



# CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

<b>Name(s)</b> Natalie C. Hartman	<b>Project Number</b> <b>J0213</b>
<b>Project Title</b> <b>The Velcro-Support Stocking</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Elastic support stockings are used to treat leg edema (swelling). Many people who need to wear them find it too difficult to apply the stockings. The goal of my invention was the design of a support stocking with a Velcro-closure, which would provide identical compression as traditional support stockings, with added ease of application.</p> <p><b>Methods/Materials</b> Materials included Futuro brand knee-high support stockings (nominal compression 15mmHg at the ankle), a mannequin "right" leg, scissors, a pediatric blood pressure cuff, sew-on Velcro 3/4 inch strips, a sewing machine and cotton thread. The blood pressure cuff was wrapped around the mannequin leg above the ankle, and inflated to a reference pressure of 60mmHg. The stocking was cut 12 inches from the top and placed on the leg. The overlap of stocking edge required to meet the nominal compression were measured and a rise from the 60mmHg baseline, to 70-75mmHg was demonstrated. Velcro strips were then cut and sewn on to permit overlap and closure of the stocking. The Velcro-closure stocking was then retested against the blood pressure cuff to confirm nominal compression range.</p> <p><b>Results</b> Three prototypes of Velcro-strip closures for the stocking were tested, including a single-strip Velcro medial closure, a medial closure with interrupted Velcro strips, and a single-strip lateral closure. The superior prototype was the single-strip medial closure, which provided the nominal pressure above the ankle.</p> <p><b>Conclusions/Discussion</b> The single-strip medial closure was the superior prototype because it provided nominal pressure combined with ease of placement onto the leg. A disadvantage of the single-strip medial closure was the stiffness of the Velcro. Currently there is no flexible Velcro available. Use of a Velcro that mimics the flexibility and elasticity of the stocking's material could further improve upon this design. Swelling of the legs in the elderly is a common problem, and compressive support stockings offer an inexpensive, safe, and effective treatment. A frequent complaint of the elderly patient is the difficulty of applying the stockings, and consequently they go unused. My velcro-closure stocking would improve the compliance of the elderly in the use of these stockings.</p>	
<b>Summary Statement</b> My product is an improvement upon the standard knee-high support stocking, retaining its traditional therapeutic features while offering simplified application to the user.	
<b>Help Received</b> My mother proofread my reports, and assisted me in holding the leg during testing. My father was the photographer.	