

NATUREWORKS

PRODUCT SAFETY & TOXICITY

Plastics are created by linking simple building blocks into long chains. At the core of our process, we harness plants to capture and store CO₂, converting it into long-chain sugar molecules. Through fermentation, these sugars are transformed into lactic acid—a natural compound present in foods like yogurt and pickled vegetables, as well as in our muscles after strenuous activity. This lactic acid serves as the foundation for producing all our Ingeo™ (PLA) biomaterials.

One of the key attributes of Ingeo is that the lactic acid building block exists in “left hand” and “right hand” versions (molecules that are mirror images of each other). By varying how we blend these, we can alter the physical properties of the grades we sell enormously, while still using only lactic acid - a substance whose toxicology has been studied at length. This is a fundamentally different approach than some existing plastics that must use other additives such as plasticizers to adjust their properties for different end uses and functionalities. Naturally, lactic acid is safe.

Ingeo PLA is a versatile material capable of replacing polyester in t-shirts, polystyrene in rigid yogurt cups, polypropylene in baby wipes, it can be used in flexible films for chip bags, as a substitute for polycarbonate in durable goods, and countless other applications. All of this is achieved without BPA, phthalates, PFAS, synthetic antioxidants, or other substances of concern.

We acknowledge there are increasing concerns about plastics related to toxicology, effects on human health, and environmental impacts. According to studies, PLA does not cause persistent microplastics and NatureWorks employs multiple methods for assessing, testing, and certifying the safety of Ingeo biomaterials. It's a fundamental part of our development process. Furthermore, we partner with the supply chain to develop finished goods and extend our stewardship to the safety of these products.

Beyond NatureWorks' own measures on safety, our customers also benefit from peer reviews carried out by independent, third parties like our GreenScreen Standard Platinum Certification from the Center for Environmental Health (CEH) and Clean Production Action (CPA) nonprofit organizations.

When used as a food packaging material, Ingeo PLA is fully compliant with long-standing, well established global legislation for materials in packaging. Ingeo PLA received clearance from the US Food Drug Administration (FDA) through Food Contact Notifications (FCNs) after a thorough evaluation of its manufacturing process, safety and toxicology data, environmental impact, and other key factors. The FDA has continued to evaluate the safe use of PLA since NatureWorks FCNs were issued through subsequent FCN notifications obtained by other PLA producers. Additionally, under FDA regulations lactic acid is Generally Recognized as Safe (GRAS) as a food additive, and in Europe as a direct addition to food with clearance at quantum satis levels (i.e. no maximum level). According to the FDA, Ingeo PLA is non-toxic.

While we continue investing in innovation and working diligently to make fundamentally safe materials, we realize that once it leaves our hands, the material is out of our direct control, so we use a variety of techniques and approaches to educate and encourage safety and compliance along the value chain:

- 1 We maintain close relations and monitor our 'chain of custody' (we want to know our customers, and we want to know our customers' customers).
- 2 We take a contractual approach providing customers and Ingeo-brand licenses with substance policies they are required to adhere to – a requirement not often found when buying commodity grade petrochemical-based plastics.
- 3 We conduct random sampling of Ingeo-brand licensees to verify how they are utilizing our biomaterials.
- 4 We take a third-party approach in having organizations like the Clean Production Action certify the safe composition of Ingeo. [View our certificate here.](#)



If you have any additional questions about Ingeo product safety, please contact us or visit the **Material Health and Safety page** on our website.

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