


A Reexamination of
William J. Darby's Radio Iron Tracer Studies

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On the basis of this thesis defended by the candidate on
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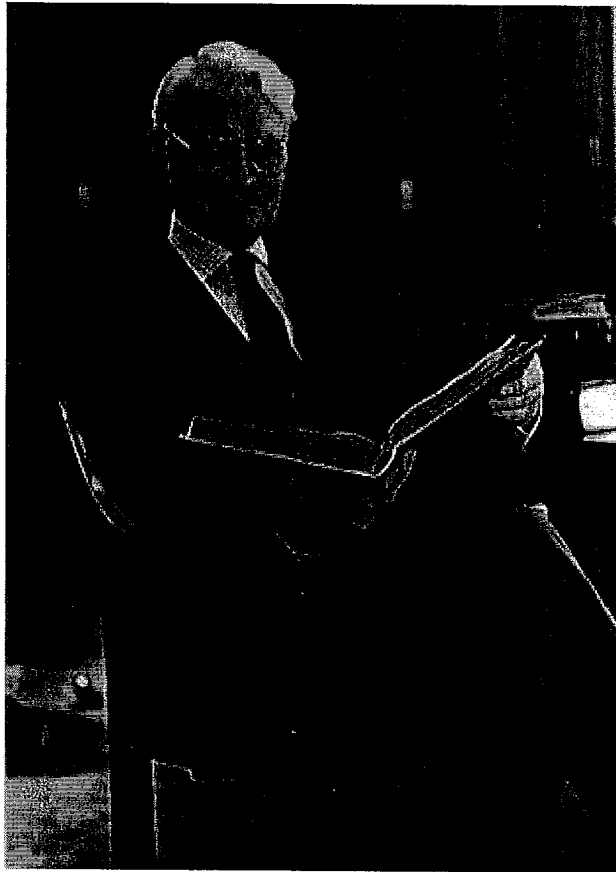
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Historical Collection, Eskind Biomedical Library, Vanderbilt University.

William J. Darby



Abstract

Experiments on humans are necessary. Experimentation is the underlying technique researchers can utilize to separate products that work from those that do not, and those that cause harm from those that benefit society. However, tests on humans are, by definition, fraught with danger. Researchers are forced to navigate between acting with excessive caution and operating with abandon. Ever since scientists began using clinical trials, they have struggled to maintain this balance. Historically, there have been glaring human rights violations (the product of excessive leniency) that inspired attempts to produce firm international guidelines. This study will scrutinize a lesser-known case of human experimentation to evaluate how medical researchers in the United States continued to justify their actions in the decades following World War II, specifically focusing on the following questions: How did researchers rationalize using non-consenting subjects? Did medical researchers use distinctive justifications for testing on different populations? How did the researchers present their morally questionable studies to the public? Are there discrepancies between the researchers' public and private rationalizations?

To answer the abovementioned questions, this paper will analyze the following two radiation studies that took place at Vanderbilt University: "The Vanderbilt Cooperative Study of Maternal and Infant Nutrition" (Darby, 1953) and the "Radioactive Iron Study on School Aged Children." These studies relate to one another in that each used a vulnerable population in morally ambiguous fashion. Following a detailed breakdown of these studies, this paper will draw upon and analyze personal correspondence, additional studies conducted by the various researchers, interviews, photographs, and news articles.

During the late 1940s, medical researchers at Vanderbilt University conducted what are now thought of as morally reprehensible tests on vulnerable populations. People were seen as a means to an end; inhumane studies were justified because they had the potential to save other, perhaps more "visible" lives.



“Segregation was strictly enforced, and the clinic treated white women only. But these were not women from Nashville’s well-to-do neighborhoods. Many were poor and their fees were based on what they could pay. Shy and eager to please, they felt lucky to have Vanderbilt doctors taking care of them and followed their orders without question.”¹ With this introduction, Pulitzer Prize winning journalist, Eileen Welsome, of the *Albuquerque Tribune* began her chapter on Vanderbilt University’s radiation studies of the 1940s. Welsome proceeded to describe some of the inflicted patients: Helen had hair loss, “water blisters” on her face, “two miscarriages”, and “pernicious anemia”, while Barbara experienced “exhaustion”, “and immunize system disorder and skin cancer.”² Welsome’s colorful and detailed expose on American radiation experiments that occurred from 1945 through 1970 captured “the full costs - scientific, social, and personal - of the radiation experiments [and] the moment when an important group of physician-scientists ceased to view themselves as healers and benefactors first, with disastrous results for their victims.” Though Welsome is not the only journalist who has documented American radiation studies, she is notable because her research, for the first time in American history, revealed the names of people injected with plutonium and “put a human face to what had previously been anonymous data published in official reports and technical journals”, ultimately leading to public outcry and demand for information.³

In 1994, President Clinton created the Advisory Committee on Human Radiation Experiments in response to the public outcry. The purpose of the Committee was to “tell the full

¹ Eileen Welsome, *The Plutonium Files: America’s Medical Experiments in the Cold War*, (New York: Random House, Inc, 1999), p. 219.

² Welsome, p. 220.

³ Harriet A. Washington, “The Plutonium Files,” *New England Journal of Medicine* 341(1999): p. 1941-1942.

story [of human experimentation] to the American public.”⁴ The Committee’s Final Report, which contained telling information about studies that occurred from the 1940s through 1974, included a section on Vanderbilt University’s radiation studies and detailed a total of four key findings: 1.) Over the three decades in question, the federal government sponsored several thousand radiation experiments, most of which purported to advance medical knowledge, 2.) The majority of the studies utilized radioactive tracers “in amounts likely to be similar to those used in research today,” 3.) Though many national organizations, such as the Atomic Energy Commission (AEC), and the National Institutes of Health (NIH), recognized that ethical research required consent, the majority of organizations did not insist upon obtaining permission from a patient, unless the patient was healthy. Rather, “it was commonplace during the 1940s and 1950s for physicians to use patients as subjects of research without their awareness or consent,” and 4.) The government should, but did not, have policies in place to protect research subjects.⁵

Though the Report was written by the nation’s experts in bioethics, radiation oncology, nuclear medicine, public health, medicine law and epidemiology, and contained information obtained by the country’s foremost researchers, historians and journalists continue to write pieces painting researchers from the time period as diabolical. Journalists such as Welsome write that: “Many of the doctors... ignored the Hippocratic Oath, the 1946 American Medical Association guidelines, the Nuremberg Code, as well as policies adopted by the Atomic Energy Commission in 1947 and by the Defense Department in 1953.” Further, “although... the experiments were so-called tracer studies, which involved administering radioactive materials in

⁴ *Advisory Committee on Human Radiation Experiments Final Report*, Preface: Introduction, p. 1.
http://www.hss.energy.gov/healthsafety/OHRE/roadmap/achre/preface_1.html

⁵ *Advisory Committee on Human Radiation Experiments Final Report*, Human Radiation Experiments: Roadmap to the Project.
<http://www.hss.energy.gov/healthsafety/OHRE/roadmap/achre/summary.html>

quantities so small that they probably caused no harm, most scientists agree that no dose can absolutely be called safe.”⁶

These assumptions and contentions will be the focus of this thesis. Did the researchers knowingly and purposefully act in a manner that was specifically banned by federal regulations? Or rather, have journalists and historians judged the researchers for their actions using contemporary ideals? Many modern historians evaluate American scientists based on their adherence to the Nuremberg Code,⁷ likely due to the code’s prominent place in history, and clear contradiction with the scientists’ actions. However, given the lack of significance the medical community placed on the Code during the time period,⁸ the Nuremberg Code does not properly identify the ideology of the time. Instead of viewing these studies in light of Nuremberg, this thesis will venture to expose the Vanderbilt Medical Center’s studies in terms of the *de facto* standards of ethical practices in the United States.

Between 1945 and the early 1970’s, medical researchers in the United States conducted tests on vulnerable populations. People were seen as a means to an end; studies were justified because they had the potential to save other, perhaps more “visible” lives. While historians now look back at the studies with contempt, this thesis will show that the Vanderbilt doctors were in fact working within the bounds of the contemporary ethical practices. As one prominent physician stated in the 1990s: “It is with some sadness and also some annoyance, I must confess,

⁶ Welsome, p. 483.

⁷ See Jordan Goodman, *Useful Bodies: Humans in the Service of Medical Science in the Twentieth Century*, (Baltimore: Johns Hopkins University Press, 2003); Adil E. Shamoo, David B. Resnik, *Responsible Conduct of Research*, (Oxford University Press: New York, 2009); Ulf Schmidt, “The Nuremberg Doctors’ Trial and the Nuremberg Code,” *History and Theory of Human Experimentation*, (Germany: Franz Steiner Verlag Stuttgart, 2007), among many others.

⁸ Schmidt, p. 108.

that I am obliged to try to exonerate ourselves for something perceived by some as devilish acts where science was God and damn all other considerations.”⁹



Written in 1025 AD, Avicenna’s *The Canon of Medicine* contains the earliest known regulations for properly conducting clinical trials. In the text, Avicenna discusses how to best use human subjects to study health remedies and explores how to properly select drugs, create appropriate control groups, and maintain safety mechanisms.¹⁰ Since the text’s inception, scientists have been using the clinical trial method to study the efficacy of various medications and scientific practices. By testing on a small group of people in a controlled, safe environment, scientists are able to create and distribute valuable medicines to the public with full knowledge that the drugs have passed numerous required reliability thresholds. As with anything involving humans, however, there has been considerable variability in the level of import clinicians have placed on their research subjects’ wellbeing.¹¹ While the majority of clinicians have the overall intent of advancing scientific knowledge, in various cases, members of the medical community in the United States have ignored their subjects’ basic human rights in favor of publishing a medical study.

When looking at trials from the past century, it becomes clear that clinical trials were most dangerous for the subject in the midst of an ongoing war. During times of war, researchers have used prisoners as research subjects against their will. In some of these cases, clinicians knew that the prisoner would be killed at the end of the study, regardless of the study’s outcome.

⁹ Welsome, p. 458. From the ACHRE meeting in Knoxville.

¹⁰ Peter L. Lutz, *The Rise of Experimental Biology: An Illustrated History*, (Humana Press, 2002). p. 60.

¹¹ For further information see: Jordan Goodman’s discussion of the usefulness of the human body, Jordan Goodman, *Useful Bodies: Humans in the Service of Medical Science in the Twentieth Century*, (Baltimore: Johns Hopkins University Press, 2003); and “Porton Down- a sinister air?” BBC News UK Online Edition. August 20, 1999. http://news.bbc.co.uk/2/hi/uk_news/426154.stm.

With this in mind, they knowingly tested unsafe drugs simply to view the medications' efficacy in a controlled setting or to study how a particular disease progressed.¹² In both Nazi Germany and the Japanese Army's Unit 731, reputable, fully educated, and connected physicians took prisoners and used them as test animals.¹³ Scientists working in Unit 731 methodically administered overdoses of vaccines or injected strains of venereal diseases into their subjects, and then allowed symptoms to progress to a specified stage. At this point, the scientists would proceed to study the disease through vivisection, a surgical operation conducted on living humans.¹⁴ While living humans commonly undergo operations, these particular surgical procedures were different; the subjects were alive and *awake* during surgery because the doctors feared that anesthesia would hinder their ability to view the body in its natural state.¹⁵ Japan was not the only nation to run trials such as this one; Germany was also notorious for its inhumane activities during the war.

The German clinical trials were conducted for the expressed purpose of garnering medical knowledge and the scientists viewed their subjects as valueless outside of the study.¹⁶ The German trials are of great importance to this paper because they eventually led to increased regulation of and attention paid to clinical activity. Following World War II, an American legal team led by Doctor Leo Alexander began prosecuting Nazi doctors for war crimes. As part of its case, the team submitted ten rules to govern legitimate, humane medical research. These ten

¹² For further information on Japanese and German tests resulting in death see: Gerhard Baader, "Pathways to Human Experimentation, 1933-1945: Germany, Japan, and the United States," (Osiris 2nd ser. 20, 2005): 205-31; Hal Gold, "Unit 731 Testimony," (Boston: Tuttle Publishing, 1966); and Sheldon H. Harris, *Factories of Death*, (New York: Routledge, 1994).

¹³ Baader, p. 230. The Nazis specifically referred to their female Polish subjects as "Rabbits", while Unit 731 referred to its Chinese subjects as "logs"

¹⁴ Keiichi Tsuneishi, "Unit 731 and the Japanese Imperial Army's Biological Warfare Program," (Sekai senso hanzai jiten: November 28, 2005). Translated by John Junkerman.

¹⁵ Hal Gold, p. 24.

¹⁶ Baader, p. 231.

points became the Nuremberg Code, the foremost document on medical ethics from this time period.¹⁷ While the code is not legally binding in the United States or in Germany, it has served as the basis for numerous legal regulations concerning medical practices in both nations.¹⁸

Regardless of the rules instituted by Alexander and his legal team, clinical trials in the United States continued to use subjects in a dubious fashion. The prison malaria study, “Procedures used at Stateville Penitentiary for the testing of potential antimalarial agents” (Alving, 1948); the Willowbrook hepatitis studies, “Viral hepatitis: immunoglobulin response during the course of the disease” (Krugman, 1969); and the Jewish Chronic Disease Hospital studies conducted by Chester M. Southam in 1963, are just three examples of studies that used vulnerable populations in a morally ambiguous fashion.

The Prison Malaria Study, which took place in three U.S. penitentiaries and studied the progression of malaria symptoms on 800 deliberately infected inmates.¹⁹ The ethical dilemma presented by this study is two-fold; the participants were inmates, which calls into question whether or not they were capable of volunteering and the participants were paid a considerable amount of money.

The Willowbrook Hepatitis Study, which took place at Willowbrook School, the largest school in the nation for the mentally handicapped, during the 1950s.²⁰ The school was, until it was shut down in the 1980s, extremely overcrowded and filthy. Because of the conditions, many students developed hepatitis. Krugman took this information and decided that he would deliberately infect his students with various forms of hepatitis to track exposures and symptoms.

¹⁷ Ulf Schmidt, “The Nuremberg Doctors’ Trial and the Nuremberg Code,” *History and Theory of Human Experimentation*, (Germany: Franz Steiner Verlag Stuttgart, 2007), p. 71-116.

¹⁸ The Nuremberg Code helped shape the Declaration of Helsinki, and the Code of Federal Regulations Title 45, Vol. 46.

¹⁹ “Prison Malaria: Convicts Expose themselves to disease so doctors can study it,” *Life Magazine*, June 4, 1945.

²⁰ A Guide to Willowbrook State School Resources, compiled Feb 2004 at the College of Staten Island, <http://www.library.csi.cuny.edu/archives/WillowbrookRG.htm>

When the public became informed of Krugman's experiments, he relayed that he did not believe his actions were immoral given that the students would have likely developed hepatitis regardless of whether or not he had injected him with the infection. Krugman involved students based on their parents' approval. In a form letter dated November 15, 1958, Krugman writes to the parents that he is going to commence "studying the possibility of preventing epidemics of hepatitis...[this study] may give the children immunity against the disease for life."²¹ Krugman attained permission to conduct studies on children by hiding the true intentions of the study.

"Serum Levels of Second Component of Complement in Cancer Patients," seems to be, given the title of the study, a study that consisted of Southam injecting cancer patients with cancer. However, as one reads the actual study, it becomes clear that, in fact, Southam was injecting a strain of cancer into "cancer patients," "a few patients with diseases other than cancer," and "healthy persons."²² Again, it is important to distinguish that Southam was not malevolent, or practicing medicine differently than most other doctors. In fact, as is written on the front page of his study, he was "supported in parts by grants from the American Cancer Society and the National Cancer Institute."²³ However, he too neglects to inform his patients that he is using them as test subjects.

The two studies that this paper will discuss occurred in the decade and a half following WWII. After numerous stories, such as Public Health Services venereal disease investigator Peter Buxton's article on the now-infamous Tuskegee Syphilis Study, appeared in the news there was a massive public outcry, which ultimately led the Office for Human Research Protections to

²¹H. H. Berman's letter to the parents of Willowbrook State School, (11/15/1958) College of Staten Island Willowbrook Collection, Staten Island, NY.

²²Chester M. Southam, "Serum Levels of Second Component of Complement in Cancer Patients," *The Journal of Immunology*, Vol. 97, No. 3, p. 331.

²³Ibid.

institute and fund the Institutional Review Board, a committee that provides oversight for all experiments involving human subjects.²⁴

Before the implementation of the IRB, few people oversaw human research programs and for the most part, the system was considered to be entirely satisfactory. In the two studies covered in this paper, the scientists were working in a large, reputable institution, Vanderbilt Medical Center, with a full team of doctors. They were not working alone or attempting to cover up their actions; these men were not monsters and the research teams were not morose. Instead, the researchers on these cases were nationally recognized and respected clinicians. By looking at how the physicians justified their programs, we will be able to come to an understanding of the underlying ethics of the time. Numerous authors have researched human experimentation in the United States: There are articles that focus on a particular study, others that are anthologies of studies, and even more that are dedicated to the history and broad implications of clinical studies. This thesis endeavors to present human experimentation in another light: from the doctors' perspectives. It is only from this particular viewpoint that we can see their true mentality and begin to understand how and why they went about their actions in the ways that they did.

²⁴ Vanderbilt University's Human Research Protection Program website: <http://www.mc.vanderbilt.edu/irb/facts/>



Chapter I // Introducing the Controversy

In the 1940s, Vanderbilt University sponsored a series of nutrition studies with the expressed purpose of understanding public health and sustenance. These studies, which did not directly benefit the subjects, gave rise to numerous questions: When was it considered acceptable to use children, either before or after birth, to benefit other people? Did the research team use all possible safety precautions to ensure the safety of the subjects? What did the researchers know or should have been expected to know about the harms of radioactive materials? Who, in particular, was tested? How do these studies relate to other studies conducted during the same time period? Were the participants notified of their participation? Was consent, or notification in the very least, expected in the 1940s? Did Darby act in a way that was similar to his contemporaries?¹ The purpose of this thesis is to answer these questions, which have, to this point, remained unanswered. Further, this thesis will compare the aforementioned answers to conclusions established in recent legal history and in contemporary medical history literature.

I. Understanding Darby

William J. Darby is considered to be one of the leading nutrition researchers of the twentieth century; he was part of the team that discovered folic acid, the first researcher to identify zinc deficiency in humans, a primary consultant for the World Health Organization, a member of the National Academy of Sciences, Consultant on Nutrition for the U.S. Air Force,

¹¹ These questions were loosely adapted from a list of questions posed by the Advisory Committee. However, as they explain, "The Committee did not have the resources to pursue these questions in both research in which children were the subjects and research in which children were exposed as fetuses. We did establish that the Vanderbilt study was not the only experiment during this period to expose fetuses in research that offered no prospect of medical benefit to them or their mothers." This paper aims to answer the questions the Committee could not or did not answer.

ACHRE Final Report, Chapter Seven: Conclusion
http://www.hss.energy.gov/healthsafety/OHRE/roadmap/achre/chap7_6.html#fnvh

and a member of the advisory panel for the National Cancer Institute.² All in all, he served on more than sixty committees and panels, was a contributing member of fifteen honors societies. Darby was appointed assistant professor of nutrition at the Vanderbilt School of Medicine in 1944 and continued to serve on Vanderbilt's faculty until his death, filling roles such as Director of Nutrition, and professor emeritus of biochemistry. On 6 June 2001, Darby died in Nashville, Tennessee after a series of strokes. He is remembered by his contemporaries as being "among the first researchers to emphasize detailed physiologic studies that essentially revised the standards of assessing nutritional status."³ As Nevin S. Scrimshaw wrote in a memoir, Darby's "positive, critical, constructive, and multifaceted approach to nutrition issues worldwide combined with an enthusiastic and charismatic personality made him an inspiring leader"⁴ and led Darby to ultimately change the field of nutrition as a whole.



William J. Darby was born in Galloway, Arkansas on 6 November 1913. His mother, a schoolteacher, understood the value of education and stressed the importance of reading to ensure that he performed at a high level in grade school. In high school, his chemistry teacher, Ms. Ora Parks, recognized his promise as a scholar and encouraged him in his scientific endeavors. Ms. Parks believed that Darby had the intellectual drive and ability to enter and ultimately excel in the Medical School at the University of Arkansas, and fully expected him to follow that route. However, Darby's path to a life working in nutrition was not as clear as Ms. Parks would have wanted: Darby graduated high school as the United States was entering the

² "Students Given Radioactive Drink," *The Tennessean*, Jan 14, 1994; William Darby, "Annual Report Division of Nutrition 1 January 1967 – 31 December 1967," *Vanderbilt University Memo*, Nashville, TN.

³ Wayne Wood, "Nutrition researcher Darby dies," *Reporter, Vanderbilt University Medical Center's Weekly Newspaper*, June 6, 2001.

<http://www.mc.vanderbilt.edu/reporter/index.html?ID=1548>

⁴ Nevin S. Scrimshaw, "William J. Darby 1913-2001," *National Academy of Sciences*, (2009), p. 19.

Great Depression and did not have the finances to attend college. As the story goes, the fall after graduation, Ms. Parks happened upon Darby and expressed concern that Darby was not attending school. She told him, "I thought you were at the University of Arkansas entering Chemical Engineering!" When Darby told her he was searching for a job, Parks sent him to speak with Dr. Paul Day who eventually gave Darby a job working as a laboratory assistant.⁵ This chance encounter with Ms. Parks and Dr. Day's sympathy for a young boy eventually led to Darby's lifelong career in nutrition studies.

In the 1930s, Dr. Paul Day, PhD., was a leading expert in nutrition sciences. He was the head of the department of biochemistry and assistant dean of the Graduate School at the University of Arkansas School of Medicine. By 1958, he had become the scientific director of the U.S. Food and Drug Administration.⁶ After exhibiting his intellect and drive, Darby garnered more and more responsibility in Day's lab, becoming Day's irreplaceable assistant. Darby realized that he would remain an assistant so long as he was without a medical degree, which ultimately revitalized his interest in medical school. Darby entered a local college as a premedical student and continued to work as Day's "co-investigator." He graduated from the University of Arkansas with a Bachelor of Science in 1936 and a Medical Degree in 1937.⁷ In 1941, Darby completed his Master's in biological chemistry at the University of Michigan and was then awarded a Ph.D. in Biochemistry in 1942. By the time he obtained his final diploma, Darby had two Master's degrees, a PhD and an M.D., and had devoted countless hours learning about and internalizing the contemporary medical practices in the United States.

⁵ Scrimshaw, p. 3.

⁶ "Medical News," *J Am Med Assoc.* 1958; 168(11): 1557-1565.

⁷ William Darby, "Some Personal Reflections on a Half Century of Nutrition Science," *Annual Review of Nutrition.* 5(1985), p. 1-24

After more than a decade of extensive post-graduate work, Darby became the International Division of the Rockefeller Foundation's fellow in nutrition and began his extensive work in nutrition. He specifically worked with families, schoolchildren, and pregnant women to determine proper doses of vitamins and nutrients to sustain a healthy lifestyle. During his tenure at Vanderbilt, he was able to continue his research, and more importantly, he was able to enact valuable changes in the literature governing the nutrient levels that physicians instructed their patients to take.

To Darby, the 1940s were an exciting time to study nutrition because of the "rapidly growing evidence and identification of new essential nutrients and related metabolic phenomena, water soluble vitamins, fat soluble vitamins, essential amino acids, trace elements, and emerging metabolic cycles and biologic phenomena relating food and nutrition to human disease."⁸ Darby was living at a time when science was growing at a "rapid" rate. While scientific methods and understandings were growing at a prompt speed during the late 1930s and 1940s, there is little evidence to suggest that medical ethics and a thorough understanding of what was expected from the doctor-patient relationship in light of these new findings were evolving at a fast enough rate to keep up with the new findings. It was during this period of exciting discoveries, total lack of consensus on ethical practices, and minimal governmental oversight that Darby conducted the two studies that will be the central focus of this paper.

II. Introduction to Darby's Studies

A. *The Vanderbilt Cooperative Study of Maternal and Infant Nutrition*

William Darby conducted The Vanderbilt Cooperative Study of Maternal and Infant Nutrition from September 1945 through, at the very earliest, May 1947. The purpose of the study

⁸ Darby, "Personal Reflections," p. 9.

was to determine the levels of iron a woman must maintain to sustain a healthy pregnancy. The study was of such significance that it was funded in full by nationally revered and respected organizations such as the Tennessee-Vanderbilt Nutrition Project, the Tennessee Department of Health, and the Rockefeller Foundation. The majority of contemporary women take iron supplements during pregnancy; this particular study provided the information that determines proper iron dosages for pregnant women to this day.

To best determine the proper dose of iron, Drs. Paul Hahn and William Darby administered Fe-59, a radioactive iron, to over eight hundred pregnant women throughout the course of the study.⁹ Following the radioactive dosage, the women, who were between ten and thirty-five weeks pregnant, received their routine dosage of iron. On their next visit to the health clinic, the subjects had their blood drawn to determine how much iron they had absorbed.

All evidence seems to indicate that the women were not notified of their participation in this study. In an interview from the 1990s, a participant stated that she remembered, "taking a cocktail... I don't remember what it was, and I was not told what it was."¹⁰ Other women confirmed that they were told to drink a "cocktail" or a "sweet" that would help their babies. While it seems that the women were not told of their participation in the study, the study itself was not hidden from the public eye. Information about the study was published in medical journals as well as widespread newspapers.¹¹

In a follow-up study that took place in the late 1960s, researchers concluded that the fetuses subjected to tests had a "small, but statistically significant" increase in incidences of

⁹ William Darby, "The Vanderbilt Cooperative Study of Maternal and Infant Nutrition," *The Journal of Nutrition*, 51: 4(1953), p. 539.

¹⁰ Wilton McClure, transcript of audio testimony before the Advisory Committee on Human Radiation Experiments, Small Panel Meeting, Knoxville, Tennessee, 2 March 1995, 182.

¹¹ "Iron Doses with Radioactive Isotopes Aid to Pregnancy, Experiment Shows," *Nashville Banner*, 13 December 1946; "VU to Report on Isotopes," *The Nashville Tennessean*, 14 December 1946.

cancer.¹² By the time Ruth Hagstrom, Vanderbilt doctor and author of the follow-up study, had completed her research, three children had died from childhood cancer. Further, many of the women claimed to have experienced painful tooth loss, weight loss, fevers and other unexplained medical issues following their participation in the study.¹³

B. Radioactive Iron Study on School Aged Children

From January through May 1945, Darby and his team of researchers administered lemonade laced with radioactive iron to school aged children and subsequently tested their blood to determine the amount of iron the children had absorbed.¹⁴ In a letter to the school board asking for permission to conduct the study, Darby wrote that the study “could serve to orient nutritional teaching, the planning of school lunches to provide the maximum benefit to the children and to stimulate further interest in the present nutrition program of the school system.” This information is true; Darby’s studies incited interest in vitamin absorption and helped define contemporary nutritional standards.¹⁵ However, in the past twenty years, people have taken issue with the fact that there is no mention of radioactive iron in the letter. In fact, Darby seems to have deliberately left out information pertaining to the consumption of radioactive material. In his description of the study (given to the school board), Darby was very clear that the study would follow a series of basic steps: “The examination of each subject would include (1) an evaluation of the diet of the child, (2) a physical examination, and (3) a laboratory examination for certain vitamins and minerals on a small sample of blood.”¹⁶ Nowhere in the letter is it mentioned that the children would drink a substance, laced with radioactive material or otherwise.

¹² Ruth M. Hagstrom, S.R. Glasser, A.B. Brill, and R.M. Heyssel, “Long Term Effects of Radioactive Iron Administered During Human Pregnancy,” *The American Journal of Epidemiology* (1969) 90 (1): p. 1-10.

¹³ ACHRE Knoxville Panel Meetings Transcript, Knoxville, TN, 1994.

<http://www.gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/pm04/pm04trns.txt>

¹⁴ *Hughes v. Vanderbilt University*, 215 F. 3d 543 - 2000

¹⁵ “William Jefferson Darby (1913-2001),” *Eskind Biomedical Library – VUMC Biographies*, June 2001.

¹⁶ William Darby, “Letter to School Board,” from the Nashville School Board Minutes, January 2, 1945.

It is clear that Darby did not notify the school board or the families of the students of the true purpose of the study. The failure to notify the school board and families could be construed as deliberate falsification of information meant to confuse the public. When contacted in the 1990s, Darby claimed that neither he nor his research team attempted to conceal their activities. He claimed that he told the school board there would be a “marker” in the lemonade, but that nobody asked what the “marker” was. It is impossible to use this as evidence of Darby’s innocence; he could have easily been attempting to protect his reputation. However, this particular mentality is in line with his thoughts on calculating risks. He was forthright about his disinterest in providing medical information to the public, a group of people, he determined, that did not need access to such information. Support for this conclusion lies in the fact that within the medical community, Darby used full disclosure, hiding nothing about his studies from his colleagues.

Darby published an article in the *Journal of Nutrition* detailing the study and titled the article, “The absorption of radioactive iron by children 7-10 years of age.”¹⁷ He stated that the purpose of the study was to determine how iron is absorbed in the bodies of seven to ten year old children. The published article details exactly how Darby and his team went about understanding how the iron was absorbed, explaining every step that the team took. While Darby was open with the medical community (he was fully funded by major national scientific organizations and published in renowned nutrition and medical journals.), he was less willing to share his studies with the general public. In contemporary articles, stories from the media, and legal writing, it appears that Darby was actively working to keep information from the public. However, his personal writings and responses in depositions seem to indicate that he simply did not feel that

¹⁷ William Darby, “The absorption of radioactive iron by children 7-10 years of age,” *The Journal of Nutrition*, (1947) 33 (1): 107.

the public had the right to certain types of information and that informing the public would hinder essential nutrition studies.



III. Darby on Calculating Risk and Conducting Research Unbridled by the Public

During the 1940s, the scientific community was creating increasingly accurate tools that allowed researchers to conduct studies that were even more beneficial to society, but had the potential to cause harm to the study participants. As the Advisory Committee on Human Radiation Experiments¹⁸ (hereafter referred to as the Advisory Committee) explained, “Venturing into new fields carried with it substantial risks: risks due to our ignorance of what lay ahead, and risks due to the lack of training of many would-be explorers.”¹⁹ In light of the hazards associated with new forms of research, the Atomic Energy Commission was developed to regulate, among other things, radioisotope usage. To obtain radioisotopes, researchers were required to submit a proposal to the AEC detailing how the radioisotopes were going to be used. It seems, however, that the AEC was extraordinarily liberal in approving studies: of the 217 requests it had received by October 1946, the AEC approved 211 and of the 94 human use requests, the AEC approved 90.²⁰ It appears that with the overwhelming amount of radioisotopes

¹⁸ The Advisory Committee on Human Radiation Experiments was a response to growing concern on the part of the public that the U.S. government had participated in unethical research conduct in the years following World War II through the Cold War. On January 15, 1994, President Clinton created the Committee, which was composed of fourteen members whose purpose was to “be fair, thorough, and unafraid to shine the light of truth on this hidden and poorly understood aspect of our nation’s past... to tell the fully story to the American public.” By the time that the Advisory Committee issued its Final Report, it had uncovered thousands of previously unknown studies using radioactive materials.

Advisory Committee on Human Radiation Experiments Final Report, Introduction, (Oct. 1995).
http://www.hss.energy.gov/healthsafety/OHRE/roadmap/achre/preface_1.html

¹⁹ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 6: Origins of the AEC, (October 1995).

²⁰ *Ibid.*

being created,²¹ there was little oversight over who was obtaining them and how they were being used. As a result, researchers were able to individually determine the steps they would take to protect the health of their research subjects.

Darby, as one of the scientists with access to radioactive iron and in an environment with little oversight or formal ethical regulations, personally had to determine the safest and most useful way of conducting research. In the years following his two famous studies in the late 1940s, he began to articulate his personal thoughts on the ethics of different scientific practices. In particular, Darby was most critical of instances in which he felt there were insufficient precautionary mechanisms to ensure indemnity of the physician and fiercely protective of the doctor's right to make unilateral decisions unimpeded by public opinion. In a letter to a peer, Dr. John Youmans, Darby writes:

The Medical Radioisotope Laboratory... serves a particularly valuable function in supervising and coordinating work relative to patient care and patient diagnosis... [but] does not offer sufficient protection... The use of isotopes is increasing, the scope of their application and the areas in the University where they are used are increasing. The possibilities of liability are likewise increasing.... During 1955-1956 there has been no monitoring by a representative of any of the committees charged with responsibility for radioisotope supervision in the University.²²

Further, in a memo to the University, Darby explains: "The present system of a Medical Radioisotope Committee and University Radioisotope Committee established in May 1956 fails to protect efficiently the University and its personnel.... The method by which radiation safety is to be maintained has had varying definitions, the latest of which is... inadequate."²³

²¹ Scientists explained that within one year of the invention of the cyclotron, the supply of radioisotopes far exceed their demand, possibly due to the fact that few scientists had been involved in radio-studies during WWII meaning that such scientific information was still relatively unknown and underused.

²² William Darby to Dr. John Youmans, Nashville, TN, (09/29/1956) Eskind Library Darby Special Collection, Nashville, TN.

²³ Memo from William Darby, Nashville, TN, (08/30/1956) Eskind Library Darby Special Collection, Nashville, TN.

It was Darby's opinion that Doctors had the full responsibility to conduct the necessary studies and it was the organization's duty to protect the researcher. By allowing inadequate personnel to oversee isotope usage, the University, Darby argued, was creating a situation in which the researchers were vulnerable. To better the university's name and science as a whole, researchers conducted studies of varying risk with the understanding that the University would protect them. This suggests that not only was Darby in full compliance with University and national regulations, but also that he was working to create even more stringent regulations.²⁴

In an article titled "Acceptable Risk and Practical Safety: Philosophy in the Decision Making Process,"²⁵ Darby details his thoughts on the considerations one must make when conducting studies on humans. He explained that side effects and long-range consequences must be evaluated with obvious and direct consequences and that one must weigh *public benefit* against *individual risk*. In his argument, he explains that in an environment in which little is known, there will always be risks but with these risks come incredible potential benefits; sometimes risks are worth taking. Darby believed that these decisions about the safety or validity of certain experiments should be left to qualified medical personnel. He felt that choices "must not be forced by public pressure exerted by premature or unwise statements of scientists in the press or on television. It has become increasingly easy for a prominent scientist to undermine the confidence of the public in the safety of its food supply through statements made...[To] undermine the confidence of the public is a serious betrayal of trust." To Darby, certain information was for qualified professionals only; spreading information about various tests

²⁴ In addition, there are numerous University memos and letters to Darby notifying him of his acceptance to various regulatory boards and his meeting of the requirements to use radioisotopes under the AME regulations. Further, Darby's archive contains letters in which he corresponds with the Atomic Energy Commission and details which members of his department are using radioisotopes. These sources lend credence to the assertion that Darby was working within the confines created by the University and federal organizations.

²⁵ William Darby, "Acceptable Risk and Practical Safety: Philosophy in the Decision Making Process," *JAMA*, Vol 224, No. 8, (May 21, 1973).

would only serve to instill fear in the public. In a sense, Darby was defending his and his coworkers' practices. By withholding information from the public, he was working to protect the future of nutrition studies and the public's confidence in medical professionals. At this point in time, there was a lack of information on nutrition; people did not know the ideal levels of vitamins for pregnant women or growing children. His studies were necessary.

In the 1940s, one of the most essential tasks for nutritionists was determining the correct level of vitamins in a healthy diet. Darby's personal and published papers seem to indicate that he was willing to take certain carefully calculated risks to study these issues. In a book review dated October 1, 1962, Darby wrote: "That accidents have occurred is well known, but this is no more reason to ban useful chemicals than is the lamentable occurrence of preventable automobile or airplane accidents reason to ban these modern modes of transportation."²⁶ To Darby, certain risks were justifiable. Scientific studies posed a threat in the same way that studies on automobiles and trips to the moon posed risks. In the name of progress, certain risks were acknowledged, but ultimately overlooked. However, by the 1960s, Darby and other researchers were already encountering resistance to various forms of research. To the opposition, he stated that he appreciated "the firmness of the scientific foundations of nutrition science and deprecate[d] the efforts of those 'theoreticians,' politicians, and activists who would shake those foundations."²⁷ These words paint a picture of Darby's anger towards those outside of the medical profession who attempted to curtail studies. Instead of purporting to portray the studies as innocuous, he described the naysayers as people who were unwilling to challenge the *status quo* in the nation's best interest. Darby, along with many other members of the medical

²⁶ William Darby, "Silence, Miss Carson." *Chemical & Engineering News* (Oct. 1, 1962): 62.

²⁷ Darby, "Personal Reflections," p. 23.

community, had a clear idea of what he viewed as ethical research and rejected judgment from outside fields.

Darby was not alone in feeling that only certain people should be privy to valuable information about medical research. Dr. William Sullivan, a pediatric researcher and Darby's contemporary, explained that conducting experimentation outside of the public's eye was part of the "ethos of the time" in which "everyone was a draftee" in a national war on disease.²⁸ Further, a November 12, 1952 memorandum by the Committee on Medical Sciences executive director asserted: "Human experimentation has, in years past, and is at present governed by an unwritten code of ethics" that is "administered informally by fellow workers in the field [and] is considered to be satisfactory... To commit to writing a policy on human experimentation would focus unnecessary attention on the legal aspects of the subject."²⁹ To these men, opening discussions about the ethics of medical practices to the wider public would be detrimental to the scientific community as a whole. Darby was not alone in asserting that the medical community needed to remain untouched by the public; in fact, it seems that in general, during the 1940s, doctors were given free reign because "the doctor... was king."³⁰



While these types of studies are expressly forbidden now, in 2011, it is less clear whether or not Darby was acting in a manner unlike his contemporaries. It is clear that the risks of radiation were not fully understood: in the 1950s, children in the United States placed their feet

²⁸ William Silverman, interview by Gail Javitt (ACHRE), transcript of audio recording, 14 February 1995 (Research Project Series, Oral History Project), p. 26.

²⁹ F. Lloyd Mussells, Executive Director, Committee on Medical Sciences, RDB, DOD, to Floyd L. Miller, Vice Chairman, Research and Development Board, DOD, 12 November 1952. ACHRE Archive.

³⁰ Leonard Sagan, interview by Gail Javitt, Suzanne White-Junod, Sandra Thomas, and John Kruger (ACHRE), transcript of audio recording, 17 November 1994 (ACHRE Ethics Oral History Project), p. 13-14.

into x-ray machines at the shoe store to ensure proper shoe fit. This one action subjected each child to twenty times the radiation of a modern-day CT scan. It was not until the 1960s that Tennessee outlawed the shoe x-ray machines.³¹ Regardless, it seems that Darby was willing to take considerable risk in the name of science. He chose to refrain from notifying the public about the intricacies of his studies because, as he wrote: "With increasingly extensive demands for safety evaluation and with continued uncertainty about the imposition of restrictive measures, the industry is reluctant to invest in research and development of these useful materials." It is this concept of weighing the risks and benefits that will be discussed in the following chapter.

³¹ Bill Snyder, "1945 VU radiation tests," *The Nashville Banner*, January 14, 1994. This little tangent hopes to allow the reader to situate herself in the late 1940s and 1950s. To argue that Darby was keeping information from his subjects is to argue that he knew the potential harms of radiation and radioactive materials. As shown by the x-ray shoe machine story, researchers did not understand the full repercussions associated with using radioactive iron tracers until over a decade after Darby's studies concluded. To be discussed in the following chapter.



Chapter II // Contextualizing Darby

*"Medical research... has a preeminent call upon every social structure for support... Let each social order give the scientist a free hand... and otherwise, for humanity's sake, leave him alone."
-Ernest Goodpasture*

It is impossible to analyze the ethics of Darby's studies without a thorough understanding of the context in which he was conducting his projects. This chapter will answer a series of questions: What was the common law understanding of consent? What did researchers know about radioactive isotopes, tracers and Fe59, in particular? Finally, were other researchers conducting studies of the same nature? The answers to these questions will help to contextualize Darby's activities and will provide greater insight into how Darby was able to justify his studies.



I. Informed Consent

As historians and the public alike question the ethics of various studies that took place in the 1940s and 1950s, one central issue of contention is "informed consent." According to the American Medical Association: "Informed consent is more than simply getting a patient to sign a written consent form. It is a process of communication between a patient and physician that results in the patient's authorization or agreement to undergo a specific medical intervention."² This understanding of consent requires that a patient fully understand what he or she is agreeing to and be of sound mind to make such a decision. People erroneously assume that the idea of

¹ David Rothman, "Serving Clio and Client: The Historian as Expert Witness," *Bull. Hist. Med.*, 77 (2003), 40.

² "Informed Consent," *AMA Website*, <http://www.ama-assn.org/ama/pub/physician-resources/legal-topics/patient-physician-relationship-topics/informed-consent.shtml>

“informed consent” is firmly rooted in medical history,³ however, it seems that “informed consent” is a contemporary policy with a chaotic background.

Thomas Percival, an English physician born in the late 18th century, wrote a book titled *Medical Ethics* and in so doing, coined the term “medical ethics.” This book, according to the American Medical Association, “asserted the moral authority and independence of physicians in service to others, affirmed the profession’s responsibility to care for the sick, and emphasized individual honor.”⁴ Just over fifty years later, in 1847, the American Medical Association created the first Code of Medical Ethics, which was based loosely on Percival’s work.⁵ The Code marked the first nationally recognized set of rules governing medical work.

While there were no legal codes regulating physician conduct prior to the 1840s, many authors were vocal in their opposition to physicians who took advantage of their positions of authority and worked without their patients’ best interests in mind. In 1849, a Connecticut physician named Worthington Hooker wrote a book titled *Physician and Patient*, which attacked physicians “with an unsparing hand.”⁶ In effect, Hooker was acknowledging that physicians were taking advantage of their patients’ vulnerabilities by unscrupulously conducting tests that had the potential to be detrimental to their patients’ health.⁷ He was firmly opposed to the lying and

³ In order to explain that most researchers believed in informed consent, Susan Lederer includes first hand quotations from doctors discussing the ethics of their actions. One man, William Osler, said that he always obtained “full consent” from his patients and further realized that he, and the rest of the medical community, had “no right to use patients entrusted to our care for the purpose of experimentation.” Lederer’s dialogue is essential because it shows that there were discussions about human experimentation’s morality during the time in which Darby was conducting studies. Lederer concludes that ethical dilemmas occurred because the medical community failed to regulate its members’ activities. However, it is simple to find a single doctor from the first half of the 20th Century to testify that he only conducted studies if he had obtained consent from his patients. The reality, however, is that “informed consent” did not become a legal issue until the late 1950s.

⁴ “History of Medical Ethics,” *AMA Website*, <http://www.ama-assn.org/ama/pub/category/8291.html>

⁵ Ruth R. Faden, *A History and Theory of Informed Consent* (Oxford: Oxford University Press, 1986), p. 69.

⁶ Worthington Hooker, *Physician and Patient* (New Haven: T.J. Stafford, 1852), p. 27.

⁷ Hooker’s understanding of 19th century medicine is in line with but offers new understanding to the Final Report’s analysis of the patient-physician relationship, which explained, “Hippocratic medicine is the belief that each patient poses a unique medical problem calling for creative solution. Creativity in the treatment of individuals, which was not commonly thought of as requiring consent, could be -- and often was-- called experimentation. This tradition of

deception that was a commonplace in medicine. He argued: "the good, which may be done by deception in a *few* cases, is almost nothing, compared with the evil which it does in *many* cases... The evil which would result from a *general* adoption of a system of deception [shows] the importance of a strict adherence to truth in our intercourse with the sick."⁸ He was opposed to the idea of intentionally keeping information from patients in order to deliberately create an environment of "deception." Regardless, Hooker was fully supportive of the right to keep information from the patients if the information was unclear or if it had the potential to confuse the patient. In this sense, Hooker was of a similar mindset to many of his contemporary physicians who believed that patients should be spared from information that could potentially cause distress or confusion. He was similar to Darby and hundreds of other physicians who worked over a half century later and believed that the physician had the right and the obligation to withhold certain information from the patient.

In 1883, Austin Flint, author of *Medical Ethics and Etiquette*, distinguished between rules that had "moral weight" and medical etiquette, which he argued was simply a matter of convention. He explained that, when confronted with a dilemma, physicians should err "on the bright side" and that "unfavorable events which may be apprehended should not be referred to in the hearing of the patient, although it may be judicious to mention them to friends in order that they be not taken by surprise, and attach blame to the physician for concealment." Even by the end of the 19th century, doctors felt the right to withhold information. It seems that doctors did so with the patients' best interests in mind. Though this concept may now seem overtly paternalistic, it was widely accepted in the medical community. Further, it is important to note

medical tinkering without explicit and informed consent from a patient was intended to achieve proper treatment for an individual's ailments; but it seems also to have served (often unconsciously) as a justification for some researchers who engaged in large-scale clinical research projects without particular concern for consent from patients." *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 2, p. 4, (October 1995).

⁸ Hooker, p. 378-381.

that none of the authors mentioned “consent” or any concept akin to it. While Flint explained that the physician must not shrink from exposing the chances of death when discussing procedures with his patients, he fails to mention the concept of consent.⁹ This understanding of medical ethics that was solidified during the 19th century did not change dramatically over the next fifty years. As author Ruth Faden explains “[a]lthough the American Medical Association revised its code in 1903, 1912, 1947, 1957, and 1980, up until the 1980 revision, the viewpoint on the patient-physician relationship remained largely unchanged.”¹⁰

Conversely, in its Final Report, the Advisory Committee notes various times in which research organizations stated a policy that required the use of “volunteers.” In 1925, Army regulation noted that “volunteers” should be used in research on yellow fever, a dangerous mosquito-borne disease. In 1932, the Navy allowed for studies involving divers so long as the subjects were volunteers (an in-depth look at this study shows that Navy divers were dying from embolisms associated with deep dives and submarine missions). Further, in 1932 researchers conducted a study of the influenza vaccine at San Quentin on a volunteer-only basis.¹¹ These regulations seem to indicate that people *were* in fact thinking about consent in the mid-twentieth century. However, as etymologists and sociologists are quick to point out, the term “volunteer” “is ambiguous [and was] commonly used to refer to healthy subjects.”¹² In other instances, the word simply referred to the research subject.¹³ Through the industrial revolution, World War I and World War II, consent as a widespread concept remained absent and medical ethics continued unchanged.

B. “Consent” during the 1940s

⁹ Flint, p. 23.

¹⁰ Faden, p. 74.

¹¹ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 1, p. 1, (October 1995).

¹² *Ibid*, p. 16

¹³ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 2, p. 1, (October 1995).

I. Experiments on the General Population

In 1942, a group of researchers from Rochester University asked the American Medical Association whether it was "desirable" to conduct a gonorrhea study on an unknowing population. In its response, the AMA stipulated that studies with "any risk" must utilize subjects who have given consent, that animals must be experimented on before humans, and that all experiments must take place under "proper medical protection and management."¹⁴ This official memo can be taken as an indication that the country, or at least the important research regulation boards, was conscious of the need for consent. But, regardless of the official position, it is clear that consent and volunteering were still not fully understood- even following the October 9, 1942 memo, the CRM continued to approve proposals that allowed for studies on peoples with cognitive disabilities, institutionalized peoples and children. Further, in instances in which the subject was a patient or the investigator anticipated minimal harm to be inflicted on the subject, the investigator was at liberty to determine how to proceed.¹⁵

Further, there seems to have been a pervading difference between how people viewed healthy subjects and subjects already under a physician's care. The majority of the physicians interviewed for the Final Report of the ACHRE agreed that they routinely used patients as subjects: As one conference participant stated, "[t]he therapeutic illusion is maintained, and the patient is often not even told he is participating in research. Instead, he is told he is 'just going to have a test.' If the experimental procedure involves minimal risk, but some discomfort, such as hourly urine collection, all you do is tell the patient: 'We want you to urinate every hour.' We merely let them assume that it is part of the hospital work that is being done."¹⁶ Dr. Paul Beeson,

¹⁴ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 1, p. 3, (October 1995).

¹⁵ *Ibid.*

¹⁶ Transcripts of "Social Responsibility in Pediatric Research" conference, 1 May 1961, p. 7. School of Law, Boston University (ACHRE Records).

a researcher from Emory who conducted research in the 1940s agreed and stated, "I don't remember ever asking their permission to do it. I did go around and see them, of course, and said, 'We want to do a study on you in the X-ray department, we'll do it tomorrow morning,' and they said yes. There was never any question. Such a thing as informed consent, that term didn't even exist at that time."¹⁷ Finally, radiologist Leonard Sagan, who conducted experiments from 1956 through 1957, concurred, stating, "So what did we do? I'd find some patients in the hospital and I'd add a little ACTH to their infusion and collect urines and measure output of urinary corticoids. . . . I didn't consider it dangerous. But I didn't consider it necessary to inform them either. So far as they were concerned, this was part of their treatment. They didn't know, and no one had asked me to tell them. As far as I know, informed consent was not practiced anywhere in that hospital at the time."¹⁸ The aforementioned physicians' personal accounts of human experimentation are indicative of the just how blasé the typical interviewee was about his experiences. This indicates that it was simply not conventional to obtain consent from one's patient.¹⁹ The Advisory Committee came to the same conclusion: "Obtaining consent from patients within the normal clinical relationship was not a common practice in late 1946. At that time, and for many years to come, patient trust and medical beneficence were viewed as

¹⁷ Paul Beeson, interview by Susan E. Lederer (ACHRE), transcript of audio recording, 20 November 1994 (ACHRE Research Project Series, Interview Program File, Ethics Oral History Project), 16-17.

¹⁸ Leonard Sagan, interview by Gail Javitt, Suzanne White-Junod, Sandra Thomas, and John Kruger (ACHRE), transcript of audio recording, 17 November 1994 (ACHRE Research Project Series, Interview Program File, Ethics Oral History Project), 13-14.

¹⁹ There were exceptions. In the 1949 "Doctor and Patient and the Law," physician Louis J. Regan wrote, "The physician must keep abreast of medical progress but he is responsible if he goes beyond usual and standard procedures to the point of experimentation. If such treatment is considered indicated, it should not be undertaken until consultation has been had and until the patient has signed a paper acknowledging and assuming the risk." By the 1956 edition, he includes a full explanation of the Nuremberg Code, and his understanding of experimentation had expanded to three pages of analysis. The Advisory Committee noted that Regan was particularly influenced by the Nuremberg trials in a way that the majority of the medical community was not. *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 2, p. 6, (October 1995).

unshakable moral foundations on which meaningful interactions between professional healers and the sick should be built."²⁰

2. Experiments on Children

In 1949, the Atomic Energy Commission's Isotope Division created a set of rules that determined the qualifications a researcher must have to partake in studies using radioisotopes and listed specific ways in which radioisotopes could be used. In particular, the Isotope Division included a section under the heading "Normal Children," which stated: "In general the use of radioisotopes in normal children should be discouraged. However, the Subcommittee will consider proposals for use in important researches, provided the problem cannot be studied properly by other methods and provided the radiation dosage level in any tissue is low enough to be considered harmless."²¹ This section is particularly insightful because while it discourages the use of radioisotopes in children, it notes that there was a dosage level that researchers determined to be harmless. Further, it must be noted that Darby's study took place a full five years prior to this regulation and could, very possibly, have been included in the category of proposals that could not "be studied properly by other methods."

III. Informed Consent from the 1950s through the 1980s

"Informed consent" first appeared as an issue in American medicine in the late 1950s and early 1960s. Notable historians Ruth Faden, Tom Beauchamp, and Nancy King wrote that they were unable to locate a single substantial discussion in the medical literature of consent and patient authorization from this time period and from 1930 to 1956 they "were able to find only

²⁰ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 2, p. 3, (October 1995).

²¹ AEC Subcommittee on Human Applications of the Committee on Isotope Distribution, 13 March 1949 ("Revised Tentative Minutes of March 13, 1949, Meeting of Subcommittee on Human Application of the Committee on Isotope Distribution of U.S. Atomic Energy Commission: AEC Building, Washington, D.C.") (ACHRE Records).

nine articles published on issues of consent in the American medical literature.”²² In fact the term “informed consent” was not coined until 1957. “Thus, informed consent emerged and developed in clinical medical ethics as a set of reflections on the rights of patients that used as its data base legal case materials in malpractice, research ethics materials that emerged after Nuremberg, and new federal policies and regulation.”²³ While some people analyze medical research in the late 1940s based on the principles of the Nuremberg Code,²⁴ the reality is that Nuremberg did not truly inform medical ethics until the following decades.

Many historians use Nuremberg as evidence that physicians consciously decided to ignore ingrained ethical practices. However, it seems instead that Nuremberg and the trials that followed WWII were the first incidence of these ethical principles being utilized in a legal context. While people assume that the Nuremberg Code was *based* on the contemporary ethics in the United States during World War II, it seems more likely that the Code was created as an effort by the prosecution to more easily arraign the defendants. “The Nuremberg Doctors’ Trial and the Nuremberg Code,” written by Ulf Schmidt, details the steps by which the Code was created. In particular, Schmidt explains how one of the primary assignments for the American prosecutors was to show the differences between the American and German experiments on humans during World War II. The prosecutors anticipated that one of the principal modes of defense would be a *tu quoque* argument in which the defense would use cases such as the study of malaria on prisoners in the United States and on infants with spina bifida in Britain. These studies “raised the question whether American and perhaps British researchers were likewise

²² Faden, p. 86.

²³ Ibid, p. 92.

²⁴ Adil Shamoo and David Resnik, *Reasonable Conduct of Research*, (New York: Oxford University Press, 2009) outlines various ethical standards for different studies. While Shamoo and Resnik’s research identifies the regulations and standards post 1945, it dedicates the entire ethical discussion to the studies themselves and utilizes anachronistic regulations (such as those imposed by the Institutional Review Board) to analyze the studies. The authors simply state that because Nuremberg was in effect and doctors did not follow the code, the doctors were unethical.

guilty of professional misconduct and if not, why not.”²⁵ In effect, the Americans needed to differentiate between the studies conducted by the Axis powers and those conducted in the United States and Great Britain. In the spirit of furthering this defense, the legal team created the Nuremberg Code; the Code was not created or informed by the medical community.

Further, while the concept of “informed consent” was developed in the late 1950s, it took over two decades for it to be thoroughly adopted by the medical community. As Faden explained, “informed consent” as both a legal practice and part of medical guidelines was introduced to the medical school curriculum in the 1970s,²⁶ meaning that new doctors were not given the tools by which to understand “informed consent” until over twenty years after the Nuremberg trials. Further in 1980, K. Danner Clouser wrote: “During the last ten years, and particularly in the last five, a *surprising* [author’s italics] phenomenon has taken place. There has been an incredible surge of interest in biomedical ethics.”²⁷ This language is of particular import because it describes interest in medical ethics as *surprising*, which can only mean that conversations about ethics in medicine were simply not commonplace until the 1970s.

In 1982, the President’s Commission commissioned a survey of 2,000 people in America, in which over 80% of physicians stated that they obtained consent. This seems to indicate a drastic change in the physician-patient relationship. However, even by the 1980s, physicians were not clear about what exactly constituted “informed consent.” In fact, only 26% of the physicians designated “that informed consent had anything to do with a patient *giving permission, consenting, or agreeing* to treatment.”²⁸ Rather, physicians were more likely to

²⁵ Ulf Schmidt, “The Nuremberg Doctors’ Trial and the Nuremberg Code,” *History and Theory of Human Experimentation*, (Franz Steiner Verlag, 2007), 77.

²⁶ Faden, p. 95.

²⁷ Ibid, p. 93.

²⁸ Ibid, p. 95.

assume that “informed consent” referred to the act of *telling* the patient he or she was going to undergo treatment, rather than asking if he or she was willing to partake in the treatment.

IV. Informed Consent as it relates to Darby

The issue of “informed consent” has altered the way that people have analyzed the ethical implications of Darby’s studies. Vanderbilt did not attempt to argue that Darby, or anyone else on the research team, obtained consent. Rather, they argued: “The principle itself was not yet embedded in research practice.” Vanderbilt argued that it was necessary to understand the principles of consent. The defense explained that in practice, investigators did not routinely ask subjects for consent to perform research on them. This was especially true for subjects who were already in the hospital under the researchers care. This was confirmed by Robert Levine, Vanderbilt's expert witness and professor of medicine at Yale, who argued that because the women were Darby's patients, he was not obligated to receive consent.²⁹

Emma Craft and the team of prosecutors argued that, in 1945, consent was considered necessary and because of this, it is clear that Darby practiced “outright deception.”³⁰ Historians, lawyers and the media alike have claimed that researchers in the 1940s and 1950s must have deliberately acted in an unethical way based on the contemporary understanding of consent. It seems, however, that applying the issue of “informed consent” may be anachronistic; it is extremely likely that Darby and his coworkers were operating in an environment in which “informed consent” was not even part of the dialogue. As the Advisory Committee concluded: “By contrast, various sources confirm that it was not conventional to obtain consent from patient-subjects.... [Most physicians] agreed that consent played little or no role in research with patient-subjects, even where there was no expectation that the patient would benefit medically

²⁹ Rothman, “Serving Clio,” p. 34.

³⁰ Ibid, p. 32.

from the research. At the same time, however, there was also agreement that, where patients were used as subjects in nontherapeutic research, the research usually posed little or no risk to the patients.”³¹ Therefore, in order to best understand Darby’s actions, it is necessary to look at the language in his studies and discussions with the medical community instead of exterior regulations that may not have even been part of the discussions of the time.³²

In his article chronicling his experience as an expert witness for the plaintiff, Emma Craft et al, David Rothman, explains that two of the central questions at issue in the Craft v. Vanderbilt litigation were: 1.) what were the ethical standards of the time, and 2.) what did the medical community know about radioactive materials, including, most importantly radioactive iron?³³ It is clear that, in the time period of 1945 through 1949, there was neither medical code arguing for consent, nor widespread *de facto* use of consent. It seems that, in reality, when the judge stated Darby used “fraudulent concealment,” he was using an *ex post facto* law and understanding that neither Darby nor his contemporaries were conscious of. The answer to Rothman’s second question lies in a careful analysis of radioisotope usage in the 1940s.

³¹ Advisory Committee on Human Radiation Experiments Final Report, Chapter 17: Findings 8-14, p. 1, (October 1995).

http://www.hss.energy.gov/healthsafety/OHRE/roadmap/achre/chap17_2.html

³² Further, as authors William Moss and Roger Eckhardt, “The Human Plutonium Injection Experiments,” *Los Alamos Science*, 23 (1995), asked, “Is informed consent still possible if the patients are not told that the material under study is radioactive plutonium [or in our case, radioactive iron]? Many experts feel the answer is yes, because these two words, especially in the forties, would not have done anything to help the patient assess the risk.” This analysis mirrors Darby’s paternalistic analysis of providing certain information to the general public; if the information will not make sense to and could potentially cause fear in the public, why is it necessary to keep them fully informed?

³³Rothman, p. 28.



Chapter III // Radioisotopes: History, Usage, and Knowledge of Potential Hazards

When looking at and analyzing Darby's studies in hindsight, people find issue with the fact that Darby's team used high doses of radioactive tracers, substances that we now know pose significant risk to patients. While researchers continue to use tracers in research on people, the dosage and application are monitored by stringent research protocol. Further, not only are radioisotopes still in use, their demand is increasing with tens of millions of procedures using the product performed each year.¹

A radioactive isotope or a radioisotope is an atom that has an unstable nucleus, which has more energy than a normal nucleus. As the nucleus decays, energy can be passed on to a new particle within the nucleus or to an atomic electron in the form of radiation. Two of the most significant ways that radioisotopes are used are as a source of radiation and as tracers. Tracer atoms are used when information about "movement, transformation, and chemical behavior of atoms and molecules" is desired.² They are extremely valuable because they have almost identical compositions and act in the same ways as their non-radioactive counterparts, but can be tracked with different machines such as a Geiger counter, to determine where the atoms ended up. This is the form of radioisotope that Darby was using. He utilized the radioactive form of Iron, Fe59, to track total Iron absorption in the human body. Darby's particular study on pregnant women exemplified some of the negative aspects of radioisotopes; if used excessively on a human being, they can cause radiation poisoning, cancer and other serious problems.

The radioisotope can occur naturally or can be artificially produced. Today, there are more than three thousand radioisotopes known, many of which can be used in constructive

¹ Rex Boyd, "Radioisotopes in Medicine," *World Nuclear Association* 1 (Oct. 15 2010), p. 1.

² Paul C. Aebersold, "Isotopes-Their Distribution and Use," *The Scientific Monthly* 69 (Dec., 1949): 349.

technologies. However, in the 1940s, researchers were just starting to understand how to produce, harvest and utilize radioactive isotopes.

II. Creation of Radioisotopes

The 1940s were a period of great expansion in the world of radioisotopes. Scientists began using radioactive indicators, or tracer atoms in the 1910s but did not begin using common elements as tracers until the 1930s.³ The invention of the cyclotron, a then-advanced particle accelerator, in the mid 1930s allowed scientists to create radioisotopes for all of the elements, however, production was extremely expensive and, therefore, small-scale.⁴ This meant that the majority of research institutions were kept from experimenting with radioisotopes, hindering their use as a major research tool until the creation of a method of mass production.

During World War II, the Manhattan and Plutonium Projects injected funds into atomic research, eventually giving rise to superior methods for large-scale production of isotopes. Scientists who had once worked individually with the cyclotron began to participate in the government's study of atomic energy, leading to vast advancements in the field of radioisotope research. As Paul Aebersold, who was under the tutelage of Dr. Ernest O. Lawrence, creator of the cyclotron, wrote in a journal article: "They soon realized that the uranium chain reactor would be an excellent unit for large-scale production of a wide variety of useful radioisotopes. At the conclusion of the war these scientists, realizing the potential value of radioisotopes to peacetime research, proposed that reactor-produced radioisotopes be made generally available for scientific investigation."⁵ War related activities grew into peacetime research and investigators who had invested themselves in nuclear research during WWII continued to work to understand the intricacies of radioactive materials. In fact, following WWII and in anticipation

³ Ibid.

⁴ Ibid, p. 350.

⁵ Ibid, p. 354.

of continued research in the field of nuclear medicine, Congress developed the Atomic Energy Commission, which regulated research and nuclear activity in the same way in which the Manhattan Project controlled atomic science throughout WWII.

III. Dissemination

At the end of World War II, much of the knowledge garnered through wartime projects was made available to the broader scientific community. In particular, qualified medical personnel could purchase radioisotopes, which were once near-to-impossible to obtain. During a conference at Princeton University on September 2, 1946, Glenn Seaborg stated: "In a recent announcement from the headquarters of the Manhattan Project it was disclosed that a large number of such radioisotopes are now available for distribution to research men through qualified research institutions."⁶ At this point, research organizations began to receive sizable shipments of radioisotopes and large-scale research projects ensued.

From August 2, 1946 to June 30, 1949, the Atomic Energy Commission made over 7,000 shipments of radioactive isotopes and over 700 shipments of concentrated stable isotopes to different universities and institutions for peacetime research. This initial shipment of Commission-produced isotopes resulted in the publication of over 1,900 articles in scientific journals by 1949. The publications included information about the biological and medicinal use of isotopes, the diagnostic use of tracers, and "the manner in which some of these compounds are selectively absorbed by certain tissues, or are differently metabolized."⁷ It is clear that the scientific community was enthralled by radioactive isotopes and intended to use them far into the

⁶ Glenn T. Seaborg, "Radioactive Tracers: Applications to Chemistry and Medicine," *Science* 105 (Apr. 1947): 349.
⁷ Aebersold, "Isotopes," 355.

future.⁸ Aebersold and his team at University of California, Berkeley, who expected isotope utilization to increase in the coming years, noted that the Commission was going to encourage even wider use of isotopes, and concluded that “as tools of science and technology, isotopes will take their place with other long-established scientific instruments, and their should be no end to their growth in usefulness.”⁹

It does not seem that researchers paused for even a moment to question whether or not it was ethical to experiment with radioisotopes on human beings. In fact, researchers were conducting purely experimental studies on patients using radioactive iron until the end of the 1950s.¹⁰

IV. Knowledge about Radioisotopes

Researchers use radioactive substances because they have the same chemistry as their nonradioactive counterparts, meaning that they go through the same chemical processes as an ordinary compound with the only difference being that the radioactive compound can be measured using simple instruments.¹¹ This was an incredible discovery for the medical community as investigators could now see exactly where substances were going and how much of the substance the body absorbed. In papers and studies from the late 1940s, researchers were still continuing to explain how radioactive substances were used. It seems that in every study in which radio iron was used, the researcher began by explaining how the substance worked and how such a finding will benefit science, thereby indicating that radioactive isotopes, including Fe 59, were very new and relatively unknown, even in the medical field. As Seaborg wrote, the

⁸ William Balfour (William Balfour, “Radioactive Iron Absorption,” *Journal Ex. Medicine*, 78: 3 (1943).), wrote: “Radio iron is perfectly adapted to the study of the elusive iron element as it shuttles about within the body. Probably by no other means can we get a comprehensive understanding of the true internal iron metabolism,” p. 16.

⁹ *Ibid*, p. 359.

¹⁰ E. E. Pochin, “Section of Experimental Medicine and Therapeutics,” *Proceedings of the Royal Society of Medicine* 49 (Feb. 1956): 868-870.

¹¹ Corrigan, “Use of Radioactive Isotopes,” 309.

“future seems to hold unlimited possibilities for the application of radioactive tracers to scientific problems. It is certain that the applications made thus far are just the beginning of what is going to become an extremely large and successful field of research.”¹² Researchers were thoroughly optimistic about the “vastly superior” method¹³ and began to conduct numerous projects with their newfound information.

Darby and his research team knew just as little about radioactive iron as the rest of the medical community. In a letter to a colleague about the pregnancy study, he explains that he anticipates that the study will provide very valuable information: “The pregnancy study is all over... Actually, it looks like that’s what the study is going to turn into—one paper after another, if we can ever get time to write the papers. A tremendous amount of exceedingly interesting information is becoming evident.”¹⁴ In a letter two years prior, Darby had written about the intended purpose of the study. He explained that he desired to understand “the correlations between nutritional status of women during pregnancy and the course of pregnancy and labor and the condition of the infants.”¹⁵ The innocence with which Darby wrote these letters is telling. It does not seem that Darby would have written such exposing letters if he truly believed that he was acting in the wrong. Rather, it seems that Darby had serious, true aims and acted upon those intentions in a misguided fashion.

Darby was not the first researcher to conduct studies using Fe59, radioactive iron, as a tracer. As Seaborg notes: “The most simple and direct use of an element as a tracer is accomplished by its administration as a simple inorganic compound, in which case the

¹² Seaborg, “Radioactive Tracers,” p. 354.

¹³ Balfour, “Radioactive Iron Isotopes,” p. 29.

¹⁴ William Darby to William McGanity, Nashville, TN, (11/12/1949) Eskin Library Darby Special Collection, Nashville, TN.

¹⁵ William Darby to Dr. Smith, Nashville, TN, (09/21/1945) Eskin Library Darby Special Collection, Nashville, TN.

distribution of the tagged element... is determined by measuring the radioactivity of the samples of tissues and body fluids. A very large number of experiments of this type have been performed, principally to aid in the understanding of mineral metabolism."¹⁶ Researchers both abroad and in the United States had extensive experience with Fe59 because it was one of only ten useful radioactive isotopes that the cyclotron was capable of producing. Therefore, scientists were able to begin experimenting with Fe59 starting in the early 1940s.¹⁷ As a result of numerous studies, by 1946, researchers actually knew the amount of Fe 59 the human body absorbed when it was consumed.¹⁸ It was not until 1956, however, that researchers recognized that there was the possibility of "long-term hazards" of utilizing large doses of radioactive iron.¹⁹ In fact, investigators tended to harp on the short term, quickly recognized symptoms of radiation effects and, when such effects were absent, concluded that the dosage was safe.²⁰

V. Was the Medical Community Fearful of Potential Hazards?

1. Hazards in the General Population

Before distributing the product and information about the product to the wider scientific community, certain restrictions had to be placed on its use. Congress wrote the Atomic Energy

¹⁶ Seaborg, "Radioactive Tracers," p. 353.

¹⁷ There were hundreds of purely experimental studies using radioisotopes including: J. Badenoch, "Iron Metabolism in Steatorrhea: The Use of Radioactive Iron in Studies of Absorption and Utilization," *Blood* (1954) 9: 123-133, a study in which researchers used radioactive iron to determine the absorption of oral iron in steatorrhea. The study compared sixteen patients with steatorrhea and fifteen without. All thirty-one patients received radioactive iron and had their blood tested for radioactivity; William Balfour, "Radioactive Iron Absorption in Clinical Conditions," *Department of Obstetrics of the University of Rochester School of Medicine* (April 2, 1942), a study that compared radioactive iron absorption in pregnant women with radioactive iron absorption in pregnant canines; D. Harold Copp and David M. Greenberg, "A Tracer Study of Iron Metabolism With radioactive Iron," *Division of Biochemistry, University of California Medical School, Berkely* (April 1, 1946); Wendell C. Peacock et al, "The Use of Two Radioactive Isotopes of Iron in Tracer Studies of Erythrocytes," *From the Radioactivity Center, Massachusetts Institute of Technology, Cambridge; the Medical Clinic of the Peter Bent Brigham Hospital, and Department of Medicine, Harvard Medical School, Boston* (January 19, 1946), a study in which the researchers ultimately determined that "It is evident that no radiation effects are to be expected, and none have been observed."

¹⁸ G. Robert Greenberg, Letter to the Editor of *Journal of Biological Chemistry*, July 30, 1946.

¹⁹ Pochin, "Section of Experimental Medicine," p. 863.

²⁰ Peacock, "The Use," p. 614: "In no instance has any change in blood picture occurred, as evidenced by changes in hematocrit or hemoglobin levels... Three subjects have married subsequent to receiving radio-iron, and have begotten normal children. In addition, radio-iron, in dosages about equivalent to that received by recipients, has been given to 65 patients on the wards of the Peter Bent Brigham Hospital, without observed radiation effects."

Act of 1946, which created the Atomic Energy Commission and the Committee of Isotope Distribution. The Commission, composed of notable researchers with extensive experience with radioactive materials, determined allocation and distribution rules, and reviewed all requests for studies using radioactive materials.²¹ Members of the Commission took these precautions because they had a fear that the material could possibly harm the human body. As Aebersold explained: "Because radioactive materials are potentially hazardous to health, it is necessary that the prospective user have adequate facilities, proper safety equipment, and specialized scientific background to insure their safe handling and use."²² While the community understood that radioisotopes could potentially cause harm to the human body, studies continued across the country at an increasing rate.

By 1948, the scientific community knew the *short-term* impact of radioisotopes on human beings. They understood that a radioactive tracer administered by mouth or intravenously eventually comes into physical contact with the human body, leading the patient's entire body to become "more or less radioactive. [They knew that] the urine, feces, and perspiration of such a patient may be radioactive, depending upon which element is in use, and it is possible that, when heavy doses are given for the purpose of treatment, the excreta from the patient can be sufficiently radioactive to be dangerous."²³ Dangerous. What is dangerous? To whom is the material dangerous?

Later on in the same article, "danger" is qualified. Dr. K. E. Corrigan explained the dangerous aspects of radioactive materials as they relate to the nurses, doctors and researchers, neglecting to mention that radioisotopes could have a detrimental effect on patients. He explained that the cumulative effect of contact with radioactive materials is potentially harmful

²¹ Aebersold, "Isotopes," 351.

²² Ibid.

²³ K. E. Corrigan, "Use of Radioactive Isotopes," *The American Journal of Nursing* 48 (May, 1948): 309.

given the fact that it is impossible to physically feel radioactive materials on the body; if nurses and doctors cannot feel the materials, they are less likely to use them cautiously. Corrigan explains, however, that these specific issues do not apply to the patients because the “patient is receiving only one dose, or one series of treatments intended for a very specific purpose and ending with a very definite result which can be predicted and checked. The nurse who breaks the rules will get an unknown, unmeasured dose and will accumulate a dosage to a dangerous degree, while the patient is quite safe.”²⁴ According to the medical community, as long as doctors acted with caution and ensured that their patients received only a finite dose of radioactive tracers, there were no dangers associated with receiving that type of treatment.

It seems that if the medical community was worried about protecting any population, it was the doctors and nurses handling the isotopes. Corrigan reminds medical personnel that there were a few rules they should follow when interacting with radioactive materials: 1.) do not be nervous; instead confidence is important; 2.) do not believe popular fallacies (e.g. If one works around radioactive substances, one will become sterile); 3.) follow all plans and procedures in order to be as efficient as possible; 4.) do not contaminate the floor or one’s hands with radioactive substances.²⁵ Reviewing these “essential” rules is a helpful exercise; it helps a modern reader to understand just how little the medical community knew about these substances.

2. Hazards Associated with use in Children

During the 1940s, researchers did not understand the full magnitude of risks posed to children by subjecting them to radioactive treatments. As the Advisory Committee reported, the medical community did not associate increased risk of cancer with exposure to radiation. Duffy and Fitzgerald, two researchers who published a study in 1950, which, based on the findings

²⁴ Corrigan, “Use of Radioactive Isotopes,” 309.

²⁵ Ibid.

from the 1920s that showed a causative relationship between exposure to radium-based paint and early onset cancer, raised the question as to whether there is the possibility of a strong connection between irradiation in childhood and development of cancer:

To pose a cause and effect relationship between thymic irradiation and the development of cancer would be quite unjustified on the basis of data at hand when one considers the large number of children who have had irradiation of an "enlarged thymus." However, the potential carcinogenic effects of irradiation are becoming increasingly apparent, and such relationships as those of thymic irradiation in early life and the subsequent development of thyroid or thymic tumors might be profitably explored.²⁶

This demonstrates that while researchers were interested in looking into the connection between radiotherapy and cancer, they were exceptionally hesitant to predict prematurely a causal relationship. A 1949 radioisotope use policy from the Massachusetts General Hospital further exemplifies the medical community's lack of understanding of the long-term consequences of radioisotope usage. In May 1949, Dr. Shields Warren, director of the AEC Division of Biology and Medicine, helped create the Massachusetts General Hospital standard which included the following provisions: "Children (all patients below 15 years of age) shall not receive more than a total of 0.8 rep; In the case of iodine, the thyroid, which retains most of the radioactivity, is radioresistant. In this case, the permitted dosage may be increased by a factor of 100."²⁷ It seems that children were at risk of receiving high levels of radioisotopes through nontherapeutic studies at a time in which researchers had an incomplete understanding of long-term consequences of radioisotope usage as well as underdeveloped ways to accurately regulate dosages in children. In summary, during the period in which children were exposed to the highest levels of risk from nontherapeutic research involving radioisotopes, investigators had a limited understanding of the potential long-term risks of low-dose radiation and of methods to accurately calculate the tissue

²⁶ B. J. Duffy and P. J. Fitzgerald, "Thyroid Cancer in Childhood and Adolescence: A Report of Twenty-eight Cases," *Cancer*, 3 (November 1950): 1018-1032.

²⁷ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 7, p. 10, (October 1995).

doses in children.

VI. How did Darby use radioisotopes in his studies?

Darby's specialty was nutrition and he was dedicated to understanding the correct levels of nutrients in diets for specific populations. He conducted studies all over the world on specific nutrients to best determine the ideal food regimen.²⁸ The two studies that received the most notoriety and ultimately resulted in legal cases were The Vanderbilt Cooperative Study of Maternal and Infant Nutrition, and the Radioactive Iron Study on School Aged Children. Both of these studies used radioactive iron to establish a better understanding of iron deficiency. Iron deficiency, or anemia, is one of the most common nutritional deficiencies and is often found in young children and pregnant women.

In the study on pregnant women, Darby utilized an unselected group of women and fed them "single doses of iron tagged with the radioactive isotope."²⁹ As Dr. Hagstrom, a Vanderbilt doctor, explained in 1968: "The method used was to feed a single isotope of iron, wait two to four weeks, secure an aliquot of maternal blood and determine the counts per minute of Fe 59 in the blood sample."³⁰ However, it seems that Darby unknowingly administered an excess of Fe59. As stated above, researchers knew how much radioactive iron the human body would absorb. Researchers were able to use this information to guide their studies. Darby's study, however, was very different: he was conducting research on pregnant women, essentially one human body with

²⁸ Darby conducted hundreds of studies across the world. Studies include: William Darby and D. F. Milam, "Field study of the prevalence of the clinical manifestations of dietary inadequacy." *Am. J. Public Health Nation's Health* 35:1014-1021.; William Darby, C. G. Salsbury, W. J. McGanity, H. F. Johnson, E. B. Bridgforth, and H. R. Sandstead, "A study of the dietary background and nutriture of the Navajo Indian." *J. Nutr.* 60:3-19.; William Darby, G. A. Goldsmith, R. C. Steinkamp, A. S. Beam, and E. McDevitt, "Resurvey of nutritional status in Norris Point, Newfoundland." *J. Nutr.* 40:41-69.; and William Darby and V. Patwardhan, *The State of Nutrition in the Arab Middle East*. Nashville, Tenn.: Vanderbilt University Press.

²⁹ Ruth Hagstrom, "Long Term Effects of Radioactive Iron Administered During Human Pregnancy," *American Journal of Epidemiology* 90 (Jan., 1969): 2.

³⁰ *Ibid*, p. 3.

two beings.³¹ This posed a very distinct problem: because plasma iron is directed not only to the maternal bone marrow, but also to the fetus by way of the placenta, the study would have only measured the iron that did not go to the fetus (i.e., it would not have been marked as “absorbed”).³² It is quite possible, though not yet confirmed, that Darby may have increased the amount of radioactive iron administered to the women to compensate for this, possibly causing radiation sickness in the women and a higher incidence of cancer in the children who received Fe59 in utero.

In the Radioactive Iron Study on School Aged Children, Darby administered radioactive iron to approximately 200 children, from ages seven to ten years old. There was not a follow-up study as there was for the Maternal study, so it is impossible to know for sure, but in newspaper articles and the resulting lawsuits from the 1990s, neither a higher incidence of cancer nor severe radiation sickness resulted from the study.

³¹ Other investigators used radioactive iron as a tracer in studies on pregnant women: Hahn PF, Ross JF, Bale WF, Whipple GH, “The Utilization Of Iron and The Rapidity of Hemoglobin Formation in Anemia Due To Blood Loss,” *J Exp Med.* 1940 May 31; 71(6): 731–736.; William Balfour, “Radioactive Iron Absorption in Clinical Conditions,” *Department of Obstetrics of the University of Rochester School of Medicine* (April 2, 1942).

³² Hagstrom, “Long Term Effects,” p. 4.



Chapter IV // Darby and the Law

As a nutrition specialist, Darby was especially interested in bettering the quality of Americans' dietary health. One of the major medical issues in women and children in the 20th Century was iron deficiency. Though we now consume record amounts of meat, iron-rich foods were not a large part of the average American's diet sixty years ago. Darby worked with the Tennessee Department of Health, and the Rockefeller Foundation to work to understand how to incorporate more iron into the diets of women and children. Two of Darby's studies, The Vanderbilt Cooperative Study of Maternal and Infant Nutrition and The Radioactive Iron Study on School Aged Children, used trace levels of radioactive iron to best determine how these two demographic groups absorb iron. This knowledge would eventually serve to ensure these two vulnerable populations received the necessary amount of iron.

The aforementioned information can be found in documents from the 1940s: not only did Darby receive funding for these studies through national organizations, he also published the findings in scientific journals, and issued press releases at the conclusion of his studies. However, in the 1990s, reports began to surface about the medical profession and its inclination to hide vital information from the American public.

The 1994 ACHRE Final Report points to Darby as one of the hundreds of doctors who used radioactive materials without the consent of his patients. Law firms capitalized on this potential cash-cow situation and began to organize class action lawsuits. Two of the lawsuits pertaining to the Vanderbilt studies were *Hughes v. Vanderbilt University* and *Craft et al v. Vanderbilt University*.

Thought there was minimal written evidence linking the class action participants to the studies, the prosecution worked to find all subjects who exhibited some form of a medical problems and could show that they might have come into contact with Vanderbilt and the Nutrition Study. Law firms, realizing the massive payout to be had, began organizing massive class action suits, two of which eventually materialized (and provided, as was expected, a major source of income for the firms).

A. Hughes v. Vanderbilt University

Darby's 1945 study using school-aged children remained relatively unknown until 1994, when *The Tennessean* ran a front-page story titled "Students Given Radioactive Drink," which chronicled details of the study. The following day, *The Nashville Banner*, ran a similar story and assigned blame to Vanderbilt University. In the wake of the media's exposure of the study, two individuals, Katherine Henley and Ernestine Hughes, filed class action suits.

Katherine Henley filed a class action suit on January 17, 1995 alleging that she had been harmed by Darby's study when she was a student. However, two years later, it was determined that Henley was enrolled in neither Caldwell nor Random schools, the only schools in which Darby had conducted the study. Henley's case was dismissed on July 8, 1998; this was widely reported by the media given the public's intense interest in the case. Just over a month after Henley's case was dismissed, Ernestine Carter Hughes, a student at the Caldwell School during the time of the study, filed a class action suit on August 24, 1998.

In *Hughes v. Vanderbilt University*, Ernestine Hughes explains that she, along with 187 peers from the Caldwell and Ransom schools in Nashville, was unknowingly subjected to radio iron testing in 1945. In the lawsuit, the prosecutors argued: "The plaintiff... in the exercise of reasonable diligence did not know or have reason to know the true nature and dangers of

radioactive experimentation to which they were subjected to in the past.... A great many members of the class still do not know about the experiment."¹ The prosecution argued that not only did Darby and his research team fail to notify the families; they also actively attempted to hide the true nature of the study from the school board. The District Court concluded that Hughes's case was barred by the statute of limitations² and dismissed the case.

The Radioactive Iron Study on School Aged Children has not resulted in any other legal action. Further, despite the publicity given to the study, none of the student subjects has come forward claiming to have suffered from the study. This could potentially indicate that the levels of radio iron used in the study were not great enough to cause noticeable harm to the study participants.

B. Craft v. Vanderbilt University

In 1995, the Advisory Committee on Human Radiation Experiments submitted to the public its Final Report, which contains information about radiation experiments that were conducted in the years following World War II. The Report specifically details Darby's Cooperative Study of Maternal and Infant Nutrition and explains the purported detrimental effects that the study had on its participants. One woman, Emma Craft, read a report of an eleven-year-old girl who had died of a rare cancer of the upper thigh caused by the radiation she

¹ Ibid.

² Tennessee has a one-year statute of limitations. Hughes claimed that she did not know of the study until she heard about Henley's case dismissal (in 1998), but the judge concluded that there was sufficient publicity in 1994 and 1995 to start the statute of limitations at that point. "The statute of limitations commences to run when the plaintiff knows or has reason to know of the injury which is the basis of his action. A plaintiff has reason to know of his injury when he should have discovered it through the exercise of reasonable diligence." See *Sevier v. Turner*, 742 F.2d 262, 273 (6th Cir.1984). Further, "[w]here events receive widespread publicity, plaintiffs may be charged with knowledge of their occurrence." *United Klans of Am. v. McGovern*, 621 F.2d 152, 154 (5th Cir.1980).

had received *in utero* and realized that she had been one of Darby's patients in the late 1940s.³ The young girl detailed in the Report was Carolyn Craft, Emma Craft's deceased daughter.⁴

In the highly publicized court case, *Emma Craft, et al. v. Vanderbilt University, et al.*, prosecutors based their case on four major claims: a) that Darby knowingly conducted studies that would have adverse effects on his patients' health; b) that the purpose of the study was not as benign as the researchers had claimed; c) that the standards of the day required informed consent and that Darby deliberately kept information from the community in an act of "fraudulent concealment"; and d) that Darby was under qualified to conduct a study of such magnitude.

The prosecutors claimed that the evidence showed that the experiments were not used to benefit the subjects' health; rather, the subjects unknowingly took part in an experiment that was *detrimental* to their health. They claimed that any reasonable doctor in the 1940s would have known about the damaging affects of radioactive materials. They point to articles such as Dr. Pollard's *Applied Nuclear Physics*, which ultimately declared: "The final words of caution we wish to write concern genetic changes. The exposure of an individual to radiation automatically renders him liable to suffer a mutation, and there is no threshold to the radiation dose, which will produce the change. It is just a gamble."⁵ They also drew on Major Joe W. Howland's 1946 Secret Report on Medical Research Programs, which detailed a study titled, "Experiments to test the validity of the linear r-dose/u mutation rate relation at low dosages."⁶ These studies examined the relationship between cancer and radiation, but ultimately did not conclusively determine the

³ Though it is widely reported that Craft was one of the women given radioactive iron, it still has yet to be determined whether or not she was in the group that received the active ingredients.

⁴ Emma Craft, transcript of audio testimony before the Advisory Committee on Human Radiation Experiments, Small Panel Meeting, Knoxville, Tennessee, 2 March 1995, 136.

⁵ *Applied Nuclear Physics*, Pollard and Davidson, 1942, p. 168, from *Craft* evidence.

⁶ Major Joe W. Howland, "Summary, Medical Research Program, 1943-1946," Secret Report, Manhattan Engineering District, from *Craft* evidence.

actual causative relationship between cancer and radiation. The prosecution, however, claimed that such studies must have indicated that the research community knew about the effects of radiation on the human body.

In 1963, however, the Atomic Commission claimed: "scientists were just beginning to make the connections between fallout and excess cancers in exposed populations."⁷ Further, Darby stated that he had no reason to believe that the study could cause harm: "If we had believed otherwise we would never have conducted the study."⁸ The defense maintained that one must differentiate between large-scale radiation doses, such as those that someone would receive working in a radiation plant, and small-scale radiation doses such as those used in tracer studies. They claimed that the concerns detailed in the studies brought forth by the prosecution were applicable in high dose radiation cases and broadened their argument by explaining that, "the levels of radiation and risks to the participants in the iron absorption study less than the rate from pelvis x-rays taken during pregnancy which were widely used in the 1940s based on the belief at that time that such diagnostic techniques posed no risk to the mother or the unborn fetus."⁹ In fact, when the Committee on Human Experimentation asked Oak Ridge scientists about dosages, the scientists analyzed the data, and concluded that the fetal doses were "a few tens of millirads," which is considerably lower than previously thought and, according to specialists, extremely unlikely to cause fetal abnormalities.¹⁰

This conclusion is supported by other literature, such as a booklet distributed by the Atomic Energy Commission and written by Norman Frigerio. As Frigerio wrote: "Damage from radiation tends to be largely cumulative so that, in general, a few thousand rads will be legal

⁷ Welsome, p. 226.

⁸ "Transcript of the Evidence," April 9, 1996, before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 53.

⁹ "Proposed Pretrial Order No. 4" (1996), before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 5.

¹⁰ Welsome, p. 439.

whether given over seconds or years. The maximum lifetime dose that can be considered 'safe' has been set at about 250 rads."¹¹ Frigerio explained "nowadays" scientists understand the importance of carefully calculating dosages but that scientist did not always have this knowledge, as the total understanding of radiation was inferior in the 1940s. "As little as a decade ago a few routine medical and dental X-ray examinations might deliver perhaps 300 rads locally."¹² In doses of 50 to 400 rads, certain issues such as premature aging, cataracts, growth impairment, anemia and cancer are more likely to occur. Leukemia is the

"earliest and most common cancer associate with radiation... a single dose of about 200 rads roughly triples one's chances of developing leukemia within a period of 10 years following irradiation. However after radiation at doses below 50 rads, permanent damage of any sort is hard to find. One's chances of developing leukemia or the other late effects just described are probably raised a trifle... but, all in all,"

the effects are similar to a "bad cold, last only a few days."¹³

Darby's studies used radiation dosages of "a few tens of millirads" or around .03 rads, which is far below the range indicated by Frigerio to have the potential to have serious negative health effects. In effect, by quoting articles that suggest a probable cause-and-effect relationship between all radio iron dosages and cancer, the prosecution ignored the essential finding that the amount of radio iron administered greatly affects the health impact.

The prosecution argued that "Vanderbilt failed to disclose any of the relevant matters that would have aroused Plaintiffs' suspicions, including the facts of their exposure to radioactive iron, the risks of such exposure, and Vanderbilt's actual knowledge of scientific research linking radioactive iron exposure to cancer."¹⁴ The prosecutors argued that Vanderbilt University and William Darby actively worked to keep information from the patients; that Darby specifically

¹¹ Norman A. Frigerio, "Your body and radiation," *U.S. Atomic Energy Commission, Division of Technical Information* [1966], p. 23.

¹² Frigerio, p. 27.

¹³ Frigerio, p. 50.

¹⁴ *Craft v. Vanderbilt University*, 940 F.Supp. 1185, 113 Ed. Law Rep. 1157, 10.

worked to deceive the community. Additionally, they argued “the standard of care required that human subjects would not be exposed to radioactive iron without their informed and voluntary consent as to both the fact of exposure and the risks of exposure.”¹⁵

None of these allegations can be confirmed. In fact, in depositions from the trial, and earlier documents unrelated to the trial, Darby attempted to differentiate between knowledge that a scientist should have access to and information that should be available to the public. In his deposition, Darby explained that he “felt it was unnecessary” to inform women about the radioactive content of the drink they were given. In his deposition, Darby explained: “We did not decide that we would not inform them. We simply felt it was – felt it was unnecessary. It was not the kind of thing that you did to sit down and... say that routine drawing of blood has a – any kind of – well, has to be explained in complete detail to the patient, because it was that – it was that safe.”¹⁶ Darby explains that not only did he believe the procedure to be safe, he also felt that it was not standard medical practice to maintain an ongoing conversation with the patient about the procedures. This statement does not appear to be an act of cover-up. In papers that he wrote decades before, Darby insists on the need to exclude the public from certain types of information in order to protect them.¹⁷ The fact that the study itself was in two national newspapers and published in a well-known medical journal demonstrates that the investigators did not know of the potential injury caused to the subjects nor did they take any actions to conceal their acts. As

¹⁵ Plaintiffs’ Amended Proposed Pretrial Order No. 4, Jan 13, 1997, before the Honorable John T. Nixon, District Judge, Nashville, TN.

¹⁶ Deposition of Darby, May 20, 1994, Nashville, TN.

¹⁷ Darby understood that the majority of the American public would have little knowledge of radioisotopes and used this knowledge to determine that, more often than not, the subject would only be confused by information about the study. Darby was paternalistic; he was not devious, as was suggested by the prosecutors.

the defense argued: “how in God’s earth somebody can beat the statute of repose by arguing fraudulent concealment by a party who issues a press release?”¹⁸

Further, the plaintiff claimed that the purpose of the study was to use radioactive iron to understand what the substance did to the human body: “[T]hey were following them [the pregnant women] for this purpose, to study morbidity and mortality of exposure to radioactive iron.”¹⁹ This too was denied by the defense. Instead, they explained that in Nashville, Tennessee in the 1940s, “nutrition surveys of this region indicated that pregnant and lactating women had less than usual body concentrations of certain factors possibly related to nutritional state,”²⁰ and that certain studies were necessary in order to determine levels of these factors. In the Outlines of Plans for a Cooperative Study of Nutritional Status during Pregnancy, the research team asked a central question: “Can one favorably alter the course of pregnancy, etc., by providing a more liberal dietary intake of the food factors which are found to be low?”²¹ and explained that the radio iron studies would be one of the first studies on pregnancy and would provide necessary information concerning iron supplements during pregnancy. Stephen Sacks, the lead defense attorney, explained: “This is not some radiation study where unwitting people were bombarded with radiation to test how people would respond to radiation... This is a case that involves a nutrition study. It was an important study. It was a study of anemia in pregnant women, a very serious health issue in the 40s.”²² The prosecution’s allegation that Darby was using radio iron for the purpose of studying radioactive materials is entirely unfounded and misconstrues the purpose of the study entirely.

¹⁸ “Transcript of the Evidence,” April 9, 1996, before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 9.

¹⁹ “Transcript of the Evidence,” April 9, 1996, p. 100.

²⁰ Summary Report Section B Vanderbilt Nutrition Project Jan 1, 1946 – June 30, 1946, Nashville, TN.

²¹ Outlines of Plans for a Cooperative Study of Nutritional Status during Pregnancy, (unknown date) Rockefeller Archive Center, New York, NY.

²² “Transcript of the Evidence,” April 9, 1996, before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 3.

Finally, the prosecutors argued that Vanderbilt acted with negligence in allowing Darby to conduct this type of study. They claimed that Darby was not qualified to conduct a radiation study and, therefore, the University was not acting within the guidelines set forth by the Atomic Commission. Darby was not a radiation scientist and has never claimed to be one. In a deposition on May 20, 1994, Darby stated, "I was not and I am not still an expert in radiation."²³ The prosecution used this as a central argument, claiming that because Darby was not a radiation scientist, he did not "even know of the standard information that radiation scientists knew about, the lack of a threshold dose."²⁴ However, what the prosecution failed to mention was that Darby was not in charge of determining the actual doses of radiation. While Darby was the head of the entire Nutrition Study, Dr. Paul Hahn designed the iron absorption aspect of the study. Dr. Hahn was one of the most respected radiation researchers in the nation, had studied with Nobel Laureates, and was on numerous national radiation committees. Further, many factors that may have contributed to the radio iron's injurious effect on the fetuses were beyond Hahn's and Darby's control. When Oak Ridge scientists examined the iron they had given to Vanderbilt University, they concluded that the iron manufactured in their facilities contained more Iron-55 than they had previously thought.²⁵ Therefore, Hahn and Darby could have easily given the correct dosage, but had a negative outcome because of an error on the part of the Oak Ridge facility. To argue that Darby's relative inexperience with radiation (though he was certified to run radiation studies on his own) meant that the entire experiment lacked qualified doctors is to ignore the numerous radiation experts involved in the study. Vanderbilt was working within the

²³ Deposition of Darby, May 19, 1994, Nashville, TN.

²⁴ Plaintiffs' Amended Proposed Pretrial Order No. 4, Jan 13, 1997, before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 138.

²⁵ Iron-55 differs from Iron-59 in that it has a much longer half-life; Iron-55 has a half-life of five years, while Iron-59 has a half-life of 47 days. Hahn, the director of Vanderbilt's program noted the importance of half-life; he concluded that it "must not be too long.... Such long-lived materials prevent good control of the supplied radiation and also might prove ultimately carcinogenic in themselves."

guidelines set forth by the AEC and ensured that all of its scientists were certified to work with radioactive materials.

The case did not go to trial, instead, Vanderbilt University settled out of court for \$10 million. In his memorandum opinion, Judge John Nixon of the U.S. District Court for the Middle District of Tennessee supported the settlement and explained:

The subjects were pregnant women who were not informed of the risks of ingesting radioactive iron isotopes... Because actions by both Vanderbilt and the Rockefeller Foundation in this joint project were so entwined with those by Tennessee, they could be found liable under federal civil rights law. The claims were not time-barred under Tennessee's medical malpractice statutes, because "the experiments did not constitute medical care." Instead the court concluded that the statute of limitations may be tolled because of fraudulent concealment, noting that "[w]here a confidential relationship exists, as between a physician and a patient, there is an affirmative duty to disclose, and that duty renders silence or failure to disclose known facts fraudulent."²⁶

This opinion, which approved the settlement agreed upon by Vanderbilt and Craft et al, hinges on the following assumptions: that Darby knew of the risks and elected not to inform his patients, there was an act of fraudulent concealment, and that he was acting in a duplicitous manner by not telling his subjects about the study. In his statement on the settlement, Vanderbilt's General Counsel, Jeff Carr resisted and contested these postulations, arguing that Vanderbilt researchers were entirely unaware of the harm that could be caused by radioactive tracers and that there could not have been "fraudulent concealment" given the fact that the study was "announced by the University, reported at the time by both Nashville newspapers, and published in the scientific literature."²⁷ Further, Joseph C. Ross, associate vice chancellor told the *New York Times*: "While it would not be acceptable today to give radioactive isotopes to pregnant women, it is also clear that this was carefully evaluated at the time, and there was a feeling then that it was safe. We want to be as helpful as we can, but to create the feeling that we've done something wrong, we

²⁶ Abstract of *Craft v. Vanderbilt University*, Fed Suppl. 1998; 18: 786-98.

²⁷ Michael Schoenfeld, "Craft v. Vanderbilt Settlement Proposed," *VU Online News Releases*, May 27, 1998. <http://www.vanderbilt.edu/News/news/may98/nr8.html>

don't want to do that." Even following the settlement, there was a wide discrepancy between how different parties viewed the Vanderbilt Cooperative Study and its researchers. In fact, Vanderbilt wished to take responsibility for the study: "Vanderbilt is responsible. We step up to that. We designed it. We implemented it. We published it and we are proud of it because it led to important advances."²⁸

As the massive settlement indicates, people in the 1990s were reluctant to allow Darby to justify his studies and had an inability to contextualize the work he conducted. Because the case never went to trial, Darby was not able to defend his actions. However, Darby's "Personal Reflections" from the early 1970s, provides some insight into what Darby would have argued if he had been given the opportunity. In the paper, Darby writes about how certain members of the medical community have unscrupulously broadcasted various pieces of information, confusing the public. He writes: "Politicians and self-appointed, self-serving 'public advocates' with their creed of antiscience, antiestablishment, anti-industry have found nutrition and food to be sensitive public issues. Unfortunately even some nutritionists have blurred the boundaries between science and advocacy, thereby causing additional confusion in the public mind."²⁹

Darby realized the importance of his studies and elected to keep his subjects and the general public ignorant, because, ultimately, informing an uneducated public could have harmed his ability to conduct research.

By examining the data garnered by both sides of the case, certain facts become apparent:

- 1.) radioactive iron was used for the specific purpose of determining the correct level of iron supplements;
- 2.) little was known about the connection between radioactive tracers and cancer;
- 3.) Darby and his team exercised the appropriate amount of caution for the time period;
- 4.)

²⁸ "Transcript of the Evidence," April 9, 1996, before the Honorable John T. Nixon, District Judge, Nashville, TN, p. 17.

²⁹ Darby, "Personal Reflections," p. 12.

Darby did not desire to nor see the purpose of informing the subjects about the study; and 5.) the study resulted in an extraordinary amount of information about pregnancy supplements.



In 1998, Vanderbilt University settled the Craft litigation by agreeing to pay \$10 million to the Craft family and other individuals harmed by Darby's study on pregnant women. This settlement was not an admission of guilt. In his formal statement, Vanderbilt's General Counsel, Jeff Carr, stated: "The studies used a radioactive tracer, the most accurate scientific tool then available for measuring the rate of absorption of nutritional iron. Those conducting the studies believed that the use of the tracer posed no risk of harm to the participants, and the study, including the use of the radioactive tracer, was announced by the University, reported at the time by both Nashville newspapers, and published in the scientific literature."³⁰ Vanderbilt University was rightfully willing to provide compensation to the families that had been harmed but stopped short of admitting guilt to acting unethically. Vanderbilt was, in fact, working within clearly defined standards imposed by federal regulations. As the chairman of Vanderbilt's Isotope Committee, Dr. Meenely, wrote to Dr. Darby:

I am glad to inform you that the Hospital Medical Advisory Committee has unanimously approved the recommendation of the Hospital Radioisotope Committee that you have met at least the minimum AEC Requirements and, therefore, are authorized to use therapeutic radioisotopes through the Clinical Radioisotope Center. Your authorization... is in conformity with Atomic Energy Commission requirements for Clinical use of therapeutic isotopes. Specifically it authorizes you to determine whether patients are suitable for therapy and to prescribe radioisotope therapy for them.³¹

It is clear that by the time regulations were in place, Darby was authorized to use radioactive materials and was considered to be an expert on the field, fully supported by Vanderbilt University.

³⁰ Michelle Schoenfeld, "Craft v. Vanderbilt Settlement Proposed," *Vanderbilt Online News Releases*, (May, 1998). <http://www.vanderbilt.edu/News/news/may98/nr8.html>

³¹ Dr. Meneely to Dr. Darby, Nashville, TN, (05/24/1956) Eskind Library Darby Special Collection, Nashville, TN.

Many of the claims made by the prosecution were either greatly exaggerated or entirely unfounded. To argue that Darby knowingly subjected his study participants to dangerous tests to understand how radiation harms the human body is character assassination. When one actually inspects the historical record rather than listening to paid expert witnesses who reference a single author who proves their point, it becomes abundantly clear that Darby was not an extremist, he was not acting alone, and he did not intend to cause anyone harm.

This conclusion is not meant to devalue the injury caused to the pregnant subjects and their fetuses. The trauma that these women experienced is very real. It is understandable that these victims would want to pinpoint a culprit; it often dulls the pain to know that someone is paying for the harms that you have experienced. However, the focus of the blame has been falsely placed on Darby.

The real culprit was the system that allowed doctors to work unquestioned and unhindered. Experiments on humans are necessary. Experimentation is the underlying technique researchers can utilize to separate products that work from those that do not, and those that cause harm from those that benefit society. However, tests on humans are, by definition, fraught with danger. Researchers are forced to navigate between being too cautious, and being too lenient. They are obligated to understand the difference between treatment and research. Ever since scientists began using clinical trials, they have struggled to maintain this balance. This equilibrium is hardest to achieve when the subject is a patient and the patient needs a treatment. Historically, this particular relationship between the researcher and the subject has produced glaring human rights violations that have inspired attempts to produce firm international guidelines. This thesis serves as a reminder of the past and a warning for the future. Having a more complex understanding of history will allow us to think more clearly of what we want for

the future. The purpose of this last section is to compile the findings of this thesis, address what conclusions indicate about the state of medical ethics, and provide suggestions for future medical research standards.

In researching medical history and Darby's work in particular, I have come to the following conclusions: 1) From 1944 through 1963, Vanderbilt University, and the United States government as a whole, sponsored numerous studies with the intent purpose of advancing medical knowledge. 2) These studies often used radioactive tracers in amounts that were found to be unlikely to harm adult subjects. 3) Radioactive tracers continue to be used in research. 4) Our contemporary conception of consent was virtually unheard of in the 1940s and 1950s, particularly in studies that used patient subjects. 5) Darby did not recognize or understand the potential for harm when he used radioactive materials in his studies. 6) The patient-researcher relationship allowed for researchers such as Darby to capitalize on their dominant position and act in unscrupulous ways. 5) Humans were used as means for the sake of others.

In examining these conclusions, I have determined that various precautions must be taken to ensure the safety of future generations. Between 1945 and the early 1970s, medical researchers in the United States conducted morally reprehensible tests on vulnerable populations. People were seen as a means to an end; inhumane studies were justified because they had the potential to save other, perhaps more "visible" lives. Regardless of the legal and ethical understandings of the 1940s, elementary ethics tells us that human beings are not to be used as means. Herein lies the crux of the paper. People were used to benefit other people. They were no longer treated as individual persons with the right to autonomy. When researchers use people as means, they begin to act in an unethical and repugnant manner. This is especially true when the subject is harmed by the study in an effort to assist other people.

Research continues to be conducted primarily on patients. Given that every one of us will likely be a patient at some time in our lives, we will all be potential research subjects. Therefore, medical ethics are an issue that personally concerns each one of us. Just like in the 1940s, when one becomes a patient the rules for consent are somehow altered. As Committee Member Jay Katz wrote: "Patient consent, until most recently, has not been enshrined in the ethos of Hippocratic medicine... the idea of patient autonomy is not to be found in the lexicon of medicine."³² He further concludes that, because consent has not been an important part of medical ethics, there remain gross deficiencies in the way that physicians approach consent. He continues, "for not only does it take time to change historical practices, it also requires more thoughtful rules and procedures that currently exist."³³ Most importantly, Darby's studies are a great indication of what can happen when researchers use other human beings for what they believe to be honorable purposes. In this sense, we must further examine what consent means in contemporary times. Are patients truly *informed* when they give consent? Do patients really know what they are agreeing to when they sign on the dotted line?

As the Advisory Committee on Human Radiation Experiments' Research Proposal Review Project showed, of the greater-than-minimal-risk-studies they examined, twenty three percent were ethically unacceptable and another twenty three percent raised ethical concerns. Further, other studies showed that a full seventy-five percent of the aforementioned studies raised ethical concerns.³⁴ These studies show that informed consent continues to be a precarious issue and indicate that there needs to be a clearer understanding of the difference between a research and therapy.

³² Jay Katz, "Statement by Committee Member Jay Katz," Advisory Committee on Human Radiation Experiments Final Report: Part IV, (October 1995). http://www.hss.energy.gov/HealthSafety/ohre/roadmap/achre/jay_katz.html

³³ Ibid.

³⁴ *Advisory Committee on Human Radiation Experiments Final Report*, Chapter 18 Documents, (October 1995). <http://www.hss.energy.gov/HealthSafety/ohre/roadmap/achre/index.html>

Risks are inevitable as research is a “voyage into the unknown.”³⁵ In fact, risky moves often have the greatest rewards. One contemporary situation in which risky behavior is displayed is in studies using subjects whose prognoses are almost certain death and who have no alternative method of treatment. They are often told that they *may* benefit from alternative, and virtually untested treatments. Though the researcher’s primary motive is to gain medical knowledge, he often poses as a messiah whose only goal is to help the patient. In this sense, there can be a blurred distinction between research and treatment, as the researcher draws in patients using a convoluted promise of bettered health.

Misplaced trust has the ability to deceive. The issues that occur with human subjects—most importantly, the combating sides of advancing medical knowledge and protecting the subject—are increasingly complex. While we now have more stringent regulations, there are still violations of basic human rights. When we place emphasis on the idea of “consent,” we lose sight of what the word, the specific regulation, is meant to prevent. When scientists conduct experiments on people who feel that they have no choice but to participate, the study becomes unethical. When scientists motivate people to participate by providing nourishment to a group that otherwise would go hungry, the study is unethical.

As the past has shown us, the benefits of research are incalculable. This does not mean, however, that we can forget those who have been harmed along the way. We must ensure that that the legacy of distrust and lack of dignity with which studies were conducted in the past are not repeated in the future. The research community must begin to place more emphasis on understanding human ethics and transform the protection of the subject from a secondary to the primary objective. A researcher’s principal concern must be the wellbeing of the subject. Finally,

³⁵ *Advisory Committee on Human Radiation Experiments Final Report*: Official Documents, (October 1995). <http://www.hss.energy.gov/HealthSafety/ohre/roadmap/achre/overpt4.html>

the public must have a clearer understanding of research in order to hold the medical community accountable. When the public allows researchers to work without any oversight, there is bound to be violations of human rights. Though it is important to trust medical professionals, it is equally important to be informed and to ask questions and demand answers. Studies that used people as means were conducted because the American public allowed them to be conducted. People did not ask questions. We must take the initiative and protect ourselves by becoming informed and holding our medical professionals accountable.

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