

## Poster journal

### Seal and Heal

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#### Commentary:

Tissue adhesives and sealants are liquid or semiliquid compounds that are applied on a tissue incisions to close the wound surfaces, adhere to soft tissues and provide haemostasis. It can comprise of natural substances, synthetic chemicals, in the form of monomers or polymers, and undergoes polymerization or crosslinking reactions to function as an insoluble adhesive matrix, when applied onto tissue and biomimetic tissue adhesives<sup>1,2</sup>.

Tissue adhesives allows innate wound healing processes through adhesion of the tissue to the tissue or non-tissue surfaces, which exhibits attractive properties like less traumatic wound closure, no suturing required after surgery, comfortable application, appreciable cosmetic results, and localized drug release<sup>2</sup>.

The various mechanisms these tissue adhesives functions is through molecular bonding, mechanical coupling, and thermodynamic adhesion. Interatomic and/or intermolecular forces is created between the tissue and the adhesive which will form hydrogen bonding, capillary forces, van der Waals forces, static electric force, and covalent bonds<sup>2</sup>.

Ideal properties of tissue adhesives are being safe, easily sterilizable, nontoxic, easy preparation, should have flowable characteristics, reduce bleeding and surgery duration, exhibit strong tissue bonding and adhesion, haemostatic property, tissue healing and regeneration characteristics, and infection control. It should be easily degradable and absorbable with minimal or no toxicity and importantly, it should be affordable and cost-effective<sup>1</sup>

Natural tissue adhesives can be protein-based which are further classified into fibrin-based, collagen-based and gelatin-based and polysaccharide-based adhesives are again classified chitosan-based, alginate-based, and chondroitin-based<sup>2</sup>. They are directly extracted from natural sources sources, such as human blood, porcine or bovine<sup>1</sup>. Polysaccharide based tissue adhesives are biodegradable and biocompatible, while protein based tissue adhesives resembles tissue structures<sup>6</sup>. Fibrin based glue consists of human derived fibrinogen, human or bovine thrombin along with calcium chloride. They exhibits similar process that of last stage of blood clotting whereas protein based adhesives does not exhibit any physiological coagulation<sup>1</sup>.

Synthetic and semisynthetic adhesives includes polycyanoacrylates, polyurethanes, poly (ethylene glycol), polyesters, hyperbranched and dendrimer polymers<sup>2</sup>.

Cyanoacrylate, a well-known household name as an adhesive, is widely used in industries. It is gained popularity in medical field also for its property of faster wound healing, lesser infections and cosmetic acceptance<sup>3</sup>. They are a safe, antimicrobial tissue sealant used for lacerations, incisions, and in excisions and dermatologic surgeries<sup>4</sup>. They also have high bond strength—the highest in the market—and minimal cost for large scale production<sup>5</sup>. Dermabond is widely used cyanoacrylate tissue adhesives<sup>2</sup>.

Biomimetic adhesives the next generations tissue adhesives that is found mainly in mussels. They exhibit stable adhesion even in wet environment. Mussel-inspired and gecko-inspired adhesives are examples of biomimetic adhesives<sup>2</sup>. Blue mussels are small bivalves which can attach to a wider range of surfaces including rocks, wood and ship hulls. They can attach to all kinds of organic and inorganic surfaces, even on adhesion resistant material like polytetrafluoroethylene(PTFE). They secrete an exogenous substance which comprises of a stem, byssal threads and byssal plaques that will help them to fix onto the surface. Lot of research are being done with biomimetics adhesives<sup>6</sup>.

With rapid advancements in medical biotechnology newer bioadhesives can overcome various drawbacks and necessities of current bioadhesives, which will pave way for ideal tissue adhesives and change the future of tissue adhesives and sealants.

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