

The above principles can also be as well applied to making emulsified products. If the active drug is soluble in oils (if the active is a salt, often the base is oil soluble), an emulsion will help stabilize the drug.

## Conclusions

In conclusion, there are several promising alternatives to lyophilization either currently in use for sterile products (aseptic crystallization/precipitation and drying, vacuum-drying), while sterile spray-drying is very near to commercialization, and leverages mature powder-filling technology. Early-phase concepts include bulk tank agitated freeze-drying, drying on a fiber matrix, and fully contained powder reconstitution and injection devices. Overall, there are strong reasons for optimism that within a decade, higher efficiency alternatives to lyophilization will be available as established technology.

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