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Free China, Korea to Embark Upon Wide-ranging Technical Cooperation

Technical cooperation is a major feature in the Sino-Korean economic cooperation worked out at the binational ministerial conference which was held in Taipei September 10-13.

In the field of technical cooperation, the two delegations agreed to promote institutional cooperation in science and technology, to initiate cooperation in joint and coordinated research programs, to further cooperate in the peaceful application of atomic energy and to step up the exchange of visits program so as to enhance the exchange of technical knowledge and experience.

These were agreed upon in one of the official-level meetings held before the full-fledged ministerial conference took place. The discussion over technical cooperation was made at the technical group meeting jointly presided over by Mr. Sun Chin-son, director of International Cooperation Department, Ministry of Economic Affairs of the Republic of China, and Mr. Kim Hyung-ki, director of the Technical Cooperation Bureau, Ministry of Science and Technology of the Republic of Korea. The discussants spelled out the following specifics:

1. Institutional Cooperation in Science and Technology

1) KORSTIC and SDC:

To facilitate the interflow of information between the two countries in the field of science and technology and to complement the resources of each, the Korean Scientific and Technological Information Center (KORSTIC) of the Republic of Korea and the Scientific Documentation Center (SDC) of the Republic of China, it is agreed that both governments will encourage KORSTIC and SDC to establish a close relationship. Such a relationship may be built on the exchange of a memorandum of understanding between the heads of the two organizations after they have consulted on the details of the cooperation. KORSTIC is prepared to accept staffs from SDC for observation and training if ROC has such an interest.

2) KIST and ITRI:

In view of the potential benefits to be expected from close relationship between the Industrial Technology Research Institute (ITRI) of ROC and the Korean Institute of Science and Technology (KIST) of ROK, both of which are enaged in the industrial research, it is agreed that both governments will encourage the two research institutes to enter into close cooperative relationship through exchange of information, researchers and possible undertaking of joint research programs.

2. Promotion of Cooperation in Joint and Coordinated Research

1) Production of Hydrocarbon (Petro Yeast)

Production of hydrocarbon protein (petro yeast) on an industrial scale is being pursued in both countries to secure a new source of feed supply. It would be desirable for both ROK and ROC to share experience on this subject. The two governments will encorage KIST and Chinese Petroleum Corporation (CPC) to explore the possibility of technical as well as economic cooperation for the industrialization of hydrocarbon protein production.

2) Lysine Production and Enzyme Pregaration

ROC, at the pleasure of the ROC, will be pleased to receive one or two ROC scientists at KIST to observe lysine production and enzyme preparation for possible cooperation between the two countries in these fields.

3) Chemical Reagents and Fine Chemicals

ITRI and KIST will study concrete cooperation on this topic when they develop into closer relationship.

4) Additional Areas for Science Cooperation

Recognizing the importance of the technological research to the further development of industry, it is agreed that the MOST of ROK and the NSC of ROC be asked to study and develop the other joint and/or coordinated programs in the areas such as pesticides, food, steel, shipbuilding, electronics, and so forth, for the benefit of the related industries in both countries.

3. Peaceful Application of Atomic Energy

In recognition of the similarity of endeavors in the peaceful applications of atomic energy and the benefits expected to derive from the exchange of researchers and technical experts and management experience exchange, it is agreed that both countries will cooperate in this field as follows:

1) Exchange of information and experience on the construction of experimental reactors.
2) Exchange of nuclear power plant personnel between the Taiwan Powar Company and Korea
3) Exchange of information in the construction and technical review of nuclear power plants, including such aspects as quality assurance and quality control.

4. Exchange of Visits Program

Recongnizing the value of the exchange of visits program in the various fields of each country's interest, it is agreed that the program be maintained at least at its present level of twenty visitors each way and per diem for each visitor be increased to US$20 or more as mutually agreed upon.

Preliminary Results in Cryogenic Preservation of Grey Mullet (*Mugil cephalus*) Sperm

(Continued from previous issue)

As soon as the contents in the vial reached the cryogen temperature (—196°C), the liquid resumed its stillness. The cooling rate was extremely fast and not under control; the process often is referred to as "uncontrolled freezing." It took less than a minute for the sperm in the sample from normal temperature abruptly being brought down to an abnormally low condition. About two minutes later, the frozen sample was transferred into a styrofoam box, which filled with liquid nitrogen. When the freezing experiment was completed, the box with liquid nitrogen and specimens was put into the freezing compartment (—20°C) of a refrigerator. In order to keep the specimens constantly at —196°C, a refill of liquid nitrogen in an interval of every 2—3 hr was necessary. And a shift around the clock was organized.

B. Cryo-protectants and diluent

The protectants tested were glycerin and dimethyl sulfoxide (DMSO). The concentrations were 3.3, 5, 7.5, and 15% (v/v) for both protectants. The diluent for the preparation of these concentrations was marine fish saline. The saline contained: NaCl, 1.35 g; KCl, 0.06 g; $NaHCO_3$, 0.02 g; $CaCl_2$, 0.025 g; $MgCl_2$, 0.035 g; and distilled water, 100 ml.

In some experiments, the milt was diluted with saline prior to the addition of protectant. Thus the cell count of the sperm solution varied from experiment to experiment. (In fact, the sperm count for each collection would differ.) The concentration of protectants used were kept constant unless otherwise mentioned.

C. Thawing

Frozen living cells would resume their usual activities after thawing. In the present study, thawing temperature was between 20 and 24°C. Frozen samples were thawed by gentle agitation in a water bath of that temperature range, and slow thawing at room temperatures or in 35—37°C water bath was used. Immediately after the ice in the sample was dissipated, the vial was taken from the bath, and the reactivated sperm was ready for further tests.

D. Motility and fertility observations

The viability of the frozen-thawed sperm could be verified by motility and fertility. Motility was induced by dilution of the milt on a microscope slide smear with excess of sea water.

For the fertility test, a small quantity of fresh eggs (300—400) was transferred into a 1,000 ml beaker. The egg mass was overspread with the thawed sperm, including the protectant. With a piece of chicken feather, the components were well mixed. While sea water was slowly added, gentle agitation was also applied. At 20—30 min intervals after 2 or 3 washings, aeration was supplied to those beakers containing clean eggs. Later on, changing of sea water at 5—6hr intervals could be helpful. The eggs were incubated at 28—32°C (room temperature). Cleavage of fertilized eggs might be observed under a profile projector (Nikon, Model 6C) about 1.5hr after fertilization took place.

Results and Discussion

Motility is one of the most direct expressions of a living organism. And this expression was used to verify the effect of the freezing process upon the frozen-thawed grey mullet sperm. A prevalent fact was that when sea water was added to a milt smear, the activity of fresh healthy sperm mass was induced, vigorous and turbulent; but in the order of 2 min, it cursorily ceased. This observation was vividly seen under 40× magnification. A sluggish motion followed, which was interfering with a few individuals thrusting around. This view was better seen under 400× magnification.

No freezing was achieved for samples that were exposed above 0°C and application of protectants was proven unadvantageous to those sperms. On the contrary, its ill effects corresponded directly to the temperature gradient. The sperms with protectant had a much shorter life than those in pure milt samples.

The motility at best for non-frozen samples was described in Table 2 and these samples contained no protectants. The sperm activity of these preparations clearly corresponded to the temperature gradient. Milt collecting was under unsterile conditions. At higher temperatures (24 or 14°C) contaminates actively developed. A delicate yellowish film with offensive odor developed on these samples. Among the 5°C samples, with no protectants, the motility of sperms could be retained up to 23 days.

Sperm cells in samples with or without protectants held at —20°C were equally destroyed. After an hour, no more motile sperm was found (Table 2). When the samples were kept at —196°C, after 47 hr and 92 hr (Table 2), sperm motility was comparable to the sperm from fresh samples; suspending in 5 or 7.7% of either glycerin or DMSO effected no marked difference. The 15% concentration of either was lethal (Table 2).

Table 2. Sperm motility after holding at various temperatures and the effect of protectants

Temperature (°C)	Without protectant		With protectant	
	Duration		Duration	
	Motile	Non-motile	Motile	Motile
			Glycerin (5, 7.5%)	DMSO (5, 7.5%)
24	24 r	48 hr	—	—
14	96 hr	120 hr	24 hr	24 hr
5	23 days	29 days	15 days	15 days
− 20	—	<1 hr	<1 hr	<1 hr
−196	—	—	92 hr	92 hr

* In addition, sperms from samples of pure milt; saline and milt (1:1); 15% glycerin and 15% DMSO were non-motile after holding at −196°C for less than an hour.

Liquid nitrogen storage facility was not yet available in this laboratory. Would —20°C storage conditions enable keeping sperms alive after the milt samples were frozen in liquid nitrogen? Under these circumstances, 3 series of preparations, including samples with two respective protectants of 5, 7.5 and 15% and pure milt were prepared. Each samples with two plunged into a liquid nitrogen bath until the freezing was completed. These frozen samples were kept in a —20°C refrigerator. On the 13th day, they were thawed and examined for vital sperms. No motile sperm was ever found in any of them; despite the fact that the thawing temperatures were varied (quickly in a 35—37°C water bath or more slowly at room temperature). However, no contaminates developed and the physical appearance of these thawed samples was similar to the fresh milt.

Insemination of frozen-thawed sperms with fresh eggs was performed and the results are summarized in Table 3. At this time, the spawning season was approaching its end. These experiments were somewhat hindered by the lack of healthy eggs, as indicated by the poor results (from 0 to 14%) shown from the mass fertilization conducted at the same time and which was to be the control. About 3% fertility from samples kept at 5°C for 4 days was the best. Those 5°C samples were not frozen and had no protectants. Among the 1% fertility kept for 3 days, 7 larvae were hatched. At —196°C, the positive fertilization appeared among the 5% glycerin samples and the fertilized eggs developed further after 4-cell cleavage. Results in another experiment, after 30 hr at —196°C were negative, as was the control.

The spawning season for grey mullet was rather short (about 3 months). Selection of qualified spawners was a difficult frontier for the artificial propagation work. During early and middle period of the spawning season, the number of males was notably more than the females. But the supply of qualified males would be somewhat handicapped at the end of the spawning season, because many have had their sperm discharged. In addition, among the pond-reared mullet, the females usually outnumber the males. Similar events have been observed in Israel. If a supply of sperm was ever ready, the difficulties for the artificial propagation work could very well be partially alleviated. In liquid nitrogen storages, the vitality of the sperm cells was retained (presently up to 92 hr). It is realistic to postulate that grey mullet sperm could be preserved by ultra-low temperature for a longer period, although variables, such as proper protectants, kind of diluents and their respective proper concentrations should be further investigated in order to secure predictable results.

Summary

Among samples kept above freezing point (24, 14 and 5°C), sperm motility was retained up to 23 days at 5°C in the non-protectants preparations (Table 2); the same preparations of 3 to 6 days at 5°C samples showed 1 to 3% fertility (Table 3).

Among frozen-thawed milt samples (with protectants) held at —196°C for 92 hr, sperms were vigorously active and comparable to the fresh sperm (Table 2). Sperm recovered from 5% glycerin samples after 47 hr at —196°C showed some degree of fertility (Table 3); the fertilized eggs developed further than 4-cell cleavage. The effect of the croy-protectants glycerin and DMSO at 5 and 7.5% concentration with marine fish saline as diluent was beneficial.

Table 3. Percent of fresh eggs fertilized with sperm recovered from 24, 14, 5, −20 and −196°C in reference to various conditions*

Temperature (°C)	47 hr	3 days	4 days	6 days	23 days
24	—	0	—	—	—
14	—	0	—	—	—
5	—	1	3	1	0
− 20	—	0	—	—	—
−196 (in 5% glycerin)	+**	—	—	—	—
Control***	+	10	14	1	0

* Samples above 0°C were pure milt; −20°C included both protectant preparations. At −196°C, in addition, glycerin of 7.5% and 15%; DMSO of 5, 7.5, and 15%; and saline 1 to 1 milt preparations were negative in fertility.

** Positive without estimation.

*** Controls were from mass fertilization conducted at the same time with fresh sperm.

Guidebook on Taiwan Off The Press

A guidebook on Taiwan compiled by the National Science Council for the benefit of American scholars has come off the press.

The 103-page brochure, entitled *A Guide to Living in Taiwan,* contains all the essential information a visiting scholar needs to know about his host country. It also tells the reader how to prepare for his Taiwan assignment as well as the small details involved in everyday living during his tour of duty.

NSC is sending 500 copies of the attractive brochure to the National Science Foundation in Washington D.C. for distribution to interested scientists and scholars. Another shipment will be sent to the Science Counselor of the Chinese Embassy there. Copies will be furnished upon request.

The National Science Council has announced that research grants will be awarded to a total of 1,491 faculty members and research scientists for the academic year 1973-74. Among the grantees are 475 protessors and researchers of corresponding rank, 402 associate professors and researchers of corresponding rank, 401 lecturers and researchers of corresponding rank and 213 teaching assistants and researchers of corresponding rank. Grants will be withheld from those who move to administrative positions after the announcement was made.

A New Alphameric Code for Chinese Ideographs* (Derived From Structural Analysis of Chinese Ideographs)

Nelson Chou

The codification of the Chinese language poses a unique problem for coding system designers. There is no definite set of sound symbols which can represent all the vocabulary items in the Chinese language. of the more than 47,000 ideographs (the basic unit of the language), there are only about 1,300 sounds to represent them, resulting in a large number of homophones. If a coding system for the Chinese ideographs is desired, there is no alternative but to deal with the physical structures of the ideographs themselves. Since there are no structural regularities in the juxtaposition of the composing units of the ideograph, the development of a coding system to cover all the Chinese ideographs has been a difficult task.

In the past, most of the methods of arranging Chinese ideographs were developed for either partial solution of specific field of knowledge, or limited use in printing and listing. Not until the late 1950's did people begin to attempt to solve the problem of coding Chinese ideographs for computer input.

After three years of study of almost all the Chinese ideographs, the writer found the following:

1. Every ideograph is unique in structure; and
2. An ideograph is composed of either a single basic unit (graphic element), or a group of basic units in one of the following four major patterns:
   - a A horizontal pattern in which there are two or more components placed horizontally (in a row),
   - b A vertical pattern in which there are two or more components placed vertically (in a column),
   - c A bordered pattern in which there are two or more components, one of which forms a border (the border component borders at at least two sides of the inner portion), and the other forms the inner portion,
   - d An independent pattern in which there is only one component with one or more basic graphic elements connecting or superimposing each other.

Based upon these findings, the writer developed an alphameric code for Chinese ideographs.
This coding system makes the following contributions:

1. It proposes a new way of analyzing Chinese ideographs for the purposes of coding and decoding. Chinese ideographs that desigtes the structural levels by using pattern codes, structural symbols, and divisional signs. With the designation of the structural levels, the system keeps under firm control not only the juxtaposition of each composing subunit but also the number of the subunits, thus guaranteeing the reversibility of the coding process.
2. It is the only coding system of Chinese, known to the writer, that provides redundancy for error detection and correction.
3. It is the only coding system of Chinese that has a reversibility potentiall for reconstructing the original ideographs from codes, where an expansion of its vocabulary will not cause problems for the coding process.
4. This coding system of Chinese does not require the code to have previous knowledge of the Chinese language.
5. There are seven processing rules, four major patterns (twenty-five sub-patterns), and seventy-two basic graphic elements in this coding system. The coding process can be easily learned with proper training.
6. It is probably the only coding system of Chinese that has the flexibility for modification without causing much complication for the coding process.

* *This is an abstract of one of the papers presented at the Symposium on Computers and Chinese Input/ Output Sytems held in Taipei last August.*

Y. S. Sun, left, minister of economic affairs of the Republic of China, and Tae Wan-Sun, vice premier and minister of economic planning of the Republic of Korea, sign the joint statement marking the successful conclusion of the eighth Sino-Korean Ministerial Conference on Economic Cooperation. Among the withnesses is Professor M. C. Chang, standing behind Minister Sun at left, vice chairman of the National Science Council. Technical cooperation is part of the binational cooperation scheme.

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