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THE POSSIBLE USE OF AUTOCLAVING MICROEMULSIONS FOR STERILIZATION

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INTRODUCTION

An important aspect in the formulation of emulsions with particle sizes in the submicron range (0.1-0, 2μ) (1), intended for parenteral use is the sterility of such products. Since these systems are quite responsive to a number of stress situations, including thermal stress (2,3) and passage through a membrane filter (4,5), the conventional methods of heat and cold sterilization seem less than desirable. Although sterilization under aspectic conditions of both the aqueous and nonaqueous phases before emulsification exists as a possibility, this may be impractical in large production situations. The following study was designed to investigate the effects of autoclaving soyabean oil-in-water emulsions inoculated with test organisms with respect to both the sterility and stability of the system.

EXPERIMENTAL

MATERIALS - Soyabean oil, refined (Welch, Holme, and Clark Co., Inc., Lot 41-137, U549577), Span 80 (Ruger Chemical Co., manufactured by Atlas Chemical Co., No. 14771),Tween 80 (Ruger Chemical Co., Lot No. 1580), distilled water, 30 ml multidose vials of type I glass, 48 hour cultures of E. coli and B. subtilis, not ATCC.

METHOD - A 10% soyabean oil-in-water emulsion was prepared using a blend of Span 80 and Tween 80 at the correct H.L.B. as the emulsifying agent. Using a Cornwall syringe, twenty multidose vials were filled with 30 ml of emulsion. Ten of the samples were inoculated with 0.1 ml of suspension of B. subtilis in normal saline and the remaining ten samples were inoculated with 0.1 ml of E. coli. Six vials of each type of inoculated samples were autoclaved at 121°C for twenty minutes. The remaining four vials of each type of inoculated sample were not subjected to any sterilization treatment. These samples were stored at room temperature. A 0.5 ml emulsion sample from each of the twenty vials was introduced into 15 ml of both tryptic soy and thioglycollate broth medium and stored at room temperature and 37°C respectively. After culturing for 24 hours, 0.1 ml of each broth sample was dispersed in 15 ml of the same broth

medium. The cultures were observed for growth after 72 hours. In order to confirm the results, one loopful of the 72 hour inoculum was subcultured into 15 ml of fresh broth medium of both types. These samples were observed after 24 hours.

RESULTS AND DISCUSSION

The results of this study are summerized in Table 1. The results obtained indicate several interesting aspects with respect to the use of autoclaving microemulsions for sterilization. First, the emulsions prepared were capable of supporting the growth of both an aerobe (E. coli) and a facultative anaerobe (B. subtilis). Growth of each organism was noted in all four samples inoculated with E. coli and not subjected to sterilization. The same results were observed with B. subtilis. Another important aspect apparent from this study is that all of those samples inoculated with either of the two organisms and subsequently autoclaved were observed as having no growth. This suggests that autoclaving is an effective means of sterilizing microemulsions. It should also be noted that very little, if any, physical degredation of the emulsions which were autoclaved occured. From the standpoint of stability, this is an important observation.

TABLE I

EFFECTS OF STERILIZATION ON SOYABEAN OIL EMULSIONS

Organism Inoculated Into Test Emulsion	Number of 30ml Vials		Broth Medium			
			Tryptic Soy		Thioglycollate	
B. subtilis	Autoclaved	6	6	No Growth	6	No Growth
	Unsterilized	4	4	Growth	4	Growth
E. coli	Autoclaved	6	6	No Growth	6	No Growth
	Unsterilized	4	4	Growth	4	Growth

REFERENCES

(1). M. Deitel, V. Kaminsky, CMA Journal, 111, 1 (1974).

(2). E. R. Garrett, J. Pharm. Sci., 54, 1557 (1965).

(3). J. E. Tingstad, J. Pharm. Sci., 53, 955, (1964).

(4). M. T. Yeo, et al, Archives of Surgery, 106, 792 (1973).

(5). J. Cornell, Minnesota Pharmacist, 11 (1976).