Team Name: TEAM NATURA

	Name	Branch and Semester	Contact Number	Email- ID
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Note:

1. One can participate either as a part of a team or an individual basis. Switching teams is not allowed.
2. The uploaded ideas will be screened to go to the second round.
3. Judging: competition entries shall be judged, or winners selected based on the following criteria
   - Is the problem worth solving
   - How innovative or novel is the idea
   - Scientific accuracy
   - Social impact
   - Scalability
4. Decisions of IIC JSSSTU in respect of all matters to do with the competition will be final and no correspondence will be entertained.
5. In second round, the selected teams will have to present their idea in front of the jury panel.
6. Idea should be submitted in **.pdf** format.

Abstract: **(not more than 150 words)**

The present article talks about the feasibility, production and the scope of a biodegradable PPE kit in the market. The subsequent sections will throw light on how effective biodegradable PPE kits are to solve few of the existing problems, the raw materials that can be used and the possible methods of producing a material that can match up to the criteria of a PPE kit and can bear the additional benefit of being environment friendly.

Introduction **(not more than 200 words)**

With the Covid 19 pandemic gripping ever so tightly, crippling and suffocating the world's economic and emotional resources, the demand for PPE kits has increased many folds. Personal Protective Equipment (PPE) is specialized clothing or equipment worn by an individual for protection against infectious materials. Majority of the used PPE kits are disposed off after a single use. These PPE kits, largely made of polypropylene, refuse to decompose, and can contribute to various environmental hazards. PPE kits cannot be cleaned and reused multiple times due to obvious health and safety reasons. The most effective solution would be to come up with a material

that is biodegradable, and more preferably, is a plant based polymer, so that it can achieve maximum carbon neutrality on decomposition. One such material is polybutylene succinate, whose properties are comparable to polypropylene, and can be an environment-friendly alternative of the same. It is obtained by the esterification of succinic acid, which is naturally found in tree resin (also referred to as amber). Appropriate chemical modifications of this compound can yield a suitable formulation for the making of a 100% biodegradable PPE kit.

Motivation **(not more than 100 words)**

The world we are living in today is becoming highly unsafe with every passing day. Earth is not a platform for human life, it's a living being. We're not on it, but a part of it. Its health is our health. And yet, here we are harming it in innumerable ways- increased carbon footprint, high global warming rates, large scale deforestation, to name a few- not realising that we cannot damage nature, without damaging ourselves first. Hence, it becomes our prime duty to build a healthy and safe world, for today and tomorrow. This project is extending a tiny step towards this intricate goal.

Methodology **(block diagram, related figures etc)**

1. The biodegradable resin used is a polymer blend of polybutylene succinate and polylactic acid, where polylactic acid can be mixed at a weight ratio of 0 to 50% on polybutylene succinate.
2. Carbodiimide is used as a crosslinker. The amount of the polycarbodiimide compound to be mixed in a biodegradable resin is preferably 0.1 to 10% by weight.
3. A mixture of polybutylene succinate and 10% polycarbodiimide on the weight of polybutylene succinate, taken as CARBODILITE (waterborne polycarbodiimide resin which contains carbodiimide group) is mixed until a homogenous composition is obtained. Small amounts of neem, tulsi and talispatra extracts may be incorporated into this mix to increase the anti-bacterial properties of the resultant fabric.
4. This composition is then subjected to melt blending at a suitable temperature. This is the polycarbodiimide master batch.
5. The master batch is then mixed with a certain amount of polybutylene succinate and polylactic acid taken at 30-50% of polybutylene succinate, and pressed at appropriate high pressure and temperature, to mold it into sheets of required dimensions.
6. The resultant material is then subjected to sterilisation with radiation of intensity ranging from 10 to 60 kGy, at room temperature.
7. The sheets can then by joined and molded to form the required fabric.

Social Impact

With the rise in Covid 19 cases, there has been a substantial increase in the amount of waste generated. In Mumbai alone, the city has generated a daily average of 50,000 kg Covid waste in the first week of April. The city of Noida has witnessed a rise from 10 kg to 60 kg of Covid waste in a day, in April alone. Adding up the numbers, the total Covid waste generated nationally is a gigantic

amount. Biodegradable PPE kits can be an answer to this waste management crisis. It can drastically reduce the carbon footprint, and if disposed properly, can lower the risk of exposure to the virus after disposal.

Market Survey

Present day PPE kits cost anywhere upto Rs 1500, based on the components it comprises of and the quality of polypropylene used. Estimating the production cost of the raw materials used – biodegradable resin, crosslinker, suitable additives, and the processes used – melt blending, radiation sterilisation- production cost of a biodegradable PPE may go upto Rs 1000 per kit, which is quite feasible for large scale production and distribution, in comparison to the existing PPE kits.