

MEDICAL BREAKTHROUGHS

RESEARCH SUMMARY

TOPIC: STICKY SEA CREATURES CLOSE WOUNDS: FROM BENCH TO BEDSIDE
REPORT: MB #4820

BACKGROUND: Animals such as mussels are literally able to stick to their environments. Now scientists are analyzing their changing chemistry of sea waters and the mussel's ability to adhere to their surroundings to develop adhesives that can be used for surgery. The large availability of this bioadhesive will enable researchers to develop new adhesives that will be waterproof, ecologically safe, and able to bind materials such as glass, plastics, metals, and wood. It can also bind materials such as bone, teeth, biological organisms, and other chemical molecules. Jonathan Wilker, PhD, a chemist and materials engineer, and professor in the department of chemistry at Purdue University says, "The "plaque" is the adhesive disc in contact with the surface. The "thread" that connects the adhesive plaque to the rest of the animal is called "thread." The combination of all the plaques plus all the threads is called the "byssus." Sometimes people also call it a "beard." If you just look at a mussel and see all of this stuff coming out of the shell it's the byssus or beard.

(Source: <https://link.springer.com/article/10.1007/s10126-007-9053-x>)

CURRENT METHODS: For humans, the typical choice of surgeries for healing lacerations, or cuts, to the skin is a suture. Sutures also are used for closing surgical incisions. A suture refers to the surgical threads that surgeons use and stitching refers to the technique that they use. For some wounds, due to trauma or surgery, staples must be used to close. There are two main types of sutures, nonabsorbable and absorbable. Nonabsorbable sutures are more often favored for skin wounds as they yield better cosmetic results. These sutures must be removed after the wound has finished healing and should not be left in too long to avoid scarring. These types of stitches are also desirable for internal wounds that need a longer amount of time to heal. The nature of nonabsorbable sutures allows them to stay strong for 300 days as they are either permanent or deteriorate very slowly. They are made from either natural fibers or synthetic threads, such as nylon, polypropylene, polyethylene, or polyester. Absorbable sutures are ideal for layers of material that can heal quickly such as muscles. These sutures are made to be able to dissolve gradually inside of the body using materials such as fibers that line animal intestines, also called catgut. These sutures are made with multiple fibers so they are less likely to break and are exceptionally strong in the first few days of healing. As they dissolve they lose most of their strength, typically, by the end of the second week, and dissolve completely within 60 days.

(Source: <https://www.health.harvard.edu/pain/sutures>)

NEW TECHNOLOGY: One of the key components being studied in order to develop adhesives from marine mussels to replace sutures is a very unique class of proteins. Proteins have been called the machinery of biology as they can do a lot of different things. A large portion of the human body is made out of proteins or enzymes and what it seems that the blue marine mussels do, are they modify these proteins to create an adhesive quality. As researchers understand what exactly those modifications are, they can make synthetic versions of it on a larger scale. And because these researchers are creating the adhesive synthetically, they have the ability to adapt the materials to their needs. Professor Wilker's lab at Purdue University has developed five to six new adhesive systems so far and they are constantly working on developing more and incorporating different properties into each.

(Source: (Source: Jonathan Wilker, PhD, Purdue University)

FOR MORE INFORMATION ON THIS REPORT, PLEASE CONTACT:

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If this story or any other Ivanhoe story has impacted your life or prompted you or someone you know to seek or change treatments, please let us know by contacting Marjorie Bekaert Thomas at mthomas@ivanhoe.com