Bioengineering Day Poster Addendum

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1. **Desired Needs**
    - Develop a non-invasive, biocompatible, nipple barrier device that blocks the infiltration of foreign contaminants into the mammary ducts in order to reduce the risk of invasive ductal carcinoma development
    - The device must be completely waterproof, sweat-resistant, and maintain adhesion during daily activities such as showering and light to heavy exercise.
2. **Major Constraints**
    - Safety/Regulatory Affairs: all materials must be biocompatible, medical-grade, and hypoallergenic. The device must comply with international standards such as ISO 10993 for biocompatibility.
    - Risks: skin irritation or allergic reactions during extended wear, water infiltration via lifting of adhesive, reduced adhesion due to extended water exposure or friction from clothing.
    - Global Impact: the device provides a low-cost, non-invasive prevention strategy that could improve accessibility for women who do not want surgical or pharmacological interventions.
    - Manufacturability: budget limitations restricted manufacturing methods, but future commercialization would require improved molding consistency, sterile packaging, and large-scale production methods.
    - Quality Control/Marketability: Wear trials and adhesion peel testing provided means of evaluating comfort, adhesion strength, and quality of waterproof performance.
3. **Engineering Standards**
    - ISO 10993-1, 5, 10, and 23: biocompatibility, cytotoxicity, skin sensitization, and irritation testing for all skin-contact materials.
    - ASTM F2255, F2256, and F2258: adhesive performance and peel-force testing.
4. **Ethical, Environmental, or Societal Concerns:** with currently limited scientific evidence of carcinogen entry through mammary ducts, claims of the device's cancer-prevention potential must be evidence-based and carefully communicated.
5. **Active Teamwork and Leadership**
    - The team was split into two subteams, the IRB team and the design team.
    - Mentor feedback from Dr. Alyssa Taylor and Dr. Geert Schmid-Schoenbein also informed design decisions.
6. **Significant Motivating Factors**
    - The project allowed the team to learn about breast cancer pathogenesis, biomaterials, biocompatibility standards, CAD design, silicone molding, and medical device testing.