

MATERIALS LICENSE

Amendment No. 06

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

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Licensee

1. Alfred I. DuPont Institute of
the Nemours Foundation2. P. O. Box 269
Wilmington, Delaware 19899In accordance with application dated
March 3, 1997,3. License Number 07-16199-01 is amended in
its entirety to read as follows:

4. Expiration Date January 31, 2003

5. Docket or
Reference No. 030-105686. Byproduct, Source, and/or
Special Nuclear Material7. Chemical and/or Physical
Form8. Maximum Amount that Licensee
May Possess at Any One Time
Under This License

A. Hydrogen 3
B. Carbon 14
C. Sodium 24
D. Phosphorous 32
E. Sulfur 35
F. Potassium 42
G. Calcium 45
H. Chromium 51
I. Iron 59
J. Rubidium 86
K. Molybdenum 99
L. Technetium 99m
M. Iodine 125
N. Iodine 131

A. Any
B. Any
C. Any
D. Any
E. Any
F. Any
G. Any
H. Any
I. Any
J. Any
K. Any
L. Any
M. Any
N. Any

A. 500 millicuries
B. 500 millicuries
C. 100 millicuries
D. 500 millicuries
E. 250 millicuries
F. 100 millicuries
G. 100 millicuries
H. 50 millicuries
I. 20 millicuries
J. 500 millicuries
K. 2 curies
L. 2 curies
M. 100 millicuries
N. 100 millicuries

9. Authorized use

A. through N. For use in research and development as defined in Section 30.4 of 10 CFR Part 30 including in vitro and in vivo studies in animals.

CONDITIONS

10. Licensed material may be used only at the licensee's facilities located at Rockland Road, Wilmington, Delaware.

11. A. Licensed material shall be used by, or under the supervision of, individuals designated by the Radiation Safety Committee, H. Theodore Harcke, M.D., Chairman.

B. The Radiation Safety Officer for this license is Elias Schwartz, M.D.



MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number

07-16199-01

Docket or Reference Number

030-10568

Amendment No. 06

12. Licensed material shall not be used in or on human beings.
13. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
14. Experimental animals, or the products from experimental animals, that have been administered licensed materials shall not be used for human consumption.
15. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash, provided:
- A. Waste to be disposed of in this manner shall be held for decay a minimum of ten half-lives.
 - B. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.
 - C. A record of each such disposal permitted under this License Condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.
16. The licensee may transport licensed material in accordance with the provisions of 10 CFR 71, "Packaging and Transportation of Radioactive Material."
17. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated September 27, 1990
 - B. Letter dated December 4, 1992
 - C. Letter dated December 18, 1992
 - D. Letter dated March 3, 1997
 - E. Letter dated April 14, 1997

For the U.S. Nuclear Regulatory Commission

ORIGINAL SIGNED BY:

By JAMES M. BONDICK

Nuclear Materials Safety Branch

Region I

King of Prussia, Pennsylvania 19406

APR 30 1997

Date _____

APR 30 1997

Charles R. Hartzell, Ph. D.
Director of Research
Alfred I. Du Pont Institute of
the Nemours Foundation
P. O. Box 269
Wilmington, DE 19899

Dear Dr. Hartzell:

This refers to your license amendment request. Enclosed with this letter is the amended license. Please note that as part of this amendment, in accordance with 10 CFR 30.36, effective February 15, 1996, the expiration date of your license has been extended by a period of five years. Your new expiration date is stated in Item 4 of the license.

In accordance with current NRC policy, your license has been reformatted to conform to licenses of this type. The changes to the license are: Item 6. in the license was reorganized by increasing mass number; Condition 13., as it appeared in Amendment No. 05 was deleted; Condition 14, as it appeared in Amendment No. 05 was separated into two conditions; and the sequence of conditions was standardized.

Please review the enclosed document carefully and be sure that you understand and fully implement all the conditions incorporated into the amended license. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I Office, Licensing Assistance Team, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Thank you for your cooperation.

Sincerely,

ORIGINAL SIGNED BY:
JAMES M. BONDICK

James M. Bondick
Health Physicist
Division of Nuclear Materials Safety

License No. 07-16199-01
Docket No. 030-10568
Control No. 124373

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C. Hartzell, Ph. D., RSO
Alfred I. Du Pont Institute of
the Nemours Foundation

-2-

Enclosure:
Amendment No. 06

DOCUMENT NAME: R:\WPS\MLTR\L0716199.01

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NAME	JBondick/jmb <i>JB</i>						
DATE	04/23/97	04/ /97	04/ /97	04/ /97	04/ /97	04/ /97	04/ /97

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April 14, 1997

License Number: 07-16199-01
Docket Number: 030-10568
Mail control Number: 124373

Mr. James M. Bondick
USNRC Region I
Licensing Section
475 Allendale Road
King of Prussia, PA 19406

Dear Mr. Bondick:

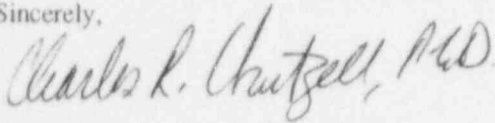
In reference to your letter dated April 4, 1997 concerning the application to amend our license, we are providing you with the following information:

1. Thank you for your comments on use of Cobalt-57.
2. In reply to your questions regarding P-32 and radioiodine use:
 - a. We will require the following surveys for P-32 usage conditions: 1) up to 200 microcuries will require daily monitoring with a survey meter and monthly wipe tests, 2) 200 to 500 microcuries will require daily monitoring with a survey meter and weekly wipe tests, 3) over 500 microcuries will require monitoring with a survey meter and wipe tests after each use.
 - b. We confirm that for experiments where more than 1 millicurie of radioiodine is used, we will provide special safety instructions which include a mandatory radiation survey and wipe test for radioactive contamination after each use.
 - c. We will use the following procedure for bioassay after radioiodine use: Any person handling and using in an experiment 1 millicurie of radioiodine (non-contained forms) shall notify the R.S.O. or Deputy R.S.O. at least 24 hours in advance of such usage and shall have a thyroid count performed within 72 hours after use. Records of thyroid counts will be maintained permanently in the office of the R.S.O. and placed once per year in employee's medical records.
3. The following is a single description of our survey program:

All areas where radionuclides are used will be monitored by wipe test with the following frequencies: Monthly when using less than 200 microcuries per experiment; weekly when using 200 to 500 microcuries per experiment; after each use when using more than 500 microcuries per experiment. In addition, the area, clothing and person will be monitored by survey meter after each use of a gamma-emitting radionuclide (such as I-125) or a beta-emitting nuclide exceeding 0.250 MeV (such as P-32). If radionuclides are not being used, surveys are not required. Contamination shall not be allowed to remain on working surfaces or floors unless properly shielded. Contamination is defined as beta or gamma activity greater than 200 dpm or alpha activity greater than 20 dpm as determined by wipe test on a surface of 100 cm².

Thank you for your review of our amendment application. If you need additional information to continue the review process, do not hesitate to contact Grace Hobson, Ph.D., Deputy RSO at (302)651-6829 or me at (302)651-6819.

Sincerely,

A handwritten signature in cursive script that reads "Charles R. Hartzell, Ph.D.".

Charles R. Hartzell, Ph.D., RSO
Director of Research
The Nemours Foundation

APR - 4 1997

License No. 07-16199-01
Docket No. 030-10568
Control No. 124373

Charles R. Hartzell, Ph.D., RSO
Director of Research
Alfred I. Du Pont Institute of
the Nemours Foundation
P. O. Box 269
Wilmington, DE 19899

Dear Dr. Hartzell:

This is in reference to your letter dated March 3, 1997 requesting an amendment to Nuclear Regulatory Commission License No. 07-16199-01. In order to continue our review, we need the following additional information:

1. Item 4. in your letter requests the addition of Cobalt-57 to your license. Cobalt-57 is produced in a cyclotron is not byproduct material as defined in 10 CFR 30.4 and is not subject to licensing by the NRC. Therefore, you may procure and use it without amendment to your NRC material license. However, you should contact your State regulatory authorities to determine the State licensing or registration requirements for use of this radionuclide.
2. The following questions are in regard to Item 5 in your letter which requests a change to Section XIII, number 5(p. 17) of your Radiation Safety Manual. Your proposed change in survey requirements appears to allow a significant decrease in radiological surveillance, if areas where up to 1 millicurie of I-125, or up to 1 millicurie of P-32 are only surveyed once each week.
 - a. The proposed survey requirement where P-32 is used conflicts with the requirements of Items 4. and Item 4.(e) in the letter dated December 4, 1992. Item 4. states: " For all persons using 500 microcuries or higher quantities of P-32 our procedures include the following," and Item 4.(e) states: "Mandatory radiation survey and wipe test procedures are required for designated laboratory areas and bench surfaces following each usage above these levels." Please specify what surveys (including surveys for removable contamination) you will require to be performed for the following P-32 usage conditions: 1) up to 500 microcuries, 2) 500 microcuries to 1 millicurie, and 3) over 1 millicurie.

- b. A review of your file indicates that experiments are conducted each day of the week in the Research Building, and iodinations are performed approximately once each month with 1 to 2 millicuries of iodine-125. Please confirm that for experiments where more than one millicurie of radioiodine is used, you will provide special safety instructions which include a mandatory radiation survey and wipe test for radioactive contamination after each use.
 - c. Item V., "Health Protection Rules for Radionuclide Laboratories," submitted with the letter dated September 26, 1990 states: "Any person handling and using in an experiment...10 millicuries of iodine-125 and/or iodine-131(non-contained forms) shall notify the R.S.O. at least 24 hours in advance of such usage and submit a urine sample for counting. Within 72 hour after handling and using in an experiment any of the above, the person shall again submit a urine sample to the R.S.O for counting." Confirm that these bioassay procedures will be required for individuals working with 1 to 2 millicuries of radioiodine.
3. Your proposed survey requirements do not provide clear guidance to authorized users considering the type and quantities of radionuclides authorized on your license. Using the criteria of less than 0.2 MeV, only Hydrogen-3, carbon-14, sulfur-35, and technetium-99m listed on your license are considered low-risk radionuclides. The other radionuclides listed on your license, especially iodine-125 and iodine-131, require special consideration for survey requirements. Table 1, Survey Frequencies, in Regulatory Guide 8.23 discusses survey frequencies that are acceptable to the NRC. This table specifies areas where daily surveys should be conducted, usage levels when monthly surveys should be conducted, states that all other laboratories should be surveyed weekly, and describes what constitutes a weekly and monthly survey. Consider the range of activity and types of radionuclides used in experiments and iodinations performed at your facility, please prepare and resubmit a single description of your survey program. Enclosed is a copy of Regulatory Guide 8.23, Revision 1, January 1, 1981. You may find Table 1 in this guide useful in the preparation of your response.

C. Hartzell, Ph.D.
Alfred I. Du Pont Institute of
the Nemours Foundation

-3-

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I Office and refer to Mail Control No. 124373. If you have any technical questions regarding this deficiency letter, please call me at (610) 337-6951.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

**ORIGINAL SIGNED BY:
JAMES M. BONDICK**

James M. Bondick
Health Physicist
Division of Nuclear Materials Safety

License No. 07-16199-01
Docket No. 030-10568
Control No. 124373

Enclosures:

1. 10 CFR Part 20
2. Regulatory Guide 8.23

DOCUMENT NAME: R:\WPS\DLTR\L0716199.01

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NAME	JBondick/jmb <i>JB</i>						
DATE	04/04/97	04/ /97	04/ /97	04/ /97	04/ /97		

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030-10568

March 3, 1997

License Number: 07-16199-01

USNRC Region I
Licensing Section
475 Allendale Road
King of Prussia, PA 19406

Dear Sir/Madam:

We hereby request the following amendment to our license:

1. Elias Schwartz, MD replace Charles R. Hartzell, Ph.D. as Radiation Safety Officer. A copy of Dr. Schwartz's CV is enclosed. Dr. Schwartz joined the Alfred I. duPont Institute in September 1996 as Director of Medical Research. He has 30 years of experience in the use of radioisotopes in laboratory and clinical investigations. During his fellowship at the Children's Hospital Medical Center and Harvard Medical School in Boston, he completed a full course in Radiation Principles organized by Harvard Medical School, including homework and a final examination, as preparation for obtaining an individual Atomic Energy Commission (AEC) license, which he held for many years. He has extensive experience using tritium, C-14, P-32, and S-35 in the laboratory and has used Fe-59 and Cr-51 for human studies. He has published more than 200 papers in the medical literature, of which many have involved the use of radioactivity in molecular biology and studies of protein synthesis. While at the University of Pennsylvania as a faculty member, he relinquished his individual AEC license when the University expressed a preference for investigators to operate under a blanket license at the institution. He has trained many research fellows, graduate students and postdoctoral trainees in the use of radioisotopes.
2. Authorization to hold radioactive material with a physical half-life of less than 120 days for decay-in-storage before disposal in ordinary trash.
3. Removal of the following condition from our license: The licensee shall not store licensed material contained in waste for more than two (2) years from the date the waste is put into storage or January 31, 1993, which ever is later.
4. Addition of Rubidium-86 (any chemical and/or physical form; 500 millicuries maximum amount that licensee may possess at any one time) and Cobalt-57 (any chemical and/or physical form; 500 millicuries maximum amount that licensee may possess at any one time) to our authorized use list for use in research and development as defined in Section 30.4 of 10 CFR Part 30 including *in vitro* and *in vivo* studies in animals.
5. Change of Section XIII, number 5 (p. 17) of our Radiation Safety Manual to: Every laboratory using radionuclides must survey the area once each week to check for contamination. The location of the survey areas and counting results (plus control values) must be logged into an Area Monitoring Log maintained by the supervisor of each radionuclide laboratory. The Area Monitoring Log must contain a diagram of the laboratory with the monitored area numbers, the net counts per minute at each location, the background, date, the radionuclides used in the area since the previous survey, and the

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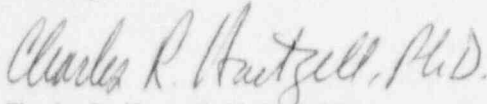
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name of the person who performs the test. In laboratories where less than 1 mCi of a gamma-emitting radionuclide or 1 mCi of a beta-emitter exceeding 0.250 MeV (such as Phosphorous-32) are used during a week, the weekly survey may be made by survey meter. All other radionuclide use requires a weekly wipe survey. In addition, a representative of the R.S.O. will check records and spot check by means of unscheduled wipe tests at least once every three months. If nuclides are not being used, the survey is not required.

Please find enclosed a check in the amount of \$610 to cover the amendment. If any further information is required, please do not hesitate to contact Grace Hobson, Ph.D., Deputy RSO at (302)651-6829 or me at (302)651-6819.

Sincerely,



Charles R. Hartzell, Ph.D., RSO
Director of Research
The Nemours Foundation

encl. (2)

Curriculum Vitae

ELIAS SCHWARTZ

Home Address:

Date of Birth:

Place of Birth:

Marital Status:

Social Security:

Education:

1952-1956 A.B. Columbia College (summa cum laude)

1956-1960 M.D. Columbia University College of Physicians and Surgeons

Postgraduate Training and Fellowship Appointments:

1960-1961 Internship, Montefiore Hospital, New York

1961-1963 Pediatric Residency, St. Christopher's Hospital for Children, Philadelphia, PA

1965-1967 Hematology Fellowship, Children's Hospital Medical Center, Boston, Mass.

Military Service:

1963-1965 Chief of Pediatrics, Offutt AFB, Nebraska

Faculty Appointments:

1963-1965 Instructor in Pediatrics, University of Nebraska School of Medicine, Omaha, Nebraska

1967-1968 Assistant Professor of Pediatrics, Jefferson Medical College, Philadelphia, Pennsylvania

1968-1972 Associate Professor of Pediatrics, Jefferson Medical College, Philadelphia, Pennsylvania

1971-1972 Assistant Professor of Medicine, Jefferson Medical College, Philadelphia, Pennsylvania

1972-1996 Professor of Pediatrics, University of Pennsylvania, Philadelphia, Pennsylvania (Werner and Gertrude Henle Professor of Pediatrics - 1994 to 1996)

1975-1976 Visiting Scientist, Institute for Cancer Research (Laboratory of Dr. Robert Perry), Philadelphia, Pa.

1978-1996 Member, Genetics Graduate Group, University of Pennsylvania

1979	Visiting Scientist, The Weizman Institute of Science (Laboratory of Dr. Uri Littauer), Rehovot, Israel
1979-1996	Professor of Pediatrics in Human Genetics, University of Pennsylvania, Philadelphia, Pennsylvania
1987	Visiting Professor, Department of Hematology (Dr. Eliezer Rachmilevitz, Director), Hebrew University-Hadassah Medical Center, Jerusalem, Israel
1987	Research Exchange Professor, The Weizmann Institute of Science (Laboratory of Dr. Uri Littauer), Rehovot, Israel
1990-1996	Chair, Department of Pediatrics, University of Pennsylvania, Philadelphia, Pennsylvania
1996	Werner and Gertrude Henle Professor Emeritus of Pediatrics, University of Pennsylvania, Philadelphia, Pennsylvania
1996-	Faculty position pending in the Department of Pediatrics, Jefferson Medical College, Thomas Jefferson University, Philadelphia, Pennsylvania

Hospital and Administrative Appointments:

1967-1972	Director, Division of Pediatric Hematology-Oncology, Jefferson Medical College, Philadelphia, Pennsylvania
1967-1968	Assistant Member, Cardeza Foundation for Hematologic Research, Philadelphia, Pennsylvania
1968-1972	Associate Member, Cardeza Foundation for Hematologic Research, Philadelphia, Pennsylvania
1972-1990	Director, Division of Hematology, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
1972-1996	Senior Physician and Hematologist, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
1972-1996	Consultant Hematologist, Children's Seashore House, Philadelphia, PA
1990-1996	Physician-in-Chief, and Werner and Gertrude Henle Chair, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
1990-1996	Member, Board of Trustees, The Children's Hospital Foundation and The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
1990-1996	Member, Board of Directors, Philadelphia Child Guidance Center, Philadelphia, Pennsylvania

Specialty Certification:

National Board of Medical Examiners
 American Board of Pediatrics
 American Board of Pediatric Hematology-Oncology

Licensure:

Pennsylvania, New York

Awards, Honors and Membership in Honorary Societies:

Phi Beta Kappa

Alpha Omega Alpha

M.A. (honorary) - University of Pennsylvania, 1972

Invited speaker and visiting professor - National and international conferences, medical schools, research institutes, medical societies and hospitals.

Memberships in Professional and Scientific Societies (past and present):

American Federation for Clinical Research

American Medical Informatics Association

American Pediatric Society

American Society for Clinical Investigation

American Society of Hematology

Scientific Subcommittee on Pediatric Hematology (1985-87)

Scientific Subcommittee on Hemoglobin/Red Cells (1988-1992)

American Society of Pediatric Hematology/Oncology (Vice President, 1988-89;
President, 1989-91)

Association of American Physicians

Association of Medical School Pediatric Department Chairmen, Inc.

Board of Directors and Medical Advisory Board, Cooley's Anemia Foundation (1977-)

Chairman, Governor's Committee on Sickle Cell Disease (Pa.) (1974-77)

Chairman, Pennsylvania Medical Committee on Sickle Cell Disease (1988-90)

Eastern Society for Pediatric Research

International Association of Jazz Educators

Pennsylvania Medical Society

Philadelphia County Medical Society

Philadelphia Health Care Congress

Philadelphia Hematology Society (Past President)

Philadelphia Pediatric Society

Society for Pediatric Research

Review Groups and Editorial Boards:

National Institutes of Health Reviewers Reserve (NRR) (1991-)

National Institutes of Health Hematology Study Section 1 (1987-91)

National Institutes of Health Policy Board for Penicillin Trials in Sickle Cell Disease
(1987-95)

NHLBI Research Review Committee B (1981-1984)

Chairman, National Heart, Lung and Blood Institute Research Review Committee for
Atherosclerosis, Hematology and Hypertension (1984-85)

National Institutes of Health site visits, special study sections for research and training
grants

Cooley's Anemia Foundation

Apotex Research Inc., Safety Committee on L1 in Thalassemia (Chairman, 1995-)

Editorial: Blood (past)

American Journal of Pediatric Hematology/Oncology (past)

Reviewer for many other journals

Academic Committees (University of Pennsylvania – past 6 years)

1987-1991	Chairman, Curriculum Committee, University of Pennsylvania School of Medicine
1990-1996	Standing Committee, University of Pennsylvania School of Medicine
1990-1996	Steering Committee of the Standing Committee, University of Pennsylvania School of Medicine
1990-1996	Academic Review Committee, University of Pennsylvania School of Medicine
1992-1996	Policy and Research Advisory Board, Institute for Environmental Medicine, University of Pennsylvania School of Medicine
1995-1996	Committee on Faculty Research Incentives

Major Teaching and Clinical Responsibilities (University of Pennsylvania – mainly recent):

Extensive teaching experience of medical students through lectures, conferences and rounds: 1967-1972 Jefferson Medical College; 1972-1996 University of Pennsylvania School of Medicine. Yearly invited lecture to students at the University of Pennsylvania School of Veterinary Medicine; lectures to students in several medical schools in U.S.A. and abroad.

Pediatric Senior Rounds - weekly - 1990 to 1996

Chief's Rounds - weekly - 1996

Supervision of graduate students and post-doctoral students (recent only):

Name	Year Degree Obtained	Degree	Current Position
P. Trifillis	1994	Ph.D.	Postdoctoral Fellow, Thalassemia Institute, Cyprus
M. Keller	1994	Ph.D.	Core Lab Director, duPont Hospital for Children
Z. Cui	(1994-1996)		Postdoctoral Fellow, Dept. of Pediatrics, Univ. of PA

Extensive clinical practice experience in pediatric hematology since 1967.

Academic administrative experience includes being Division Chief of Pediatric Hematology-Oncology at Jefferson Medical College (1967-1972), Division Chief of Hematology in the Department of Pediatrics of the University of Pennsylvania School of Medicine (1972-1990), and Chairman of Pediatrics at the latter institution (1990-1996). In the position of chairman I was responsible for 16 divisions with more than 170 full-time faculty members, hired more than 70 new faculty members, and controlled a yearly budget of 70 million dollars (FY96), which had a financial surplus for each of the six years of my chairmanship.

BIBLIOGRAPHY:

Published Peer-Reviewed Articles

1. Schwartz, E. and MacElfresh, A.E.: Treatment of painful crises of sickle cell disease. *J. Pediatr.* 64:132, 1964.
2. Schwartz, E.: Thrombocytopenia purpura following rubella. *Bulletin of the Children's Memorial Hospital, Omaha*, Dec. 1965, p. 2-6.
3. Schwartz, E., Baehner, R.L. and Diamond, L.K.: Aplastic anemia following hepatitis. *Pediatrics* 37:681, 1966.
4. Schwartz, E. and Gerald, P.S.: Mouse hemoglobin: composition of multiple electrophoretic bands. *Experientia* 23:763, 1967.
5. Schwartz, E. and Nathan, D.G.: New methods of counting ^{14}C labelled hemoglobin and hemin. *J. Lab. Clin. Med.* 70:841, 1967.
6. Schwartz, E., Smith, D. and Nathan, D.G.: Loci of human hemoglobins. *Lancet* 2:1422, 1967.
7. Schwartz, E. and Baehner, R.L.: Diurnal variation of serum iron in infants and children. *Pediatr. Clin. N. Amer.* 15:473, 1968.
8. Kan, Y.W., Schwartz, E., and Nathan, D.G.: Globin chain synthesis in the alpha thalassemia syndromes. *J. Clin. Invest.* 47:2512, 1968.
9. Schwartz, E., Kan, Y.W., and Nathan, D.G.: Unbalanced globin chain synthesis in alpha thalassemia heterozygotes. *Ann. N. Y. Acad. Sci.* 165:288, 1969.
10. Schwartz, E.: The silent carrier of beta thalassemia. *N. Engl. J. Med.* 281:1327, 1969.
11. Schwartz, E.: Heterozygous beta thalassemia: balanced globin synthesis in bone marrow cells. *Science* 167:1513, 1970.
12. Lubin, B.H., Baehner, R.L., Schwartz, E., Shotet, S.B., and Nathan, D.G.: The red cell peroxide hemolysis test in the differential diagnosis of obstructive jaundice in the newborn period. *J. Pediatr.* 48:562, 1971.
13. Hamilton, R.W., Schwartz, E., Atwater, J., and Erslev, A.J.: Acquired hemoglobin H disease. *N. Engl. J. Med.* 285:1217, 1971.
14. Bulova, S.I., Schwartz, E., and Harrer, W.V.: Hydrops fetalis and congenital syphilis. *Pediatrics* 49:285, 1972.
15. Schwartz, E., and Atwater, J.: Alpha thalassemia in the American Negro. *J. Clin. Invest.* 51:412, 1972.
16. Friedman, Sh., Oski, F.A., and Schwartz, E.: Bone marrow and peripheral blood globin synthesis in an American Negro family with beta thalassemia. *Blood* 39:785, 1972.
17. Gill, F.M., and Schwartz, E.: Hemoglobin Lepore trait: bone marrow and peripheral blood globin synthesis. *Science* 178:623, 1972.
18. Gill, F.M., and Schwartz, E.: Synthesis of globin chains in sickle β -thalassemia. *J. Clin. Invest.* 52:709, 1973.
19. Friedman, Sh., and Schwartz, E.: Beta thalassemia in the American Negro. *J. Clin. Invest.* 52:1453, 1973.

20. Asakura, T., Agarwal, D.A., Relman, A., McCray, J.A., Chance, B., Schwartz, E., Friedman, Sh., and Lubin, B.: Mechanical instability of the oxy-form of sickle hemoglobin. *Nature* 244:437, 1973.
21. Habib, M.A., Watson, V., and Schwartz, E.: The effect of sodium cyanate on globin synthesis. *Blood* 41:635, 1973.
22. Gill, F.M., and Schwartz, E.: Free alpha globin pool in human bone marrow. *J. Clin. Invest.* 52:3057, 1973.
23. Schwartz, E. and Gill, F.M.: Regulation of hemoglobin synthesis in beta thalassemia. *Ann. N. Y. Acad. Sci.* 232:33, 1974.
24. Asakura, T., Ohnishi, T., Chance, B., Friedman, Sh., and Schwartz, E.: Abnormal precipitation of oxyhemoglobin S by mechanical shaking. *Proc. Natl. Acad. Sci. USA* 71:1594, 1974.
25. Asakura, T., Adachi, K., Sono, M., Friedman, Sh., and Schwartz, E.: Mechanical stability of hemoglobin subunits: An abnormality in β^S -subunits of sickle hemoglobin. *Biochem. Biophys. Res. Comm.* 57:780, 1974.
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Research Grants (Principal Investigator):

Heme & Globin Synthesis in Infants and Children; National Institutes of Health; DK 16691-23; 7/1/72-6/30/97; \$161,108 current year.

Principal investigator of NIH Sickle Cell Center, Pediatric Hematology Training Grant, Child Health Research Center, General Clinical Research Center – totalling more than ten million dollars of NIH support in the past ten years. These grants were transferred to different principal investigators either on my becoming chairman (1990) or on leaving the institution (1996).

Lectures and Addresses (past 3 years):

"The View from a Young Chair: What Questions do I Need Answered?", presented at Association of Medical School Pediatric Department Chairmen meeting, Tempe, AZ, 3/4/93.

"Family Life in the Megakaryocyte", Israel Pediatric Hematology Society, Netanya, Israel, 6/22/93.

"Thalassemia in Children-1993", Israel Pediatric Society, Jerusalem, Israel 6/23/93.

Presented three talks at Pediatric Conference in Cooperstown, NY; "A New Look at Iron Deficiency", 8/20/93; "Anemia of Chronic Disease", 8/21/93 and "Thalassemia in Children-1993" 8/22/93.

"Thalassemia-1993", Pediatric Grand Rounds, Maimonides Hospital, Brooklyn, NY 9/14/93.

"Thalassemia-1994" and "A New Look at Delta Thalassemia" presented as the Mahesh Memorial Lecture and Grand Rounds, respectively, Medical College of Georgia, Augusta, GA 3/22-25/94.

"Thalassemia-1994", Grand Rounds, Baystate Medical Center, Springfield, MA, 5/12/94.

"Hydroxyurea Therapy in Thalassemia Intermedia", European School of Haematology, Paris, France, 9/29/94.

Presented three talks at the American Austrian Foundation, Salzburg, Austria; "Iron Deficiency in Children", 5/16/95; "Approach to the Anemias of Infancy and Childhood", 5/17/95 and "Children Who Bruise, Bleed or Clot Excessively", 5/18/95.

"Thalassemia-1995", Grand Rounds, Christiana Hospital, Wilmington, DE, 5/25/95.

Presented two talks at Association of Medical School Pediatric Department Chairmen, annual meeting, "Developing Departmental and Divisional Budgets, 3/8/96, and "Managing People and Programs", 3/10/96.

"If gold ruste, what shal iren doo?", Waldo Nelson Lecture, Philadelphia Pediatric Society and the St. Christopher's Hospital for Children, Philadelphia, PA, 5/29/96.

"Hippocrates At the Millennium", Keynote Speaker: Department of Pediatrics Twenty-sixth Annual Commencement Exercises, Schneider Children's Hospital, Long Island Jewish Medical Center, New York, 6/14/96.

"New Developments in Iron Deficiency and Iron Overload", Carpenter Noone Lecture, Bryn Mawr Hospital, Bryn Mawr, PA, 11/5/96.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

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INFORMATION FROM LTS

PROGRAM CODE: 03620
STATUS CODE: 0
FEE CATEGORY: 3M
EXP. DATE: 20030131
FEE COMMENTS: -----
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LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED

APPLICANT/LICENSEE: ALFRED I. DU PONT INSTITUTE
RECEIVED DATE: 970312
DOCKET NO: 3010568
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ACTION TYPE: AMENDMENT

2. FEE ATTACHED

AMOUNT: \$610.00
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3. COMMENTS

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M. A. Perkins
3/13/97

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Renewal	
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Amount	<u>8610</u>
Fee Category	<u>3M</u>
Type of Fee	<u>AMP</u>
Date Check Rec'd	<u>4/2/97</u>
Date Completed	<u>4/2/97</u>
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