Emmett Barkley, Ph.D.
Special Virus Cancer Program, NCI
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This is an interview with Dr. Emmett Barkley, who played a key role in our biohazards development and the viruses cancer programs at NCI. The interviewer is Dr. Carl Baker, former director of the National Cancer Institute.

Baker: Emmett, you played a leading role in our biohazards activities at the NCI, and so we want to get a recording of some of your experiences and ideas. Perhaps first, if you could just briefly give us a little bit about your background.

Barkley: Certainly, Carl. I came to NIH in 1963. I was a civil engineer graduate from the University of Virginia and I was coming to work in the Laboratory Design and Construction program at NIH. When I arrived, there had been a change in interest there, and they were hoping to recruit engineers who could join with the scientists to understand science in a way that would make it more helpful to communicate design criteria to more traditional engineers and architects, and I had the opportunity of being asked to serve as an engineer liaison with the National Cancer Institute, which I thoroughly enjoyed.

I began to use my engineering skills in this way to communicate criteria for facilities, and I had apparently developed some relationship, a valuable relationship, and I was asked to play a key role in this whole new field of viral oncology, particularly in developing the concepts for design of the new building and to also address some of the containment issues that were thought might be related to this new program, because it was thought that there could be hazards associated with it, like occupational cancer from exposure to

viruses that might be proven to cause human cancer. I found that work challenging and exciting. The Cancer Institute thought I would be better able to serve them, serve the broader purpose, if I were to move from my civil engineering background to a doctorate-level academic preparation in the sciences, and I was sent to the University of Minnesota to continue my academic education, where I took courses in environmental health, public health, and microbiology.

Baker: I think Dr. Endicott, who was director of the Cancer Institute, and Bob Learmouth, the executive officer, were important in your being sent to Minnesota to get additional training as well as supporting the engineering activities under Chris Hanson.

Barkley: That is correct. In fact, I think it was Dr. Endicott's vision that a prudent management decision had to recognize the potential risks associated with a whole new commitment and effort in the field of viral oncology. He saw it as a long-term activity, and I was fortunate to be selected to receive quick training. And when I finished my degree, I came back to the Cancer Institute.

Baker: What was your thesis subject?

Barkley: My thesis subject was to investigate the parameters that biological safety cabinets might require to provide protection both to the cell-culture work that was the dominant means of support in viral oncology and to protect the worker from being exposed to hazards.

Baker: You say hazards. Do you mean a device that would protect the worker when he wasn't actually inside the cabinets?

Barkley: That's right. These are devices that the investigator works with his hands through an opening.

Baker: So the air flows are very important.

Barkley: That's right. So I actually defined the airflow characteristics that would require or that would in fact provide protection for the investigator and protection for the virus cell cultures.

Baker: And then the virus cancer program, I assume, used some of that information to see that such cabinets were designed and used properly.

Barkley: That is correct. And the term biological safety cabinet type 2 describes that type of cabinetry, and it is the principal piece of equipment used in not only viral oncology today, but all infectious diseases and all recombinant DNA research. So it had its major thrust through these initiatives in the early '60s that were led by the National Cancer Institute.

Baker: While we're on that topic, let's introduce the history of the biohazards symbol, which is now used everywhere as a warning of biohazards. You'll recall we let a small contract to investigate what kind of symbol would be best remembered for what it stood for and ease of recognition, and we had 30 different forms, as I recall, that were field tested, and the one that won the field testing was the one that's used broadly today as the biohazard symbol.

Barkley: That is correct. In setting up the biohazard program as a part of the viral oncology activity, it became early recognized, not only by staff but by the advisors that made up the advisory committee for that aspect, and the warning symbol was identified as an important one. And the task was given to a contractor of the Dow Chemical Company that had been selected to work with the office on safety issues, and it was a very, very

excellent study. It was led by Robert Markel who was a colleague of mine in the biohazards office. The result of that, as you have stated, was adopted first nationally, the ANSI standards, and now it's been adopted shortly after that, in the early '70s, internationally. It has the same prominence as the radiation symbol.

Baker: Very comparable in its principle.

Barkley: Yes. And so it's used worldwide to alert anyone who may be near a biological agent that could be hazardous. It's used in the shipment of human specimens to testing laboratories. It's used for the transportation of materials. It's a wonderful and continuing benefit from the vision that the National Cancer Institute set to complement the viral oncology activities.

Baker: You and Hellman were kind of initial leaders in developing these standards and other aspects of biohazards in those days.

Barkley: That's correct.

Baker: I sent you nine questions which I've been using in this series of interviews. It's been a long time since you were at NCI, and so some of these may be actually not relevant here in your case, so please let me know that if you feel that way. And, of course, the first question deals with five or more of the most scientific results that were highly significant in the period 1950-1980, and indicate key scientists involved. Now, it's been a long time since you were there are NCI, so it's hard to recall a lot of these things. On the other hand, by taking so long, the things that stand out after this gap may add to the significance of the things that are recalled. So I know you are an engineering background and not biochemistry or something in that area, but do you have any impression of what

the key findings and the key leaders were?

Barkley: Well, I have my own sense of that. It was a very exciting time, and I, as is true for most science, the great discoveries follow the work and the contributions of many. And I think some of the most exciting things that I think truly benefitted from the viral oncology program during this period of time were both the increase in discoveries of viruses that can cause cancer in mammalian systems, but I think most importantly, it opened the whole scientific field to the use of molecular studies and looking how viruses interact within the cells they infect and how they infect them. And I think the tantamount success of that is probably in terms of the value of what we see retroviruses are today to science, and I would certainly put Timmons and Baltimore's work, although they were not major beneficiaries of some of the directed programs of the viral oncology program, but the gains that the program made scientifically provide the foundation for them to make the discovery of not only reverse transcriptase...

Baker: Baltimore did receive from the program, though, a sizable amount of the virus, which was useful in isolating the reverse transcriptase.

Barkley: Yes, he did. And I think it not only pointed out, from the standpoint of that how the program contributed to that, is that not only did the program develop the science that people built upon, but it provided resources that were clearly would not have been available had there not been the commitment within the Cancer Institute to make those broadly available to not only people within its intramural program, but its contractors and to other academic scientists. So I see that as one of the major benefits of it. I think the work that Bishop and Varmus did towards the end of that period were, could be related to

the great advancement in science during the viral oncology program. So I see it more in the collective body of science.

Baker: To go back earlier, though, nobody was interested in viruses and cancer before 1953, and Ludwig Gross first showed that cell-free extracts of leukemia could lead to inducement of new cancers, and nobody believed him for a couple of years, I think, and then his work was confirmed, and that's changed the whole outlook of the role of viruses. Also, you're right on the resources. Today, all sorts of things are available commercially which were not available at all in those days, and I agree that one of the major outcomes of the program was the resource development, and Dr. Stevenson I think played a key role in that, and Harvey Scudder earlier. So we can thank them for a lot of this. Do you think there are any other key administrative or management decisions that affected this field?

Barkley: Well, I think the decision that Dr. Endicott made when it became evident that Congress was going to support the viral oncology program as a special initiative--I guess it was, it used to be called viral leukemia program. He knew that science decisions and the network for the study of science decisions was going to take some time for excellent preparation, and he used that knowledge to take advantage of the initial funds that Congress gave to NIH to build a new building. I mean, his vision was that he could not ask scientists to take on a new field in a concentrated area that may involve new hazards without trying to prepare to assess those hazards as a continuing part of this effort. But I think it's not often that a leader at that level will see some of the possible adverse aspects of the whole new scientific discipline. He saw that and he went forward to ensure that if viruses were to be proven to be hazardous to man in the laboratory, that there would be a

safe environment in which this work could proceed. So he basically laid the foundation to continue that commitment to viral oncology even if hazardous situations were discovered in the course of this work. So I thought that was a very, very key managerial decision, and of course the one about setting up a superb resource capability was novel, at least within the NIH community, and is now the model for the development of strong commitments for resources for supporting the science.

Baker: I think we were all a little surprised with how quickly, when we got funds from the Congress for this special hazards building and cutting across a lot of the red tape because of the emergencies, possibly hazardous work that would go on, we got to building something much faster than what's normally done. That was partly Dr. Endicott's skill, too. And he always felt, though, that he wanted the building to be much more flexible than it finally turned out to be, partly because the staff ordered their own offices and, well, one of our geneticists, scientists, liked to live in the middle of his animal rooms, and some of those staff actions sneaked through and reduced flexibility. But the other reason for getting the building was the growing program needed more square footage of space, and this helped solve that problem, too.

Barkley: Well, it's interesting that the building did retain his wish for flexibility for part of it. You'll recall there was an open bay where some experimental laboratories were built around specific purposes and functions. There was a process laboratory that would receive human tissues from all over the world where scientists were attempting to isolate human cancer viruses, and this was done under high containment because the approach was to assume that you were going to be successful at your efforts of isolation. The

regular laboratories that supported much of the work of the intramural program also had some flexibility, but it appeared not to. They used cinderblock walls, which give you a sense of permanence, but, in fact, the way the slabs were done, you could tear the walls down and relocate them without the expense of having the movable partitions that would also be tight. But the permanence of appearance of a concrete-block wall did discourage interest in renovation, no question about that.

Baker: The third question we've pretty much covered, about your participation in this field. Is there any other activity you thought was particularly positive that we haven't covered?

Barkley: Well, I guess one thing that I think should be recorded is that Dr. Endicott also felt that as this program developed, as the viral oncology program developed, we should be in a position to support the work at other institutions where major discoveries might be made regarding the isolation of human cancer viruses, and particularly if they proved to be of high risk of infection for man. And so the biohazard program actually developed specifications and built a mobile viral leukemia laboratory that could be located at any university around the country so that a scientist, discovery could be continued and not curtailed because of the lack of such types of facilities.

Baker: How much use did that get?

Barkley: Well, it got--it did not get a lot of use. In ways, that's fortunate. The hazards did not really materialize in the virus cancer program. But they did--the facility did pay for itself in two important tasks it was given. Shortly after the unit was completed, there were the infections in Germany of an unknown virus that had resulted in the death of a number of physicians and laboratory technicians. This was the only trailer or facility that could be

provided to the Centers for Disease Control that was given the national charge to determine the cause of these mysterious infections among the laboratory community in Germany, and the trailer was dispatched to CDC in Atlanta, was put into operation, and within six months the Marburg virus was isolated in that trailer.

Baker: That's Marburg?

Barkley: Marburg. It's a virus of monkeys and causes a serious hemorrhagic fever.

Baker: Yeah. Very high mortality.

Barkley: High mortality. And that was--that work was accomplished because a trailer, a laboratory of high-containment capabilities could be moved anywhere, could be made available to them. The CDC had no laboratories at that time that could handle an agent as infectious as that and as lethal as that.

Baker: With respect to NCI grants and contracts, did the biohazards group impose the requirements of safety, or did you try to sell them on the need for it without looking like a policeman?

Barkley: I think clearly the latter. The effort was constructive, collegial, and collaborative. It was probably one of the first approaches to health and safety issues in a laboratory, in a science laboratory, that was not a regulatory type or a punitive type or an adversarial type. And I think the basis of that again stems from the way the leaders of the Cancer Institute structured this whole program, from Dr. Endicott down to his sub-science managers and support staff. We were all working together to bring about a success, and the biohazard component was an integral part of the science mission, and so we were partners rather than policemen. And it's that style and philosophy that I carried forward

in my career that brought me to be asked to set up the Division of Safety for all of NIH, and it's the same philosophy I use here at the Howard Hughes Medical Institute, having health and safety professionals become an integral part of the scientific team, drawing upon the judgments of scientists, many of whom were very astute at looking at issues of whether scientific experiments might in fact bring unusual risk to people. So it's a whole style, approach, of making health and safety an integral part of science that I think began during that time, and it endures today because of the success I think it had in the viral oncology program. And no one ever looked at us as that we were coming there to find reasons to shut down a lab. Everybody looked at us as being members of a team that were trying to find practical ways to enable research to flourish safely.

Baker: Very good. As you've noticed, some of my questions are a little bit loaded because I have a fair amount of knowledge of what went on in the past here. The fourth question deals with the main leaders who influenced the direction and course of events. We've touched on this. Anybody else comes to mind that were very influential, you think? And I go back to prior to 1972.

Barkley: There were wonderful leaders who emerged from this area. Dick Rauscher obviously, comes to mind as a person who is. These leaders, new leaders, had the benefit of being nurtured by strong scientists within the Cancer Institute, the noble ones who resided in the building… and who saw cancer viruses as a...

Baker: Of course, Ray Bryan was.

Barkley: Ray Bryan.

Baker: Pioneers...

Barkley: Was the pioneer.

Baker: Who persisted in viruses work before it was acceptable.

Barkley: That's right.

Baker: And he was in Andervont's biology lab, which Andervont did a lot on the genetic side. Did you have anything to do with Bob Huebner?

Barkley: Bob Huebner certainly was a strong force, always generating new ideas, always stimulating colleagues to just enjoy and benefit for science. Yes. And I can remember the joy that was within the Cancer Institute when they were able to wrestle it away from the Allergy and Infectious Diseases, so you could be unleashed totally.

Baker: Not quite totally, because I always compared him with General Patton, who would have taken all the gasoline in Europe if he could, so he had to sometimes say no.

Barkley: You are correct to correct me, because, fortunately, he was brought in to work with leaders who were strong enough to focus that enthusiasm and energy in ways that were very, very productive. Of course, Todaro, his colleague, did some very, very fine work. But it's also interesting to look at the way in which these strong scientists nurtured their younger colleagues. And if you look today at people who were leaders in the field, many of them really acquired their strengths through this program. I meant to jot down several names in particular, and I'm...

Baker: It's hard to remember names and dates when you look back.

Barkley: Vanderwood who had brought his lab from Plum Island to Building 41, then became the Cancer Institute's major scientific manager at Frederick and is now the director of a foundation sponsoring science today. Peter Fishinger clearly was among those who

grew. The president of Merck--his name escapes me right now.

Baker: You'll find that becomes more common as you get older.

Barkley: There are a number of key people that I think led and grew from those experiences.

Baker: How about lay members and political figures influencing this area?

Barkley: Well, you mentioned Ken's executive officer. I think there were a lot of lay leaders and non-scientists within the Cancer Institute who were...

Baker: I was getting outside the institute.

Barkley: I probably just knew of the people on the Hill who worked...

Baker: At your level, you didn't get directly involved.

Barkley: I didn't get directly involved in them.

Baker: But, obviously, Mary Lasker.

Barkley: Mary Lasker, certainly.

Baker: A prime example of a layperson who were very influential. Sidney Farber, while not a layperson, was a political figure in his skill in testifying. And so there were important influences in that direction as well. On the sixth question that deals with the resources, I think we've touched on that. It is amazing, now you can buy kits which allow you to do analyses in an hour which may have taken two weeks when I was at the NCI, and the variety of techniques have blossomed, not all of which started after the Cancer Act of '71. Many of these activities were already in being before that. I think the discovery that excision enzymes can split nucleic acids is the key finding that allowed you to do the sequencing work, which the viral oncology program was heading toward but didn't get onto the actual tools that allowed the analysis of the sequencing until the excision

enzymes became available. So I think that's a key thing. And then Varmus and Bishop finding that you had genes in normal chromosomes that had the same sequencing or practically as the virus that caused cancer. Those are the two prime examples. And I think the viral oncology program laid a lot of foundation for that and provided resources to move that way, but those findings actually, of course, took place outside the NCI, those two.

Barkley: That's true. But what I said earlier, at least I feel that in science that programs like the viral oncology program contributed more to science than what was just done by those who were a part of it. Science is a field that everybody benefits from, and I think that the program enabled discoveries that accelerated what we now know to be molecular biology that may have been delayed for a number of decades had it not been so much energy developed in that area.

Baker: Let's turn to the question of planning. The NCI was different, perhaps, from all the other institutes in utilizing systems planning, which, as you know, not every academic scientist is in favor of, believing that individual scientist should be free to do what he determines should be done. Actually, we turned to systems planning to develop budgets in which you had to look at different priorities and different relationships among the parts. So a systems diagram is a very useful tool in looking at these broad programs and considering and reconsidering priorities, which helps you then develop the budget request for the Congress. How do you see this kind of systems planning in terms of the viral oncology effort?

Barkley: Well, it's probably one of the early programs within the National Institutes of Health that

really began to think in those terms, and I think--and it was... I'm trying to think of the person who, along with you, that...

Baker: Carrese?

Barkley: Caresse, Lou Caresse. I think it was evident that when resources to support science became more prevalent, this type of planning became essential, and I think the Cancer Institute's effort demonstrated its value. I think it's not a predictive tool for when certain goals are going to be achieved and needs to be reassessed periodically as new discoveries occur, but I think it enables a large organization like the Cancer Institute to begin to see the fields of opportunity where more resources may be needed, and I think that is important. I also feel that identifying scientists who are unusually creative should be encouraged to follow their intellectual lead, too. So I think you need that cutting edge and you need that planning sophistication to go hand in hand.

Baker: Too many people, it seems to me, are seeing this as an all-or-none, do all of the supporting of the individual scientists and none of the planned, central, managed, targeted programs, and others thought the opposite. I always saw it as a combination. You need both. It's not a matter of one way or the other. Maybe we got acceptance broader by getting the participation of 250 scientists at the Early House meetings on going over the proposed goals and objectives and approaches and asking scientists to look at that and give us their input. You participated in the Early House meetings.

Barkley: Yes.

Baker: What's your impression of that as you look back at that experience?

Barkley: I look back at that as one of the most valued experiences in my career because it really--it

was a demonstration of the excitement that these fine minds had of the work that was ahead, and it was the way of fostering collaboration among scientists, not only in terms of planning efforts, but in the execution of science, and it was a wonderful experience. At Hughes, it's similar to that. We have these science meetings, not for planning purposes, but for trying to communicate science among our scientific community. I think you were strongly influential in seeing that this not be viewed as only a single approach, that it had to be not only planning for its value but it also was supporting the individual pursuits. And I can remember as the planning efforts looked at certain areas and its programs and its execution, they went out to try to find the best minds that could expand the particular field. But those minds were then allowed to be creative. So you had the best of all worlds in that. And I think everybody, to some degree, who were leading science as an institution looked to planning as a crucial effort, particularly the government agencies that have to get the support from the Congress.

Baker: Well, it seemed like to me that the scientific community was divided into thirds. One third were opposed to planning in any form; one third was, well, let's see what happens; and the other third was, why didn't you do it before now? And I was hoping that we can build an esprit de corps through such meetings, and, of course, it was planned that you would update, as you mentioned. And I think if we had continued with these meetings periodically, it would have helped build better esprit de corps than we had. But this sort of died by the wayside a little later. On the use of these meetings and collaboration, the viral oncology program, of course, sponsored a series of meetings, partly at Early House, partly in Hershey, Pennsylvania, and a couple of other places. These were meetings

where people freely discussed the current status well before publication, led to a lot of collaborations. Maurice Hilleman from Merck said that one of the main reasons he participated in the program was for the information he got at these annual meetings. And Bob Gallo, of course, continued this kind of meeting in the AIDS area, too. So these communication ventures are of considerable importance.

Barkley: Absolutely, absolutely.

Baker: Interesting question here. If you could have changed anything in the viruses cancer field as it developed, what would you like to have changed and how? That's not an easy question.

Barkley: Well, I guess the... There was an issue where some of the intramural laboratories in the program became dominant in their use of resources that the program was able to make available, particularly in viruses, quantities, and things like that. And I think we saw the tremendous expansion of specific laboratories, which I think allowed the science of the senior person of that laboratory to dominate the direction of that huge group. And I think it created tension, it created a competition that was not as healthy as I would have liked to have seen, and the feeling that resources were being captured by just several large labs. And I think I would have tried to, if I had the power at the time, to try to augment that somewhat.

Baker: Were you there when the vendor committee looked at viral oncology programs?

Barkley: I was kind of towards the end of my tenure in that area. I had set up, gone to the Office of Research Safety within the Cancer Institute at that time and was out of the viral oncology program itself. But I know that they were looking at that.

Baker: Because this apparently was one of the main concerns of the vendor committee that, as they put it, too much influence. Now, it's interesting. They didn't question the science. The science, they thought, was well done. And so to me it's a bit of an anachronism that you think the program was well done but we don't want it to continue that way. Now, did you mean other people besides Huebner when you were talking about certain intramural labs having undue influence, shall we say?

Barkley: Well, I think a lot of the programs were awfully large. I think clearly the...

Baker: Medniger had the largest block of funds in contracts. But Huebner..

Barkley: Huebner had the major resource area. And I think this criticism also continued...

Baker: We were talking about certain key scientists intramurally having influence over program segments which some people thought were too large, too much power in the hands of a few. You were talking about the various labs along these lines and how criticism was growing about this.

Barkley: Yeah. I think it started as size of the labs, but the command they had over the resources like the quantity of viruses that were available. And I just probably would have--maybe some… I don't think [?] had it correct in terms of his total criticism, but I think if one had the future vision, they may have tried to augment that a little bit along the way.

Baker: Let me pose another approach to this. We talk about fighting a war on cancer. In a war, if you're going to win, you've got to have generals whether you like them or not. A grants philosophy would be analogous to giving individual soldiers a lot of bullets without telling them which direction to fire the guns. So somebody needs to muster resources to solve problems. Huebner to me was one of the best, certainly commanding

resources, but using them for great benefit for progress in the field. It may well be we needed a lot more situations like that, not fewer, where you got real strengths, and many of the outstanding scientists, if they were good at handling bigger resource issues and staff, might be even more influential in their results than the individual-grant type of approach. So I wonder where we would be if we had more acceptability of that kind of thing instead of raising the issue of fairness. Fairness is a good block for a lot of progress.

Barkley: Well, I don't know what's between the two. I don't think the grants mechanism in itself is, from a total point of view, is the best model for accelerating science in certain areas, but the grants program has a lot of criticism because the feeling is it biases towards short-term success, and so people are basically saying that they're going to do on their proposals what they know they're going to be able to accomplish, so it really kind of takes away the creative experimentation and the efforts that may require long-term commitment to bring about. So it's...

Baker: I'm not sure we got a better mechanism for funding, creating research in individuals with no central control, and I'm certainly as much a backer of that as I am the use of contracts. You need, again, both. One problem in grants is it's mostly geared to particular disciplines and is not geared well for using multidiscipline collaborations that are necessary for solving some problems in cancer. And so, again, you need both. It's not an issue of one or the other.

Barkley: No. I think you do need both, but I guess the--I think the mechanism that's used at Hughes has value in what it attempts to do is to identify high-quality scientists, including

young scientists who have demonstrated potential to be the, I use the term generalists of science, supporting them and letting them run without the time-limit restrictions.

Baker: I think you've used a pattern of NIH to some extent, but you've put a lot more resources behind the selected individuals, I think, than the usual grant system does. Is that correct?

Barkley: That's right. I think they get more resources to some degree. They probably don't get the resources... I mean, obviously, there are others who are supported on NIH grants who have clearly much more resources. But I think what it has done is it provides an opportunity for a much, much longer time of support without...

Baker: What is the average length?

Barkley: It's basically five years.

Baker: In the Ludwig Institute, we moved to six years.

Barkley: Okay. So you understand that, and basically they're not putting in proposals and they're not--and they're basically being selected on their demonstrated ability, as judged by their peers, as being superb scientists.

Baker: How do you handle construction needs?

Barkley: Well, when a new investigator is appointed, they are basically fully equipped with the equipment that they need to be excellent scientists, and their space is generally renovated to meet their needs.

Baker: So the parent organization has to supply some space, but Hughes would renovate. That's the way the Ludwig Institute...

Barkley: We renovate the space and then we pay them a fee for the space that they have.

Baker: Yeah.

Barkley: We have built buildings where or contributed to buildings where we have a large contingent, and then, but we deed the buildings to the university that used the space, so that's worked out. But we also look at areas where, much as the Cancer Institute did, where it looks like a discipline or collaboration is being not fully developed because of lack of resources, lack of support for talent. And 10 years ago, we decided a major area of support that the Institute would contribute to is the area of structural biology, and these are very expensive activities because of the equipment that's used and lines that need to be made available, and so the Institute contributed the building, and Dean Lyons brought in a whole new group of investigators in structural biology and supported them well, and we've seen a great acceleration in this field. So it's another strategy that has similarities in terms of the viral cancer program because it was trying to develop, it was trying to bring competent people into an area that focused towards a particular area of science. So there are different models that are available in that regard. I think the Institute has found that it has tried not to construct large laboratories; I mean more to laboratory groups. It's tried to give its focus on the independence of investigators, and so our laboratories don't even approach those of the size of the …or things like that. We let them... But we build collaboration and we build on, we encouraged meetings that you all had as well, really. We try to make it easier for scientists to be removed from the bureaucracy of having their work supported to just being free to explore.

Baker: Let me turn now to the Cancer Act of 1971 that President Nixon signed into law on December 23, 1971. If you go back and look at the hearings that Congressman Rogers had and you listen to some of Mary Lasker's and Sidney Farber's pitches, there was more

concern about delivery of health care in cancer subjects, and I wouldn't say less interest in research, but at least bringing into the game healthcare delivery in addition to research funding, and we ended up in the new law with the cancer control program being brought back into the Cancer Institute, which introduced healthcare issues and introduced far greater numbers of activist groups than we had when the function of the Cancer Institute was, shall we say, all research. Do you have any comments on the effects of this?

Barkley: I don't know that I can comment on the effects of that because I was more related to the pure research effort that was underway. I think my perception is that it's the--it has more of a troublesome element to it than a positive one in terms of science and what science can do to prevent or control disease, and I think that becomes--because the people want the end product right away, and so the cost of healthcare delivery is so phenomenal that I think if that side of an agency's responsibility exercised dominance, that the ability to do research that may further the cause of the nation in terms of controlling disease would not happen.

Baker: This is why I was really not in favor of cancer control being brought back. I thought we had our hands full with research, and you would dilute the research effort, in a sense, by having to spend so much time on healthcare delivery problems, which this nation has not yet solved anywhere. And the activist groups have been a growing concern. I went to a meeting of the National Cancer Advisory Board, and we had--well, even the first meeting, about 200 people in the room, it was sort of a circus-like atmosphere, which you had so many activist groups represented, sitting in on the meeting, and not too quiet always. But, of course, you can live with it. It's a different world. You have to…I think

it seems to be doing fairly well with this.

Barkley: Well, I think they're trying to control it. I think there certainly is an important role of the research agency to be a part of science communication, science education. We need to understand that the goals are not, remain unachieved not because we're not providing money into healthcare, but because the science hasn't really solved those problems that would make healthcare a reality in some of these areas. But I think the way the Cancer Institute has handled it, it has increased public awareness of what is meaningful today, and what our challenges are and what we don't know and why we need to do research. And I think the activist groups that are disease oriented have been helpful in certainly getting the Congress to feel a little more comfortable about increasing the budget of NIH. You need to have that element there, but I would think placing the healthcare delivery *per se* is unfair to be placed as a responsibility of a basic-science enterprise.

Baker: How do alternative medicine activities look to you at NIH?

Barkley: Alternative medicine has the same problem. If it is run by activist groups, it will fail. If alternative medicine is looked at as opening opportunities for support of science initiatives that are not in the mainstream, I think there might be some value because, after all, some of the greatest discoveries in science have come serendipitously. But I think--I don't think that you will ever have that if alternative medicine is just to try to prove the value of protocols that a lot of people say ought to be investigated. I think there needs to be some--we cannot adhere to the standards that have been used in the past of when one should be at a point of looking at research therapies.

Baker: Well, certainly things have changed under the label of nutrition, the number of items now

sold, which supposedly are not drugs but are nutritional factors. But they're sold because of the drug action, not because of nutrition.

Barkley: That's right.

Baker: And they haven't been tested for safety in many cases.

Barkley: Today we're seeing...

Baker: So I agree with you. I don't object entirely to the alternative medicine group at NIH providing they do some decent trials and rule in or out the value of some of this stuff that's being sold. But it's overwhelmed, almost, by the commercial aspects of all this. Fortunately, it hasn't been dominant yet. But these extremists are, I think, bad on either end of the spectrum, but that's all part of the game.

Barkley: And I don't think that's going to improve until science education in this country improves.

Baker: Yes, I agree.

Barkley: And I don't think it's the burden of the National Institutes of Health to do science education, though we've got--somehow, science education has got to become an integral part of this nation's intellectual growth.

Baker: Yup, I agree. Any additional comments you'd like to make?

Barkley: I very much enjoyed the opportunity to talk to you again on this subject, and I look forward to having your work completed so that others can benefit from what I think was a wonderful initiative on the part of the Cancer Institute and one that may not have solved the cancer problem, but certainly accelerated the growth of scientific knowledge in which we're seeing new opportunities where this might be a future reality.

Baker: Well, in following your career, I think the Cancer Institute made a good decision in sending you off for additional training. It's paid off very well. So, thank you very much.

Barkley: Same to you.

Baker: This concludes the interview.

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