



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Evan W. Chan	Project Number 22663
Project Title Invention of a Natural Collagen-like Material as a Plastic Substitute for Making Dental Devices	
Abstract Objectives/Goals The objective of my project is to develop a new dental material, starting with all natural and edible ingredients, which can be used to replace plastics for the construction of a mouth guard used to prevent damage to the teeth resulting from bruxism (forceful and involuntary grinding of the teeth). Methods/Materials I experimented with various edible ingredients which together can be formulated to create materials that have properties like soft plastics. I ended up developing a new material using gelatin derived from fish and glycerin. The right proportions of glycerin and gelatin were dissolved in aqueous solution at 90 degrees Centigrade. The slurry solution was poured into a mold and allowed to cool slowly to form a soft plastic-like material. The physical properties of this material were tested using an Instron material testing machine. This material was then formed into a mouth guard which could be worn. Results I invented a new material that is edible, pliable, and malleable and yet can resist strong tensile and compressive stress (up to 400 psi) without breaking. It is as strong as conventional polyethylene plastic. It can be formed into any shape by pouring into a mold. Furthermore, the material can be embedded with various small molecules such that when this material is used to make a dental mouth guard, it will prevent bad breath, plaque formation, and tooth decay. Conclusions/Discussion A new material has been developed that has the desirable properties for dental materials. It can be used as a dental guard for preventing the deleterious effects of bruxism. As yet not widely noticed, bruxism during sleep causes extensive damage to one's teeth, possibly causing the disappearance of all the enamel on the teeth. The percentage of the population that is afflicted with bruxism is larger than formerly thought by dentists. My new mouth guard material provides a solution for preventing trauma to the teeth caused by bruxism and yet avoiding the side effect of the wearer of the mouth guard ingesting plastic. My material is very affordable (roughly one tenth the cost of existing mouth guards) and can be mass-produced for the public.	
Summary Statement The invention of a new material that can replace plastic as a mouth guard against bruxism.	
Help Received Mr. Scott Wang helped me conduct my tensile tests in the laboratory of a company called NPIC. Dr. Bing Han assisted me conduct my compression tests at the Dept. of Chemical Engineering and Material Science at the University of California, Irvine.	