLT 137 Class Size	24
2.	Mean, Range, and Standard Deviation of Test Scores of the Control and Test Groups	26
3.	Pretest/Posttest Raw Test Scores	27
4.	Summary of Student Satisfaction Survey Items Dealing with Case Studies	29

Chapter I

THE PROBLEM AND ITS BACKGROUND

The Clinical Laboratory Sciences category of Medical Laboratory Technician (MLT) was first certified by the Board of Registry of the American Society of Clinical Pathologists in 1969. For Registry qualification, an individual must have completed a 2 year associate degree program accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) of the Committee on Allied Health and Accreditation (CAHEA). Because this position was initially designed to fulfill basic laboratory functions in predominately rural areas, the community or junior college provided the perfect educational facility. The more complicated procedures and the corresponding technology was limited to the larger medical facilities located in the metropolitan areas. During the 1970s, the Medical Technologist (MT), a baccalaureate degreed individual, performed the more involved procedures. The majority of the Medical Technology programs were hospital based programs, so the major medical centers conveniently staffed their laboratories with program graduates.

Tremendous advances in the field of Medical Technology have occurred within the last 10 years but these advances have

been paralleled with a disturbing decrease in enrollment in medical technology programs. The recent technical advances coupled with the decrease in prospective MTs has caused a great expansion in the role of the Medical Laboratory Technician (MLT). This expanded role now challenges MLT programs to produce an extensively prepared professional within the same time frame allotted to this task 20 years ago. With increased amounts of material being presented, the MLT student must be encouraged to enhance his or her comprehension and retention abilities.

Statement of the Problem

Due to the advances in the field and the increases in the amount of material that must be presented and retained, the MLT educator must employ a variety of teaching techniques to enhance comprehension and retention. One such technique could be the case study. Although the case study is commonly used in the field, its effectiveness has not been evaluated with this student population. Therefore, the problem in this study will be to determine the effectiveness of the case study method for information retention and the satisfaction level of the student with this method.

Statement of the Purpose

This study has attempted to determine the effectiveness of the case study in the sample population. Along with deter-

mining the student perception of satisfaction with this technique, this study has evaluated the capacity of case studies to increase comprehension and retention of information in medical laboratory technology.

Research Questions

For the purposes of this study the following research questions were asked:

1. Do MLT students consider case studies a preferable aid for independent study?
2. Can case studies be effective in increasing comprehension and retention?
3. What level of satisfaction is achieved through the use of case studies by the MLT student?

Definition of Terms

For the purpose of this study the terms are defined as follows:

Case study. A form of simulation used to present material pertaining to a specific example.

Comprehension. The understanding and application of specific concepts and information.

Effectiveness. A quantifiable measurement in information retention.

Independent study aid. A technique used by a student to increase the effectiveness of individual study.

Medical Laboratory Technician (MLT). An individual who meets those requirements established by the American Society of Clinical Pathologists Board of Registry.

Medical Laboratory Technology program. A program which offers a course of professional study accredited by the National Accrediting Agency for Clinical Laboratory Sciences.

Medical Laboratory Technology student. A student enrolled in an accredited Medical Laboratory Technology program.

Retention. The retaining of information.

Satisfaction level. The degree of contentment awarded to an activity.

Simulation. A technique used to present "real life" situations in a controlled setting.

Assumptions

The assumptions of this study included the following:

1. The participant classes were comparable in performance.
2. The students of the test group utilized the case studies uniformly.
3. Effectiveness can be measured.
4. Satisfaction levels can be measured.

Limitations

The limitation of the study is that only one Medical Laboratory Technology program participated which affects the ability to generalize this information.

Significance of the Study

This study could provide information encouraging other MLT educators to explore various teaching techniques for increasing retention and comprehension and for achieving student satisfaction factors. If validated, this study could result in the incorporation of this teaching strategy into Medical Laboratory Technology Programs.

CHAPTER II

REVIEW OF RELATED LITERATURE

Expanding Role of MLT

The position of Medical Laboratory Technician (MLT) was first established in 1969. The initial duty of the MLT included performing routine laboratory procedures in mostly small, rural hospitals. Educating the prospective MLT was undertaken largely from a vocational approach concluded within 18 months to 2 years. Because the Medical Technology field was rather limited in scope at this time, the 2 year, task-oriented training program proved very effective. With major advancements occurring in the field within the last 10 years, the function of laboratory medicine, including the role of the MLT, has expanded tremendously (Peschel, 1989). This expanding role presents great challenges to both the student and instructor involved in MLT education. As stated by Sultz, Sawner, and Sherwin (1984), "the maintenance of clinical competence in all of health care . . . may be considered the responsibility of the educational institutions. Thus, the role of educational institutions grows with each biomedical advance" (p.275).

MLT programs are still limited to a 2 year time period

but the amount of material that must be presented and retained has increased as much as ten-fold (Peschel, 1989). Not only has the scope of practice increased, but also the types of laboratory settings in which MLTs must perform are constantly expanding. This poses yet another challenge to the educator. According to Tornyay (1989) ". . . new sites of care, such as the home or independent office practice, require a level of judgement that can be achieved best by increased education" (p. 101). The increased educational needs in allied health were recognized federally in a 1979 report to Congress by the Bureau of Health Professionals. The fifth of the Bureau's six objectives stated that there was a need to "Increase the efficiency and effectiveness of the education and training of health personnel" (p. 20).

The evidence consistently proves that more education is warranted. However, the most effective means of providing greater amounts of information to the students in what has become an inadequate amount of time remains undetermined. MLT faculty is now charged with producing an individual who can function in every aspect of a more diverse laboratory setting with increasingly higher anticipated levels of expertise. Sultz et al. (1984) emphasized that "entry-level preparation should develop both the skills for life-long learning and the expectation that the exercise of those skills is a continuing, individual obligation" (p. 276). Because a graduate's

performance greatly depends on his or her level of retention, educators must employ a variety of teaching techniques that will enhance student retention of vital information.

Comprehension and Retention

Comprehend by definition is "to grasp mentally; to understand" (Webster, p. 128). Comprehension is considered the ability to comprehend. Hoover (1980) contends that comprehension should be considered in a ranging category. He stated that comprehension constitutes not only the "lowest level of understanding" but also "at the highest level . . . the learner may be able to extend thinking beyond the data" (p.26). Comprehension is readily enforced through application of presented material. For example, Hoover relayed the case of the "science student who draws conclusions from a particular experiment at the comprehension level and [sic] is now able to apply the basic principle(s) to related experiments" (p. 26). Once comprehension and application are engaged, "review and practice contribute substantially to retention" (p. 153).

By definition the word retention is the "capacity for retaining" (Webster, p. 511). Retain according to Webster is "to hold in; to keep in mind" (p. 510). The allied health educator must become more involved in enhancing the retention capabilities of students. Being a technical field of study,

medical laboratory technology is extremely fact-based. Bevis (1978) stated that the recall of "facts" decreases at a high rate. As an example, at the conclusion of a course with primary objectives directed to the learning of facts, the learner can remember about three-fourths of the information; at the end of the year he can remember half of the information; and only one fourth of the material 2 years later. Retention is essential to the MLT. Many graduates experience as long as a 6 month hiatus between the completion of the MLT program and their sitting for the national certifying examinations. The necessity for retention is epitomized when considering the final outcome of an MLT's performance--patient welfare. Roberts and Thurston (1984) observed that "teaching methodology is a factor that may strongly influence knowledge acquisition and retention" (p. 21).

Learning Style Preferences

Vittetoe in a 1983 study stated that "learning styles are probably acquired through direct experience with the modes of learning that have given the learner satisfaction and success" (p. 661). Perhaps the most effective teaching methodology would be one that was specifically designed for or at least applied to the particular student population. Vittetoe in the same study evaluated the learning style preferences of a group of medical technology (MT) students. She concluded that MT

students preferred learning in the "concrete dimension" (p. 662). The student preferred "learning tangible, specific, practical tasks, with focus on skills in a [sic] well-organized, teacher directed class, with expectations, assignments and goals clearly identified" (p.662). These results classified MT students in Kolb's Learning Style Inventory as "accommodators" which are defined as individuals who "lean toward concrete experience and active experimentation" (p. 661).

Simulation/Case Studies

Simulation and case studies provide the mechanism to create concrete learning experiences and imitate active experimentation. Simulations are used frequently in allied health education. Knopke and Diekelmann (1978) asserted that simulation "can be used in many ways to facilitate the achievement of different types of learning objectives" (p. 79). Through enhancing this achievement, simulation "can aid in the acquisition and retention of factual knowledge" (p. 79). The major advantage of using simulation in a health care setting is "the fact that all students can be allowed full responsibility for their own behavior without risk to anyone" (p. 79). Sagen (1976) described simulation as "the representation of a problem or phenomenon in a more simplified form that directs the student to key elements"

(Jacobs, p.23). He identifies three types of simulation:

symbolic, that is, verbal, pictorial, or statistical presentation of problems or situations; mechanical such as computerized mechanical patients which simulate various symptoms; and interpersonal, such as role playing among students, or the use of role-playing nonprofessional to develop diagnostic and other problem-solving competencies (p. 23).

According to Mays (1983), MLT students "preferred not to act out a role" (p. 722) which indicated that interpersonal simulation would not be effective for this student population. Yet, she determined that "the students preferred 'categorical reasoning' as a basis for accepting or rejecting ideas and preferred to use deductive syllogistic reasoning for inferences" (p. 722). The information provided in symbolic simulation very often incorporates these types of reasoning skills for resolution. Mays also stated that MLT students are "capable of making decisions on their own and should do well studying independently" (p. 772). Symbolic simulation can be presented as the case study. This case approach as described by Hoover "may be used to resolve problems and to derive principles" (p. 99).

Case Studies in Related Fields

The case study method has become a more prevalent teaching strategy in the field of medicine particularly in the area of nursing education. Gessner (1986) referenced the adult education concept of "Start where the learner is" (p.

215) as the beckoning call to use the case study method. She contended that "the educator is challenged to find some method or practice to interest the learner in the content and enhance continued interest" (p. 215). The case study method appeared to meet this challenge.

Tarcinale (1987) identified seven steps necessary to design a good case study:

1. The purpose and objectives (expected behavioral outcomes of the learner) must be clearly stated and understood by the instructor. . . . 2. The story line used to create the case study should be developed from one (or more) cases that the instructor is familiar with. . . . 3. Organize the case study into proper sequence and introduce it slowly. . . . 4. Use the opportunity to prod learners into thinking. . . . 5. Design the case study as to address no more than three or four objectives. . . . 6. The inclusion of imagery can be helpful to the learner only if the pictures or illustrations complement the information presented and do not conflict with it. . . . 7. Present thought-provoking questions to the learner about the case study by stimulating them to draw on some of the new information to produce a new response. (p. 341)

He justified the case study benefit when he stated that "the learner is capable of identifying several characteristics in the case study that he or she understands and can use this information to explain or respond to questions about the case study" (p.341). Gessner (1986) experienced similar results with her students and cited the following advantages:

The content can be introduced in a stimulating manner in a short period of time . . . The case study captures and maintains the interest of the learner. . . . Credibility of the instructor as a knowledgeable practi-

tioner is established when case examples from practice are presented. (p. 215)

She also cited as a major advantage the fact that the "learner evaluation feedback indicates that this is an interesting and helpful teaching methodology" (p.215). Huston and Marquis (1987) conducted a study that evaluated the effect of case studies on improving decision-making skills for senior nursing students. They cited advantages for both the learner and instructor as a result.

Case studies have been used for a variety of topics including the areas of direct patient care, ethics, supervision, nursing diagnosis, and decision-making skills. Edwards and Marier observed that the case study method was used in many medical residency programs as a mechanism for "verifying skills in history-taking and physical examination, encouraging clinical decision-making, assisting in the setting of priorities for patient-care responsibilities, giving feedback on clinical performance and management decisions" (p.223). The areas most affected by the case study approach appear to be those involving higher learning levels such as the cognitive domain. Scanlan (1978) identified case studies as a mechanism by which "learners can be encouraged to develop and refine high-order cognitive skills" (p. 125). He emphasized that through this method "students are required to organize their thinking and establish meaningful relationships

between otherwise discrete elements of theory and practice" (p. 125). In a 1988 study utilizing case studies to teach nursing diagnosis, Crosby and Dunn surmised "that understanding of the information precluded accurate usage. . . . Understanding was operationalized as accurate identification of nursing diagnoses represented in simulation situations--case studies [sic]" (p. 212). Yoder (1990) supported the effectiveness of case studies in the cognitive domain, but she concluded the most valuable aspect of this method was that "carefully designed and strategically placed case studies add an exciting dimension to any learning experience" (p.277).

Evaluating Case Study Effectiveness

Because case studies most often involve the cognitive domain of learning, a combination of testing strategies have been documented as necessary for evaluation. Hoover (1980) suggested that "one of the most effective means of evaluating student mastery of case studies is to give them a case similar to the one they have been studying and then ask them to answer questions about it" (p. 212). This type of testing could be readily adapted to a classroom setting, but unfortunately national examinations that regulate competent entrance into the field of medical technology were not designed to allow for this type of questioning. Therefore, multiple-choice tests

must be used in an appropriate manner that accommodates evaluating different knowledge levels. McGuire (1983) supported the use of multiple-choice questions for evaluating this variety of knowledge levels. She noted that "the most important innovation (in multiple-choice tests) has been the increasingly widely accepted practice of designing items to a table of test specifications that included, preferably, both cognitive skill and content domains" (p. 263). When multiple-choice questions are designed in this manner, McGuire observed the tests "are regularly shown to assess a broader and more relevant range of competencies" (p. 263). She compared the case study evaluation, as Hoover recommended, to the multiple-choice test technique and determined that the performance between the two "are in general agreement . . . as would be expected" (p. 268).

Summary

Because the role of laboratory medicine has been constantly expanding since 1969, the position of the MLT now entails a greater knowledge base. This knowledge must be provided to the MLT student at an accelerated pace over a maximum 2 year period. Literature affirmed that MLT faculty must ensure successful comprehension and retention of presented material. Vittitoe (1983) contended that learner satisfaction directly related to learner success and that this

satisfaction was dependent on learning style. She classified medical technology students as "accommodators" according to Kolb's Learning Style Inventory. "Accommodators" preferred "concrete experiences and active experimentation." Case studies provided a means to oblige these preferences. Case studies have been most often associated with the higher level of knowledge. Because the use of this method incorporates the application of knowledge, success implied comprehension. Measuring success with this method has been accomplished by both case study presentation and multiple-choice tests. Although this method is widely used in other areas of medical education, the success of case studies with this student population was not addressed in current literature.

CHAPTER III

METHODOLOGY

This study was conducted to determine the effectiveness of case studies as an independent study aid for Medical Laboratory Technology students. This was a descriptive study which incorporated a pretest/posttest design using ex post facto data. A Likert-format questionnaire was used to gather informational data. This chapter describes the setting, the population and sample, the instruments used, the data collection, and the treatment of that data.

Setting

The pretests and posttests as well as the satisfaction surveys were administered to first year students enrolled in the Medical Laboratory Technology program at El Centro College. The administration occurred in a traditional classroom setting.

Population and Sample

The population consisted of Medical Laboratory Technology students from El Centro College. The sample of convenience included those students enrolled in MLT 137:Immunohematology. The actual sample size was 80 students. The test group

consisted of 40 students who received the MLT 137 Course Syllabus containing the case study booklet. The control group was composed of those students who used the MLT 137 Course Syllabus prior to the case study addition.

Protection of Human Subjects and Agency Approval

Permission to administer the tests and survey and to utilize the data was secured from the El Centro College MLT program director. See Appendix A.

This study was exempt from review by the Human Subjects Review Committee because the subject matter was categorized as research conducted on the effectiveness of an instructional technique. The last four digit number derived from their social security number was assigned to each participant to ensure anonymity. For example, a social security number of 463-33-5796 was identification number 5796.

Instruments

Case Study Booklet

Objectives for 10 separate case studies were written based on the MLT 137 course outline and general objectives (see Appendix B). Between four to six objectives pertained to each case. The booklet was composed of two major sections (see Appendix C). The first section presented the cases including the intended objectives, the case study, and study questions. The second section contained the answers to the

questions posed in section one. Before completion, the booklet was reviewed by a peer group of four. The group included the MLT program director, the associate dean of the Health Occupations division, and two blood bank specialists. Changes were made as necessary following the recommendations of the review group (see Appendix D). The changes were primarily clerical along with one antigram correction and the addition of one question for clarification. During the last two weeks of MLT 137, the test group was given instructions for use of the case study packet. Each student was allowed one week to utilize the case studies.

Pretest and Posttest

The pretest given before the case study booklet was utilized encompassed all course objectives for MLT 137. The final examination for MLT 137 provided the posttest data used in this study. This test covered specific objectives covered in class and duplicated in the case study booklet. The test questions for both examinations were derived directly from stated objectives. Test reliability was determined after the first 20 students had participated and subsequently with the administration of each examination. The item analysis performed provided the frequency and proportion for each test item and from that information the reliability coefficient was calculated using the Kuder-Richardson Formula 20. These computations revealed an overall .72 KR20 on the pretest and

a .73 KR20 on the posttest. According to Economics Research, Inc. (1990), the producers of the ParSCORE software utilized by the Health Occupations division, the reliability coefficient should be .70 or higher for a "good" classroom test. The validity was determined for both examinations through peer review. The tests were reviewed by the program director and several blood bank specialists. The point value for both examinations was 150 points each. The examination format included multiple-choice questions, multiple-multiple choice, matching, and short answer (see Apendix E and F).

Student Satisfaction Survey

The Student Satisfaction Survey used in this study was an investigator-made Likert-type perception assessment. The 13 item survey consisted of a five category forced response format. The responses ranged from agree to disagree with a corresponding scale of 1-5. Items 1 and 11 required the enumeration of hours. Items 2, 3, and 4 were used to determine the student's current study aids. Items 5, 6, 7, 8, and 9 pertained specifically to the use of case studies. Items 6 and 9 were negative statements. Items 12 and 13 allowed the investigator to ascertain the students' opinions on applied knowledge and retention. At the conclusion of the survey items, a space was provided for any additional comments. Content validity was determined by peer review. The survey was not statistically evaluated for reliability but

the responses from class to class was very consistent.

Data Collection

This investigator was granted permission by the program director to collect ex post facto data and to conduct this study (see Appendix A). All student participants gave verbal permission for their examination scores to be used. The students were informed that their names would not be used in the study and that their anonymity was protected by a coding system derived from their social security numbers. Data collection for the control group included the MLT 137 classes of 1986, 1987 and 1988. The MLT 137 classes of 1989, 1990, and 1991 provided the test group data. The pretest and posttest examinations were administered in the traditional classroom setting. The pretest was administered at the completion of the course objectives within the last two weeks of the Spring semester during a regularly scheduled class session. Following the pretest, the test group was given instructions for using the case study booklet and allowed to use the cases for one week. The posttest was administered during the final week of the Spring semester under the same conditions as the pretest. The Student Satisfaction Survey was administered to the test group following the posttest administration and before the posttest scores were revealed to the participants.

Treatment of the Data

The investigator scored each test. The mean, range, and standard deviation were determined for each group on the pretest and posttest scores. The t test was done to determine the significance between the mean gain scores of the two groups. A .05 significance level was used. Descriptive statistics, such as frequency and percentage were performed on the Student Satisfaction Survey. For the convenience of summarizing the data, the responses of strongly agree "1" and agree "2" (strongly disagree "5" and disagree "4" on items 6 and 9) were interpreted as favorable responses. A response of "3" was interpreted as neutral. The remaining responses of strongly disagree "5" and disagree "4" (strongly agree "1" and agree "2" on items 6 and 9) were interpreted as unfavorable responses.

CHAPTER IV

FINDINGS OF THE STUDY

This study was conducted to evaluate the effectiveness of case studies as an independent study aid for Medical Laboratory Technology students. Along with the effectiveness of case studies, this study explored the student's perception of this technique. This chapter presents a description of the participants, the results of the data collected, the statistical analysis of those data, and the correlation to the research questions.

Description of Participants

Eighty first-year students enrolled in MLT 137: Immunohematology in the El Centro College Medical Laboratory Technology Program participated in the study. Ex post facto data collection began with those students enrolled in Spring 1986. Student participation occurred over a six year period of time due to class sizes (see Table 1). Because the study was consistently conducted near the completion of the Spring semester (beyond the drop date), subject mortality was eliminated. All students completed both the pretest and posttest. The control group had 40 members as did the test group. All participants had very limited immunohematology

Table 1

MLT 137 Class Size

Year	Number of Students
1986	17
1987	10
1988	13
1989	12
1990	8
1991	22

knowledge and no previous blood bank experience.

Findings by Research Question

The Student Satisfaction Survey utilized in this study presented the information pertaining to the first research question--How do MLT students consider case studies as an independent study aid? The survey revealed that 81% of the test group used independent study aids. The study aids considered in this survey included reading the text, reviewing the lecture material, and utilizing case studies. A majority response of 73% indicated that reading the text proved to be insufficient. For reviewing the lecture material, only 27% strongly agreed that this method was sufficient for test preparation. Another 45% disagreed that this technique was sufficient. Finally, 100% agreed that case studies were a

beneficial use of study time. Analysis of the test score data addressed the second research question--Can case studies be effective in increasing comprehension and retention? The pretest and posttest utilized in this portion of the study were valued at 150 points each. The raw data including mean scores, ranges, and standard deviations for each test in both groups is presented in Table 2. For the control group, the scores on the pretest ranged from 36 to 150 with a mean score of 118 and a standard deviation of 25.8. The posttest for this group ranged from 65 to 150 with a mean of 115 and a standard deviation of 21.2. The test group demonstrated a pretest range from 51 to 150 with a mean of 124 and a standard deviation of 20.8. On the posttest, this group ranged from 57 to 150 with a mean of 128 and a standard deviation of 17.5. The control group demonstrated a decrease in mean scores between pretest and posttest which resulted in a -3.0 gain score. The test group displayed an increase in scores between pretest and posttest and achieved a +3.9 gain score. When observing the raw scores, 45% of the control group experienced an increase in scores between pretest and posttest. In the test group, 70% displayed an increase between the two tests. See Table 3. A t test was performed on the gain scores from the control group versus the test group. The t value for the control group compared to the test was 2.11. In order for t to be significant at the .05 level for a two-tailed test, t 79

Table 2

Mean, Range, and Standard Deviation of Test Scores of the Control and Test Groups

Group	Test	Range	Mean	Standard Deviation
Control	Pretest	36 to 150	118	25.8
	Posttest	65 to 150	115	21.2
Test	Pretest	51 to 150	124	20.8
	Posttest	57 to 150	128	17.5

Note: N = 40 in Control Group N = 40 in Test Group

must be equal to or greater than 1.991 (80 subjects with 1 degree of freedom).

The Student Satisfaction Survey also provided the data necessary for the third research question--What level of satisfaction is achieved through the use of case studies? Based on survey results, the test group members studied immunohematology for one to two hours a night. The week the case studies were utilized, 67% of the group increased their study time to an average of 2.5 hours. When addressing areas of satisfaction, 91% of the responses were favorable. These areas of satisfaction referred to the individual student's perceived satisfaction with the effect of case studies on practical perspective, application of knowledge, recall, comprehension, and retention. The obtained percentages are summarized in Table 4.

Table 3

Pretest/Posttest Raw Test Scores

ID. No.	Control		ID. No.	Test	
	Pretest	Posttest		Pretest	Posttest
0434	78	88	0553	136	145
0610	145	124	0912	112	127
1147	120	120	0936	133	138
1292	133	127	1023	145	125
2511	136	123	1114	104	114
2630	138	116	1548	150	136
2995	96	103	1566	118	138
3399	108	108	1944	106	126
3710	138	129	2154	137	138
3735	133	126	2454	123	130
3816	124	105	2766	142	128
3960	110	111	2908	120	121
4146	84	81	3567	121	124
4561	101	127	3682	148	144
4738	147	150	3830	136	130
4794	129	135	3928	104	137
4934	122	126	4089	139	141
5037	118	103	4130	125	129
5105	80	118	4207	129	121
5128	117	139	5054	140	127

Table 3, cont'd

Pretest/Posttest Raw Test Scores

ID. No.	Control		ID. No.	Test	
	Pretest	Posttest		Pretest	Posttest
5204	144	124	5338	51	57
5359	126	127	5750	142	137
5594	133	99	5839	102	120
5856	109	106	5865	138	150
6354	85	101	6008	140	136
6455	108	91	6236	150	142
7130	88	126	6453	126	138
7334	150	129	6474	121	124
7615	88	66	6632	100	108
7953	123	129	6681	109	132
8195	36	65	7437	117	136
8196	145	124	7452	120	126
8283	140	148	7963	75	85
8763	150	148	8088	147	150
8772	89	92	8727	102	99
8925	149	150	8988	122	123
9066	144	135	9025	108	119
9695	139	107	9299	148	128
9731	130	106	9597	134	150
9913	96	87	9838	126	141

Note: N = 40 Maximum score = 150

Table 4

Summary of Student Satisfaction Survey Items Dealing with Case Studies

Item subject	Favorable responses %	Unfavorable responses %	Neutral %
Practical perspective	100		
Application of knowledge	82		18
Recall	82	9	9
Comprehension	100		
Retention	92		8

Summary

The findings presented in this chapter correspond to the three research questions posed in this study. The information obtained from the Student Satisfaction Survey addressed the first and third research questions. The second research question dealing with the effectiveness of case studies was statistically evaluated through descriptive and inferential statistics. The descriptive statistics revealed that the test group demonstrated higher means on both the pretest and posttest than did the control group. However, the range of scores on both tests from both groups was quite

comparable. The test group did achieve a much larger gain score. Through inferential statistics, the t test supported a significant difference between the performance of the two groups.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the effectiveness of the case study method for comprehension and retention of information in medical laboratory technology. This study also explored the student preference of this method over common study aids and assessed their corresponding satisfaction. Student preference and satisfaction were evaluated through the information collected from the Student Satisfaction Survey. The survey was utilized following peer review and achieved very consistent results through three separate administrations.

The study was conducted over a 6 year time span beginning with data collection in Spring 1986. This study incorporated a two-group pretest-posttest design incorporating a control and a test group. Both groups participated in this study by taking the pretest and posttest. The test group was instructed with proper use of the case study booklet and encouraged toward independent study between pretest and posttest. The test group was also surveyed with the Student Satisfaction Survey to assess preference and satisfaction

levels.

The case study booklet for MLT 137: Immunohematology was developed for the purpose of this study. The booklet consisted of two parts: 1) the presentation of the objectives, the case, and the study questions and 2) the answers and discussion to the questions posed in part one. The study evaluated whether gain occurred in the test group following the case study intervention, when compared to the control group which lacked that intervention. The two tailed t test was performed on the gain score means using the appropriate degrees of freedom to determine any significant difference in the scores at the .05 level. The t test supported an affirmative response to the second research question--Can case studies be effective in increasing comprehension and retention?

Conclusion

This study revealed that the case study method can be effective for increasing comprehension and retention of information in medical laboratory technology. More importantly, the study showed that MLT students prefer using case studies over conventional independent study aids such as reviewing the text and/or lecture material. That preference was supported with overwhelmingly positive responses and comments which were interpreted by this researcher as satisfaction with this method.

Discussion

Tarcinale (1987) ascertained that today's learners are "members of a fast growing society where information increases at a remarkable rate" (p. 341). That "fast growing society" obviously includes the area of medical laboratory sciences as reinforced by Peschel(1989). Tarcinale further determined that "the case study is a teaching technique whereby large quantities of information can be introduced and collapsed to a manageable size to enable the learner to develop an appreciation of the whole" (p.341). Fuzard (1989) supported the fact that adults learn best when they "perceive the information being taught as immediately useful" (p. 276). A study by Crosby and Dunn (1988) showed a significant difference between pretest and posttest results when the case study method was employed as the primary intervention with the sample population consisting of nursing students. From comparison of the pretest and posttest scores of the control and test groups, the case study method appears to be an effective study aid for medical laboratory technology students. As determined by Johnson and Purvis (1987) and validated with the Student Satisfaction Survey of this study, the case study method was considered a satisfactory learning tool by students. Students commented that this method allowed them to utilize information presented to them in class. A study conducted by Huston and Marquis (1987) established that

the rewards for students through this mode of teaching are "multifaceted" and that "the final evaluations by students have been favorable" (p. 211). Similar findings were revealed in this study.

Based on the documented success of nursing educators with this method and the results of this study, MLT educators should begin implementation of case studies into their current curricula. Because the practical aspects of the presented case are essential, MLT educators could call upon clinical faculty to assist with case development.

Recommendations

Based upon the results of this study, the following recommendations are made:

1. The study could be conducted during a single semester with the participation of several randomly selected Medical Laboratory Technology programs.
2. Medical Technology students could serve as the population for the study.
3. The case studies could be written for more than one course subject.
4. The study could include a second posttest to evaluate the effectiveness of this method on long term retention.
5. The evaluation of the tests could include a

categorization of question level to determine which domain of learning is most affected by the case study method.

6. A second case study booklet containing realistic patient names and cases could be incorporated in this study to evaluate the effect of humor as a learning enhancement tool.

7. The study could include a comparison between the control and test group considering the level of satisfaction achieved with the case study method versus traditional independent study aids.

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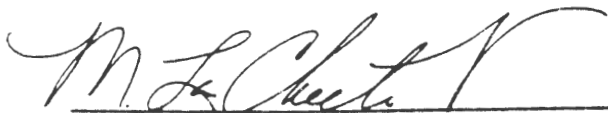
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APPENDIX A
AGENCY CONSENT FORM

TEXAS WOMAN'S UNIVERSITY

CONSENT FORM

I, the undersigned, do hereby grant permission to Jodi L. Hillier to utilize information gathered during an educational experiment at El Centro College. I understand that examination scores and a student satisfaction survey collected from first year MLT students will serve as the required data. I understand that this study incorporates the use of case studies provided to the students as part of the MLT 137 syllabus and that classroom space was utilized. I understand that the data collected from this experiment may be made available for educational, informational and/or research purposes; and I hereby consent to such use. I also consent to the use of the name of this program and school in the written and oral presentation of this material.



M. LaCheeta McPherson, PhD, MT(ASCP)
Program Director
Medical Laboratory Technology Program
El Centro College
Dallas, Texas

10-21-91

Date

APPENDIX B

MLT 137 COURSE OUTLINE AND OBJECTIVES

I. Blood Collection

- | | |
|---|--|
| <p>A. Blood donors</p> <ol style="list-style-type: none"> 1. Identification 2. Selection 3. Medical history 4. Physical exam | <ol style="list-style-type: none"> 1. List the information required from a potential blood donor. 2. Describe the process of donor selection. |
| <p>B. Special donor categories</p> <ol style="list-style-type: none"> 1. Therapeutic 2. Autologous 3. Designated 4. Hemapheresis | <ol style="list-style-type: none"> 3. Given specific medical information, categorize a potential donor. |
| <p>C. Phlebotomy</p> <ol style="list-style-type: none"> 1. Materials 2. Identification 3. Venipuncture 4. Collection 5. Donor care 6. Donor reactions | <ol style="list-style-type: none"> 4. Outline the acceptable physical requirements for blood donation 5. Define each special donor category. 6. Perform a mock each anticoagulant. 7. Describe proper donor care. 8. Discuss adverse donor reactions. |

II. Components

- | | |
|---|--|
| <p>A. Anticoagulants/
preservation</p> <ol style="list-style-type: none"> 1. CPD 2. CPDA-1 3. Additive systems 4. Heparin | <ol style="list-style-type: none"> 1. Explain the difference between anticoagulants and preservatives. 2. Give the mechanisms of each anticoagulant. |
| <p>B. Preparation</p> | <ol style="list-style-type: none"> 3. Outline the preparation of components from whole blood. |
| <p>C. Red blood cells</p> | |
| <p>D. Plasma</p> | <p>For each component, describe the following:</p> |
| <p>E. Cryoprecipitate</p> | <ol style="list-style-type: none"> 4. Preparation |
| <p>F. Platelets</p> | <ol style="list-style-type: none"> 5. Expiration |
| <p>G. Granulocytes</p> | <ol style="list-style-type: none"> 6. Storage requirements 7. Appropriate use |

III. Genetics

- | | |
|-----------------------------|---|
| A. Terminology | 1. With proper terminology explain basic blood bank genetics. |
| B. Gene action | |
| C. Dominant vs. recessive | 2. Given specific cases, calculate gene frequency. |
| D. Gene interaction | |
| E. Blood group nomenclature | |
| F. Parentage testing | |
| G. Mathematics | |

IV. Immunology

1. Explain the basic immunology of blood banking.

V. ABO Blood Groups

2. Correlate ABO antigens to the expected antibodies.
3. Perform ABO groupings.
4. Given a family pedigree, trace the ABO inheritance.

- A. Antigens
- B. Antibodies
- C. Genetics
- D. Testing
- E. Discrepancies

VI. Rh/Hr System

1. Interpret the various Rh nomenclatures.
2. Describe the inheritance theories for Rh.
3. List the Rh antigens.
4. Describe the clinical significance of Rh Antibodies.
5. Perform Rh typing.

- A. Nomenclature
 1. Fisher-Race
 2. Wiener
 3. Rosenfield
- B. Genetics
- C. Antigens
 1. Single
 2. Compound
- D. Antibodies
 1. Types
 2. Clinical significance
- E. Testing

- VII. Major Blood Group Systems For each of the major blood group systems:
- A. MNSs
 - B. P
 - C. Lutheran (Lu)
 - D. Kell (Kk)
 - E. Lewis (Le)
 - F. Duffy (Fy)
 - G. Kidd (Jk)
1. List the antigens of the system with corresponding antibodies.
 2. Outline the clinical significance of the antibodies
 3. Describe any distinguishing characteristics useful in identification.
- VIII. Other Blood Groups
- A. High frequency
 - B. HTLA
 - C. Sda
 - D. Low frequency
1. Categorize the members of other blood group systems.
 2. Give distinguishing characteristics of each group
- IX. Pretransfusion Testing
- A. Transfusion request
 - B. Blood sample
 - 1. Label
 - 2. Type
 - 3. Age
 - 4. Storage
 - C. Records
 - D. Serological Testing
 - 1. Blood typing
 - 2. Antibody detection
 - 3. Crossmatching
 - E. Selection of Units
1. State the purpose of pretransfusion testing.
 2. List those tests required for pretransfusion evaluation.
 3. Describe the blood sample(s) required.
 4. Discuss the importance of maintaining accurate patient records.
 5. Outline the steps of the serological tests involved.
 6. Describe the basis of each serological test.
 7. Discuss the advantages or disadvantages of enhancement medias.
- X. Identification of Unexpected Allo Antibodies
- A. General procedures
 - 1. Screening
 - 2. Identification
 - B. Interpretations
 - 1. Single allo antibodies
1. Define allo antibodies.
 2. Outline the steps of the serological tests involved.
 3. Discuss the patient information necessary for investigation.

APPENDIX C
CASE STUDIES FOR IMMUNOHEMATOLOGY

CASE STUDIES
for
IMMUNOHEMATOLOGY

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INTRODUCTION

The following cases have been designed as a study aid for students of Immunohematology. These cases should be used in addition to classroom instruction. The instructor should encourage the students to answer the questions from present knowledge and available sources before consulting the provided answers.

TABLE OF CONTENTS

Introduction	i
Case 1: ABO Interpretation	1
Case 2: ABO Discrepancy	2
Case 3: Rh Genotyping	3
Case 4: Antibody I.D.- Simple	4
Case 5: Antibody I.D.- Variation	5
Case 6: Antibody I.D.- Multiple	6
Case 7: Positive DAT	7
Case 8: Donor Evaluation	8
Case 9: Post Natal Testing	9
Case 10: Component Selection	10
Answers	11

Case 1

OBJECTIVES

1. Interpret normal ABO groupings.
2. Describe the basis of the ABO typing procedure.
3. Discuss the validity of given results.
4. Select the most appropriate type(s) for possible transfusion.

CASE

A 29-year old female, O.Bea City, is admitted to your hospital for liposuction. The physician has ordered a type and crossmatch for two units of blood for AM surgery. Her ABO results follow:

anti-A	anti-B	Reverse A	Reverse B
4+	4+	0	0

(Her Rh type is positive.)

Due to a recent blood shortage, you have a limited number of blood products in stock. Your inventory includes:

whole blood	RBCs
10 O+	15 O+
4 A+	10 A+
2 B+	2 B+
	1 AB+

QUESTIONS

1. What is the blood type for Ms. City?
2. What are you specifically determining with the forward type? Reverse type?
3. How do the forward and reverse types correlate?
4. What determines the validity of an ABO grouping?
5. From the available stock, which products would you select for Ms. City? Why?

Case 2

OBJECTIVES

1. Interpret normal ABO groupings.
2. Identify the discrepancy.
3. List the possible explanations for the discrepancy.
4. Recommend possible resolutions.

CASE

A 62-year old Kansas woman, Anne T. Emm, was last treated at your hospital for injuries incurred during a tornado several years ago. Her ABO results at that time were

anti-A	anti-B	Reverse A	Reverse B
4+	0	0	4+

Now she has been admitted for colon cancer. Her doctor has ordered two units of RBCs for transfusion. Upon this admission, her ABO results are as follows:

anti-A	anti-B	Reverse A	Reverse B
4+	2+	0	4+

QUESTIONS

1. What is her initial ABO grouping?
2. What does her second ABO grouping indicate?
3. List five possible explanations.
4. Identify the most probable cause.
5. What testing must be done to confirm your explanation?

Case 3

OBJECTIVES

1. Given the present Rh antigens, determine the most probable genotype (Fisher/Race).
2. Transcribe the genotypes to Wiener nomenclature.
3. Determine the most probable parentage.
4. List other probable genotypes from the most probable parents.

CASE

Snow White admits to having seven men currently in her life, which presents some problem in determining the father of her baby. She has narrowed the possibilities down to three. The Rh phenotyping on all involved parties follows:

	anti-D	anti-C	anti-c	anti-E	anti-e
Snow White	+	+	+	+	+
Grumpy	+	+	0	0	+
Happy	0	0	+	0	+
Sneezy	+	0	+	+	+
Baby Snow	+	0	+	+	0

QUESTIONS

1. Give the most probable genotype for each party.

(Wiener)
(Fisher/Race)

Snow White

Grumpy

Happy

Sneezy

Baby Snow
2. Who is most likely Baby Snow's father?
3. What other genotypes could offspring from the most likely couple?

Case 4

OBJECTIVES

1. Interpret the given test results.
2. Identify any abnormalities.
3. Outline further necessary testing.
4. Identify the antibody.
5. Discuss the clinical significance.
6. List the means of RBC sensitization.

CASE

Patient Juliet Romeo has just delivered her tenth child. Her antibody screen is positive. The results of the antibody identification are on antigram I. Except for a freak poisoning in her teenage years, Mrs. Romeo has not been ill and has never received blood.

QUESTIONS

1. What does the positive antibody screen indicate?
2. Interpret the antigram.
3. Is this antibody clinically significant? Explain.
4. How was Mrs. Romeo most likely sensitized to this antibody's corresponding antigen?

Case 5

OBJECTIVES

1. Interpret given test results.
2. Outline necessary confirmatory testing.
3. Explain the occurrence of reactions at various phases.
4. Identify the most probable antibody(ies).
5. Discuss the clinical significance.
6. Discuss the validity of an ordered test.

CASE

Patient Bette R. Pass is a 37-year old female. She has three children and has received blood as the result of a car accident ten years ago. She has been admitted for elective surgery and requires a group, screen and hold.

QUESTIONS

1. Interpret antigram II.
2. What testing is necessary to confirm your findings.
3. What could cause the variation in reactions?
4. Are your findings clinically significant? Explain.
5. How would you respond to the ordered "group, screen and hold"?

Case 6

OBJECTIVES

1. Interpret antibody panels.
2. Outline the necessary confirmatory tests.
3. Describe the appropriate product for transfusion.
4. Calculate the frequency of the required product.
5. Select the most appropriate product.

CASE

Patient Emma Mune (her friends call her "Em") is a 45-year old white female. In 1988, she had her wisdom teeth removed by an inexperienced dental student. As a result, she received two units of blood. She is scheduled for jaw reconstruction and her oral surgeon has ordered two units of blood. Her pre-transfusion work-up yielded a positive antibody screen. Antigam III shows the result of her antibody identification.

QUESTIONS

1. Which antibody(ies) is(are) present?
2. What tests would need to be done for confirmation?
3. For Em Mune to receive blood, what specifically must be done to the RBCs?
4. What is the percentage for finding acceptable units?

Case 7

OBJECTIVES

1. Based on the given information, describe the proper action to be taken.
2. Outline the necessary laboratory investigation.
3. Interpret the given test results.
4. Identify the source of the reaction.
5. Describe the precautions that must precede subsequent transfusions.

CASE

Patient Ima N. Trouble was transfused with three units of blood seven days ago. Her hemoglobin and hematocrit have begun to drop with no evidence of active bleeding. Her serum bilirubin is increased and she has slight hemoglobinuria. A DAT performed on a seven day post-transfusion sample is positive (2+). The doctor again orders three units of blood.

QUESTIONS

1. What is your response to the doctors orders?
2. What is a possible explanation for Mrs. Trouble's trouble?
3. What does the DAT indicate?
4. What further testing is required?
5. Interpret antigram IV.
6. What must be insured before transfusion may occur?

Case 8

OBJECTIVES

1. Name the source of guidelines for donor selection.
2. Outline the physical requirements for whole blood donation.
3. Evaluate the prospective donor.
4. Justify your evaluation.
5. Categorize the donor.

CASE

You are in the process of interviewing Mr. Oscar Meyer as a prospective blood donor. He seems to meet all of the physical requirements. While gathering information on his medical history, he informs you that he had malaria during the Korean Conflict. He also informs you that he received a hepatitis immunization following a "small QC problem" at his bologna plant.

QUESTIONS

1. What agency sets the requirements for blood donation?
2. According to this agency, what are the physical requirements for blood donation?
3. What is your evaluation of this prospective donor?

Case 9

OBJECTIVES

1. Describe the most effective prenatal testing.
2. Describe the most effective postnatal testing.
3. Evaluate the given test results.
4. Outline further necessary testing.
5. Determine the clinical significance.
6. Select the most appropriate component for exchange transfusion.
7. Discuss the mother's candidacy for Rh immune globulin.

CASE

Mama Bear has a positive antibody screen. The results of her antibody identification are on antigram V. Baby Bear appears jaundiced and has a positive DAT. Mama Bear is O,Rh negative; Baby Bear is A,Rh positive.

QUESTIONS

1. What antibody(ies) is/are indicated by the panel?
2. What can be anticipated about Baby's phenotype?
3. If transfusion becomes necessary, what requirements must be met?
4. State the prerequisites for Rh immune globulin administration.
5. Evaluate Mama's candidacy for Rh immune globulin?

Case 10

OBJECTIVES

1. Discuss the proper use of blood components.
2. Describe the preparation of given components.
3. List the storage conditions for blood components.
4. Correlate given components to the corresponding outdate.

CASE

A 14-year old male hemophiliac, Theodore Cleaver, is admitted for an emergency appendectomy. In addition to the Beav's prescribed commercial AHF, the physician will order another blood component to help prevent bleeding complications.

QUESTIONS

1. What will the most appropriate blood component be in this case? Why?
2. How is this product prepared?
3. What is the proper storage for this and similar products?
4. How long can this component be stored?

ONE

Genetics
The Human Blood
Groups by J. H. H. Sanger

1st Ed. No. 0108

REAGENT RED BLOOD CELLS
14M ANTIHUMAN MEMBRANE
Panel ONE and Fix-A-Panel ONE

Note: The solution of panel donors for any antigens, marked 1
may have been determined with a single sample of the
specific antibody, due to the shortage of some antibodies.

U.S. Patent No. 415

Antigen I

NAME
CAMPBELL
INSTRUMENT
DATE
1951

BLOOD GROUP SYSTEM		ABO										Rh		Le		L ^a		L ^b		L ^c		L ^d		L ^e		L ^f		L ^g		L ^h		L ⁱ		L ^j		L ^k		L ^l		L ^m		L ⁿ		L ^o		L ^p		L ^q		L ^r		L ^s		L ^t		L ^u		L ^v		L ^w		L ^x		L ^y		L ^z		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L 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^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L ^{ab}		L ^{ac}		L ^{ad}		L ^{ae}		L ^{af}		L ^{ag}		L ^{ah}		L ^{ai}		L ^{aj}		L ^{ak}		L ^{al}		L ^{am}		L ^{an}		L ^{ao}		L ^{ap}		L ^{aq}		L ^{ar}		L ^{as}		L ^{at}		L ^{au}		L ^{av}		L ^{aw}		L ^{ax}		L ^{ay}		L ^{az}		L ^{aa}		L 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RECEIVED

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[illegible]

MARY MANN

Anticodon

CO	DATE AC'D	AM	ACCOUNT
011			REVENUE

BLOOD GROUP		ABO										Rh		Hemoglobin		Erythrocytes		Leucocytes		Platelets		Sedimentation		Other	
No.	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	1913	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
2	1914	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
3	1915	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
4	1916	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
5	1917	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
6	1918	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
7	1919	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
8	1920	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
9	1921	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
10	1922	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
11	1923	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
12	1924	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
13	1925	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
14	1926	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
15	1927	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
16	1928	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
17	1929	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
18	1930	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
19	1931	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
20	1932	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
21	1933	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
22	1934	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
23	1935	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
24	1936	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
25	1937	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
26	1938	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
27	1939	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
28	1940	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
29	1941	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
30	1942	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
31	1943	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
32	1944	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
33	1945	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
34	1946	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
35	1947	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
36	1948	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
37	1949	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
38	1950	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
39	1951	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
40	1952	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
41	1953	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
42	1954	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
43	1955	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
44	1956	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
45	1957	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
46	1958	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
47	1959	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
48	1960	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
49	1961	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
50	1962	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
51	1963	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
52	1964	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
53	1965	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
54	1966	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
55	1967	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
56	1968	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
57	1969	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
58	1970	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
59	1971	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
60	1972	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
61	1973	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
62	1974	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
63	1975	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
64	1976	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
65	1977	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
66	1978	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
67	1979	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
68	1980	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
69	1981	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
70	1982	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
71	1983	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
72	1984	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
73	1985	+	+	+	+	+	+	+	+	+	+	+													

No. 11 Cb: This cell is $\text{Bt}(a,1)$. The α (Diego) has a very low incidence among Caucasian bloods, but is of variable frequency in populations of Mexican origin, and among American Indians. It is common in South America (Carib Indians 56%), is present in Chile (2.5%), in Japan (0.12-0.15%) and in Chippewas (11.3%). In the United States it has been found in Eskimos. The β antigen is well developed at birth, and anti- β has been responsible for the majority of the reactions in Rh incompatibility. It has also been reported to be the cause of an acute hemolytic transfusion reaction (Hosley, Hines, *Br J Haematol* 1959; 10: 536). Anti β is so commonly present in sera of non-transfused people, transfusions as a direct α - β agglutination and sometimes preceding an anti- β agglutination test for its detection [first listed 1915, 1922, 1938]. In blood groups in man, ed. ed. Oxford: Blackwell Scientific Publications 1975, 3: 372-378.]

ONE

20002
Pantograph, Inc.
1000 Lexington Road
Beverly Hills, Calif. 90212

REAGENT RED BLOOD CELLS
HIM ANTIHUMAN IDENTIFICATION
Panel ONE and Firm Panel ONE

Note: The status of panel donors for any antigen marked 1 may have been determined with a single example of the specific antibody, due to the shortage of some antibodies.

U.S. Patent No. 415

Lot No. 0108

Antigram III

NAME _____
GROUP _____
HISTORY _____
INTERPRETATION _____

BLOOD GROUP SYSTEM		AB										Rh				D				F				I				J				K				L				M				N				O				P				Q				R				S				T				U				V				W				X				Y				Z				AA				AB				AC				AD				AE				AF				AG				AH				AI				AJ				AK				AL				AM				AN				AO				AP				AQ				AR				AS				AT				AU				AV				AW				AX				AY				AZ				BA				BB				BC				BD				BE				BF				BG				BH				BI				BJ				BK				BL				BM				BN				BO				BP				BQ				BR				BS				BT				BU				BV				BW				BX				BY				BZ				CA				CB				CC				CD				CE				CF				CG				CH				CI				CJ				CK				CL				CM				CN				CO				CP				CQ				CR				CS				CT				CU				CV				CW				CX				CY				CZ				DA				DB				DC				DD				DE				DF				DG				DH				DI				DJ				DK				DL				DM				DN				DO				DP				DQ				DR				DS				DT				DU				DV				DW				DX				DY				DZ				EA				EB				EC				ED				EE				EF				EG				EH				EI				EJ				EK				EL				EM				EN				EO				EP				EQ				ER				ES				ET				EU				EV				EW				EX				EY				EZ				FA				FB				FC				FD				FE				FG				FH				FI				FJ				FK				FL				FM				FN				FO				FP				FQ				FR				FS				FT				FU				FV				FW				FX				FY				FZ				GA				GB				GC				GD				GE				GF				GG				GH				GI				GJ				GK				GL				GM				GN				GO				GP				GQ				GR				GS				GT				GU				GV				GW				GX				GY				GZ				HA				HB				HC				HD				HE				HF				HG				HH				HI				HJ				HK				HL				HM				HN				HO				HP				HQ				HR				HS				HT				HU				HV				HW				HX				HY				HZ				IA				IB				IC				ID				IE				IF				IG				IH				II				IJ				IK				IL				IM				IN				IO				IP				IQ				IR				IS				IT				IU				IV				IW				IX				IY				IZ				JA				JB				JC				JD				JE				JF				JG				JH				JI				JJ				JK				JL				JM				JN				JO				JP				JQ				JR				JS				JT				JU				JV				JW				JX				JY				JZ				KA				KB				KC				KD				KE				KF				KG				KH				KI				KJ				KL				KM				KN				KO				KP				KQ				KR				KS				KT				KU				KV				KW				KX				KY				KZ				LA				LB				LC				LD				LE				LF				LG				LH				LI				LJ				LK				LM				LN				LO				LP				LQ				LR				LS				LT				LU				LV				LW				LX				LY				LZ				MA				MB				MC				MD				ME				MF				MG				MH				MI				MJ				MK				ML				MM				MN				MO				MP				MQ				MR				MS				MT				MU				MV				MW				MX				MY				MZ				NA				NB				NC				ND				NE				NF				NG				NH				NI				NJ				NK				NL				NM				NO				NP				NQ				NR				NS				NT				NU				NV				NW				NX				NY				NZ				OA				OB				OC				OD				OE				OF				OG				OH				OI				OJ				OK				OL				OM				ON				OO				OP				OQ				OR				OS				OT				OU				OV				OW				OX				OY				OZ				PA				PB				PC				PD				PE				PF				PG				PH				PI				PJ				PK				PL				PM				PN				PO				PP				PQ				PR				PS				PT				PU				PV				PW				PX				PY				PZ				QA				QB				QC				QD				QE				QF				QG				QH				QI				QJ				QK				QL				QM				QN				QO				QP				QQ				QR				QS				QT				QU				QV				QW				QX				QY				QZ				RA				RB				RC				RD				RE				RF				RG				RH				RI				RJ				RK				RL				RM				RN				RO				RP				RQ				RR				RS				RT				RU				RV				RW				RX				RY				RZ				SA				SB				SC				SD				SE				SF				SG				SH				SI				SJ				SK				SL				SM				SN				SO				SP				SQ				SR				SS				ST				SU				SV				SW				SX				SY				SZ				TA				TB				TC				TD				TE				TF				TG				TH				TI				TJ				TK				TL				TM				TN				TO				TP				TQ				TR				TS				TT				TU				TV				TW				TX				TY				TZ				UA				UB				UC				UD				UE				UF				UG				UH				UI				UJ				UK				UL				UM				UN				UO				UP				UQ				UR				US				UT				UU				UV				UW				UX				UY				UZ				VA				VB				VC				VD				VE				VF				VG				VH				VI				VJ				VK				VL				VM				VN				VO				VP				VQ				VR				VS				VT				VU				VV				VW				VX				VY				VZ				WA				WB				WC				WD				WE				WF				WG				WH				WI				WJ				WK				WL				WM				WN				WO				WP				WQ				WR				WS				WT				WU				WV				WW				WX				WY				WZ				XA				XB				XC				XD				XE				XF				XG				XH				XI				XJ				XK				XL				XM				XN				XO				XP				XQ				XR				XS				XT				XU				XV				XW				XX				XY				XZ				YA				YB				YC				YD				YE				YF				YG				YH				YI				YJ				YK				YL				YM				YN				YO				YP				YQ				YR				YS				YT				YU				YV				YW				YX				YY				YZ				ZA				ZB				ZC				ZD				ZE				ZF				ZG				ZH				ZI				ZJ				ZK				ZL				ZM				ZN				ZO				ZP				ZQ				ZR				ZS				ZT				ZU				ZV				ZW				ZX				ZY				ZZ			
Lot	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

APR 11 1964
U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C.

Point: The notion of power doesn't say anything useful! may have been discussed with a single example of the open air authority, due to the absence of some subjects.

0108

[illegible]62

No. 11 (cont.) This cell is (b) (c). Dr° (Berges) has a very low incidence among Caucasian bloods, but is of variable frequency in populations of Mongolian origin, including American Indians. It is common in South American Carib Indians (36.5%), is present in Chinese (7.5%), in Japanese (8-12%), in Chippewy Indians (11.5%), but has not been found in Eskimoes. The Dr° antigen is well developed in both, and anti-Dr° has been responsible for the metabolic disease of the newborn. This antibody has also been reported to be the cause of an acute hemolytic transfusion reaction (Hann & J. Thorpe, *Br. J. Transf. Med.* 1949, 20: 581-586). Anti-Dr° is occasionally useful in testing of many unmixed people, sometimes as a direct agglutination and sometimes according to antibodies used in detection. [For further details see Race & R. Sanger, *A Blood Groups in man*, 2nd ed. Oxford, Blackwell Scientific Publications 1955, 372-378.]

ONE

ONE
 Diagnostic Reagents
 Division, Inc.
 New York, N.Y. 10017

REAGENT RED BLOOD CELLS FOR ANTIBODY IDENTIFICATION Panel ONE and Ficin Panel ONE

Note: The values of panel donors for any antigens marked () may have been determined with a single example of the specific antibody, due to the shortage of some substrains.

US Govt Form 415

1-4 No. 0108

NAME: **Antigen V**
 LAB: **MB**
 TEST DATE: **11**
 INTERPRETATION: **MB**

MINI-GROUP SYSTEM		Rh										P		Le ^a		Le ^b		Le ^c		Le ^d		Le ^e		Le ^f		Le ^g		Le ^h		Le ⁱ		Le ^j		Le ^k		Le ^l		Le ^m		Le ⁿ		Le ^o		Le ^p		Le ^q		Le ^r		Le ^s		Le ^t		Le ^u		Le ^v		Le ^w		Le ^x		Le ^y		Le ^z		Le ^{aa}		Le ^{ab}		Le ^{ac}		Le ^{ad}		Le ^{ae}		Le ^{af}		Le ^{ag}		Le ^{ah}		Le ^{ai}		Le ^{aj}		Le ^{ak}		Le ^{al}		Le ^{am}		Le ^{an}		Le ^{ao}		Le ^{ap}		Le ^{aq}		Le ^{ar}		Le ^{as}		Le ^{at}		Le ^{au}		Le ^{av}		Le ^{aw}		Le ^{ax}		Le ^{ay}		Le ^{az}		Le ^{ba}		Le ^{bb}		Le ^{bc}		Le ^{bd}		Le ^{be}		Le ^{bf}		Le ^{bg}		Le ^{bh}		Le ^{bi}		Le ^{bj}		Le ^{bk}		Le ^{bl}		Le ^{bm}		Le ^{bn}		Le ^{bo}		Le ^{bp}		Le ^{bq}		Le ^{br}		Le ^{bs}		Le ^{bt}		Le ^{bu}		Le ^{bv}		Le ^{bw}		Le ^{bx}		Le ^{by}		Le ^{bz}		Le ^{ca}		Le ^{cb}		Le ^{cc}		Le ^{cd}		Le ^{ce}		Le ^{cf}		Le ^{cg}		Le ^{ch}		Le ^{ci}		Le ^{cj}		Le ^{ck}		Le ^{cl}		Le ^{cm}		Le ^{cn}		Le ^{co}		Le ^{cp}		Le ^{cq}		Le ^{cr}		Le ^{cs}		Le ^{ct}		Le ^{cu}		Le ^{cv}		Le ^{cw}		Le ^{cx}		Le ^{cy}		Le ^{cz}		Le ^{da}		Le ^{db}		Le ^{dc}		Le ^{dd}		Le ^{de}		Le ^{df}		Le ^{dg}		Le ^{dh}		Le ^{di}		Le ^{dj}		Le ^{dk}		Le ^{dl}		Le ^{dm}		Le ^{dn}		Le ^{do}		Le ^{dp}		Le ^{dq}		Le ^{dr}		Le ^{ds}		Le ^{dt}		Le ^{du}		Le ^{dv}		Le ^{dw}		Le ^{dx}		Le ^{dy}		Le ^{dz}		Le ^{ea}		Le ^{eb}		Le ^{ec}		Le ^{ed}		Le ^{ee}		Le ^{ef}		Le ^{eg}		Le ^{eh}		Le ^{ei}		Le ^{ej}		Le ^{ek}		Le ^{el}		Le ^{em}		Le ^{en}		Le ^{eo}		Le ^{ep}		Le ^{eq}		Le ^{er}		Le ^{es}		Le ^{et}		Le ^{eu}		Le ^{ev}		Le ^{ew}		Le ^{ex}		Le ^{ey}		Le ^{ez}		Le ^{fa}		Le ^{fb}		Le ^{fc}		Le ^{fd}		Le ^{fe}		Le ^{ff}		Le ^{fg}		Le ^{fh}		Le ^{fi}		Le ^{fj}		Le ^{fk}		Le ^{fl}		Le ^{fm}		Le ^{fn}		Le ^{fo}		Le ^{fp}		Le ^{fq}		Le ^{fr}		Le ^{fs}		Le ^{ft}		Le ^{fu}		Le ^{fv}		Le ^{fw}		Le ^{fx}		Le ^{fy}		Le ^{fz}		Le ^{ga}		Le ^{gb}		Le ^{gc}		Le ^{gd}		Le ^{ge}		Le ^{gf}		Le ^{gg}		Le ^{gh}		Le ^{gi}		Le ^{gj}		Le ^{gk}		Le ^{gl}		Le ^{gm}		Le ^{gn}		Le ^{go}		Le ^{gp}		Le ^{gq}		Le ^{gr}		Le ^{gs}		Le ^{gt}		Le ^{gu}		Le ^{gv}		Le ^{gw}		Le ^{gx}		Le ^{gy}		Le ^{gz}		Le ^{ha}		Le ^{hb}		Le ^{hc}		Le ^{hd}		Le ^{he}		Le ^{hf}		Le ^{hg}		Le ^{hh}		Le ^{hi}		Le ^{hj}		Le ^{hk}		Le ^{hl}		Le ^{hm}		Le ^{hn}		Le ^{ho}		Le ^{hp}		Le ^{hq}		Le ^{hr}		Le ^{hs}		Le ^{ht}		Le ^{hu}		Le ^{hv}		Le ^{hw}		Le ^{hx}		Le ^{hy}		Le ^{hz}		Le ^{ia}		Le ^{ib}		Le ^{ic}		Le ^{id}		Le ^{ie}		Le ^{if}		Le ^{ig}		Le ^{ih}		Le ⁱⁱ		Le ^{ij}		Le ^{ik}		Le ^{il}		Le ^{im}		Le ⁱⁿ		Le ^{io}		Le ^{ip}		Le ^{iq}		Le ^{ir}		Le ^{is}		Le ^{it}		Le ^{iu}		Le ^{iv}		Le ^{iw}		Le ^{ix}		Le ^{iy}		Le ^{iz}		Le ^{ja}		Le ^{jb}		Le ^{jc}		Le ^{jd}		Le ^{je}		Le ^{jf}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le ^{jt}		Le ^{ju}		Le ^{jv}		Le ^{jw}		Le ^{jx}		Le ^{ji}		Le ^{jj}		Le ^{jk}		Le ^{jl}		Le ^{jm}		Le ^{jn}		Le ^{jo}		Le ^{jp}		Le ^{jq}		Le ^{jr}		Le ^{js}		Le 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ANSWERS

Case 1

1. What is the blood type for Ms. City?

AB

2. What are you specifically determining with the forward type? Reverse type?

The forward type determines the presence or absence of A and B antigens on the RBC.

The reverse type determines the presence or absence of the corresponding ABO antibodies.

3. How do the forward and reverse types correlate?

Under normal circumstances, the correlation between the forward and reverse types serves as a form of quality control. Once the forward type is determined, the results of the reverse can be anticipated and vice versa.

4. What determines the validity of the ABO grouping?

The matching results of the forward and the reverse types.

5. From the available stock, which products would you select for Ms. City? Why?

Obviously, the one AB+ unit would be selected. From the remaining stock, none of the whole blood products would be appropriate for transfusion. Each would contain antibodies that would react with the A and B antigens on the patient's RBCs (O contains anti-A, anti-B, anti-A,B; A contains anti-B; B contains anti-A). From the available RBCs, the choice would be the A+ RBCs. The packed RBCs will have a limited amount of plasma containing antibodies and the anti-B produced by a type A individual is not as reactive as the anti-A produced by a type B individual.

Case 2

1. What is her initial ABO grouping?

A

2. What does her second ABO grouping indicate?

Her second grouping forwards as an AB and reverses as an A indicating an ABO discrepancy.

3. List five possible explanations.

Because the reverse typing is not altered, the problem most likely stems from an RBC problem. These results could indicate abnormal proteins, a mixture of cell types, spontaneous agglutination, polyagglutination, weak expression of an antigen or acquired "B" antigen. Several technical considerations could also be involved - over centrifugation, sample mix up, reagent contamination, improper technique or dirty glassware.

4. Identify the most probable cause.

Based on the strength of the reaction with anti-B and the patient diagnosis, the most probable cause is an acquired "B" antigen.

5. What testing must be done to confirm your explanation?

The patient's serum can be tested against patient cells. The anti-B in the patient's serum will not agglutinate cells with acquired "B" antigen. If the patient is a secretor, saliva studies will demonstrate A and H substances but no B.

Case 3

1. Give the most probable genotype for each party.

	(Wiener)	(Fisher/Race)
Snow White	R1R2	CDe/cDE
Grumpy	R1R1	CDe/CDe
Happy	rr	cde/cde
Sneezy	R2r	cDE/cde
Baby Snow	R2R2	cDE/cDE

2. Who is most likely Baby Snow's father?

Sneezy

3. What other genotypes could offspring from the most likely couple?

R1R2, R1r and R2r

Case 4

1. What does the positive antibody screen indicate?

The positive antibody indicates the presence of an unexpected antibody.

2. Interpret the antigram.

Anti-Kell is present.

3. Is this antibody clinically significant? Explain.

Yes; any antibody that reacts at body temperature and can potentially cause a transfusion reaction or hemolytic disease of the newborn is considered clinically significant. Anti-K has been implicated in both.

4. How was Mrs. Romeo most likely sensitized to this antibody's corresponding antigen?

The two means by which RBC immunization can occur are through blood transfusions or fetal-maternal blood exchange associated with pregnancy. Because Mrs. Romeo has not received blood, her sensitization is pregnancy related.

Case 5

1. Interpret the antigram.

Anti-M is present.

2. What testing is necessary to confirm your findings?

The patient cells must be typed for the M antigen. Two additional cells (Fya+M-) should be tested to rule out the presence of anti-Fya.

3. What could cause the variation in reactions?

The presence of multiple antibodies can cause variable reactions. In this case the anti-M is demonstrating dosage. Dosage is the ability of an antibody to react stronger with cells demonstrating a double dose of an antigen (homozygous) than with those demonstrating a single dose (heterozygous).

4. Are your findings clinically significant? Explain.

Anti-M is rarely clinically significant, but those antibodies detected at 37C or AHG phase may be potentially significant. (Be aware of the protocol in the individual blood bank labs on dealing with anti-M).

5. How would you respond to the ordered "group, screen and hold"?

The physician must be notified that a potential problem exists. The patient no longer qualifies for "group and screen". In all likelihood, blood will be crossmatched on this patient.

Case 6

1. Which antibody(ies) is(are) present?

Anti-C and anti-Fyb are present.

2. What tests would need to be done for confirmation?

The patient cells should be typed for the corresponding antigens. Additional cells may be tested to definitely rule out anti-K, anti-Lea and anti-Jkb (the ficin reactions help you eliminate these antibodies).

3. What testing is necessary for Em Mune to receive RBCs?

The cells to be transfused must be antigen negative for C and Fyb.

4. What is the percentage for finding acceptable units?

The percentage of C negative is 30%; the percentage of Fyb negative is 20%. These percentages must be multiplied to determine the availability of compatible units.

$$0.30 \times 0.20 = 0.06$$

Approximately six of 100 units will be compatible.

Case 7

1. What is your response to the doctor's orders?

The doctor must be informed of the positive DAT. A transfusion reaction workup must be performed before blood can be given.

2. What is a possible explanation for Mrs. Trouble's trouble?

Mrs. Trouble is most likely experiencing a delayed hemolytic transfusion reaction.

3. What does the positive DAT indicate?

The positive DAT indicates in vivo sensitization of the RBCs. Antibodies are coating the circulating RBCs.

4. What further testing is required?

An antibody elution must follow a positive DAT if blood has been transfused within the last 14 days.

5. Interpret the antigram.

Anti-Jka is present in the eluate.

6. What must be insured before transfusion may occur?

Any RBC products transfused to Mrs. Trouble must be Jka negative.

Case 8

1. What agency sets the requirements for blood donations?

The most prominent source for blood donation requirements is the American Association of Blood Banks (AABB).

2. According to this agency, what are the physical requirements for blood donation?

The physical requirements include weight - 110 pounds or more; temperature - 37.5C or less; pulse - between 50 to 100 beats per minute; blood pressure - systolic between 90-180 mm Hg with diastolic between 50-100 mm Hg; skin lesions - none present; general appearance - healthy; and hematocrit - no less than 38% for female and no less than 41% for male.

3. What is your evaluation of this prospective donor?

Most likely Mr. Meyer has been exposed to Hepatitis A. If the "hepatitis immunization" was human gamma globulin, he must be deferred for six months. If Mr. Meyer has received the HBIG, he must be deferred for 12 months. The HBIG may prolong the incubation period of hepatitis B.

Case 9

1. What antibody(ies) is(are) indicated by the panel?

Mama Bear has anti-S.

2. What can be anticipated about Baby's phenotype?

Baby Bear's cells are S positive.

3. If transfusion becomes necessary, what requirements must be met?

The RBCs selected for transfusion to Baby Bear must be negative for the S antigen.

4. State the prerequisites for Rh immune globulin administration.

The three prerequisites for Rh immune globulin administration include 1) mother must be Rh negative, 2) she must not have anti-D, and 3) the baby must be Rh positive.

5. Evaluate Mama's candidacy for Rh immune globulin.

Mama Bear should receive Rh immune globulin. (Although she has a circulating antibody, the Rh immune globulin will still prevent the production of anti-D)

Case 10

1. What will the most appropriate blood component be in this case? Why?

Cryoprecipitate will be the most appropriate blood component because it is a concentrated form of factor VIII.

2. How is this product prepared?

Cryoprecipitate is prepared from the plasma portion of whole blood. The plasma should be separated and placed at -18C or colder within six hours of the phlebotomy. The plasma is then thawed at 1-6C. When the plasma becomes slushy, it is centrifuged at 1-6C using a heavy spin. The plasma is then expressed into a satellite bag leaving the solid cryoprecipitate.

3. What is the proper storage of this and similar products?

This and similar products should be stored at -18C or colder.

4. How long can this component be stored?

This product expires one year from the draw date.

APPENDIX D
EVALUATION FORM FOR CASE STUDIES

Case Study Critique/Review Form

Thank you for taking the time to review these case studies. As mentioned to you, the intention of this packet is to provide to the student an effective independent study tool. As you read over these cases, please consider the following:

Clarity

Is the wording clear?

Is the purpose understandable?

Is the task evident?

Practicality

Is this feasible knowlege for an MLT student?

Can this information be effectively covered in class?

Realism

Does this case represent a true life situation?

Would an MLT be involved in such a case?

Validity

Are the objectives warranted by the case as presented?

Correctness

Do the answers correspond to the questions asked?

Are the answers correct?

Application

Does this case apply to "real life" situations?

Do the cases apply to the expectations of MLTs in the blood bank?

Please make any additional comments that you deem necessary.

APPENDIX E
PRETEST EXAMINATION

MLT 137 Immunohematology
Pretest

Questions 1 - 41 are valued at 2 points each. Answer 1 - 31 on the Green Scantron answer form.

1. IgG antibodies characteristically
 1. are destroyed by enzymes.
 2. react at 37c in vivo.
 3. react at 4c in vivo.
 4. react at AHG phase in vitro.
 - a. 1 and 3
 - b. 2 and 4
 - c. 1, 2, and 3
 - d. 4 only

2. IgM antibodies characteristically
 1. may bind complement.
 2. cross the placental barrier.
 3. react at 4c.
 4. cause warm autoimmune disease.
 - a. 1 and 3
 - b. 2 and 4
 - c. 1, 2, and 3
 - d. all of the above
 - e. 4 only

3. Anti-M characteristically
 1. is mostly IgG.
 2. is detected at room temperature.
 3. is non-red cell immune.
 4. demonstrates dosage.
 - a. 1 and 3
 - b. 2 and 4
 - c. 1, 2, and 3
 - d. all of the above
 - e. 4 only

4. Which of the following blood groups are closely related?
1. ABO
 2. Lewis
 3. H
 4. Se
- a. 1 and 3
 - b. 2 and 4
 - c. 1, 2, and 3
 - d. all of the above
5. A patient has an anti-f. Choose the most appropriate unit for red cell transfusion.
- a. R2r
 - b. R1R2
 - c. R0R0
 - d. rr
6. Which of the following women should receive Rh immune globulin?
- a. AB negative, Ab screen - negative, Baby - B negative
 - b. O negative, Ab screen - positive (anti-D), Baby - A positive
 - c. B Du positive, Ab screen - negative, Baby - B negative
 - d. A negative, Ab screen - negative, Baby - A positive
7. A patient has an anti-E and anti-Fya. Choose the appropriate unit for transfusion.
- a. R1R2 Fy(a-b+)
 - b. R1r Fy(a+b+)
 - c. R0R0 Fy(a-b-)
 - d. rr" Fy(a-b+)
 - e. R2R2 Fy(a+b-)

MATCHING Follow the instructions given for each set.

8.-13. Given the blood group name, match the corresponding antigen.

- | | | |
|-----------|-------|---------|
| 8. _____ | Lewis | a. U |
| 9. _____ | Kell | b. Leb |
| 10. _____ | Duffy | c. C |
| 11. _____ | Kidd | d. Fyb |
| 12. _____ | MNSs | e. Jka |
| 13. _____ | Rh | ab. Kpa |
| | | ac. Lua |

14.-19. Designate the following antibodies as MOSTLY (a) IgG or (b) IgM

- | | |
|-----------|----------|
| 14. _____ | anti-K |
| 15. _____ | anti-M |
| 16. _____ | anti-N |
| 17. _____ | anti-Fya |
| 18. _____ | anti-A,B |
| 19. _____ | anti-P |

20.-25. For each of the given blood groups, designate the corresponding antigens and/or antibodies as (a) enzyme destroyed, (b) enzyme enhanced or (c) not affected by enzymes.

- | | |
|-----------|-------|
| 20. _____ | Rh |
| 21. _____ | Kell |
| 22. _____ | Duffy |
| 23. _____ | Kidd |
| 24. _____ | Lewis |
| 25. _____ | MNSs |

26.-31. Determine if the following antibodies can cause (a) HDN, (b) HTR, (c) both, or (d) neither.

- 26. _____ anti-Lea
- 27. _____ anti-D
- 28. _____ anti-P
- 29. _____ anti-Jka
- 30. _____ anti-N
- 31. _____ anti-Lea

DEFINE each of the following terms.

- 32. dosage
- 33. homozygous
- 34. heterozygous
- 35. red cell immune
- 36. responder
- 37. anamnestic response
- 38. immunogenic
- 39. allelic pair
- 40. HTLA
- 41. high incidence antigen

Interpret the following. (8 points each)

	anti-A	anti-B	anti-A1	RA1	RA2	RB	D	Dx	Du	Dux
42.	4+	0	4+	0	0	4+	3+	0		
43.	0	0		4+		4+	0	0	3+	0
44.	0	4+		4+		0	0	0	+	+
45.	4+	0	0	4+	0	4+	0	0	0	0
46.	4+	3+	0	4+	0	0	3+	0		

47. State two observations about the antibody displayed in these screen results. (5 points)

	untreated cells			ficin treated cells	
	37c	AHG		37c	AHG
I	0	0		0	0
II	0	2+		0	0
AC	0	0		0	0

48. A positive antibody screen is followed by a _____.
49. List the steps for interpreting a panel antigam. (2 points)

50. Interpret and explain the given DAT results. (5 points)

AHG	3+
anti-IgG	2+
anti-C3	1+

51. The DAT test for _____.

52. List three conditions that can cause a positive DAT. For each condition give the source of the antibody and antigen. (6 points)

53. A positive DAT is followed by _____.

54. Interpret antigram #1. (5 points)

55. Interpret antigram #2. (5 points)

Gamma

1991-1992

413 Laeue Mo 413

**REAGENT RED BLOOD CELLS
FOR ANTIBODY IDENTIFICATION**

1. *Chrysomelids* (1000)

Note: The status of panel donors for any antigens marked 1 may have been determined with a single example of the sera. Obviously, due to the shortage of some antibodies.

NAME: Antigam 7 ID No. _____

TEST DATE _____

UP _____

PHYSICIAN _____

HISTORY

INTERPRETATION.

[illegible]

Additional Information: The suspension of pooled cord cells is prepared from cord bloods that have been individually tested and found to give negative reactions with one anti-H reagent. The final pool is confirmed to give the reactions: 1-, Lea(b-) and S(a-). Please note that new conditions imposed by the FDA are making it necessary for all manufacturers to cease distributing products containing red cells obtained from umbilical cord blood. The last issue of *Transfusion* One to feature a No. 11 cell consisting of pooled cord cells will be Lot 0530, due to be shipped on May 30, 1989.

No. 3 Cell: The Colton phenotype Co(a-b⁺) has a frequency of approximately 1 in 700 in the Caucasian population. Anti-Co^a has been reported to cause hemolytic disease of the newborn, and several of the known examples were stimulated by blood transfusion. Anti-Co^b would be reactive with 8-10% of random Caucasian bloods. Both antibodies are usually reactive by the indirect antiglobulin technique, and their reactivity is enhanced if the red cells are enzyme treated.

POLYMER

$P_1 d_1 - p_1 v_1$	$A_m \cdot g/L$	$A_m \cdot 1.1$
---------------------	-----------------	-----------------

81

SHADED COLUMNS DENOTE ANTIGENS WHICH MAY BE DESTROYED, DEPRESSSED OR ALTERED AS A RESULT OF ENZYME TREATMENT.

ACD and ACD₂

gamma

March 14, 1961

0404

**REAGENT RED BLOOD CELLS
FOR ANTIBODY IDENTIFICATION**

Land Use and Urban Form and

Note: The status of panel donors for any antigens marked 1 (plus) have been determined with a single example of the appropriate antibody, due to the shortage of some antibodies.

NAME: _____
GROUP: _____
HISTORY: _____

INTERPRETATION

Integram 2

22

LAST DATE

DISCUSSION

INTERPRETATION

[illegible]

Additional Information: The suspension of pooled cord cells is prepared from cord bloods that have been individually tested and found to give negative reactions with one anti-H reagent. The final pool is confirmed to give the reactions: 1-, Le(a-b-) and S(a-). Please note that new conditions imposed by the FDA are making it necessary for all manufacturers to cease distributing products containing red cells obtained from umbilical cord blood. The last issue of Panel One to feature a No. 11 cell consisting of pooled cord cells will be Lot 0530, due to be shipped on May 30, 1989.

No. J Cell. The Colton phenotype Co(a,b-) has a frequency of approximately 1 in 700 in the Caucasian population. Anti Co^a has been reported to cause hemolytic disease of the newborn, and several of the known examples were stimulated by blood transfusion. Anti Co^b would be reactive with 8-10% of random Caucasian bloods. Both antibodies are usually reactive by the indirect antiglobulin technique, and their reactivity is enhanced if the red cells are enzyme treated.

APPENDIX F

MLT 137 FINAL EXAMINATION

MLT 137 Immunohematology

Final Exam

Answer questions 1 - 40 on a GREEN Scantron. All questions are valued at 2 points each unless otherwise designated. Good luck.

1. Which of the following antibodies are "naturally occurring"?

1. A
2. anti-D
3. B
4. anti-A,B

- a. 1 and 3
- b. 2 and 4
- c. 1, 3 and 4
- d. 4 only
- e. all of the above

2. What are the percentage distributions of the ABO groups?

- a. O - 45%, A - 40%, B - 11%, AB - 4%
- b. O - 40%, A - 45%, B - 4%, AB - 11%
- c. O - 45%, A - 11%, B - 40%, AB - 4%
- d. O - 40%, A - 45%, B - 11%, AB - 4%

3. Which terminal sugar is the determinant for the A antigen?

- a. N-acetyl-D-galactosamine
- b. D-galactose
- c. N-acetyl-D-glucosamine
- d. L-fucose

4. The crossmatch procedure tests

- a. donor cells against patient serum.
- b. donor cells against donor serum.
- c. patient cells against donor serum.
- d. patient cells against patient serum.

5. Patient I.M.Rich is badly injured in a golfing accident. He must receive blood immediately upon arrival to your hospital. The trauma team is unable to provide a crossmatch sample at the time the blood is requested. Which of the following products would you release to Mr. Rich?
- a. O positive whole blood
 - b. AB positive whole blood
 - c. O negative packed cells
 - d. AB negative packed cells
 - e. O positive packed cells
6. Which of the following could be considered a delayed transfusion reaction?
- 1. CMV infection
 - 2. graft vs. host disease
 - 3. viral hepatitis
 - 4. hemolytic transfusion reaction
- a. 1 and 3
 - b. 2 and 4
 - c. 1, 2 and 3
 - d. all of the above
 - e. 4 only
7. Interpret the following DAT:

AHG (poly)	3+
anti-IgG	0
anti-C3	3+

The positive DAT is a result of _____ coating the RBCs.

- a. IgG
- b. complement
- c. IgM
- d. autoantibody

8. Select the genotype(s) representing a heterozygous condition.
1. Fy (a+b-)
 2. M+N+
 3. R1r (for e antigen)
 4. R1r (for c antigen)
- a. 1 and 2
 - b. 1 and 3
 - c. 2 and 4
 - d. 3 and 4
 - e. 4 only
9. What percentage of the general population is Rh negative?
- a. 15
 - b. 85
 - c. 10
 - d. 4
 - e. 11
10. A burn patient requires FFP transfusion for volume replacement. The units you thaw will outdate in ____ hours.
- a. 2
 - b. 4
 - c. 6
 - d. 12
 - e. 24
- 11.-12. A unit of FFP (in the frozen state) must be stored at (11)_____ and has an expiration of (12) _____.
11. a. -18C
 - b. 4C
 - c. -4C
 - d. 18C
12. a. 8 weeks
 - b. 72 hours
 - c. 42 days
 - d. 1 years
 - e. 5 years

13.-14. A prospective blood donor is a professional jockey weighing in at 95 lbs. Because he is a little (no pun intended) nervous, his pulse is 98 beats per minute and his blood pressure is 175/100 mm Hg. The remainder of his physical and medical history is fine.

13. From this information, you would _____ him as a blood donor.

- a. accept
- b. defer
- c. reject

14. You would take this action based on _____.

- a. weight
- b. pulse
- c. blood pressure
- d. occupation
- e. height

15.-17. Mama Bear has a positive antibody screen. You identify an anti-C. Baby Bear appears jaundiced and has a positive DAT (2+). Mama Bear is O⁺ (R₂R₂) and Papa Bear is O⁺ (R₁r).

15. What are the possible genotypes for Baby Bear?

- 1. CDe/CDe
- 2. CDe/cDE
- 3. CDe/cde
- 4. cDE/cde
- 5. cDE/cDE

- a. 1, 3 and 5
- b. 1 and 3
- c. 2 and 4
- d. 2, 4 and 5
- e. all of the above

16. What is Baby Bear's most likely genotype?

- a. R₂r
- b. R₁r
- c. R₁R₁
- d. R₁R₂
- e. rr

17. For transfusion, what type of blood should Baby Bear receive?
- a. O+ R2r
 - b. O+ R1r
 - c. O+ R1R1
 - d. O- rr
 - e. O- R2R2
18. The most important check in the investigation of a possible transfusion reaction is _____ .
- a. clerical
 - b. serological
 - c. academic
 - d. medical
19. Which mom is a candidate for Rh immune globulin?
- a. O neg, Ab screen - pos (anti-D), baby - O neg
 - b. O pos, Ab screen - neg, baby - O pos
 - c. O neg, Ab screen - neg, baby - O neg
 - d. O neg, Ab screen - neg, baby - O pos
20. Du testing includes
- 1. testing the patient cells with anti-D
 - 2. incubating at 37c for 15 minutes
 - 3. performing the AHG phase
 - 4. running the Rh control
- a. 1 and 3
 - b. 2 and 4
 - c. 2 and 3
 - d. 1, 2 and 3
 - e. all of the above

30. - 35. Match the appropriate immunoglobulin to the characteristics.

- | | | |
|-----------|---|----------------|
| 30. _____ | smallest immunoglobulin | a. IgG |
| 31. _____ | optimal reactivity room temperature or colder | b. IgM |
| 32. _____ | unable to cross the placenta | c. IgG and IgM |
| 33. _____ | may bind complement | |
| 34. _____ | optimal reactivity AHG phase | |
| 35. _____ | can cause HDN | |

36.-40. Match the definition to the correct term.

- | | | |
|-----------|----------------------------|---|
| 36. _____ | direct antiglobulin test | a. condition of being made sensitive to a specific substance after the initial exposure |
| 37. _____ | anamnestic response | b. serological test used to detect sensitization of RBCs in vivo |
| 38. _____ | indirect antiglobulin test | |
| 39. _____ | sensitization | c. the effect of an antibody reacting stronger with cells homozygous for the corresponding antigen than with heterozygous cells |
| 40. _____ | dosage | d. serological tests used to detect the sensitization of RBCs in vitro |
| | | e. secondary response to an immunogenic substance after serum antibodies can no longer be detected |

41. - 45. For the given results, interpret the ABO and Rh.
(10pts ea.)

	anti A	anti B	anti A1	RA1	RA2	RB	anti D	Dx	Du	Dux	int.
41.	4+	4+		0	0	0	3+	0			_____
42.	0	4+		4+		0	0	0	0	0	_____
43.	0	0	0	4+		4+	0	0	+	+	_____
44.	4+	0	0	4+	0	4+	3+	0			_____

CASE STUDY questions are valued at 5 points each.

Pt. name Abe Lincoln I.D.# 296498
 date 5/2/90 tech XY

			cells							int
anti-A	anti-B	anti-A, B	A1	A2	B	anti-D	Dx	Du	Dux	
0	4+	0	4+		0	3+	1+			B _{pos}

Antibody screen

Lot # 123/4

	37C	AHG
I	0	0
II	0	0
AC	0	2+

Interpretation negative

Crossmatch

Donor #	IS	37C	AHG	int
<u>296677</u>	<u>+</u>	<u>0</u>	<u>0</u> ✓	<u>Compatible</u>
<u>374296</u>	<u>0</u>	<u>0</u>	<u>0</u> ✓	<u>Compatible</u>

Identify any errors present.

SHARDED COLLARLESS BELMOTTE
AFTERMANS WENCH MAY BE
DECEIVED, DECEIVED OR
ALTERED AS A RESULT OF
HISTORICAL TREATMENT.

Duct I & II and Ficin-Duct I & II

**REAGENT RED BLOOD CELLS
FOR ANTIBODY DETECTION**

NAME: Harry Kissinger I.D. #
GROUP A DATE 9-3 TEST DATES 1-19-60

Note: The status of combining cell diagrams for any article may have been determined with a single example of the species.

[illegible]

1. Interpret the antibody screen.
2. State the information displayed by the reactions.
3. List the possible antibodies present.

Case

Mama Bear has a positive antibody screen. The results of her antibody identification are on antigram "Mama Bear". Baby Bear appears jaundiced and has a positive DAT. Mama Bear is O Rh negative; Baby Bear is A Rh positive.

Questions

1. What antibody(ies) is(are) indicated by the panel?
2. What can be anticipated about one of Baby Bear's haplotypes?
3. If transfusion becomes necessary, what requirements must be met?
4. Evaluate Mama's candidacy for Rh immune globulin.

APPENDIX G
STUDENT SATISFACTION SURVEY

Student Satisfaction Survey

The following statements pertain to YOUR individual study practices and the usage of case studies provided to you in this class. Please respond to each statement with 1 indicating that you strongly agree and 5 indicating that you strongly disagree.

	agree					disagree				
1. I study an average of _____ hours per night for immunohematology. (circle number)	1	2	3	4	5					
2. I study best by reading the text.	1	2	3	4	5					
3. I find reviewing the lecture material sufficient for examination preparation.	1	2	3	4	5					
4. I use independent study aids.	1	2	3	4	5					
5. I have used case studies in other courses.	1	2	3	4	5					
6. I can apply lecture materials without case studies.	1	2	3	4	5					
7. Case studies help give the lecture material a practical perspective.	1	2	3	4	5					
8. Through case studies, I can apply the required material.	1	2	3	4	5					
9. Case studies are a waste of my time.	1	2	3	4	5					
10. I feel that I have increased recall by using the case studies to apply knowlege.	1	2	3	4	5					
11. I spent an average of _____ hours studying with the case studies. (circle one)	1	2	3	4	5					
12. I feel that I comprehend more when I can apply the knowlege.	1	2	3	4	5					
13. I feel that I better retain applied knowlege.	1	2	3	4	5					

Any comments pertaining to case studies? _____