A Theoretical Solution for Ventricular Septal Defects And Pulmonary Vein Stenosis

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January 28, 2013

1 Introduction

Ventricular Septal Defects (VSD) [1] and Pulmonary Vein Stenosis (PVS) [4] are both normally non- life- threatening problems for survivors of early childhood. However, it can be a large hindrance to many patients who want a normal life. With this proposed solution, patients should be able to achieve a life mostly free of problems. Hopefully, only regular check-ups will be required after the initial treatment.

2 The Problems

VSD and PVS are rather complicated problems, but an attempt will be made to explain it in uncomplicated terms. First, a VSD can be described simply as a hole in the heart that connects two chambers (not an external hole). PVS is a term describing a smaller than normal pulmonary vein (the vein that takes blood from the lungs back to the heart).

3 The Combined Approach

The proposed treatment is combination of two techniques on the forefront of medicine. First, a series of nanorobots will be injected into the patients bloodstream and will prepare the site for placement cells. Next, a series of synthetically designed cells will be injected into the patient, slowly curing the patient over a period of months to prevent shock to the patients heart.

4 The NanoRobots for VSD

Nanorobots are present in many science fiction movies. However, technology has come to the point where this can become a reality. The job of the nanorobots is relatively simple. When injected, they begin by floating to the blood stream. When the robots reach the heart, using a networking algorithm called Boids[5], they will find the defect in the wall of the heart. They will attach along the edge of the defect and each will signal that they are ready (For renderings of the gripping point, see figures 1,2,3). When the algorithm determines that they are fully coating the hole, they will emit a special RFID signal, allowing the physician to know when it is time to inject the cells.

5 The NanoRobots for PVS

Once the signal is received, a mixture of cells (more on that later) and more nanorobots is injected into the patient. These new robots will flow through the bloodstream until they arrive at the pulmonary vein. At this point, the robot will puncture a small hole in the vein. This hole will allow the robot to access the outside of the vein. Due to the pressure from the vein, a quick patch will need to be applied to prevent excessive blood loss. After the robot is on the outside, it will begin synthesizing a artificial second layer of the vessel wall. This second vessel wall is composed of a structure similar to plastic that permits cells to grow on it like a vine. This scaffolding then decays once cell growth has started, permitting no artificial objects to remain in the body. Once this second layer has been applied, a small hole will be made allowing the nanorobot(s) to access the original cell wall. The robot will proceed to remove the original cell wall once the artificial larger one has set properly. This artificial cell wall will be designed to encourage growth of a larger natural cell wall, allowing the artificial one to decay after a period of time.

6 The Cells

Synthetic biology is also a new and fast growing field. The main premise of synthetic biology is to use genetic engineering techniques to provide a host cell with new abilities by injecting DNA into the host cells. After a cell has divided once, the cells used in this proposal will harden when they come in contact with a activator located on the nanorobots (see figure 4). They will then proceed to divide and harden, filling the cavity but no more than that. It is crucial that the nanorobots completely encircle the site so that a group of cells does not go "rouge" and create a growth in the heart.

7 Conclusion

While some of the technology referenced in the paper will take some time to develop, we are getting closer every day. This is the era of biological printers [3] and nanorobots that can enter the bloodstream[2]. One day we will hopefully reach a cure for this and many other medical problems using synthetic biology and nanorobotics.

References

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[4] "Pulmonary Vein Stenosis Program." About Pulmonary Vein Stenosis. N.p., n.d. Web. 23 Jan. 2013.

[5] Reynolds, Craig. "Boids (Flocks, Herds, and Schools: A Distributed Behavioral Model)." N.p., 6 Sept. 2001. Web. 23 Jan. 2013.

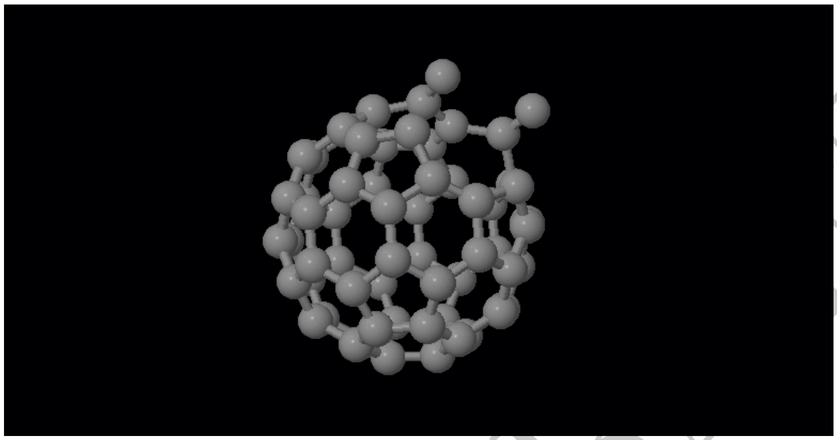

Figure 1: Gripping Point of the NanoRobot

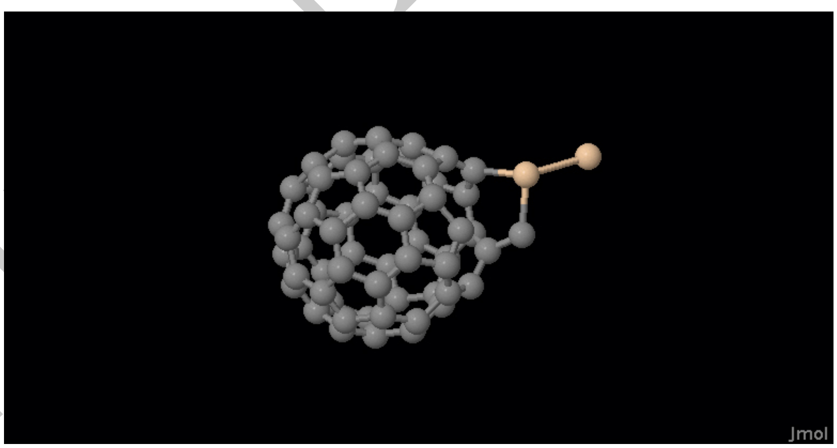

Figure 2: The head of the NanoRobot connected to a Silicon series

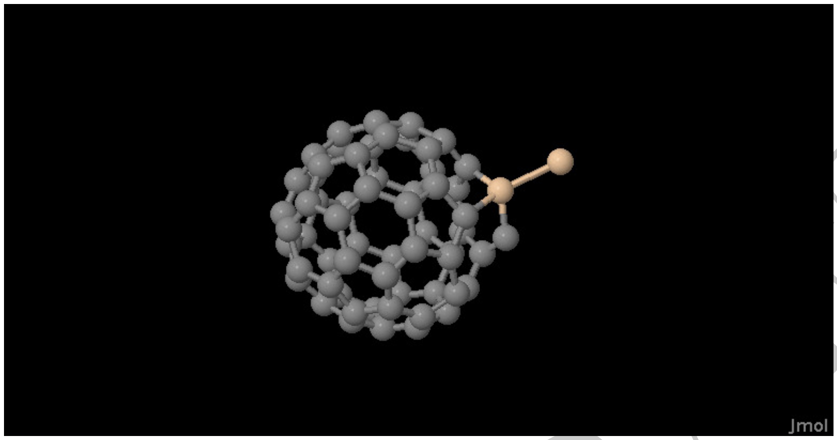

Figure 3: NanoRobot head after it has fully attached itself

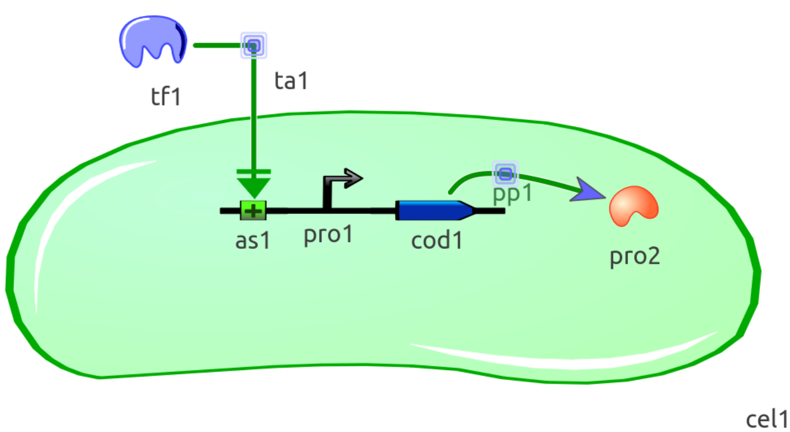

Figure 4: Diagram of cell hardening process