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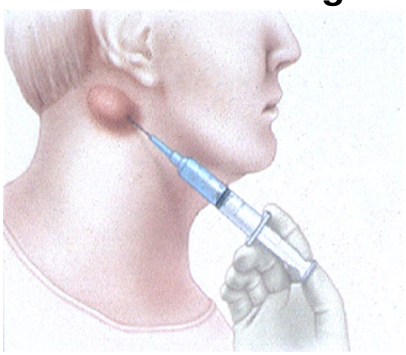
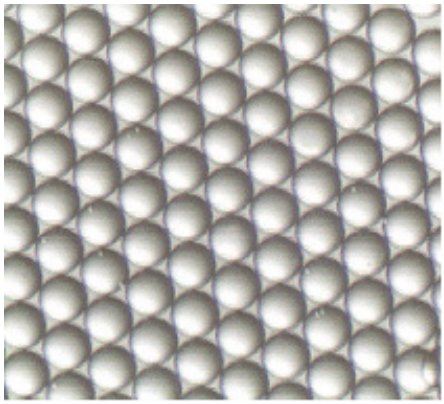
Overview of drug delivery

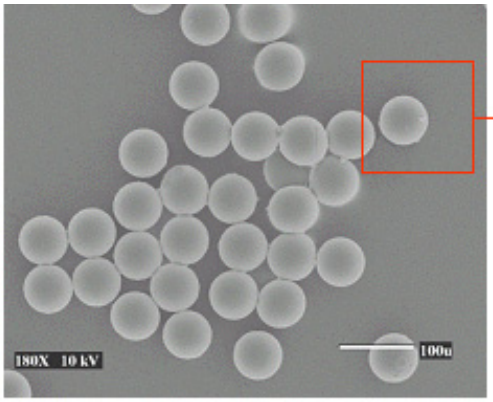


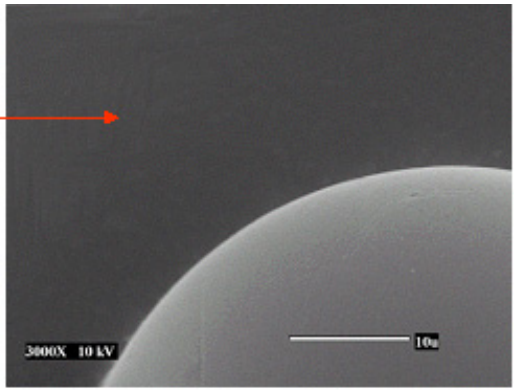
Effective chemotherapy with paclitaxel is relying on the development of new delivery systems that can provide localized sustained release and reduced toxicity at the same time. One approach to drug localization and controlled pharmacokinetics is direct injection of drug-loaded-microspheres into tumor tissue. Unfortunately, the current methods of obtaining biodegradable polymer microsphere are complicated, with poor or no control over the microsphere size. Moreover, they generate microspheres of wide size distributions, which, in turn, leads to little control over release rates.

Solid microspheres

Control of microsphere size and size distribution are the ultimate goals of drug delivery, since a particular release rate and a desired route of administration require a particular sphere size. Using ink-jet technology and single emulsion-solvent evaporation techniques, MicroFab has obtained paclitaxel-loaded PLGA microspheres of narrow size distribution and controlled diameter (figure below).

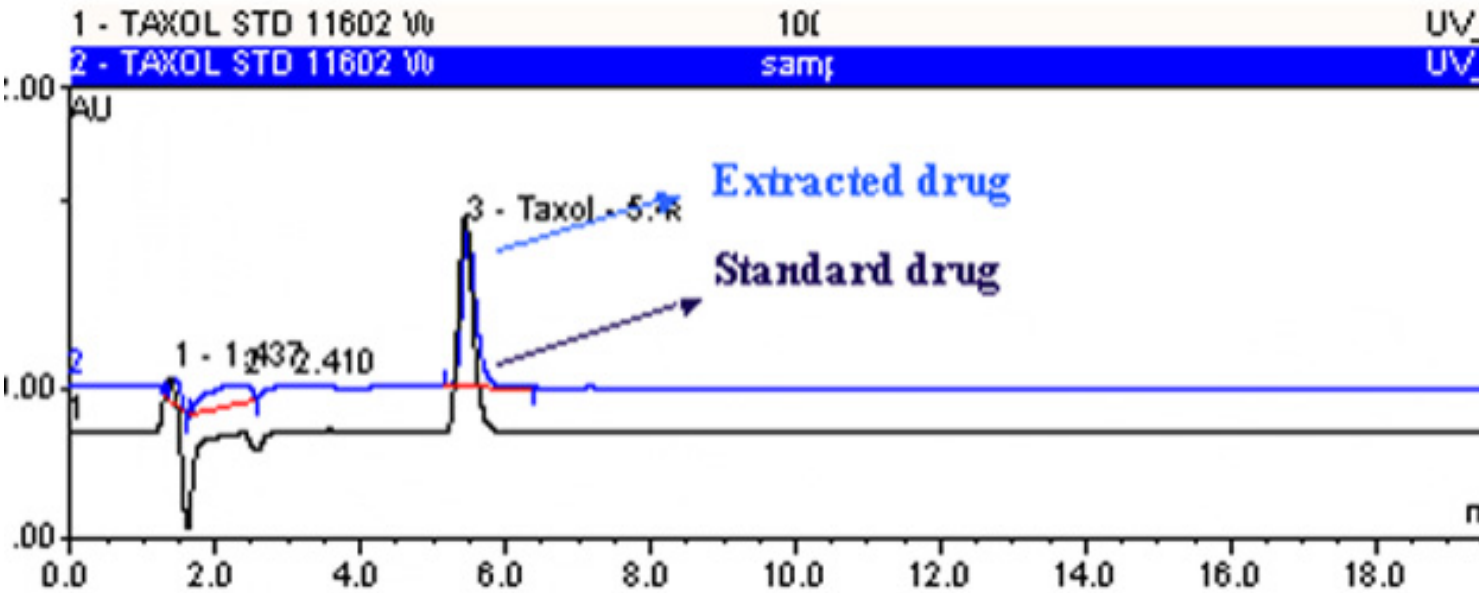






PLGA microspheres, 50um in diameter, produced using ink-jet technology and loaded with Paclitaxel.

The manufacturing procedure did not affect the pharmacological efficacy of the encapsulated drug, as indicated by HPLC chromatograms and confirmed by tissue culture assay (figure below).



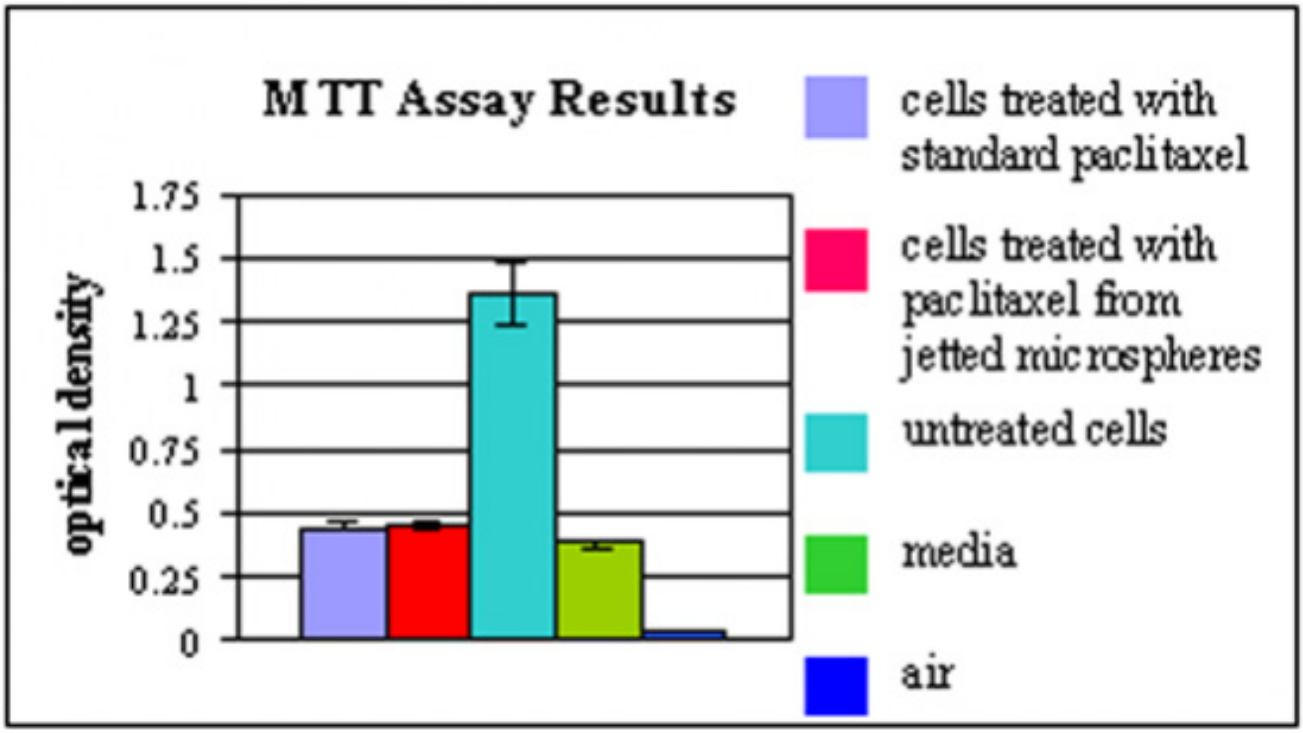


Table 1: Comparison of Paclitaxel Release Rates from Jetted Microspheres

Table 2: Comparison of Paclitaxel Release Rates from Jetted Microspheres

Table 3: Comparison of Paclitaxel Release Rates from Jetted Microspheres

Table 4: Comparison of Paclitaxel Release Rates from Jetted Microspheres

Table 5: Comparison of Paclitaxel Release Rates from Jetted Microspheres

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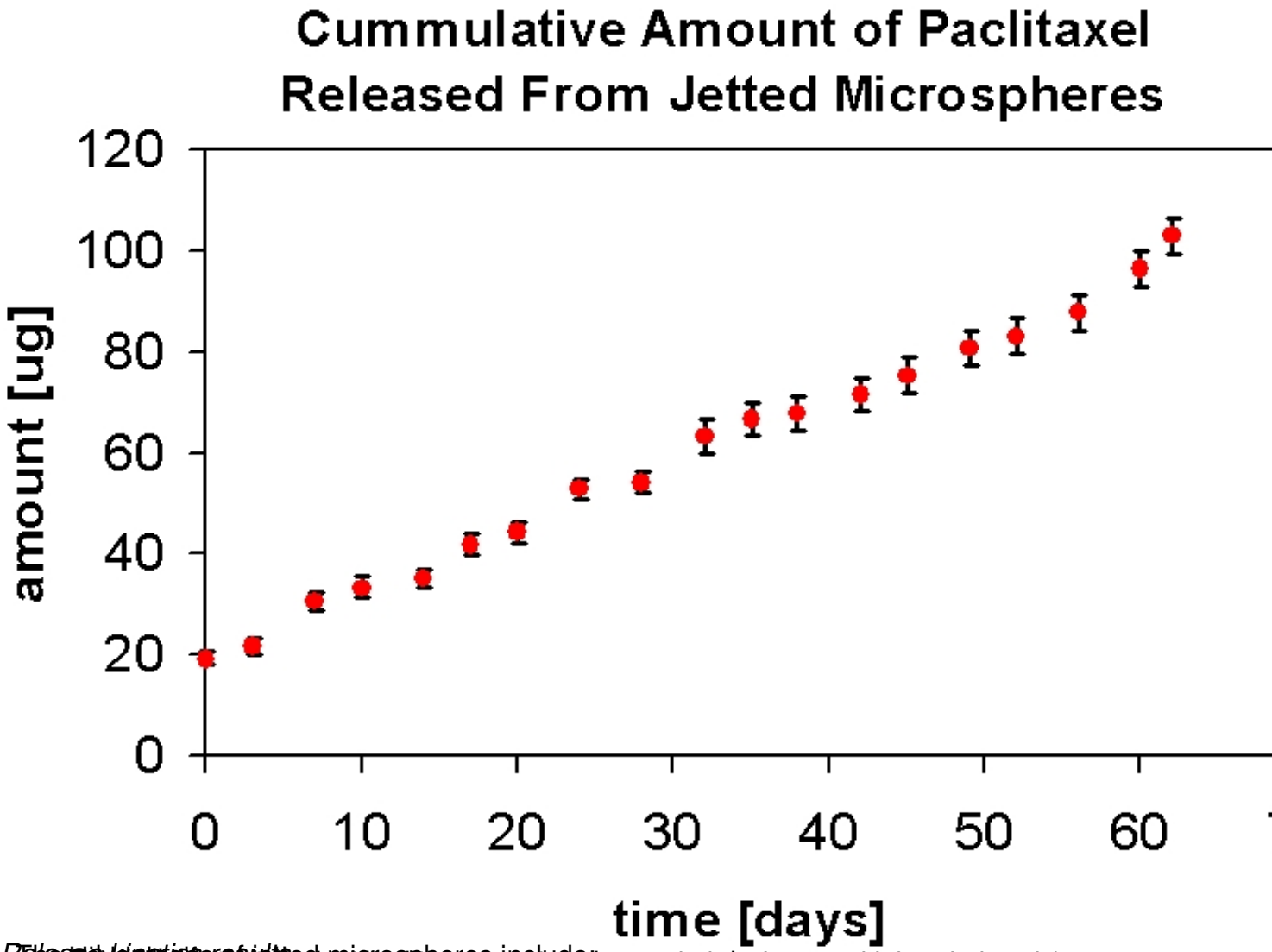
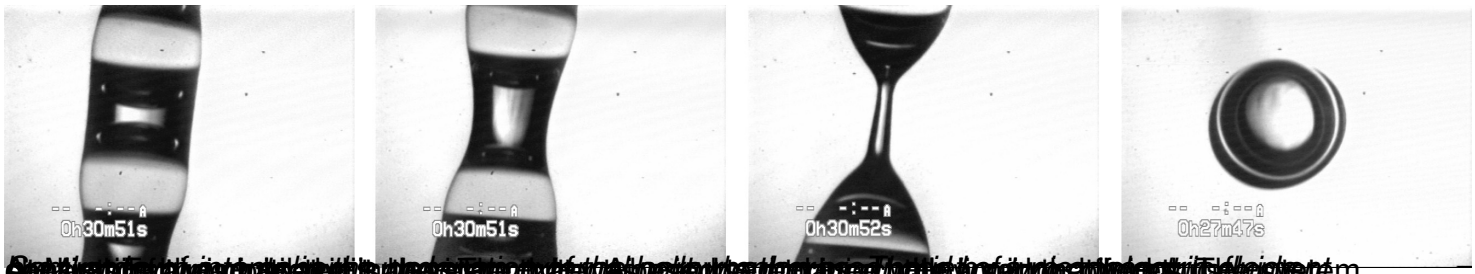
Table 50: Comparison of Paclitaxel Release Rates from Jetted Microspheres



Release kinetics of jetted microspheres

Multilayer microspheres

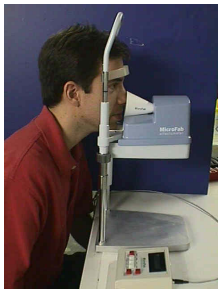
Many types of cancers do not respond to just one drug, but to a combination of at least two cytotoxics or two anticancer drugs. Moreover, combined therapy may reduce the risk of recurrent cancer. However, problems exist as the two drugs have different dosage requirements when administered subsequently. As opposed to microspheres consisting of a solid polymer microsphere, double-layer microspheres consisting of a core of one polymer surrounded by a coating of a second polymer could be an important step toward solving these problems. The two loaded drugs can attack two different cancer cell types. Therefore, the microspheres will have impact on a broader range of cancer types. The two polymers can be chosen so that their release rates are different, and the amount of drugs released per day will be different.



Transdermal Delivery

MicroFab s JetLab® II Platform can be used to dispense and print drugs, polymers and adhesives for transdermal delivery applications. Applications include microneedle coating/filling; precision drug dispensing onto flexible films, including multi-layer or multi-drug; and precise printing of drug/polymer combinations.

Nasal & Inhaler Delivery



Ink-jet technology can be used to manufacture solid powders for pulmonary drug delivery, create vapors for pulmonary delivery, and generate liquid droplets for nasal delivery. Vapor delivery is based on MicroFab's AromaJet® Technology, which can project aromas for marketing and simulation applications, and create personalized fine fragrances. AromaJet® Technology's digital control has been used in medical diagnostics applications and explosives vapor detector calibration.