Microbial production of polyhydroxy alkanoates (PHA) from Cupriavidus Necator (ATCC 17697) using residual milk whey as the main carbon source

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Introduction. As a biopolymer, PHA has some serious attributes that make it attractive to both the biomedical and the traditional polymer making industries. This microbial produced plastic is biodegradable, multifunctional, it has a generally good biocompatibility, and most importantly, it is produced in an entirely sustainable way that doesn't harm the environment. Since it can degrade naturally, contamination isn't really an issue; PHA won't accumulate for long periods of time like the petroleum derived polymers do, and thus, this plastic could be the key to diminish environmental impact, considering that petroleum-based plastics create a considerable global problem through their grade of pollution. The high degree of biocompatibility makes PHA an ideal material for different biomedical applications. (1)(2)
The project's objective is to produce PHA from waste generated by the dairy industry, in order to utilize it in industrial applications.

Methodology.

First, milk whey is hydrolyzed so as to obtain the main sugars that compose it, which will serve as a substrate for our strain of Cupriavidus Necator (ATCC 17697). This said strain should be cultivated under specific parameters of temperature and pH (3), limiting its nitrogen source. PHA's recovery is performed through the use of organic solvents (4). For characterization, conventional analytical techniques are utilized, such as spectrophotometry with digital melting point meter.

Results.

The five tests were realized using whey as culture media, the pH was maintained in 7 throughout the process and the temperature in 28 C°. The presence of the biopolymer was verified by staining part of the media with Nile Blue A. On average, 39.8% of PHA was recovered during the five preliminary pellets. As optimal parameters are found for bacteria growth and adaptation techniques become more effective towards PHA recovery, improving of the obtained recovery rate percentage is expected.

Table 1. Dry weight Percentage of the recovered polymer.

	Pellet 1	Pellet 2	Pellet 3	Pellet 4	Pellet 5
% dry weight	37	42	39	33	48

Conclusions. In a preliminary standard, it seems whey is an apt subtract for PHA production, utilizing Cupriavidus Necator (ATCC 17697). Although the current average of dry weight percentage is 39.8%, this is expected to improve due to modifications in the physical and chemical parameters in which the bacterium is utilized.

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