

Improving mechanical birth control methods

Intrauterine devices combining new designs with a trace of copper offer more effectiveness and—even more important—few side effects

by Barbara J. Culliton

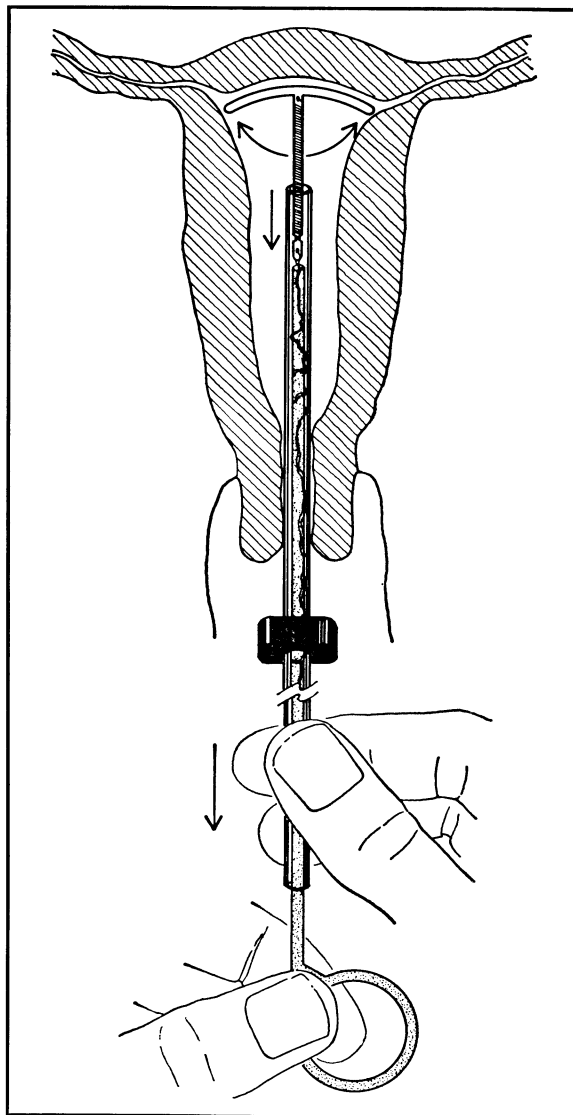
The idea that by placing an object in or near the uterus a woman can prevent herself from becoming pregnant has a long and venerable history. Cleopatra is reported to have used a sea sponge soaked in vinegar. Ninth century Persian writers describe the use of a cervical plug made of paper, tightly wound in the shape of a cone and bound with thread. And there are those who recount that the ancients placed stones in the uteri of camels to prevent pregnancy during caravan journeys, though, Dr. Hugh Davis of the Johns Hopkins University School of Medicine, says "when attempts are made to verify this charming camel tale, the cited references vanish in the vast and uncharted sands of Araby."

Apocryphal or not, the tale illustrates the fact that contemporary physicians are by no means the first to view intrauterine devices as a useful, and some believe ideal, contraceptive. They are, however, the first to take IUDs out of the shadows of medical folklore. Dr. Davis says it was 1958 before IUDs were accepted for experimental study by any major medical institution in the United States; it was then that Dr. Lazar Margulies commenced testing a coil-shaped device at New York's Mount Sinai Hospital. And it was not until 1962 that a major scientific conference was convened on the subject in this country.

Prior to that time, the history of IUDs in the 20th century was written by investigators in Europe and the East. Credit for launching the modern era usually goes to Ernst Grafenberg, a German scientist who in the late 1920's and early 1930's reported good results, first with a silkworm gut ring wound with a spiral of silver wire and then with a silver ring that bears his name.

Grafenberg's predecessor was Dr. R. Richter, who worked extensively on

The "T device" is easily inserted by a doctor and is highly effective when wound with a pure copper coil.



Johns Hopkins

silkworm gut devices in the early 1900's. Richter daringly published a paper in 1909 entitled "A Means of Preventing Conception," at a time when the idea was not only unaccepted but illegal. Indeed, IUDs traveled a long and tortuous road before being accepted by the medical profession. Prof. Ludwig Fraenkel of Breslau, in modern-day Poland, a town near Richter's village of Waldenberg, wrote in 1932, "All intrauterine devices have to be condemned because all of them are dangerous."

Today, that view is as outmoded as Richter's device. After 12 years of experimentation, in fact, IUDs are already entering their second generation as evidence accumulates showing that devices can be designed that are not only virtually free of the disadvantages of those now a decade old but also are 99 percent effective in preventing pregnancy. Researchers are now going beyond the problem of design of a device that can be accepted and retained in the uterus to the alloying of materials for a chemical assist to the devices' still-unclear contraceptive functioning.


According to Dr. Louis Hellman, deputy assistant secretary for population affairs for the Department of Health, Education and Welfare, one of the most exciting lines of current research centers on the use of copper in IUDs. Copper, he believes, could be the element that will give intrauterine devices a degree of effectiveness that will make them virtually equal to oral contraceptives. Dr. Hellman was formerly chairman of obstetrics and gynecology at the State University of New York at Brooklyn and was head of the Food and Drug Administration's Advisory Committee on Obstetrics and Gynecology when FDA gave IUDs an official stamp of approval in 1968 (SN: 2/3/68, p. 112).

At the present time, FDA approval is somewhat academic because the agency does not regulate IUDs before they appear on the market, though if legislation giving FDA broad authority to preclear all types of medical devices materializes, the situation may change (SN: 5/23, p. 500).

The special ability of copper to enhance the contraceptive action of intra-

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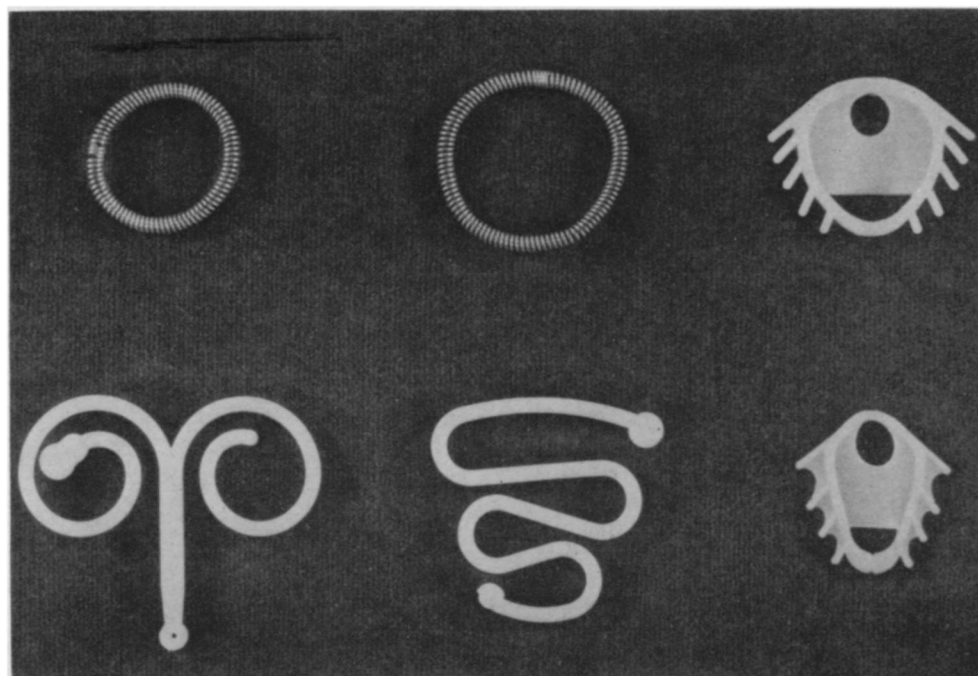
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Hugh Davis/Johns Hopkins

IUDs: Early ring types, coil and loop, and the new experimental shields.



Y. Karsh

Hellman: Virtually equal to the pill.

uterine devices was first observed by a South American scientist, Dr. Jaime Zipper of Santiago, Chile, who discovered its effectiveness in the course of animal experiments, and who has collaborated with investigators at the Population Council in New York in clinical trials. A T-shaped device with a thin coil of pure copper wound around its vertical arm appears to be effective. Many investigators feel that there is no reason to anticipate adverse reactions to the copper. The T device was designed by Dr. Howard Tatum, who was looking for an IUD that would not be expelled, as many coil and loop devices are, and that would not induce the well-known side effects associated with most IUDs—pelvic cramps and irregular bleeding. "The T," Dr. Tatum says, "is small and conforms to the uterine cavity,

causing virtually no distention. It was very free of side effects but alone was not a good contraceptive. The addition of copper coil has solved that problem." Including the clinical experience reported by Dr. Zipper in Chile, close to 4,000 women have now been fitted with the T-plus-copper IUD, with highly encouraging results. It appears to be 99 percent effective and can be tolerated by women who have not previously borne children, and its contraceptive effects are quickly reversible. "Fertility is restored within a day or two of its removal," says Dr. Tatum, adding that less than one percent of users have had the T device removed for medical reasons (pain and bleeding), compared to a 15 percent removal incidence for loop devices.

At Johns Hopkins, Dr. Davis is having similarly encouraging results with a shield-shaped device in which copper ions are blended with plastic as the device is manufactured. He reports that it has been inserted in 900 women since last October; none has become pregnant. Like the T device, the shield is accepted by women who have not borne children and, says Dr. Davis, "is, for all practical purposes, non-expellable." In addition to pain and bleeding, the rate of spontaneous expulsion of other devices, sometimes without the wearer's knowledge, has been high, in some instances over 20 percent.

The question still plaguing scientists is how IUDs work. For some time a principal theory has supposed that the devices somehow speed the passage of an ovum through the fallopian tubes so that when it reaches the uterus it is too

die Länge, Richtung und Weite festzustellen. Nunmehr werden zwei Fäden, zu einer einfachen Schlinge geschürzt, in das Auge der Hohlsonde gelegt, durch den Draht (Mandrin) festgeklemmt (vgl. die Abbildung) und langsam in den Uterus bis zum Fundus ge-

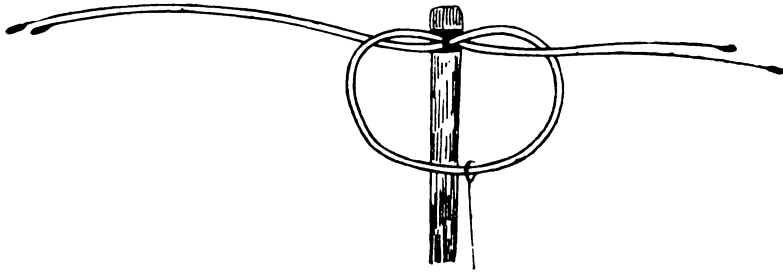


Abbildung in natürlicher Größe.
Die Fäden zu einer einfachen Schlinge geschürzt, in das Auge der Hohlsonde eingeklemmt und durch den Mandrin festgehalten.

schohen. Der Mandrin wird jetzt etwas zurückgezogen, die Fäden werden frei und springen heraus. Durch Drehungen um die Längsachse der Sonde wird dieser Zweck noch sicherer erreicht. Nunmehr wird nach einigen stopfenden Bewegungen, welche die Fäden

Hugh Davis/Johns Hopkins

Richter's intrauterine ring: The first IUD to be used successfully in women.

immature to implant. Recently this idea has been superseded by assumptions that IUDs act locally, exerting an effect on the endometrium or lining of the uterus.

The additional contraceptive effect of copper, though not entirely understood, appears to come about by a separate mechanism. The copper, Dr. Davis speculates, may be interfering with enzyme systems, activating enzymes which can immobilize or destroy sperm. Dr. Tatum points out that its effect appears to be localized—if it is placed in one uterine horn in a rabbit, it does not impair fertility in the other—and that it may alter the uterine environment to prevent a fertilized egg from implanting. "After implantation has occurred," he says, "the addition of copper has no effect on the course of pregnancy."

While there is no definitive explanation of the contraceptive action of IUDs themselves, current theories of mechanism focus on the now-established fact that leukocytes congregate around the device in the uterus. Investigations show, Dr. Davis points out, that this accumulation of leukocytes, the protective cells of the body's immune system, is not in response to bacterial infection, as has been supposed, but is directly related to the presence of the device itself.

His own studies of the mechanism of action of the shield, which he considers among the best of available designs, suggest that contraceptive effects are related to the size of the device, increasing as its surface area increases. "Ranking devices according to this factor," he reports, "discloses an excellent correlation between pregnancy rates and the total surface area of plastic in potential con-

tact with the endometrium." Increasing surface area increases the degree of endometrial reaction.

Assuming that the presence of leukocytes in unusually large numbers in the uterus is primary to IUD action, more than one explanation is possible. First, the leukocytes which have responded to the device as a foreign body may also recognize a fertilized egg as foreign, containing, as it does, genetic information from the sperm which is foreign to the female. Thus, it could be a simple matter of immune rejection.

Another possibility is that some of the aggregated leukocytes disintegrate, liberating a toxin that destroys egg, sperm or both. Or it could be that some of the defensive cells attracted by the IUD gobble up both sperm and ova. Drs. Nuri and Emel Sagiroglu of Ankara, Turkey, working with the Lippes Loop, find that macrophages attracted to the device digest material from the uterine, presumably reproductive cells.

Though no contraceptive researcher predicts that there will ever be a single method of birth control equally effective and suitable for all women, many believe that the IUD approaches the ideal. This is because of its ease of insertion, its potential for long-term, uninterrupted use and because it does not produce systemic or broad effects on the body as oral contraceptive drugs do. As new research develops ways to bring its effectiveness rate close to that of birth control drugs, the appeal and use of the IUD is increasing, particularly in light of the disturbing questions that have been raised about the safety of the pill (SN: 3/14, p. 266). □

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