U.S. NAVY MEDICAL DEPARTMENT ORAL HISTORY PROGRAM

ORAL HISTORY WITH DR. SAM T. GIBSON

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Interview with Dr. Sam T. Gibson, World War II Navy physician. Dr. Gibson was a researcher in the development of serum albumin.

What was your background before the war?

I went to Georgia Tech for 4 years and graduated in chemistry. While I was there I was in the ROTC program and elected the Navy. I therefore got an ensign of the line commission when I graduated.

I then attended Emory Medical School and graduated in 1940. I applied and was accepted as an intern in internal medicine at Peter Bent Brigham Hospital, now Brigham and Women's Hospital, in Boston. I went there in June 1940.

About January or February of '41 I began getting letters about going on active duty as a line officer. I went to the naval district headquarters there in Boston and told them I intended to spend the rest of my life in medicine. What could they do to get me transferred from the line? They told me to change my home address to Boston and they could take care of it. I did that and got a lieutenant j.g. commission in the Medical Corps.

I then received other letters about going on active duty. I asked for 6 months delay because I had just gotten through the preliminary part of a 15-month internship and I had hardly been on the ward very long. I did receive a 6-month delay.

In October of '41 I went on active duty. Dr. Edwin Cohn had been working on his plasma fractionation program and wanted to do tests on patients. I think Dr. Cohn got permission from the Navy

to get two "jaygees" assigned to his lab. I and Dr. Lorande Woodruff were the ones assigned. Dr. Woodruff, who also became my roommate, was a surgical intern from Yale. Actually, we were assigned to the Naval Hospital at Chelsea with TAD at Harvard to Dr. Cohn's office. A Dr. Weiss was the professor of medicine at Brigham and we reported to him.

What was Dr. Cohn's title?

He was just an ordinary full professor of chemistry. Later on he got one of the title professorships. Dr. Weiss died in January 1942 and Dr. Charles Janeway, a pediatrician, took over the responsibility for coordinating the clinical trial of the albumin.

Dr. Janeway supervised both of us.

What kind of man was Cohn?

He was what you would call a character. Cohn was born in Savannah, GA, and his father was a tobacco importer in New York. I can't recall whether Cohn went to Yale or Harvard but he did not go to medical school. He got a Ph.D. in chemistry and went to Denmark for a year. There he worked with a distinguished chemist and then came back to join the Harvard faculty.

I guess it was in the late '20s when it was discovered that liver extract treated pernicious anemia. The discovery was made with feeding people liver. They had to eat it several times a day. Cohn worked on making an injectable liver extract and, in the early '30s

when the Nobel committee recognized the treatment of pernicious anemia, they awarded it to three people, Mino, Murphy, and I can't remember the third. Cohn was not named. And, of course, what made it a workable product was that it was injectable instead of edible. And Cohn never got over that and was frustrated in not being recognized.

So you think his motivation for working on albumin then was because he had been slighted for the Nobel?

Yes. I'm sure he had the Nobel in mind when he did the research on albumin. He was also someone who believed in doing chemistry correctly. When he set up a system to use chemicals, he worked out the best way and maintained exacting standards.

Plasma had been used since the late 30s, hadn't it? What was special about albumin?

In 1940 there was a plasma program for Britain based in New York. It worked for several months and the doctor responsible for that program was Dr. Charles Drew. What's seldom mentioned is that not a drop of that plasma was ever used by anybody.

When the Army and Navy were getting ready for the war that looked inevitable, they reactivated Dr. Drew's collection center in New York. Then the Red Cross decided to set up collection centers.

So the plasma program was already underway by the time World

War II broke out. Plasma, as I understand it, was used during the early stages of the war. But there was something special about albumin that made it superior to plasma. What was that?

Dr. Cohn's program was premised on his idea that albumin would be more desirable than plasma for several reasons. Albumin was responsible for the osmotic effect of plasma and was the protein that drew most of the fluid from surrounding tissues into the bloodstream when it was administered for shock. It would also be possible to utilize other byproducts of the fractionation process--the like fraction 2--which had antibodies for other purposes.

The albumin was put up in a 25 percent solution so that 100 ml of 25 percent albumin--one unit--produced the same effect as a 500 ml bottle of plasma.

So then there was an economy of volume. A corpsman could carry a lot more albumin and get the same effect as a larger volume of plasma.

Five times more. The albumin was also in solution whereas the plasma was a powder and required a bottle of water to reconstitute it. You therefore needed more volume of space than the bottle of albumin.

So with both plasma and albumin, the theory was when an individual lost a large volume of blood and went into shock, the blood vessels would collapse. With the infusion of plasma, you would

increase blood volume to counteract this. Albumin did the same thing because the osmotic effect would drew fluid from the body to keep the blood vessels patent.

Exactly.

Would it be correct to call it serum albumin?

Yes, that was the name--"normal serum albumin (human)" because they were also working on "normal serum albumin (bovine)." The aim of the latter was to have the bovine source and eliminate the need for human donors.

You were working in Dr. Cohn's program when Pearl Harbor was attacked. What are your recollections of that?

As I said, Dr. Woodruff and I started in October. We contacted the emergency rooms at Boston City Hospital, Mass General, Beth Israel, and Brigham. We got an apartment and left our phone numbers with the emergency rooms so we would be called whenever they had someone in shock. We then would take some bottles of albumin over and administer it. Then we'd measure blood pressure and hemoglobin response to the albumin.

Dr. Cohn invited Dr. Woodruff and me to have Sunday brunch at his house on December 7, 1941. We went out Saturday night to a party and got terrific hangovers. Then the next morning we went to Dr. Cohn's house. That was the last thing in the world we wanted to do.

So you were hung over from the night before when you got there.

Right. I sipped for an hour a small glass of vermouth. We not only had a regular brunch, we had some sort of gooey custard dessert. Neither one of us ate very much that day.

I took Lorrie to the apartment so he could go to bed. And I had a date with someone. And after I had left him, I turned on the radio in the car and that was my introduction to Pearl Harbor. This was about 3 or 4 o'clock on Sunday afternoon of the 7th.

What was your first reaction to that radio news about Pearl Harbor?

I stopped at the corner drugstore, called Lorrie and said, "Wake up. We're at war!" So he did, and I went out on my date.

What did you do the next day?

We went to Brooks Brothers because we had just one uniform at the time and had been wearing civilian clothes. We needed another uniform and an overcoat.

How did life change for you at that point?

Very little, except it was easier to get people to test the albumin on.

Would you have tested more than one patient a day?

Sometimes. Sometimes we had none. We started with Lot 9 which

was experimental. I think there were something like 80 cases that we reported on in January 1942. As the contracts were activated by the commercial fractionators we would test every lot.

Didn't the Red Cross blood drives give you a lot more blood to work with?

Right.

I understand the albumin didn't really see a lot of use in the field until 1943.

Yes. In October of '41, when we went to Dr. Cohn's to test the albumin, we used Lot Number 9. That's how many lots he had made experimentally. So there wasn't a lot of albumin on hand.

Right after Pearl Harbor, the professor of surgery at the University of Pennsylvania, Isidor Ravdin, had taken a bag full of albumin units and flown to Hawaii to treat the survivors of the attack. When he came back he gave a very glowing report of albumin's benefits to the burn victims. It was on the basis of this report and on the basis of 80 cases we had done from October to January that helped persuade the National Research Council to approve albumin in January 1942.

Then there was a question of letting contracts for commercial preparation. There were something like seven companies that expressed an interest in it and were eventually approved. They had to set up their labs under Cohn's supervision. They had to

accumulate the plasma, fractionate it, and run it through all the tests, which took time so there wasn't a lot of serum albumin all during '42. That's why it wasn't used until '43.

What companies were involved in producing the albumin?

Armour, Sharpe and Dohme, Hyland, Cutter, and three more.

You would get a batch of albumin manufactured by one of these companies and test a sample from the lot. How much of a sample did you get to work with?

I don't remember whether it was one or two units because we almost never rejected any. During World War II all the commercial fractionators had to come to Cohn's lab and be trained. So it was a small group of people who all knew each other. Cohn kept a hand in the testing at the chemical end for consistency and so forth.

The Army and Navy had two men working on this, CAPT Lloyd Newhouser, MC, of the Navy and Douglas B. Kendrick. He eventually ended up as a major general in the Army Medical Corps. These two worked on the contracts for dried plasma. Plasma was being prepared all during this time. As we got more albumin both Kendrick and Newhouser tested it in their respective hospitals.

I think it was in a North Carolina hospital that they had an unfortunate experience. They administered the albumin too quickly and it created such pressure that it burst one of the ligatures in the patient and the patient died. Kendrick then decided the Army

wouldn't use albumin.

Was it the speed with which it was infused or was it the volume that caused the problem in this case?

I know absolutely nothing about the case, but my personal opinion is that one of the ligatures was faulty and slipped. The blood pressure had been restored successfully.

So it wasn't a problem with the albumin. It was a problem with the surgery.

Well, Kendrick blamed the albumin. The fact that albumin has been used successfully in several wars shows there was nothing wrong with the product.

How much human blood was required to make a single unit of albumin?

I think something like 9 or 10 units of blood but I'm not sure of that at all.

Once there was a demand for albumin, the biggest problem was finding human donors for the blood.

That's right.

You needed so many human donors in order to obtain enough albumin that they decided to go the bovine route. How did that come about?

You really should talk to Dr. James Heyl because he was the sole tester of this. He was still alive at Christmas last year.

Was he affiliated with the Navy at all?

Yes. He was a naval officer and went on active duty in the Pacific later.

I understand there were problems with the bovine albumin.

First they tested about 80 medical students and didn't find a problem. Later they found some who reacted when they ate beefsteak. Then they tested it on a larger number of people. Dr. Heyl went to several prisons around New England and got permission to test prisoners to see if they turned up anyone who was allergic without having received it. Dr. Cohn, Dr. Janeway, Dr. Heyl, Dr. Woodruff, and I went along. We went to Norfolk prison in Massachusetts. There were something like 900 prisoners there. Cohn, Janeway, and Heyl talked to the assembled group and got about 90 percent volunteers to be tested. Dr. Heyl gave about 40 people intravenous bovine albumin. One of the recipients died in the first week after receiving it.

Was it a reaction?

Yes. The decision was made to stop testing, although Cohn had one lab continue to try to refine it to see if they could get rid of whatever might be creating the allergy. The professor of surgery

at the University of Minnesota continued to use the bovine albumin all during the war. He had allergic reactions but no fatalities that I can recall.

Were you ever able to pinpoint the element in the bovine albumin that caused the problem?

No. It was recrystallized five to ten times but the element was never found.

But most of the albumin used in the Pacific was human?

All of it was. There were no military contracts for bovine.

Isn't there a difference in the reaction of a patient to albumin versus the reaction to receiving whole blood?

Yes. Unlike whole blood, albumin has no oxygen-carrying red cells. But the osmotic property of plasma and albumin improved the circulation.

What was the mechanical procedure for processing a unit of albumin?

Dr. Cohn took a batch of plasma and added 5 percent ethanol. That precipitated Fraction I. He then adjusted the chemical milieu by adding more alcohol and got Fraction II, III, IV, and V. Albumin was the fifth fraction, Fraction V.

Didn't you need an enormous amount of human plasma to get that Fraction V?

Yes. But the other fractions were available for use where they were needed as opposed to wasting it by putting it into somebody in shock.

What would Fraction I have been?

Fibrinogen. When you separated out II and III together, that was gamma globulin which was for prevention of infectious disease in children. He never found a good use for IV. And V was albumin.

Was separating plasma from whole blood a centrifuge operation?

Yes.

Then once you had the plasma, you had the raw material for the next stage which was a chemical-induced fractionation.

That's right.

How was the albumin stored and shipped? Wasn't it in bottles?

The albumin was stored in double-ended bottles with stoppers at either end. Each bottle was enclosed in a tin can along with the apparatus for its administration. You opened the can with the attached metal key, removed the bottle of albumin, and then inserted the air filter needle through the top rubber stopper to provide an airway. Then you inserted the needle of the intravenous set--which

included rubber tubing, a filter, and an intravenous needle--through the rubber stopper at the opposite end. Then you were ready to insert the needle into the patient's vein and begin administering the albumin.

The albumin was already in a 25 percent solution. That was Cohn's big selling point. He found that 25 percent was acceptable to the bloodstream.

How big were the cans?

About 4 inches high and about an inch and half in diameter.

So you started with the three-stage approach, you had plasma, which was certainly an improvement of what was available. Serum albumin was an improvement over plasma because of its osmotic quality and the fact that it provided other benefits. And then the third stage was the whole blood itself. Once that was available, didn't it supplant the other two?

To the extent it was available.

With the whole blood, I understand there was a very rigorous regime as to how the blood would be packed in ice and shipped. Did they use dry ice?

No. Regular ice because dry ice would hemolyze the blood if it got it too cold.

Without something like glycerol added, the red cells would freeze and be destroyed.

That's right. The whole blood was shipped from San Francisco to Hawaii and there the ice was replenished. From there it was distributed to the front.

Your role in all of this began as one of the original experimenters with serum albumin and then changed to one of quality control, the man who ensured that each lot produced came up to Dr. Cohn's standards.

Yes. Newhouser was also doing that. He was at the Naval Medical School in Bethesda. In August of '43, Newhouser needed someone else and so I transferred from Boston to his lab.

How many people did you have on your staff at that time to do the testing of the lots?

There were the two of us, Mary Sproul and me.

Did you do the testing on patients at the Naval Hospital?

We did some, but most of the patients were in DC General, which was called Gallenger Hospital at that time.

How did your career move through the war?

I worked here at the Naval Medical School from '43 to '46.

Did you stay in the Navy?

Yes. I stayed in the Reserves for 20 years and retired as a captain. I had 3 months terminal leave at the end of my active duty. My wife had 25 first cousins scattered around the country. We had met and married in '42. So, we drove around the country from New England to Florida to the West Coast and back. We spent a month in Mexico as far as the highway went and then went back to Brigham. My objective was to take the board for internal medicine. I worked at Brigham and got my boards.

In '49 Admiral [Ross] McIntire, who had retired from the Navy and was head of the Red Cross Blood Program, talked me into coming back to the Washington area to be in the blood program. So after about 5 or 6 years, I became head of the Red Cross Blood Program and was head for 10 years.

I left the Red Cross and went to NIH (National Institutes of Health) to the Division of Biologics Standards and worked with the Director. In '72 somebody downtown transferred this unit to the Food and Drug Administration (FDA) and all of us went with that transfer. I then worked with the FDA until '89 and retired then.