Dr. Andrew Baines

Dr. Baines MD, PhD, FRCPC, is a professor emeritus with the Department of Laboratory Medicine and Pathobiology at the University of Toronto. Formerly, he was Biochemist-in-Chief of the University Health Network, Vice-Dean of Medicine (Faculty of Medicine, U of T), the Principal of New College (U of T) and the Chair of Clinical Biochemistry (U of T). He is currently the coordinator of the Augusta Stowe-Gullen stream of the ground-breaking ONE program at Victoria College. In his research roles, Prof. Baines' interests included ascertaining the fundamentals of kidney function including fluid electrolyte transport, catecholamine influences, and functional effects of renal oxygen delivery. Latterly he investigated hemoglobin based blood substitutes as an alternative medium for transfusions.

Interview conducted by JULS

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JULS: Why did you choose to study life sciences?

AB: I was drawn by the diversity and the fact that it dealt with life. I was accepted into math, physics and chemistry, as well as pre-med. It shows a certain ambiguity into my thought processes at the end of grade 13, but my recollection is that I flipped a coin. My judgment in retrospect was that I was probably balancing risks and saying, if I'm going to become a productive scientist in math, physics and chemistry, I've got to be really smart and really good in math, and my chances are fairly low. The other reason I chose medicine was the association with the humanities, dealing with humans and being part of a long tradition of working with humans, health and disease.

JULS: That takes us to our second questions, why medicine?

AB: Prof. Baines: For many of the reasons I went into life sciences – it enabled one to be part of a long but evolving tradition, which dealt with human achievements, suffering and enabled one to provide some help in this.

JULS: Your major clinical interest was nephrology – why did you choose this particular specialty?

AB: There were a multiplicity of reasons in that. One was a fascination with the structure, at the nephron level, where you could see the incredible architecture of the kidney – I loved the way it looked under a microscope. I was also fascinated with the way it worked, although we didn't really know how it worked back when I was a medical student. Next, when I was doing my internship, I was frustrated by our ignorance when it came to managing problems associated with fluid balance, blood pressure and so forth. I was inspired by a very effective clinical teacher, by the name of Abe Rapaport, who was an internist, as nephrology wasn't a sub specialty at that time yet. He was very interested in laboratory medicine and diagnosis, and captured my interested with trying to understand fluid electrolyte balance, regulation of body fluids, pH, blood pressure and so on. At the heart of all these issues was the kidney. Lastly, a family member also had kidney disease. With the advice of Abe Rapaport, I went on to do a master's degree in what was then called clinical biochemistry. The Department of Clinical Biochemistry was the only one that was both clinical and research based at that time, and is now the Department of Laboratory Medicine and Pathobiology. I did my masters with a supervisor who was an expert on the kidney. When I got there, I was put in charge of teaching the medical students clinical biochemistry, which was one of the major third year courses that had

both a lecture and laboratory component. As a graduate student, I was initially in charge of the laboratory. Eventually as I became more knowledgeable about the kidney, I became responsible for teaching the kidney lectures when my supervisor decided to go to Africa and become a dean of medicine in Nigeria. He toddled off leaving me without a supervisor, and at this point I was engaged in my PhD. I then found myself practically acting as my own supervisor, because there was no one else in Toronto who knew anything about the kidney at the level of research I was doing. I was actually working with another supervisor who was a specialist in liver function, so that was interesting. Through this experience, I discovered that I enjoyed teaching and seemed to be reasonably good at it.

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JULS: Let's talk about your early work. When you first started working in the life sciences as a PhD recipient, what were the first things you began looking at?

AB: This is actually really amazing and sad. I worked on the mechanism of recovery from acute injury. To do this, I would use toxins, which attacked the lower part of the proximal tubule, and then study the regeneration of cells using enzyme biochemistry, which was in its infancy at that point. What came out of that was a PhD thesis and at least one paper, but also a fascination with how the structure of the kidney influenced its function. During this time, a colleague and classmate who was working at SickKids and doing her PhD there, was associated with a pair of twins, who were subsequently diagnosed with Bartter syndrome. I initially got the biopsy material from those twins before any diagnosis of the syndrome could be made, and saw fascinating evidence about changes in enzyme distribution in the kidney, which pointed to a defect in the distal tubule. Unfortunately, I never pursued it any further – if we had done so, we would have gotten to an understanding of the biological defect in Bartter syndrome much sooner than it had occurred. I missed the opportunity because I was focused on writing my PhD at that point, and said, 'Well, these are very interesting, but I've got to finish this PhD', rather than going ahead and exploring this serendipitous result that I had been given.

JULS: That's very interesting, almost all of the professors we've spoken to over the past few years have touched on serendipity. How did you get into researching haemoglobin-based blood substitutes?

AB: That came much later in my career. I was really interested in looking at how the structure of the kidney informed the function – I did a lot of work looking at structural functional changes at the level of the nephron, tubule, and brush border. The technique that I used was micropuncture, which interested me because I was able to work with a living kidney in a living animal, see how the nephrons within the kidney actually functioned, manipulate them and induce interesting effects. This led to a desire to have an even more controlled circumstance, so with the help of a colleague at Oxford, we developed an isolated perfused kidney system. That's where I got into the blood, because I discovered at that point that if you were doing an isolated perfused kidney, you needed something that could provide a good oxygen supply, but not get mashed up by circulation pumps as red blood cells would be. The colleague I was working with was looking at toxic effects of conjugated hemoglobin molecules, where I would look at their effects on the kidneys. That's what led to us working with a hemoglobin based substitute.

JULS: It's funny that you mentioned that, because there is currently a revival in the blood based substitute industry, in order to find ways to preserve transplant organs.

AB: That's some of my work, looking at the metabolic needs of isolated perfused kidneys, so we were actually working on a system that could be used to look at maintaining perfusion to transplant organs. The hemoglobin based blood substitute industry was initially driven by the United States military, because they wanted a blood substitute that could be easily used on the battlefield without the need for refrigeration or cross-matching. They had a very intense interest throughout the late 60s and early 70s. Then, they discovered the bloodless war, where Americans don't get hurt, so they lost interest – the funding then came from commercial companies. The idea was that this would be the panacea for all blood substitutes – we'd get over the problem of infectious diseases from donated blood being transmitted and so on. It didn't pan out, and didn't work as well as it should have and there's a whole long story about that. Though that died out, it always struck me that the preservation of organs was going to be something that needed to be done, but it was too early for it to happen while I was working on it.

JULS: On a different matter, you are the coordinator of the Stowe-Gullen stream of the Vic One program. Could you tell our readers what this is?

AB: It is a pair of courses, part of the Vic One program, which are designed to provide first year students with a challenging base and background for the area or discipline that they hope to pursue as an undergraduate and possibly in graduate studies or professional school. It provides a background for people who want to go on in the life sciences and/or professional schooling in the sciences.

JULS: What is special about this program, professor?

AB: What's special about Stowe-Gullen is that first of all the students who are there are prepared to meet a challenge, and come in knowing they are going to be challenged. They are students who, while interested in the life sciences, have a much broader sphere of interests. I think the majority of them also have an interest in the effective use of language and communication. You can find all sorts of wonderful things, but if you can't communicate them, they're useless. If you want to keep in a highly competitive field, if you want to keep funding for the sort of research that you're doing, then you're going to have to communicate not only with other scientists, but also the government, industry, and the general public.

JULS: Switching gears now, you held the positions of Biochemist-in-Chief, the Principal of New College, and the Vice Dean of Medicine.

AB: While I was at New College, I was working at the hospital in biochemistry for 10 years. I was chair of the department, which became part of the Department of Laboratory Medicine and Pathobiology. I was actually involved with the undergraduate educational program of clinical biochemistry, which is the basis of the LMP program now.

JULS: On this note, how exactly did you become the heads of these departments?

AB: I guess nobody else was around at the time, I don't know! I've made no major discoveries, missed at least one, but I've always been fascinated by the aesthetics of life. I'm obviously very interested in teaching, which I began as a graduate student, and continued when I was involved with the structuring of the medical curriculum as chair of the curriculum committee. I was always involved with medical and graduate education, and also in arts and science teaching, even as a graduate student. Later, when I came back first as an associate professor, I had taught 4th year and 3rd year courses in arts and science, and I had very great interest in the selection of medical students and design of the medical curriculum. That got me interested in New College, which saw itself as being an arts and science college with a professional bend to it. How I got to be the Biochemist-in-Chief – I guess there weren't that many other MDs – I did have some clinical practice up until I became Vice Dean, so I was seeing patients. I represented something unusual within the clinical biochemistry department, in that I was a researcher, a teacher and a clinician.

JULS: To conclude, what advice do you have for undergraduates today?

AB: I should preface my answer by saying I was born basically with a silver spoon in my mouth. I was born when universities weren't flooded, so my experience cannot be repeated by anybody anymore, and relatively speaking it was easy to do all these things. Since university populations were expanding, the need for professors was exploding, so you could pretty much do what you wanted to to an extent that's not possible now. I was lucky to always be funded up until I shut my lab down in 2006 – I usually had 2 technicians, 1-3 graduate students, and an occasional post-doc. Now? It's much harder. The research now is very much a team process. It's big business, you can't do it on a shoe string. If you're going to do it seriously, you've got to do it in a big way and you've got to have a lot of collaboration, teamwork. I guess what you need if you want to be successful in this, is the capacity to work with other people and also to be a leader. Young people who are looking for that challenge should take every opportunity they can with working with others and leading those enterprises and teams. One thing I think possibly helped me was that I was captain of the UofT rugby team for 3 years. You have to learn how to work with, and ultimately guide people in the direction that you think will be useful. There are certain life skills that go along that aren't in textbooks and journals, and they are going to be very useful. You've got to be very persuasive in selling yourself, so you get the positions to start with, and then selling your ideas so you get the funding. There's a lot of salesmanship involved, and you've got to really understand the subject, and you have to be imaginative. You've also got to be prepared to make use of the serendipitous events that happen to you, prepared to change course, change emphasis and not get stuck in a rut.

JULS: Thank you very much, Professor!