HIGH PERFORMANCE PHAs WITH LEVULINIC ACID

KEY FEATURES

> **Performance material** for the production of PHA co- and terpolymers, such as PHB3HV and PHB3HV4HV

> **Co-nutrient** with metabolically-engineered strains (like ralstonia eutropha, pseudomonas putida, cupriavidus necator) and wild marine strains for PHB3HV4HV production

> **Yield improvement** and composition design for crystallinity and property control

LEVULINIC ACID FROM GFBIOCHEMICALS

> Patented and proven technology with feedstock flexibility

> 10,000 MT/a production plant came online July 2015 in Caserta, Italy

> Targets 25,000-50,000 MT/a industrial plant by 2019

> First company to produce levulinic acid at commercial scale

> Price estimate at maturity is €1/kg
Global PHA market is expected to rapidly develop in the next five years. About 30 companies working to acquire market position. Multiple scl- and mcl-PHAs are being developed and introduced. Focus on PHAs with improved functionalities and property balances. Emphasis is on decreasing PHA manufacturing costs.

**UNIQUE OFFERING**

- High purity (>99.5%) levulinic acid as additional raw material for PHA copolymer production
- Builds in 3-hydroxyvalerate and 4-hydroxyvalerate units for PHBV product design
- Can be used to replace propionic acid or other co-nutrients for PHBV manufacturing
- Samples available for testing and for larger scale PHA manufacturing
- Literature reference list available

**VALUE PROPOSITION**

- Levulinic acid is a cost-effective building block for production of PHB3HV4HV products for film, fiber, injection molding and extrusion applications
- PHBV products have advantages compared to PHB:
  1. Improved fermentation yield
  2. Enhanced toughness and elongation properties
  3. Wider processing window due to lower melt temperature and crystallinity control