

**BIBLIOGRAPHIC DATA SHEET**1. CONTROL NUMBER  
PN-AAH-8342. SUBJECT CLASSIFICATION (695)  
PC00-0000-0000

3. TITLE AND SUBTITLE (240)

Uterine synechiae produced by cryosurgery

4. PERSONAL AUTHORS (100)

Droegemueller, William

5. CORPORATE AUTHORS (101)

Ariz. Univ. Medical Center

6. DOCUMENT DATE (110)

1980

7. NUMBER OF PAGES (120)

5p.

8. ARC NUMBER (170)

613.942.D783

9. REFERENCE ORGANIZATION (150)

Ariz.

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Sterilization    Birth control    Family planning

PROJECT NUMBER (150)

932060300

14. CONTRACT NO.(140)

AID/pha-C-1176

15. CONTRACT  
TYPE (140)

16. TYPE OF DOCUMENT (160)

53

613.942  
D783

PN-AAH-834

REPORT OF  
UTERINE SYNECHIAE PRODUCED BY CRYOSURGERY

AID-PHA-C-1176

TO: AGENCY FOR INTERNATIONAL DEVELOPMENT

FEBRUARY 1ST, 1980

UNIVERSITY OF ARIZONA MEDICAL CENTER

## 1. Report Summary

### A.

1. Project title and contract number: Uterine Synechiae Produced by Cryosurgery AID-PHA-C-1176.
2. Contract Period: from 9-1-77 to 5-31-80.
3. Total AID funding of contract to date: \$245,480.00.
4. Total expenditures and obligations from August 1st, 1979 to February 1st, 1980 are \$15,563.90.
5. Estimated expenditures for next reporting period. For the next six months we anticipate spending \$19,000.00.

### B. Narrative Summary of Accomplishments and Utilization:

During the fifteen months prior to August 1, 1979 the engineers at Valleylab in Boulder Colorado re-designed the cryosurgical system. The new equipment utilizes the lower temperature produced by liquid nitrogen. In extensive in-vitro testing of this new system, the tip of the probe will reach temperatures of  $-160^{\circ}\text{C}$  to  $170^{\circ}\text{C}$  under load within 10 seconds. The strip recordings of temperature curves are very similar from one test to another.

During the past six months, Phases I, II and III have been completed. During the last two weeks of January 1980, Phase IV has been initiated. Phase I and II established the safety of freezing the uterine cornu with the new equipment. Testing in both Phase II and Phase III has developed a standard protocol for length of freeze in relationship to the menstrual cycle. It is anticipated that we will freeze the uterus in the proliferative phase of the cycle for a single freeze/thaw cycle of 60/30 seconds. A uterus in the secretory phase will have a single freeze/thaw cycle of 90/30 seconds.

Most importantly, both gross and microscopic examination of the uterine cornu demonstrated that liquid nitrogen produced a much larger area of tissue damage than similar studies performed with nitrous oxide.

Significant accomplishments in the research program to develop a new method of outpatient sterilization for females include the following:

1. The operation can be performed without difficulty under paracervical block anesthesia.
2. There are no difficulties in consistently placing the probe at the uterine cornu.
3. None of the women who have undergone cryosurgical freezing of the endometrium with liquid nitrogen have developed postoperative bleeding or infection. Postoperative pain has been minimal.

## 1. Substantive Research Report

### A. Statement of Project Objectives:

The objective of this research program is to develop a means of outpatient sterilization for women that has minimal morbidity and a short convalescence.

### B. Accomplishments to date:

Phase 1 - Bench testing of freezing rates and temperatures monitored by thermocouples placed on the surface of excised human uteri. Four uteri were tested.

Patient A - The uterine cornu on each side was frozen for 3 minutes. Final probe tip temperature was  $-171^{\circ}\text{C}$ . Surface temperature of the uterus did not change appreciably from the ambient temperature until after 1 minute of active freezing. Minimum temperature obtained on the surface of the uterus was between  $0^{\circ}\text{C}$  and  $+5^{\circ}\text{C}$ . The ice ball diameter in the uterus was one and one quarter inches.

Patient B - Repetitive freeze/thaw cycles as follows: 60 seconds freeze, 60 seconds warm, 60 seconds freeze, were performed on the left side of the uterus. The surface temperature dropped to  $+18^{\circ}\text{C}$ . The right side of the uterus was frozen for 160 seconds. The minimum temperature noted on the surface of the uterus was  $-12^{\circ}\text{C}$ .

Patient C - The left cornu was frozen for 160 seconds and the right cornu was frozen for 180 seconds. The minimum tip temperature obtained was  $-172^{\circ}\text{C}$ . The uterine surface temperature went to  $-22^{\circ}\text{C}$  at 180 seconds.

Patient D - The uterus was frozen for 154 seconds. The probe temperature reached  $-175^{\circ}\text{C}$ . The minimum surface temperature of the uterus was  $-5^{\circ}\text{C}$ .

Phase II - Cryosurgery was performed in vivo immediately prior to hysterectomy. Seven patients had cryosurgery performed immediately prior to abdominal or vaginal hysterectomy. Several of the patients who had abdominal hysterectomy were observed during the freezing process to see if ice was visible on the external surface of the uterus. In three cases, direct surface thermocouple monitoring was performed. The surface temperature of the uterus varied between 0°C and +12°C when a single freeze/thaw cycle of 90 to 120 seconds was utilized. Gross and microscopic examination of serial sections of the uterine cornu demonstrated coagulation necrosis of the full thickness of the endometrium and necrosis of 2 milliliters of myometrium.

Phase III - Hysterectomy 24 to 48 hours following cryosurgery. To date, 7 patients have had cryosurgery 48 hours prior to hysterectomy. No infectious or bleeding complications have been observed. Five of the 7 patients had no pelvic pain whatsoever after the procedure. The other 2 patients complained of moderate uterine cramping. However, they had also had a cone biopsy of the cervix. This cramping lasted 1 to 2 hours.

Gross examination of the uterine cornu demonstrated a target area of coagulation necrosis that could be seen without magnification. This area was considerably larger than that noted with nitrous oxide. The results of studying serial sections of the uterine cornu from the 48 hours series established the following protocol for Phase IV:

- Proliferative phase: a single freeze/thaw cycle of 60 seconds freeze and 30 seconds warm.
- Secretory phase: a single freeze/thaw cycle of 90 seconds freeze, 30 seconds warm.

Phase IV - The initial three patients in this group had their cryosurgery during the last two weeks of January and will have hysterectomies the last two weeks of February.

C. Dissemination and Utilization of Research Results: A paper will be written upon the completion of Phase V.

D. Statement of Expenditures, Obligations and Subcontractor Resources:

Salary:	Karen Betts Research Nurse	\$6,632.00
	Fringe	1,260.00
Patient Stipend:		550.00
Equipment:	This is the encumbrance for cryosurgical delivery system for one year	4,249.90

Liquid Nitrogen and Cylinder cost:	324.99
Travel:	240.17
Indirect Costs:	2,287.01

Pathology Costs:

Pathology has not hired a technician. Therefore, there are no charges for Pathology.

Postage	<u>19.83</u>
	\$ 15,563.90

E. Work Plan:

Phase IV has just started. It is anticipated that Phase IV will be completed in approximately three months. To-date, we are in step with the work plan that was proposed in July 1979. We anticipate no problems in conforming to the future schedule.

F. Budget Forecast:

The investigators anticipate that expenditures will be similar in the next six months to the preceding six months. The only change anticipated is that the Pathology Department will probably start charging us for the serial histological sections of the uterine cornu. It is anticipated therefore that those pathology costs will be approximately \$3,000.00 in the next six months.

A site visit will be performed by Dr. James Shelton and following that visit, it is anticipated that the contract period will be extended without a request for increased funding.

The continued support of Valleylab greatly enhances this research program. The two cryosurgical engineers at Valleylab that are assigned to this project have made between twelve and fifteen trips from Boulder Colorado to Tucson during the past six months to help with the research.

*William Droegemüller, M.D.*

William Droegemüller, M.D.  
Professor and Associate Head