

Title: Applied Microbiology Laboratory [0-0-8-4]

Content :

1. Screening, enrichment, and isolation of microbes with a desired property. Representative examples of desired properties are (i) antibiotic resistance, (ii) production of industrially important enzymes such as proteases and lipases, (iii) degradation of specific environmental pollutants, (iv) heavy metal tolerance, (v) degradation and/or metabolism of food preservatives (e.g., sodium benzoate, etc.), etc. One or more of these properties (or any other topical property) can be chosen depending upon logistics (suitability and appropriateness of carrying out the experiment in the UG lab which is a BSL1 facility) and availability of resources such as human resources (expertise), ease of carrying out experiments at scale (cost of consumables vis-à-vis the number of students crediting the course), etc.
2. Characterization of the isolated microbe e.g., determining the resistance (antibiotics) or tolerance (heavy metal) profile, determination of MIC, etc. In case the property chosen is degradation of a chemical compound (e.g., an environmental pollutant), and if time permits, then one can attempt to elucidate degradation pathway and identify intermediates using chromatographic methods such as TLC, GC-MS, etc.
3. Purification of industrially important enzymes using conventional protein purification techniques such as ammonium sulphate precipitation, ion-exchange column chromatography, (hydrophobic column chromatography, gel-filtration column chromatography) and assess the yield and fold purification of the purified enzyme.
4. Immobilization of microbial cells by cell-entrapment method using agar, agarose or Ca-alginate and conduct fluidized bed reactor studies at lab scale for degradation of a chemical compound (e.g., an environmental pollutant).
5. Assessing the potability of water by enumerating the fecal and non-fecal coliforms, MPN, phages, etc.

Texts / References:

1. Pelczar, M. J., Reid, R. D., & Chan, E. C. (2001). Microbiology (5th ed.). New York: McGraw-Hill.
2. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011). Prescott's Microbiology. New York: McGraw-Hill.
3. Matthai, W., Berg, C. Y., & Black, J. G. (2005). Microbiology, Principles and Explorations. Boston, MA: John Wiley & Sons.
4. R. Scopes; Protein Purification - Principles & Practices. Springer Verlag, 1982.
5. Selected readings from Methods in Enzymology, Academic Press.
6. R.C.Price, Proteins. Lafbax Academic Press 1996.