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PHILIPPINES PHARMACEUTICAL INDUSTRY DEVELOPMENT STUDY

DP/PHI/87/019

PHILIPPINES

Technical report: The Supply of Animal By-products for the
production of Bioactive Substances in the Philippines*

Prepared for the Government of the Philippines
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of F. Peterfy
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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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1. SUMMARY

1270 g of porcine/bovine insulin was purchased for P8,347,000 in the Philippines in 1987, and the calculated need exceeds 85,000 g. More than 800 tons of pancreas are needed per annum at a reasonable price for economically viable production, but it cannot be provided in the Philippines. In case it is decided to proceed with insulin production, it would be up to the public sector to assume the responsibilities. In this case it is recommended to proceed in successive steps, as the stages of gland collection, extraction, purification and formulation can be separated. Purification and formulation are sophisticated technologies, and a domestic production based on semipurified imported insulin may be economically viable when the consumption reaches the level of 10 kg per year.

258 million units of heparin were purchased in 1987 and the estimated need is about 110,000 million units. Heparin can be produced with profit near to an abattoir where more than 600,000 pigs are killed per annum, the mucosa immediately removed from the small intestines, and it can be purchased for a reasonable price. This abattoir does not exist in the Philippines, consequently the private sector would not participate. In case it is decided to start heparin production, it is advisable to produce technology for formulation as a first step, because the private sector has the capacities, competence and facilities to make the formulation on contractual basis. The formulation may be economically viable when the heparin consumption exceeds the level of 5,000 million units per annum.

852 kg pancreatin was consumed in 1987. It can be produced in the Philippines, but well above the world price. The purification technology is not a sophisticated one, the therapeutic value is not high: it seems, there is no reason to promote a pancreatin project.

258 kg of dry bile/desoxycholic acid were imported between January 1987 and June 1988. Bile is the only valuable animal by-product in the Philippines. A small firm may earn some profit by collecting the bile and dehydrating it with a simple spray-dryer.

151.8 kg thyroglobulin was purchased in dosage form in 1987. It is an exceptionally high consumption. The domestic production can be organized, if thyroglobulin therapy is considered to be important, and the public sector assume the cost of investment.

On the basis of consumption data some substances were considered to have low market potential: alpha-chymotrypsin, trypsin, pepsin, lysosime, hyaluronidase, hyaluronic acid, serum gonadotropin for human use, kininogenase, apro-tinin, pancreatic trypsin inhibitor and chymosin. In case some of them is considered to have an importance, a further feasibility study should be conducted.

The supply of source material is unadequate for industrial production in the cases of gelatin and serum gonadotropin.

In spite of unfavorable conditions the domestic production of fetal calf serum should be considered, because the high price of imported sera may hinder the development of modern biotechnology in the Philippines. The production may be economically feasible when the consumption reaches the level of 500 litres per year.

Animal blood is used for food, it is not a polluting agent, and for this reason it is not important to produce food or feed grade blood hydrolisates.

4,790 litres of pharmaceutical grade fish liver oil was imported in bulk form, and 494,329 kg of unprocessed liver oil was exported. Fish liver oil can provide a good source of vitamins at an affordable price. The supply of raw material is good in the Philippines. It is recommended to conduct a detailed feasibility study in this subject.

2. BIOACTIVE PRODUCTS OF ANIMAL ORIGIN

2.1 Insulin

Usage : Treatment of insulin dependent diabetes

Insulin is produced using bovine and pig pancreas as well as the inclusion body of genetically engineered microorganisms as a source material.

The human insulin preparations are manufactured either by semisynthesis from porcine insulin or by recombinant DNA technique.

For obvious reasons the market for bovine insulin is limited to some Muslim countries. It is clearly inferior to porcine insulin regarding anti-insulin immune response induced in diabetic individuals.

The expert is convinced that the market for porcine insulin is almost static. The immune reaction to the highly purified monocomponent porcine insulin is very rare. It has a benevolent side effect that gives warning before a hypoglycemic shock. The superiority of human insulin still has to be proved in properly controlled clinical trials, although it is probable that the porcine insulin is more immunogenic. But it was demonstrated during the previous years that the monocomponent porcine insulin purified by chromatography is safe and effective for the great majority of diabetic individuals.

The expert is convinced that the cost of manufacturing of human insulin will be substantially higher for a long time because of the cost of downstream processing.

The market for porcine insulin is highly competitive and a plant should process more than 800 tons of pancreas a year to be economically viable.

Source Material: Pancreas is collected at the slaughtering line. The organ is separated from the intestines by hand, placed onto freezing trays in single layer and then immediately transferred onto the deep freezer.

The cost of purchase of pancreas was US\$ 1.5 - 1.6 per kilo in Singapore and Malaysia in 1987, packing, freezing and storage at abattoir included. Data for the Philippines are not available.

2.2 Heparin

Usage : Prophylaxis and treatment of venous thrombosis and pulmonary embolism; treatment of myocardial infarction and arterial embolism; prevention of clotting in arterial and heart surgery, and cerebral thrombosis. As an

anti-coagulant in blood transfusions, extra-corporeal circulation, dialysis procedures, and for laboratory purposes.

Heparin is extracted preferentially from pig intestinal mucosa, but beef lung is an alternative source.

For this product the market is fluctuating and very competitive.

Heparin injectable grade (150 - 200x10³ iu/g) is obtained through a sophisticated technology that necessitates the removal of proteins and pigments. Heparin crude is a lower activity product (80 - 100x10³ iu/g) with protein and pigment impurities, and offered to the world market by new producers (People's Republic of China).

A small scale plant would never be competitive economically. For an economic plant it is considered necessary to process mucosa from more than 600,000 pigs a year.

Source Material: Mucosa is obtained in the course of cleaning the porcine small intestines. This raw material has a strong tendency to decompose and cannot be preserved by freezing. Consequently the heparin extraction plants are usually located in the immediate vicinity of pig slaughterhouses, and the production is synchronised.

Mucosa can be preserved by heat treatment and drying, but it is an expensive process. The capacity of a small size heat drier per annum corresponds to the mucosa of 200,000 hogs.

2.3 Alpha - Chymotrypsin

Usage : Treatment of inflammatory conditions with associated edema and pain in soft tissue injuries (hematoma, contusions, sprains and strains), surgical and accidental trauma, dental procedures, dermatology, eye disease and eye surgery, genito-urinary disease, peptic ulcers and ulcerative colitis, respiratory tract disease, plastic surgery, thrombophlebitis and tubercular pleural effusions.

Bovine pancreas is the preferred source material for alpha-chymotrypsin production.

The market is small for highly purified alpha-chymotrypsin which is used for injectables.

A larger market exists for purified alpha-chymotrypsin, which has high activity but contains some trypsin impurities. This quality is used for tablets and ointments.

A plant should process more than 300 tons of bovine pancreas to be economically viable.

Source Material: Collection of bovine pancreas : see paragraph 2.1

2.4 Pancreatin

Usage : Treatment of dyspepsia due to fatty foods and foods rich in protein. All forms of enzymatic deficiency of the digestive tract in disease and functional disorders of the stomach, intestine, liver, gall bladder and pancreas in chronic pancreatitis, total or sub-total pancreatectomy. Enzymatic insufficiency, mainly in older persons. Fermentative dyspepsia due to vegetarian diet. Food processing and fermentation industry.

In the dosage forms pancreatin is often combined with dry bile or desoxycholic acid.

Usually pig pancreas is used for pancreatin production, because it has a higher lipase content. Pancreatin is a crude preparation and the active ingredients are: lipase, alpha-chymotrypsin, trypsin and amylase. The extraction is not a sophisticated technology and the product does not command a high price. But it is not recommended to produce it in a small scale, because of the difficulty to get a standard product since on a larger scale the individual batches can be homogenized. The relative proportions of the four enzymes can vary from batch to batch due to a variety of source material and the proteolysis during the processing. Thus a good manufacturing process and a rigorous quality control is essential.

Source Material: Collection of pancreas : see paragraph 2.4.

2.5 Dry bile/dehydrocholic acid

Usage : See paragraph 2.4

In dosage form it is usually combined with pancreatin, because bile has a great enhancing effect on lipase activity.

Dry bile is preferably produced from bovine bile.

The product is marketed in two forms: as dry bile or as dehydrocholic acid prepared from bile. But as dry bile is as effective as dehydrocholic acid, many brands contain unprocessed dry bile only. There is a constant demand for this product, but the price is moderate.

It is necessary to collect about 200 tons of bile a year to fill the capacity of a small size film evaporator and spray dryer.

Source Material: Bovine gallbladders collected during a shift are placed into a funnel with a perforated metal filter on a plastic bottle of 50-100 liters volume. The bottle contains an alkaline preservative. The bladders are cut open and the bile poured into the bottle, where it is stirred several times. The bottle are kept closed between fillings and after they are filled. The filled bottles are then stirred once a day and kept in a dark, cold place tightly capped until they are shipped.

2.6 Pepsin

Usage : Treatment of dyspepsia and disorders due to meteorism, sensation of fullness and flatulence. Food processing , and laboratory reagent.

Pepsin is usually extracted from pig gastric mucosa.

The pharmaceutical grade pepsin is not a sophisticated product, and has an activity of only 700 units/g. The demand for this product is shrinking, because the real indication (dyspepsia) is more rare than that it was thought before.

Source Material: The porcine gastric mucosa is collected within one hour after the kill. The stomach is cut off from the intestinal tract, turned inside out and the content is washed off with cold water. The mucosa is incised using

a knife and the stomach is scalped by a plastic or wooden block. The removed gastric mucosa is transferred into the freezing trays in layers of 2-2.5 cm. The tray must be placed into a freezer within one hour.

2.7 Trypsin

Usage : See alpha-chymotrypsin. Treatment of wounds. Food processing, leather industry, and laboratory reagent.

The pharmaceutical grade trypsin for tablets, ointments and powder formulations can be extracted from bovine pancreas, as a by-product of alpha-chymotrypsin or from porcine pancreas as a by-product of insulin. High activity product with minimal alpha-chymotrypsin impurity needs porcine pancreas and sophisticated technology.

There is a stable market for industrial, pharmaceutical and analytical grades.

Source Material: Collection of glands : see paragraph 2.1

2.8 Hyaluronidase

Usage : Treatment of scars, sprains, contusions. To accelerate the absorptions of infiltrations and local edema, to soften scar tissue.

Two types of pharmaceutical grade hyaluronidase exist in the market: from bacterial origin and from animal origin. Hyaluronidase of animal origin is usually extracted from bovine testes.

The market for this product appears rather limited and only a few brands exist with a low production volume.

Source Material: The bovine testicles removed in the course of cutting up are freed from the epidermis and other connective tissues attached and then transferred to a refrigerator within approximately one hour.

2.9 Thyroglobulin/Thyroid glands dessicated

Usage : Replacement or substitution therapy of diminished or absent thyroid function resulting from functional deficiency, primary atrophy, from partial or

complete absence of the gland or from the effects of surgery, radiation or antithyroid agents.

Thyroglobulin is usually prepared from thyroid glands of pigs.

It is considered to be a rather old fashioned product. The market is stable and the prices are moderate.

There are two types of thyroid products in the market: (i) cleaned, dried and powdered thyroid gland previously deprived of connective tissue and fat, where the ration of the thyroid hormones T3 and T4 should be higher than 5, and (ii) purified thyroglobulin in which the requirement for the the T3/T4 ratio is above 2.8 .

The porcine thyroid gland is removed from the neck-part of the animal together with the connective tissue after cutting open the carcass. It is cleaned by cutting through the capsule around the gland and taking the organ out of it. The collected organs are placed into the deepfreezer at the latest 60 minutes after removal and are frozen either individually or in a single layer.

2.10 Lysozyme (muramidase) :

Usage : Treatment of inflammatory disease in oto-rhino-laryngological area. Acute chronic paranasal sinusitis, allergic rhinitis, nasal bleeding, hemoptysis, hematuria, operative and post-operative bleeding, gingivitis, alveolor pyorrhea, post-extraction management. Food processing, and laboratory reagent.

Lysozyme is usually extracted from hen egg white.

In dosage form (tablet, syrup) it is used as purified lysozyme chloride. Lysozyme is usually produced as a by-product connected to an egg processing plant.

There is no well established market for this product.

Source Material: Hen egg

2.11 Chymosin (Rennin)

Usage : Dairy industry - curdling of milk in cheese production, preparation of junket.

Two types of chymosin compete for the market : microbial and calf. The relative proportion of microbial chymosin is growing, because it is cheaper, better standardized and accepted by vegetarians. Calf chymosin is required for the seasoned quality cheese brands.

Chymosin production is connected to big dairy farms, because calves have to be slaughtered before they are 30 days old. Standardization requires an industrial scale production as there is a substantial individual difference in the relative proportion of chymosin and pepsin.

The market for this product is stable and the price is moderate.

Source Material: The abomasum or 4th stomach of calves is washed with cold water, then it is placed on a perforated tray to dip. The organs are placed in a container with layers of salt, and kept in a cold, dark place before drying.

2.12 Fetal Calf Serum

Usage : Preparation of cell culture media.

Two kinds of products are on the market. The newborn calf serum is obtained immediately after birth, before the first take of colostrum. This product is as good for propagation of the majority of cells as fetal calf serum, and sometimes it is labeled as fetal calf serum. Real fetal calf serum is collected at the slaughter of pregnant cow, or after removal of the fetus using caesarian section. Newborn and fetal calf serum are rare products which have a good market. The demand is growing with the advance of biotechnology and in the supply side there is a shortage. Production of newborn and fetal calf serum is connected to big dairy farms, keeping more than 5000 heads. Newborn and fetal calf sera originating from FMD free areas command an especially high price.

Source Material: Newborn calf can be bled through the jugular vein immediately after birth. Approximately 400-500 ml blood can be drawn to a sterile container without harmful effect to the calf. After clotting the red cells are separated by centrifugation and the serum is placed into a freezer.

2.13 Gelatine

Usage : As excipient in drug formulations and as a raw material for plasma expander production. Food additive. Glue component. Photo industry.

The more economical and less polluting process is based on solvent extraction but the equipment is expensive and solvents have to be imported.

The classic process is a hot water treatment, providing less first grade quality gelatin (for pharmaceutical and photo industries) but ensuring good quality of food grade.

Gelatin production is economically feasible in large scale only, requiring space and good transportation facilities for thousands of tons of bones.

Source Material: Animal bones, skin, white connective tissue are used as a source material.

2.14 Blood Hydrolysates

Usage : Food additive and laboratory reagent.

Blood is considered as a polluting item in abattoirs, so it is processed for ecological reasons, too.

Bovine serum albumin and fibrin peptone are quality products for laboratory use.

High quality food grade blood hydrolysates can be produced by sophisticated ultra-filtration technology, but sterile conditions are required. Medium quality food grade product is obtained by acid hydrolysis.

These technologies require the continuous processing of blood in the immediate vicinity of a big abattoir. At least 2,000 tons (1) of blood per year are needed for an economic production, blood contained in 280,000 heads of cattle or 660,000 hogs.

Source Material: For bovine albumin and high grade food production blood is drawn with a hollow knife to sterile containers with citric acid stabilizer. For medium grade food the blood is collected in an open container using hollow or sticking knife, and the fibrin formed is removed by a stirrer.

2.15 Peptones

Usage : Media for fermentation, laboratory reagent.

Several qualities exist, depending on source materials and way of hydrolysis. Bovine heart, lean meat, fibrin, casein, etc. are used as raw materials with acid as well as enzymatic (trypsin, pepsin, papain) processing.

The market is dominated by big suppliers producing well standardized products in great quantity.

But there are several local or in-house producers serving a fermentation plant or a microbiological reagent workshop.

Fresh, premium quality heart or lean meat can be used only, and before processing the fat, connecting tissue, etc. have to be removed.

2.16 Other Substances of Animal Origin

Hyaluronic Acid

Usage: After ophthalmic surgery to replace the losses of eye humor and in the veterinary fat to improve the performance of racing horses.

The market is limited and a few brands exist.

Extracted from umbilical cord and bovine eyes.

(1) There is a Finnish process for 1,000 tons per year, but sterile conditions are essential.

Serum gonadotropine

Used for oesterus synchronisation and to increase fertility.

The market is hard to predict because of the competition by cheaper synthetic products . The comparative indication of different hormones is not defined yet.

Serum gonadotropine (PMS) is extracted from pregnant mare blood drawn between the 40th and 150th days of gestation.

Kininogense /Kallikrein/

Used to treat peripheral vascular and coronary diseases, and migraine. It liberates kinin peptides from kininogen and acts as a vasodilator.

It is not a widely used product and the market is not established. Extracted from porcine pancreas after autolysis.

Approtinin

Used as a vasoconstrictor for the treatment of hemorrhoids, for post-operative wound and as a laboratory reagent. Demand is decreasing following the publication of adverse effects.

Extracted from bovine lung.

Bovine pancreatic trypsin inhibitor of Kunitz

Used to treat acute hemorrhagic pancreatitis, and where disorders are induced by an excess of proteases.

It is not a widely used product and the market is not established.

Collagen

Used as excipient in the cosmetic industry, for preparation of absorbable surgical suture, as a laboratory reagent, etc.

Extracted from muscle tendons, skin, white connective tissues, bones.

The water soluble collagen is obtained either through enzymatic treatment of insoluble collagen or by extraction from the skin of young fetuses.

3. CONSUMPTION OF BIOACTIVE MATERIAL OF ANIMAL ORIGIN IN THE PHILIPPINES

3.1 Insulin

Insulin is a member of this group where calculation can be made for the quantity required in the healthsector.

The number of diabetic individuals were estimated in a "ASEAN Diabetes Prevention and Control Project" based on data of 1984

Estimated Number of Diabetics in Southeast Asia

	Population (millions)*	Estimated Number of Diabetics	% of Population
Indonesia	158.1	2,940,000	1.86
Malaysia	14.8	450,000	3.04
Philippines	52.0	2,025,000	3.89
Singapore	2.5	50,000	2.00
Thailand	49.5	1,645,000	3.32
Hong Kong	5.5	45,000**	3.00**
Taiwan	18.7	467,000	2.50
South Korea	40.4	808,000	2.00

* From Business Asia, December 1984.

** From Dr. J. Ma's study of the population over the age of 40 (communication from Prof. R. Young)

Estimates of diabetes in ASEAN countries from H. King, et al, A Review of the Epidemiology of Diabetes Mellitus in the ASEAN region.

Estimate of diabetes in Taiwan and South Korea from Farmitalia Carlo Erba.

Prof. A.D. Litonjua published the proportion of treated and untreated diabetic individuals (World Book of Diabetes in Practice, 2,239, 1986).

Treated and Untreated Diabetics in Asean

	Insulin		Tablet		Untreated	Total	
	<u>Treated</u>		<u>Treated</u>				
Indonesia	6,500	0.2 %	56,000	1.9 %	2,877,300	97.9 %	2,940,000
Malaysia	8,500	1.9 %	115,300	25.6 %	326,200	72.5 %	450,000
Philippines	4,100	0.2 %	31,700	1.6 %	1,989,200	98.2 %	2,025,000
Singapore	4,800	9.6 %	31,700	63.4 %	13,500	27.0 %	50,000
Thailand	6,500	0.4 %	37,400	2.3 %	1,601,100	97.3 %	1,645,000

There was a negative correlation between the proportion of treated Diabetes Mellitus and the taxes levied by government on the hypoglycemic agents on 1985.

Taxes Levied by Government

	<u>Import Duty</u>	<u>Sales Taxes</u>	<u>Business Taxes</u>
A. On Insulins			
Indonesia	10%		5%
Malaysia	0		0
Philippines	30%		10%
Singapore	0		0
Thailand	20%		9.9%
Hong Kong	0		0
Taiwan	10%	1.15%	35%
South Korea	22.5%	10.0%	39.75%

Source: A. D. Litonjua (World Book of Diabetes in Practice 2,239. 1986)

Another study (The Pharmaceutical Industry in ASEAN Countries, 3. Philippines, Ed: Q.L. Kintanar, 1980, UNAPDI) estimated that 352,000 individuals require insulin therapy in the Philippines, and it fits well with the data of Prof. A.D. Litonjua. Based on a dose of 20u/day the annual required amount for the country is 25.696×10^9 corresponding to 85,653 kg. of insulin.

There were 16 insulin brands registered in the December 1987 issue of PIMS :

Brand	Insulin	Producer	Price
Actraphane HM	Human	Novo	P385/1000u
Actrapid HM	Human	Novo	P385/1000u
Actrapid MC	Porcine	Novo	P275/1000u
Humulin NNPH	Human	Eli Lilly	-
Humulin Regular	Human	Eli Lilly	-
Insulin Insulatard	Porcine	Nordisk	P285.50/1000u
Insulin Mixtard	Porcine	Nordisk	P285.50/1000u
Insulin NPH	Not disclosed	Eli Lilly	P161.46/800u
Insulin Regular	Not disclosed	Eli Lilly	P 82.69/400u
Insulin Velosulin	Porcine	Nordisk	P258.50/1000u
Monotard HM	Human	Novo	P385/1000u
Monotard MC	Porcine	Novo	P275/1000u
Protaphane HM	Human	Novo	P385/1000u
Protaphane MC	Porcine	Novo	P275/1000u
Ultratard HM	Human	Novo	P385/1000u

Annual consumption data were extracted from I M S Philippine Hospital and Drug Store Pharmaceutical Audits, 1987.

Purchases of insulin products in 1987

Products	Hospitals/Government and Private		Drug Stores	
	Volume 10^6 u	P x 1000	Volume 10^6 u	P x 1000
Human insulines	1.67	550	3.00	1,004
Porcine insulines	2.83	785	5.03	1,387
Insulines of un- disclosed origin	4.20	855	26.14	5,320
Total	8.7	2,190	34.17	7,711

The total amount of insulin purchased in 1987 was 42.87×10^6 u (1430 g) and it is sufficient for the treatment of 5872 diabetic individuals. This number is higher by 43% than that of 1984. The weighted evolution index was 115 for insulin products in 1987, and it indicated that the market share was higher by 15 % than in 1986. This trend will probably continue because of high demand but it depends on the preparations being made available to a larger segments of diabetics.

An independent estimation was made using customs data published in Business Statistics Monitor, January 1987-June 1988. No distinction was made between human and animal insulins imported in dosage forms. Insulin was imported in Bulk form also as " zinc insulin crystal beef" and formulated in the Philippines.

Import of Insulins from Jan. 1987 to June 1988

	Volume 10^6 u	Content	\$ (FOB)	P(Customs)
Insulin, formulated	37,165 /kg	37.16	241,644	6,664,566
Beef insulin,bulk	352 g	9.	25,367	584,883
Total		46.16	267,011	7,249,449

This amount is lower than that the IMS estimated one by 28 %. Only the shipments that arrived at the airport and harbour of Manila are included.

Here wider summarized customs covering the whole country.

Import of Insulins from 1982 to 1987

Year	Insulins in dosage form and other anti-diabetic preparations		Insulin in Bulk form	
	Volume	FOB	Volume	FOB
	/g/	\$	g	\$
1982 *	10,692	56,177	850	63,674
1983 *	3,202,666	160,939	1,846	104,564
1984 *	18,945	174,359	693	81,467
1985 *	39,259	60,714	401	40,353
1986 *	44,206	203,004	1,260	127,764
1987 **	28,822	228,700		37,400

* Source: BOI,

** Source: Central Bank

From this table only the data on the import of insulin in bulk form is considered as a valuable piece of information. The amount imported in 1986 covers the value of "insulin of undisclosed origin" reported in IMS, 1987. The second and third column of this table covers oral hypoglycemic agents; some insulin preparations were presumably omitted since their brand names do not necessarily imply insulin content.

In summary, the amount of insulin needed in the Philippines is 85.6 kg, while only 1.4 kg was used in 1987. The consumption is growing by 15-20 % per year.

3.2 Other Bioactive Substances of Animal Origin for Human Medicines

The use of bioactive substances of animal origin in a country depends on traditions and customs. The therapeutic use of animal enzymes for instance is

considered as a Latin concept. The Chemindex International 1987 listed 25 brands in France, 23 brands in Italy, 65 brands in Spain while 1 brand in Australia, 1 brand in Canada, 2 brands in UK and 4 brands in USA based on alpha-chymotrypsin as active ingredient. Although some animal parts were used traditionnaly as medicine in this region (Annex II), it seems that the Anglo-Saxon concept has a greater influence. In 1987 several drugs containing animal enzymes were not published in the PIMS, presumably for lack of interest.

**Number of Drugs Published in PIMS with
Animal Products as Active Ingredients**

Active Ingredients	Date Issued		
	Aug. 1986	Aug. 1987	Dec. 1987
Insulin	16	15	15
Heparin	4	4	4
Pancreatin	8	7	7
Desoxycholic Acid/Bile	5	4	4
Pepsin	3	2	1
Trysin	4	3	-
Chymotrypsin	3	2	-
Hyaluronidase	1	1	1
Lysozyme	4	4	4
Thyroglobin/Thyroid glands	2	2	2
Fibrinolysin	1	1	1
Desoxyribonuclease	1	1	1

**LIST OF OMITTED DRUGS WITH ANIMAL
SUBSTANCES AS ACTIVE INGREDIENTS**

TRADE NAME	INGREDIENTS	PRODUCER	DISTRIBUTOR
Chymoral Forte	Trypsin, Chymotrypsin	Rorer	Metro
Kimose	Trypsin, Bromelain	Morishita	Morishita-Segge

Protamide	Pepsin	Oral-B	
Entozyme	Pepsin, Pancreatin, Bile	AH Robins	Metro
Chymocyclar	Trypsin, Chymotrypsin	Rorer	Metro
Tesynase	Trypsin, Chymotrypsin	Ciba	Zuellig-Pharma
Senifienta	Insulin	Novo	Nicholas

Beside insulin products the following brands were published in PIMS (December 1987) with animal products as active ingredient.

<u>Trade Name</u>	<u>Ingredient</u>	<u>Producer</u>	<u>Price</u>
Anticoagulants			
Heparin Leo	Heparin Sod.	Leo	P350/25000u
Heparin Novo	Heparin Sod.	Novo	-
Heparin Sodium	Heparin Sod.	Eli Lilly	P175.99/10000USP
Upjohn Heparin Sodium	Heparin Sod.	Upjohn	P122.35/10000USP
Antispasmodics			
Spasmo Canulase	Pancreatin, Pepsin	Wander	P231.80/100Bitab
Digestives			
Combizym	Pancreatin	Luitpold-Werk	
Enzyplex	Pancreatin Desoxycholic acid	Westmont	P145/100 Tab
Festal	Pancreatin, Bile	Hoechst	P347/100 Tab
Pankreoflat	Pancreatin	Kali-Chemie	
Pankreon Forte	Pancreatin, Bile	Kali-Chemie	P425/100 Tab
Trizymal	Pancreatin, Bile	Boehringer Ingelheim	P150/100 Tab
Hemorrhoidal			
Lasonil	Hyaluronidase	Bayer	P46.31/14g Oint.
Anti-Inflammatory			
Leftose	Lysozyme Chloride	Nippon	P152/100 Tab
Neuzym	Lysozyme Chloride	Eisai	P158.76/100 Tab
Mouth/Throat Preparation			
Dentake	Lysozyme Chloride	Eisai	P179.61/100 Cap

<u>Trade Name</u>	<u>Ingredient</u>	<u>Producer</u>	<u>Price</u>
Anti-Viral			
Flemizyme	Lysozyme Chloride	SPA/Pascual	P297/100 Tab
Thyroid Preparations			
Proloid	Thyroglobulin	Warner-Lambert	P128.10/100 Tab
Armour Thyroid	Thyroid glands	Rorer	P20.15/100 Tab

Data regarding annual purchase of drugs listed above,
collected from IMS Philippine pharmaceutical audits (1987).

Active Ingredients	Hospitals			Drug Stores		
	Government and Private					
	<u>Volume</u>	<u>P</u>	<u>EVOL</u>	<u>Volume</u>	<u>P</u>	<u>EVOL</u>
Heparin	237.5x10 ⁶ iu	2,905	217	20.5x10 ⁶ iu	227	204
Chymotrypsin	6 x10 ¹²	282	50	40 x10 ¹²	1,578	82
Trypsin (1:6)	Armour U			Armour U		
Pancreatin	62.1 kg	532*	125	790.7 kg	7,297*	147
Bile/Hydrocholic acid	3.6 kg	247**	79	45.8 kg	3,957**	106
Pepsin	14 kg	162***	74	178 kg	1,952***	89
Hyaluronidase	1.26x10 ⁶ iu	2.7	38	0.75x10 ⁶ iu	16	83
Lysozime	3.8 kg	606	106	50.9 kg	7,292	82
Thyreoglobulin	1.8 kg	42	76	150 kg	3.317	189

* Shared with Bile and Pepsin

** Shared with Pancreatin

***Shared with Pancreatin

Market Share This Year
 EVOL= ----- x 100
 Market Share Last Year

Data were also collected from the issues of Business Statistic Monitor January 1987 - June 1988 on the imports at the airport and harbour of Manila.

I. Bioactive substances imported in dosage form

Active Ingredients	Volume	\$ FOB	P Customs
Heparin	270x10 ⁶ u	30,965	796,716
Pancreatin	473.8 kg		
Bile	4.9 kg	118,095*	2,883,510*
Pepsin	380 kg		
Lysozyme	4.32 kg	6,351	217,509
Thyroid Gland	90.7 kg	8,173	202,485

II. Bioactive substances imported in bulk form

Name		\$ FOB	P Customs
Pancreatin	100 kg	2,122	47,881
Bile/Desoxycholic acid	280 kg	18,529	442,655
Lysozyme	3 kg	6,351	173,565
Thyroglobulin	40 kg	9,278	215,974

*Sum of drugs containing pancreatin, bile and pepsin.

Summarized customs data were also provided for the previous years, including "organo-therapeutic glands or other organs, organo-therapeutic extracts of glands or other organs, animal substances for therapeutic uses".

Year	Volume/kg/	\$ FOB
1982 *	3,629	45,664
1983 *	11,797	88,192
1984 *	13,517	148,755
1985 *	2,676	32,111
1986 *	5,172	52,011
1987 **	12,944	69,100

* Source: BOI, ** Source : Central Bank

It is not easy to interpret the summarized customs data because the relatively high volumes suggest that liver oil was included, but the relatively low values imply that some animal substances were left out.

On the basis of drug consumption data the animal substances surveyed can be grouped into four classes in the Philippines:

i. Substances with well established indication and protocol as well as with growing market share

Insulin and heparin can be considered as members of this class. Heparin is the standard anticoagulant drug in extra-corporeal circulation and dialysis procedures. It has an established role in the prophylaxis of venous thrombosis and pulmonary embolism, but its position is not so strong in the therapy. Calculating with an average of 50,000 u for prophylactic and therapeutic doses, the amount purchased was sufficient for the treatment of 5,160 patients. A strong upward trend was indicated by the evolution indexes. 92 percent of Heparin were purchased by hospitals giving a sound basis for the evolution index of 217.

ii. Substances with established indication and with stable market share

Pancreatin, dry bile, pepsin and thyroglobulin can be included into this group. Pancreatin-dry bile/hydro-cholic acid combinations are widely used all over the world as digestive aids for a long time and the continuing popularity indicates their efficacy, although the expert is not aware of any well conducted and conclusive clinical trials.

The import data also support the solid position of these products in the market indicated by the evolution indexes of 147 and 106 in the drug store purchases. The position of pepsin is debatable. Its popularity is decreasing, because protease deficiency is rare. In the case of pancreatin the lipase is considered to be the most valuable ingredient, not the proteases. The evolution index indicates also a downward tendency (89 in the drug store purchases), but the import data suggest an opposite trend. 93 percent of drugs containing pancreatin, dry bile/hydrocholic acid and pepsin are purchased in drug stores.

Thyroglobulin/thyroid glands were consumed in a relatively high quantity in the Philippines, and the evolution index was also high in 1987 (189 in the drug

store purchases). Thyroglobulin preparations have a role in the treatment of hypothyroidism, but the demand in the world market is low because of the risk factors. Special precautions should be taken in the case of cardiovascular diseases, hypertension, and advanced age. Dosage should be individualized.

The consumption of thyroid preparations can be considered to be high in the Philippines. Calculating with an average dose of 60mg per day and 365 daily medications in a year, the purchased amount is sufficient for the treatment of 6931 patients. Surprisingly 98.7 percent of the thyroglobulin drugs were sold in the drug stores. The data on imports indicate a lower consumption, but it is still relatively high.

iii. Substances with declining market share

Alpha-Chymotrypsin, trypsin, hyaluronidase and lysozyme can be put into this class. These active ingredients were never well established in Anglo-Saxon countries. The Latin influence is relatively weak in the Philippines, so the products based on this group of enzymes were not able to gain momentum. Data on imports support the low evolution indexes published in IMS. No alpha-chymotrypsin, trypsin and hyaluronidase was imported in the 18 months before July 1988. The amount of lysozyme imported during this period was 13 percent of that of purchased in 1987.

iiii. Substances not in the market

The drug policy in the Philippines was not a restrictive one, so drugs with good market potentials were introduced as soon as possible. Some substances of animal origin are known products for a long time, but not widely accepted in the world. So the fact that they were not introduced or were withdrawn, indicates a low market potential in the Philippines

Hyaluronic acid, serum gonadotropine for human use, kininogenase, aprotinin, and pancreatic trypsin inhibitor can be grouped into this class.

3.3 Serum gonadotropine (PMS)

As a veterinary drug serum gonadotropine may be useful for carabao breeding. A major constraint of carabao production is their poor reproductive capacity. Carabaos are late maturing animals with a long gestation period.

They exhibit weak estrous phenomena (silent heat) which makes detection of estrous difficult. The heat period of carabaos last for 5 to 36 hours. The majority exhibit estrous at night.

Regarding serum gonadotropin consumption only customs import data was available. In the issues of Business Statistic Monitor January 1987 - June 1988 the import of 23 kg Gonadotrpin was registered with a FOB value of \$ 10,435.

3.4 Chymosin (Rennin)

The Philippine Dairy Products Corp. Magnolia Division being the largest cheese producer in the Philippines, data were collected there on chymosin consumption. According to Florecita C. Fernandez, R & D Head and Mario G. Cesario, Manufacturing Superintendent the chymosin consumption is relatively low, since the bulk of cheese is processed from natural cheese imported from New Zealand. Only the milk collected in the Philippines for cheese production is curdled with chymosin. For this about 1100 liters/year of chymosin solution is sufficient and current price is P300/liter.

The milk was also treated with calf chymosin prepared in the National Research Institute but the product was not standardized and the cheese production technology had to be changed from batch to batch.

Presently chymosin of microbial origin is used. It is easy to handle and for fresh cheese production is as good as calf chymosin. Backyard cottage cheese are made by caracalf chymosin extracted by vinegar in the countryside.

3.5 Fetal calf serum and peptones

Fetal calf serum is used at the Institute of Medical Parasitology, UP Manila, the National Institute of Biotechnology and Applied Microbiology, UP Los Banos and the College of Science, UP Diliman in a volume of 10-20 liters a year. The price of fetal calf serum is P 10,000- 20,000 / liter.

Peptones are used in a moderate volume at the Department of Microbiology, UP Manila, at the Institute of Tropical Medicine, at the Biological Production Service and the National Institute of Biotechnology and Applied Microbiology. The price of lean meat or heart peptons is about P 3000 / Kg.

Presently, the consumption is low, but in case the production of vaccines and diagnostics get momentum, the demand will grow parallelly.

3.6 Gelatine, Collagen

Business Statistic Monitor registered the import of 500 kg USP grade Gelatine between January 1987 and June 1980 valued at \$ 3,065 FOB and P83,150 (Customs).

Summarized Customs Data on Import in 1987

Commodity	Quantity /Kg/	FOB Value P x 1000
Gelatin, medical grade	63,141	243.3
Gelatin, edible	15,682	51.4
Gelatin, adhesive	38,681	21.8

Source: Central Bank

Usually the amount of food grade gelatine consumed is considered higher than that of the pharmaceutical grade. In the Philippines the cheaper agar-agar and comageenin are used as gelatin substitutes.

Source : Bureau of Food and Drugs/

3.7 Blood Hydrolizate

The import of 600 kg Digested Protein was registered by Business Statistic Monitor during the above mentioned period. The sum of stated values were \$10,000 FOB and P251,975. The shipments presumably included a high quality food grade.

The customs data from the Central Bank Information Service indicate that 242,702 kg of protein and pepton were imported in 1987 with a value of \$ 612,900 FOB. Probably the bulk of this item consist of a feed grade protein substituent.

3.8 Other substances of Animal Origin

During the survey of the issues of Business Statistic Monitor, other animal products for therapeutical were also noticed, beside the ones listed in paragraph 3.2. The highest imported value in this category was reached by bee products (propolis, bee pollen protein) totalling \$ 169,667 FOB, P6,029,928.

The second on this list is fish liver oil. The imported volumes are :

Name	Volumes	\$ FOB	P Customs
Liver oil in bulk form	4,790 ltrs	48,475	1,223,792
Liver oil in dosage form	5. x10 ⁶ caps	25,869	692,527
<hr/>			
Total :		74,344	1,866,319

No brands in PIMS state clearly what products are fish liver oil.

4. DATA ON LIVESTOCK PRODUCTION

The following livestock was considered as a potential material source for the production of bioactive substances:

Carabao
Cattle
Pig
Goat
Horse
Poultry

Carabao belongs to the water buffalo family. Water buffaloes are classified into two types: the river and the swamp type. The river type is exemplified by the Indian and European breeds and considered under the dairy category. The swamp type to which the Philippine carabao belongs is primarily utilized for farm work. 99.7 per cent of the carabao are kept in backyard farms. They are usually slaughtered only after their period of usefulness between 10 and 20 years. Only carabaos which are infertile and more than 3 years old are permitted to be slaughtered. Half of the bulls are castrated. The mean body weight varies between 210 and 445 Kg. and the average weight of the carcass was 191 Kg. in the year of 1987.

The cattle population is made up from several, distinctive breeds. Commercial farms kept 14.3 per cent of animals in 1987, but there is a downward trend since 1982. In that year, 23.7 per cent of cattle were produced in commercial farms. A farm with 2400 heads was considered to be commercial. The Comprehensive Agrarian Reform Program, signed on June 10, 1988 will probably strengthen the trend. Only 1.7 per cent of the cattle were kept for milk production, and 18.8 per cent for work in backyard farms. As an average 5-6 year old animals are killed. For this reason the price of cattle is higher by 45-70 per cent than that of the carabao. It was P11.92 per kilogram liveweight for carabao and P19.72 for cattle in 1987, as an average on auction markets. The dressing yield is 40-50 per cent and the average, weight of the carcass was 142 Kg. in 1987.

14.5 per cent of pigs were produced in commercial farms in 1987. As an average 10 month-old animals are slaughtered. The dressing yield is between 60-70 per cent and the mean value for the weight of carcass was 53 Kg. in 1987. The farm gate price was P18.7 per kilogram live weight in the first half of that year.

99% of goats are kept in backyard farms. The average carcass weight was 16 Kg. and the farm gate price was P9.4 in January-June 1987.

Horses are few and light in the Philippines. 79 Kg. was the average weight of carcass in 1987.

Eggs are readily available.

The following data provided by the Bureau of Agricultural Statistics pertains to inventories as of January each year:

Summary of Livestock & Poultry Inventory, 1980-1987

Year	Carabao	Cattle	Hog	Goat	Chicken
1981	2,849,940	1,947,230	7,758,120	1,696,000	57,723,850
1982	2,908,450	1,941,650	7,794,610	1,783,180	59,710,350
1983	2,946,150	1,937,520	7,979,600	1,859,390	62,254,510
1984	3,021,650	1,850,240	7,612,650	2,362,010	59,205,330
1985	2,982,840	1,786,710	7,157,980	2,190,750	52,098,200
1986	2,984,440	1,815,140	7,274,830	2,176,930	53,004,570
1987	2,867,690	1,746,850	7,113,670	2,015,510	52,843,090

Dr. Lino Nazareno, President of Livestock Development Council and Dr. Bernardo B. Resoso, Director of National Meat Inspection Committee emphasized independently, that there is an alarming trend in cattle production. More and more farmers stop cattle breeding, and a number of pregnant cows are slaughtered in spite of a ban.

Dr. Resoso's personal projection is even gloomier than the table provided by Dr. Nazareno:

HISTORICAL AND PROJECTED CATTLE INVENTORY (1983 - 1992)

Major assumptions:

Proportion of female breeders to cattle	28%
Calf crop	40%
Mortality	1%

Annual importations:

Feeders stocks	38,400
Female breeders	38,400

	1983	1984	1985	1986	1987	1988	1989	1990	1991
Cattle beginning inventory	1,937,520	1,848,950	1,786,390	1,814,400	1,746,850	1,604,570	1,389,151	1,128,342	816,247
Female breeders						449,280	388,962	315,936	228,549
Add: Imported female breeders						38,400	38,400	38,400	38,400
Total female breeders						487,680	427,362	354,336	266,949
Calf crop						195,072	170,945	141,734	106,780
Add: feeder cattle imp.						38,400	38,400	38,400	38,400
Gross increase						233,472	209,345	180,134	145,180
Less: Mortality						16,046	13,892	11,283	8,162
Animal Slaughtered	333,760	332,320	351,580	393,320	410,630	432,845	456,262	480,946	506,965
Total deductions						448,891	470,154	492,229	515,127
Net increase (decrease)						(215,419)	(260,809)	(312,095)	(369,948)
Cattle ending inventory						1,389,151	1,128,342	816,247	446,299
	1983	1984	1985	1986	1987	1988	1989	1990	1991
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Bureau of Agricultural Statistics

Concerning carabaos and pigs a stable or moderately growing production was forecasted.

5. AVAILABILITY OF ANIMAL ORGANS AND BY-PRODUCTS

The National Meat Inspection Commission (NMIC) has authority over all abattoirs in the Philippines and collects data from all of them.

The boundaries of regions are shown on the map
Annex III

**Annual Numbers of Animals Slaughtered/Poultry Dressed
January-December 1987**

REGION	CARABAO	CATTLE	HOG	GOAT	HORSE
	Heads	Heads	Heads	Heads	Heads
I	26,046	40,211	347,600	1,826	4
II	14,721	14,273	175,184	179	-
III	22,220	15,048	525,316	159	52
IV	3,705	31,002	274,406	25	-
V	19,667	10,131	261,860	435	-
VI	32,867	37,132	207,059	6,371	-
VII	21,387	50,498	425,838	92,425	200
VIII	8,734	5,493	116,374	1,007	-
IX	3,354	9,662	92,549	2,697	144
X	3,990	15,018	164,725	1,629	277
XI	7,056	7,371	97,303	4,364	-
XII	796	3,737	39,074	5,498	-
NCR	25,512	73,870	906,021	493	2,800
TOTAL	190,055	315,446	3,633,309	117,108	3,477

Source: National Meat Inspection Commission

**ANIMAL SLAUGHTER IN AND ABATTOIRS
JANUARY-APRIL 1988**

REGION	CATTLE	CARABAO	HOGS
I	8,945	2,748	78,326
II	2,680	2,231	36,519
III	2,844	11,217	157,114
IV	25,231	5,866	41,932
V	2,314	3,518	38,908
VI	14,832	7,327	53,586
VII	14,000	8,345	144,366
VIII	1,933	3,707	25,431
IX	2,050	938	23,537
X	1,029	52	6,962
XI	1,015	74	5,180
XII	1,997	391	18,795
NCR	24,665	13,678	327,309
T O T A L	103,595	60,092	955,965

Source : National Meat Inspection Commission (6-30-88)

The cumulative data from the previous years were also provided by NMIC.

**Number of Animals Slaughtered
in Abattoirs**

Year	Cattle	Carabao	Hogs
1980	278,084	190,765	3,180,806
1981	244,052	65,745	3,890,367
1982	302,382	88,332	3,713,436
1983	360,936	93,927	4,006,091
1984	280,323	129,319	4,257,871
1985	285,796	88,944	3,347,296
1986	471,135	139,102	4,267,036

Beside abattoirs a great number of animals are killed in backyards facilities. Based on the yearly livestock production data from the Bureau of Agricultural Statistics and on livestock inventory data, an estimation was made by the expert to determine the number of slaughtered animals in 1987. The conclusion is that the great majority of carabao and cattle was killed in abattoirs, while roughly 55% of pigs and 90% of goats were slaughtered on backyard facilities.

The abattoirs are graded into four categories by NMIC, according to the quality of equipment and facilities, the hygienic conditions and the standard of management. They are either private or public, owned by the municipality.

Number of Abattoirs and Dressing Plants in the Philippines in 1988

Grade	Private	Public
"AA" Accredited	15	-
"A" Accredited	21	6
"B" Accredited	21	76
Non-Accredited	-	606

The non-accredited abattoirs have temporary licenses only and improvements are demanded by NMIC. The director of NMIC, Dr. Bernardo B. Resoso exercises a great effort to improve the quality of slaughterhouses in step by step basis.

Dr. Resoso, the CTA of the project and the expert made unannounced visits to 5 "B" grade abattoirs during the nighttime shifts. One of them (Food Terminal, Public) has the facilities and equipments required for grade "A", but maintenance and discipline have to be improved. Another one (San Juan Municipal Abattoir, Public) was degraded from the "B" Accredited to the Non-Accredited grade after our visit. The management and work discipline were of a good level at a private abattoir (Project 8). These visits provided a reliable picture on the grade of abattoirs where it would be possible to organize the collection of animal by-products. The expert is convinced that the abattoir should be at least at "B" accredited level to be considered as a potential source for collection of animal glands.

A visit was arranged to one of the "AA" grade abattoirs too. The facilities, hygienic conditions, and management were at a very good level.

A questionnaire was prepared for the survey giving a general information on the abattoir and on the status of organ collection (Annex IV)

The situation seems more favorable in the National Capital Region than the other parts of the country. In this region 23 accredited abattoirs work, but the proportion for accredited and non-accredited abattoirs and dressing plants for the whole country is 133 : 606.

The slaughter records for the individual accredited abattoirs were provided by the NMIC-Monitoring Service (Dr. Elizabeth Collanta).

SLAUGHTER RECORD FOR 1987
NCR and Abattoirs with Good Transport to Manila

ABATTOIR	ACCREDITATION	CATTLE AND CARABAO HEADS	HOGS HEADS
BACLARAN LECHONEROS private	"B"	-	7,718
FTI NEW ABATTOIR public	"A"	17,079	98,131
FTI OLD ABATTOIR public	"B"	-	59,543
PASAY CITY ABATTOIR public	"B"	14,224	88,060
SAN JUAN ABATTOIR public	"B" (temporary)	7,546	180,874
HANDALUYONG ABATTOIR public	"B"	-	5,830
MAYA FARMS private	"B"	-	7,173
SIMTA ABATTOIR private	"A"	273	16,875
LABUDAHON ABATTOIR private	"B"	-	11,909

LA LOMA LECHONEROS	"B"	-	44,240
private			
NOVALICHES	"A"	-	12,450
private			
VIB (Vitas)	"B"	69,227	205,904
public			
PUREFOODS ABATTOIR	"AA"	-	38,526
private			
V.R. CRUZ ABATTOIR	"A"	-	13,230
private			
VASQUEZ ABATTOIR	"B"	-	10,438
private			
PASIG SLAUGHTERHOUSE	"B"	2,452	67,882
public			
SAN MATEO ABATTOIR	"B"	439	1,343
private			
RODRIGUEZ ABATTOIR	"A"	1,190	4,275
private			
D. CRUZ (MALABON)	"B"	-	28,133
private			
P. SANTIAGO	"B"	-	31,452
private			
E. TUAZON ABATTOIR	"B"	-	6,921
private			
S. ANG	"B"	-	21,742
private			
RFM ABATTOIR	"AA"	1,174	55,825
T O T A L		113,604	1,018,474

If collections were organized at the 17 largest abattoirs in and around NCR, it would be possible to get by-products from 980,000 hogs and from the largest 7 abattoirs about 130,000 cattle/carabao could be utilized.

All public abattoirs and the majority of private abattoirs work on a service basis. All parts of the animal remain the property of the vendor who pays a certain fee for the slaughter. The only by-product is the gallbladder.

Intestines and stomachs are consumed with mucosa; pancreas and blood are also consumed. A part of the blood is lost as an ineffective sticking knife method is used. According to Dr. Farbos Meat Inspection Officer at the /NMIC, the market price of intestines is P20-25/kg, and that of pancreas P30-35/kg. Blood is given as a bonus to consumers.

In the Purefoods Abattoir only pigs owned by the company are slaughtered and the organs not used for food processing are sold to vendors for human consumption. The bones intestines with pancreas are sold for P 21/Kg. The whole amount of blood is collected with a hallow knife and seperated immediatelly on a Sharples separator. The blood plasma is used for sausage production , the red blood cells for feed.

In case a pig organ collection were to be organized in the largest 17 abattoirs, it would be possible to obtain a maximum of 78,400 kg of pancreas, 7,840 kg of porcine thyroid glands and 29,400 kg of bile per year. There are two abattoirs where the annual kills are around 200,000 , thus in theory it makes it possible to collect and dry intestinal mucosa, but it should be emphasized that presently it is not a by-product. From these two abattoirs not more than 38600 kg of dry mucosa can be obtained.

If the collection of bovine organs covers completely the 7 largest abattoirs, it will be possible to obtain 20,800 kg pancreas, 1950 kg of thyroid glands and 26,000 kg bile per year.

6. CONCLUSIONS AND RECOMENDATIONS

A decision to set up a domestic industrial production can be made for several reasons in a free market economy, like the Philippines:

- i. If indigenous raw materials are available with an adequate supply and at a relatively low price, or the production costs are lower for some reasons, could be a viable economic proposition and feasible from an industrial point of view.
- ii. If a transfer of sophisticated technology could give a boost to domestic R & D capabilities and have a catalizing effect on auxillary industries

manpower development, as a long term advantage, the country could be willing to absorb the higher production costs.

- iii. If a country for some reasons desires to reach self-reliance on products considered important and because of it, higher production costs could be acceptable

In this study, the above mentioned approaches were considered regarding the eventual industrial production of animal substances.

6.1 Insulin

1,270 g of porcine/bovine insulin was purchased for P8,347,000 in the Philippines in 1987. The weighted evolution index was 115 for insulin products.

The estimated number of diabetic individuals was 2,025,000 and it was calculated, that 85,653 g of insulin may cover the need of country.

Presently about 70-80 tons of porcine pancreas and 15-25 tons of less valuable bovine pancreas can be collected. Pancreas is used for human consumption, so the purchase price is influenced by the market of meat and it would be around P35/kg, including labour. The cost of paraffin carton trays, freezing and freezer transport may be P5/kg. The price of this raw material is higher by about 20 per cents in the Philippines compared to other ASEAN countries and by about 50 per cents compared to some East European countries.

An industrial plant should get more than 800 tons of pancreas at reasonable price to be economically viable. It cannot be provided in the Philippines. Presently the domestic market is very small, so the problem cannot be solved by protective tariffs. The world prices for crystalline beef or pork insulin prepreparates are moderate ones: between \$ 65,000 and 80,000 per kgs, the possibilities for export are not very good.

In case it is decided to proceed with insulin production, it is obvious that the private sector (domestic or foreign) would not participate. It would then be up to the public sector to assume responsibilities. In this case it is recommended to proceed in successive steps:

- i. Procure technologies, know how and equipment for the final purification steps and formulations. A package that includes equipment and licences may be negotiated for \$1 million. The domestic pharmaceutical industry can make the formulations on a contract basis, if technologies are provided, because the existing facilities and competence are in a high standard. The construction cost for the laboratories may be estimated to be about P5 millions, and the purification steps can be managed by one BSc and three technicians. The purification is a sophisticated technology, and the costs of energy and reagents are not high. The world price for semipurified, crystalline insulin preparations will probably go down slowly, so the domestic purification and formulation of insulin may be economically viable when the local consumption reaches the 10 kg per year level.

- ii. As a second step the acquirement of insulin isolation technology may be considered. The magnitude of expenses covering licences and equipment for collection and processing of pancreases to get semipurified crystalline insulin can be in the range of \$ 4 millions. A very slow improvement can be forecasted in the supply of raw material. It is likely, that this plant will need a permanent financial support.
Further feasibility studies will be necessary in case the insulin project have to be evaluated thoroughly.

6.2 Heparin

258 million units of heparin were purchased for P313,200 in 1987, and the weighted evolution index was very high: 216. The need can be estimated on the basis of actual European consumptions, and it may be around 110,000 million units per year.

There are two abattoirs where about 200,000 pigs are slaughtered per annum, thus in theory it makes it possible to collect and dry intestinal mucosa, but it should be emphasized that presently it is not a by-product. Intestines command of a relatively high price of P20-25/kg and consumed as food. Where bowels are used for sausage production the mucosa removed is considered to be a pollutant, and can be purchased for \$ 0.1/kg. In the Philippines the price of this source material would be more than ten times higher.

Heparin can be produced with profit near to an abattoir with more than 600,000 kills a year where the mucosa is immediately removed from the small intestines, and it can be obtained at a reasonable price. It may be still viable but less economical if mucosa is collected in two or three abattoirs and dried on the spot. Beef lung is an alternative source material, but 100 kg of lung is needed for the isolation of one million unit of heparin. Presently the world price for USPXXI grade bulk heparin varies between \$ 10 and \$ 15/million unit, consequently beef lung may be considered when it can be processed as a pollutant for a fee. In the Philippines it is possible to isolate 7,700 million unit of heparin from the intestines produced in the two largest abattoirs, but the source material for one million unit would cost more than \$ 20.

The private sector will be presumably not interested in the heparin project. In case it is decided to proceed in this field it can be organized only in the public sector. It is advisable to take a step by step approach:

- i. Procure technology for formulation of injectable preparations from bulk heparin. Licences may be purchased for \$200,000 and the private sector has the capacities, competence and facilities to make the formulations on a contractual basis. Presently there is a large difference between the prices of dosage forms in the Philippines and the bulk form in the world: \$115 FOB and \$12, respectively. The formulation may be economically viable, if the heparin consumption exceeds the level of 5,000 million units per annum.
- ii. Technologies and equipment for collection and processing of mucosa can be obtained for \$2.5 millions. The plant can be staffed by one BSc and four technicians from professional point of view. It will need a substantial financial support to compensate the operational losses.

6.3 Pancreatin

In the Philippines 0.8-0.9 tons of pancreatin were consumed in 1987, and the value of weighted evolution index was 145. The customs value of that amount of pancreatin is around \$19,000. A requirement-consumption analysis (Annex V) concluded that there was an overconsumption in the therapeutic class of alimentary tract and metabolism where the pancreatin belongs to.

Concerning the source material: see paragraph 6.1. The pancreatin command a moderate price of \$20-25/kg in the world market, and the pancreas required for the production of one kg pancreatin costs about P430. The pancreatin production does not seem to be viable economically, the production technology is not a sophisticated one, the therapeutic value is not high, so the expert is not aware of reasons to promote a pancreatin project.

6.4 Bile/Desoxycholic acid

285 kg of dry bile/desoxycholic acid was imported between January 1987 and June 1988 at a value of \$ 20,000 FOB.

These substances belong to the same therapeutic class as pancreatin: see paragraph 6.3

Bile is the only real animal by-product in the Philippines. It is possible to collect 26,000 kg. of bovine bile and produce 2100 kg dry bile or 900 kg cholic acid per annum. There is a potential for the collection of 29,400 kg of porcine bile for dehydration. Presently the world price for dry bile is about \$ 75/kg, and there is a demand for this product. The production technology is simple, and the basic equipment can be purchased for \$200,000. A small family firm may be profitable if they can collect the bile for less than \$ 1.5/ kg. (purchase, collection and transport costs included). Effective collection is important, because no preservative can be used at the dry bile production.

6.5 Thyroglobulin/thyroid glands

157.8 kg thyroglobulin was purchased in dosage form for P3,359,000 in 1987, and the weighted evolution index was high: 188.

Thyroglobulin is an old product: in 1934 it was the first protein hormone commercially introduced as a therapeutic agent, but presently it is not used widely. The Philippines is an exception. However thyroglobulin is not included in the "Consolidated list of products whose consumption and/or sale have been banned, withdrawn, severely restricted or not approved by governments" (United Nations, 1987-ST/ESA/192).

As a maximum 7840 kg. porcine thyroid glands can be collected and it is sufficient for the extraction of 200 kg. of thyroglobulin. The world price for thyroglobulin is around \$ 200/kg, and glands in sufficient amount to extract one kg substance may be purchased for P1570. The classical technology is available, but the basic equipment may cost \$200,000. It is obvious that the private sector would not invest in this project. In case it is decided to help the thyroglobulin production, because it is considered to be useful for therapy, the public sector may assume the cost of equipment. The source material is enough to cover the need, and the laboratory can be run by two technicians just in the black.

6.6 Therapeutic substances with declining or no market share Alpha-chymotrypsin, trypsin, pepsin, lysosime, hyaluronidase, hyaluronic acid, serum gonadotropin for human use, kininogenase, approtinin and pancreatic trypsin inhibitor were grouped together on the basis of IMS Philippine hospital and drug store pharmaceutical audits-1987, customs data (Business Statistics Monitor-1987,1988) and PIMS-1986,1987. The oral proteolytic enzymes were included on the list of National Drug Committee "Active Ingredients/Banned/Withdrawn/-Restricted in Other Countries but available in the Philippines", although this group was not listed in the "Consolidated list of products whose consumption and/or sale have been banned, withdrawn, severely restricted or not approved by governments" (United Nations, 1987-ST/ESA/192), these oral enzymes are widely used in Latin American countries and the expert is not aware of any severe side effects.

The drug policy in the Philippines was not a restrictive one, so the fact that these well known substances were not introduced or withdrawn or their market share is declining, indicates a low market potential in the Philippines. For this reason no pre-feasibility study was conducted on the production of these substances, but there is a possibility to do it in case it is decided.

6.7 Serum gonadotropine for veterinary use

23 kg of serum gonadotropine was imported with a FOB value of \$10,435 in 1987.

The inventory of Bureau of Agricultural Statistics does not include horses.

Based on NMIC slaughter data the number of horses can be estimated between 20,000 and 50,000 heads. Except race horses they are kept in backyard conditions. Presently it is not possible to collect source material for serum gonadotropin production in sufficient quantities.

6.8 Chymosin (Rennin)

Presently there is no market for calf chymosin in the Philippines, because the Philippines cheese industry produces mainly fresh types of cheese, and the cheaper, well standardized microbial chymosin is good for this purpose.

Commercial farms kept 14.3 per cent of the cattle in 1987, but there is a downward trend since 1982. Few dairy herds exist, only 1.7 per cent of the cattle were kept for milk production. As chymosin production is connected to large dairy farms, there is no good possibility for large scale production and export.

6.9 Fetal calf serum and peptones

No data is available on the annual consumption, but probably it is not high. The price of fetal calf serum is P10,000-20,000/liter, and that of lean meat pepton is about P3000/kg.

Presently the demand is not high for these products, because biotechnology is an embrionic stage in the Philippines. A progress in the monoclonal antibody based diagnostics or in fermentation technologies will create a need for them.

The fetal calf serum production is connected to large dairy farms (see 6.8). The possibilities are limited, but domestic production should be considered because the demand exceeds the supply in the world, so the price is very high. A dairy farm with 5000 heads of cattle can produce 800 litres of serum per annum without harmful effects on cows or calfs, and this amount is sufficient for the foreseeable future. Equipment, technology and facilities for serum collection can be purchased for \$100,000 and one technician can manage the operation. It is possible to get serum for P1200/1 (purchase of blood, labour, operational costs included). Pepton production for in house needs may be considered later, when hundreds of kilograms is used. Meat is an expensive

item in the Philippines, so pepton dried cannot be competitive in export market.

6.10 Gelatine, Collagen

63,141 kg of gelatine of medical grade and 15,682 kg of edible gelatine for a FOB value of \$294,700 were imported in 1987. Concerning collagen no data is available.

Gelatine production is economically feasible in large scale only, requiring space and good transportation facilities for thousands of tons of bones. In the abattoirs bones are usually not removed (see Annex IV). Meat processors sell the bones to vendors for food at a price of P21/kg. Only heavy bones in tens of tons quantity are processed for feed. The skin, white connective tissue, muscle tendons of pigs are used for food. There are no source material in adequate quantity and price for gelatine or collagen production in the Philippines.

6.11 Blood hydrolizate

The import of 600 kg of food grade protein hydrolisate was registered at a FOB value of \$10,000.

Animal blood is used for food in the Philippines, and it is important, because anemia is a serious problem. It does not make sense to process it, if blood is not a polluting agent. It would be advisable to use the more effective hollow knife for the collection of blood. If sticking knife is used for bleeding, about 30 per cents of blood is lost (see Annex IV).

6.12 Fish liver oil

4,790 ltrs of pharmaceutical grade fish liver oil at a FOB value of \$48,475 was imported in bulk form in 1987.

"Fisheries Statistics of the Philippines 1986" (Bureau of Fisheries and Aquatic Resources) reported the export of 494,329 kg of shark liver oil at a value of P71,038,909.

There is a good supply for production:

Quantity of shark landed
(Metric tons)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Commercial	226	166	311	467
Municipal	4,661	5,817	5,490	9,383

46 per cents of shark production were concentrated to Region X, and the consolidated production of Regions IV,VI,IX-A and X represents 82 per cents of the total. It means that oil processing can be concentrated to this area.

Species of shark, as dogfish shark, have large and fat livers, weighting from 10 to 25 % of the whole fish. Shark livers contain 62% of oil by weight, and the vitamin A content is 146,000 USP units per gram (ISSI Industrial Technology Department-Small Industry Journal, Vol.7, pp.74-78).

As fish liver oil can provide a good source of vitamin at an affordable price, it is recommended to explore this possibility.

ANNEX I

PHILIPPINES

DP/PHI/87/019

List of Persons Met

1. Dr. Alfredo Bengzon - Secretary of Health
2. Mr. Rhais Gamboa - Undersecretary of Health
3. Dr. Quintin Kintanar - Director PCHRD, Assistant Secretary of Health
4. Dr. Ramon Valmayor - Executive Director PCARRD
5. Ms. Lydia M. Joson - Chief, Microbiology and Genetics Division, Industrial Tech. Dev. Institute (ITDI)
6. Dr. William Padolina - Professor of Chemistry, U.P. Los Baños, Director of Biotech
7. Mr. Jose O. Juliano - President and General Manager Interphil Laboratories
8. Dr. Lino Nazareno - President, Livestock Dev. Council
9. Dr. Efren P. San Juan - Chief, Meat Inspection Officer
10. Dr. Patria Navarro - President, Phil. Obstetrical & Gynecological Society
11. Dr. Romero Alcasid - Director, Bureau of Animal Industry, Department of Agriculture
12. Dr. Augusto L. Lingao - President, Philippine Society of Allergology & Immunology
13. Dr. Alberto K. Alcantara - President, Philippine Society of Microbiology
14. Ms. Floricita C. Fernández - R & D Superintendent
Magnolia Div. - Philippine Dairy Products
15. Mr. Mario G. Cesorio - Manufacturing Superintendent
Magnolia Div. - Philippine Dairy Products
16. Ms. Elma Llaguno - Department of Chemistry, UP
17. Ms. Luisa S. Saniel - Culture Collection & Institute of Biology
NSRI
18. Ms. Evangeline C. Santiago - Analytical Services Laboratory NSRI
19. Mr. Jorge A.K. Ochoa - Culture Collection-Microbiology Unit NSRI
20. Ms. Maria Auxillia Tan - Culture Collection-Microbiology Unit NSRI

- 21. Ms. Virginia S. Carino - Institute of Biology, UP Diliman, QC
- 22. Ms. Adoración T. Aranez - Institute of Biology, UP Diliman, QC
- 23. Ms. Saturnina C. Halos - NSRI, UP Diliman QC
- 24. Dr. Rufino Lirag - Director ITLI, (DOST)
- 25. Dr. George L. Bunwell - Director CMS Marketing Division, United Laboratories Inc.
- 26. Dr. Marlito L. Cardenas - Head R & D, San Miguel Corporation
- 27. Dr. J. Farbos - Meat Inspection, Officer, National Meat Inspection Commission
- 28. Mr. Luis P. Jimenez - Economist, United Laboratories

ANIMAL PARTS HAVE MEDICINAL VALUES

Animal parts to treat various ailments? No kidding.

And why not? Plants have been used as medicines - lagundi to cure flu, tsaang gubat stomachache, sambong highblood pressure, herba buena headache, and so on and so forth.

In some countries, animal parts have been widely applied to cure ailments. For example, crocodile scales cooked in butter is a "remedy" for toothache and boils, bones of monkey arms boiled for 10 days to make a tonic improve blood circulation and even cure severe cases of rheumatism, whiskers of golden cat when burned and mixed with liquid opium are said to relieve the pain of snake bites, and powdered antlers of deer when injected into the body can enhance virility, heal kidney troubles, and regenerate aging tissues.

The truth of the matter is, many animal substances do possess medicinal values. In the United States, the bee venom is used to treat arthritis, snake venoms are used as pain killers, and even utilized in experiments in cancer research. In the Soviet Union, studies have shown that the velvet of deer antlers contain panocrin, a valuable tonic that accelerates the healing of wounds and ulcers.

Recently, research has been focused on marine animals that contain biologically active compounds. Some scientists believe some of these compounds may be potential drugs for certain diseases.

Some animal species are in danger of extinction because human beings catch and kill them for their curative powers. Because of the worldwide demand for medicinal animal parts, conservationists say that the implications for many wildlife populations throughout Asia and Africa are not good.

Two animals - tigers and rhinos - which are the mainstays of the animal medicine trade are among the most endangered species. Nothing is more versatile

than the rhino, at least in the minds of some Chinese, Indians, and other Asians. Almost all parts of the beast are believed to have superb medicinal value, ranging from the rhino's horn to its urine. In one zoo, health nuts line up each morning to purchase a bucketfull of rhino urine, and swear that drinking it preserves their youth!

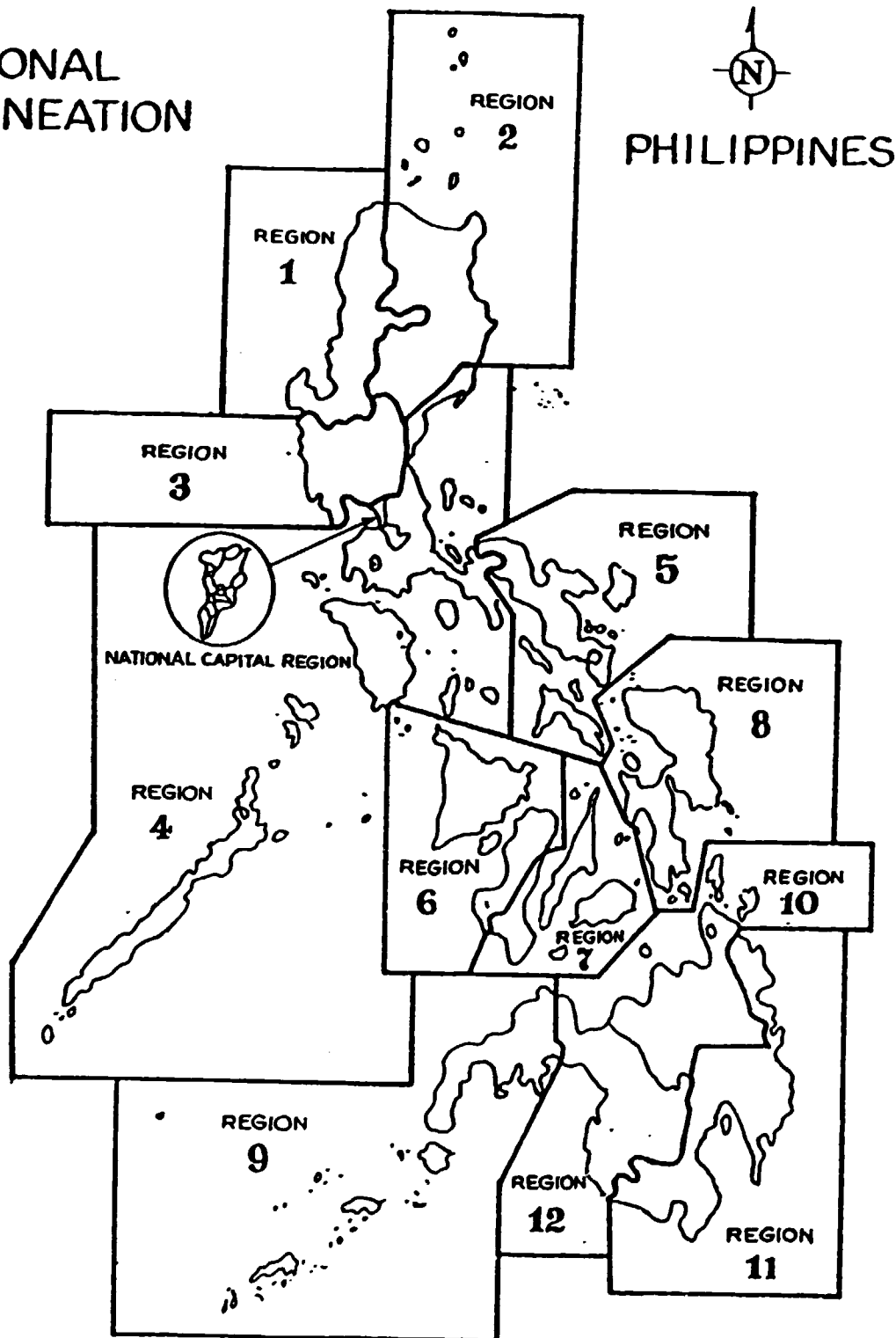
The tiger is second to the rhino in the list of the most widely prescribed pharmaceutical animals of Asia. The tiger is a potent Asian symbol of power - bravery, integrity, dignity and justice. Many of its medicinal applications are related to the symbolism.

With some animals facing possible extinction, developing medicine from abundant species of marine animals could be a logical alternative. Scientists point out that the vast resources of the oceans are still largely untapped.

The Institute of Biological Science at the University of the Philippines at Los Baños, the leading center of learning for basic biology in the country, is currently doing preliminary work on the potentials of marine animals and sources of medicine. The project, lead by researchers Arlin Lannu and Teresita Aceret, is being undertaken in cooperation with Science Media, Inc which publishes the well-known Science Club magazine.

Annex III Map of the Philippines

REGIONAL DELINEATION



REGIONS	13
PROVINCES & SUB PROVINCES	73 plus 2
CITIES	60
MUNICIPALITIES	1,531
BARANGAYS	41,196

The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations Industrial Development Organization.

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir Food Terminal Inc.
Address of Abattoir Taguig, Metro Manila

(2) Present average daily volume of slaughter

Large Animals 45 - 50 Hogs 250 - 300

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned X Privately Owned _____

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned _____

Accreditation : B

Name of Owner Government

(4) Type of Stunning

Large Animals

Hogs

_____ Captive Bolt

_____ Electrode

X Pitthng

X Striking the head

_____ Striking the head

_____ Others

_____ Others

(5) Type of Beeding

Large Animals

Hogs

X Stiking knife

X Stiking knife

_____ Hollow knife

_____ Hollow knife

(6) Type of Dressing

Large Animals

Hogs

_____ On Floor

_____ On Floor

X On Rail

X On Rail

_____ On Platform

X On Table/Platform

(7) Type of Viscera Handling

Large Animals	Hogs
_____ On Floor	_____ On Floor
<u> X </u> On Table	<u> X </u> On Table
_____ On Lavatories	<u> X </u> On Lavatories

(8) Meat Inspection

Veterinarians

_____ Government Employed
 _____ National Government
 _____ Local Government
_____ Private Employed

Meat Inspectors

 3 Government Employed
 3 National Government
 _____ Local Government
_____ Private Employed

(9) Abattoir Cleaning

_____ During Operation
 X After Operation
_____ None at All

(10) Abattoir Disinfection

_____ Daily
 X Once a Week
_____ Once a month
_____ None at All

What is the disinfectant used Lysol

(11) Vermin/Pest Control

- Doors availability
- Doors effectively closed
- Windows screened
- Others openings screened

Walls

- Concrete
- Wood

(12) Availability of Separated Tripery aside from the

Floor Area

Available: Approx. Area Sq. M.

/8:00pm
/7.14.88
ok..eric

13) Large Animals By-Products collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Thyroid gland		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Hides				X/Leather/
:Horn/Hoof				x/Suvenir/

14) Hog By-Product collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Small Intestinal Mucosa		X		
:Thyroid gland		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Skin		X		

*7.14
 ***7:00
 ok...e

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir San Juan Abattoir
Address of Abattoir San Juan, Metro Manila

(2) Present average daily volume of slaughter

Large Animals 20 - 25 Hogs 500 - 550

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned X Privately Owned _____

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned _____

Accreditation : B

Name of Owner San Juan City

(4) Type of Stunning

Large Animals

Hogs

_____ Captive Bolt

_____ Electrode

X Pithing

X Striking the head

_____ Striking the head

_____ Others

_____ Others

(5) Type of Beeding

Large Animals

Hogs

X Stiking knife

X Stiking knife

_____ Hollow knife

_____ Hollow knife

(6) Type of Dressing

Large Animals

Hogs

_____ On Floor

_____ On Floor

X On Rail

X On Rail

_____ On Platform

_____ On Table/Platform

(7) Type of Viscera Handling

Large Animals

 X On Floor
 On Table
 On Lavatories

Hogs

 X On Floor
 On Table
 On Lavatories

(8) Meat Inspection

Veterinarians

 Government Employed
 National Government
 Local Government
 Private Employed

Meat Inspectors

 3 Government Employed
 2 National Government
 1 Local Government
 Private Employed

(9) Abattoir Cleaning

 During Operation
 X After Operation
 None at All

(10) Abattoir Disinfection

 Daily
 X Once a Week
 Once a month
 None at All

What is the disinfectant used Lysol

(11) Vermin/Pest Control

 - Doors availability
 Doors effectively closed
 Windows screened
 Others openings screened

Walls

 X Concrete
 Wood

(12) Availability of Separated Tripery aside from the
Floor Area

 - Available: Approx. Area Sq. M.

/8:00pm
/7.14.88
ok..eric

13) Large Animals By-Products collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
Blood			X	
Bile	X			
Pancreas		X		
Stomach mucosa		X		
Thyroid gland		X		
Bones		X		
White connective tissue, tendons		X		
Hides				X/Leather/

14) Hog By-Product collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
Blood			X	
Bile	X			
Pancreas		X		
Stomach mucosa		X		
Small Intestinal Mucosa		X		
Thyroid gland		X		
Bones		X		
White connective tissue, tendons		X		
Skin		X		

7.14.88
 7:00pm
 *ok..**eric..

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir Pasay City Abattoir
Address of Abattoir Pasay City

(2) Present average daily volume of slaughter

Large Animals 40 - 45 Hogs 250 - 280

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned X Privately Owned _____

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned _____

Accreditation : B

Name of Owner Pasay City

(4) Type of Stunning

Large Animals

Hogs

_____ Captive Bolt

_____ Electrode

X Pithing

X Striking the head

_____ Striking the head

_____ Others

_____ Others

(5) Type of Beeding

Large Animals

Hogs

X Stiking knife

X Stiking knife

_____ Hollow knife

_____ Hollow knife

(6) Type of Dressing

Large Animals

Hogs

_____ On Floor

X On Floor

X On Rail

_____ On Rail

_____ On Platform

_____ On Table/Platform

(7) Type of Viscera Handling

Large Animals

 X On Floor

 On Table

 On Lavatories

Hogs

 X On Floor

 On Table

 On Lavatories

(8) Meat Inspection

Veterinarians

 Government Employed

 National Government

 Local Government

 Private Employed

Meat Inspectors

 2 Government Employed

 1 National Government

 1 Local Government

 Private Employed

(9) Abattoir Cleaning

 During Operation

 X After Operation

 None at All

(10) Abattoir Disinfection

 Daily

 X Once a Week

 Once a month

 None at All

What is the disinfectant used Lysol

(11) Vermin/Pest Control

 - Doors availability
 Doors effectively closed
 Windows screened
 Others openings screened

Walls

 X Concrete
 Wood

(12) Availability of Separated Tripery aside from the
Floor Area

 - Available: Approx. Area Sq. M.

/8:00pm
/7.14.88
ok..eric

13) Large Animals By-Products collection/Utilization.

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Thyroid gland		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Hides				X/Leather

(14) Hog By-Product collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Small Intestinal Mucosa		X		
:Thyroid gland		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Skin		X		

*7.14
 ***7:00
 ok...e

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir Project 8 (Labudahon)
Address of Abattoir 6 Dalson St., Project 8, Quezon City

(2) Present average daily volume of slaughter

Large Animals _____ Hogs 30 - 40

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned _____ Privately Owned X

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned _____

Accreditation : B

Name of Owner Jose Labudahon

(4) Type of Stunning

Large Animals	Hogs
_____ Captive Bolt	_____ Electrode
_____ Pithing	<u>X</u> Striking the head
_____ Striking the head	_____ Others
_____ Others	

(5) Type of Beeding

Large Animals	Hogs
_____ Stiking knife	<u>X</u> Stiking knife
_____ Hollow knife	_____ Hollow knife

(6) Type of Dressing

Large Animals	Hogs
_____ On Floor	_____ On Floor
_____ On Rail	<u>X</u> On Rail
_____ On Platform	_____ On Table/Platform

(7) Type of Viscera Handling

Large Animals	logs
_____ On Floor	_____ On Floor
_____ On Table	_____ On Table
_____ On Lavatories	<u> X </u> On Lavatories

(8) Meat Inspection

Veterinarians

_____ Government Employed

_____ National Government

_____ Local Government

_____ Private Employed

Meat Inspectors

 2 Government Employed

_____ 1 National Government

_____ 1 Local Government

_____ Private Employed

(9) Abattoir Cleaning

_____ During Operation

 X After Operation

_____ None at All

(10) Abattoir Disinfection

_____ Daily

 X Once a Week

_____ Once a month

_____ None at All

What is the disinfectant used Lysol

(11) Vermin/Pest Control

 - Doors availability
 Doors effectively closed
 Windows screened
 Others openings screened

Walls

 X Concrete
 Wood

(12) Availability of Separated Tripery aside from the
Floor Area

 - Available: Approx. Area Sq. M.

/8:00pm
/7.14.88
ok..eric

(13) Large Animals By-Products collection

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood	:	:	:	:
:Bile	:	:	:	:
:Pancreas	:	:	:	:
:Stomach mucosa	:	:	:	:
:Thyroid gland	:	:	:	:
:Bones	:	:	:	:
:White connective tissue, tendons:	:	:	:	:
:Hides	:	:	:	:
:Horn/Hoof	:	:	:	:

(14) Hog By-Product collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood	:	:	X	:
:Bile	X	:	:	:
:Pancreas	:	X	:	:
:Stomach mucosa	:	X	:	:
:Small Intestinal Mucosa	:	X	:	:
:Thyroid gland	:	X	:	:
:Bones	:	X	:	:
:White connective tissue, tendons:	:	X	:	:
:Skin	:	X	:	:

*7.14
 ***7:00
 0:..e

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir PUREFOODS Corporation Abattoir
Address of Abattoir Bo. San Roque, Metro Manila

(2) Present average daily volume of slaughter

Large Animals _____ Hogs 120 - 150 _____

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned _____ Privately Owned _____

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned X _____

Accreditation : AA

Name of Owner PUREFOODS Corporation

(4) Type of Stunning

Large Animals	Hogs
_____ Captive Bolt	_____ X _____ Electrode
_____ Pithing	_____ Striking the head
_____ Striking the head	_____ Others
_____ Others	

(5) Type of Beeding

Large Animals	Hogs
_____ Stiking knife	_____ Stiking knife
_____ Hollow knife	_____ X _____ Hollow knife

(6) Type of Dressing

Large Animals	Hogs
_____ On Floor	_____ On Floor
_____ On Rail	_____ X _____ On Rail
_____ On Platform	_____ On Table

(7) Type of Viscera Handling

Large Animals

_____ On Floor
_____ On Table
_____ On Lavatories

Hogs

_____ On Floor
_____ On Table
 X On Lavatories

(8) Meat Inspection

Veterinarians

_____ Government Employed
_____ National Government
_____ Local Government
_____ Private Employed

Meat Inspectors

 3 Government Employed
_____ National Government
_____ Local Government
_____ Private Employed

(9) Abattoir Cleaning

 X During Operation
 X After Operation
_____ None at All

(10) Abattoir Disinfection

 X Daily
_____ Once a Week
_____ Once a month
_____ None at All

What is the disinfectant used Anti-Boc

(11) Vermin/Pest Control

- Doors availability
- Doors effectively closed
- Windows screened
- Others openings screened

Walls

Concrete

Wood

(12) Availability of Separated Tripery aside from the
Floor Area

Available: Approx. Area 70 Sq. M.

/8:00pm
/7.14.88
ok..eric

(13) Large Animals By-Products collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
Blood	!	!	!	!
Bile	!	!	!	!
Pancreas	!	!	!	!
Stomach mucosa	!	!	!	!
Thyroid gland	!	!	!	!
Bones	!	!	!	!
White connective tissue, tendons	!	!	!	!
Hides	!	!	!	!
Horn/Hoof	!	!	!	!
Hog By-Product collection/Utilization				
	Discarded	Not removed	Collected for Food	Industrial Use
Blood	!	!	!X/Plasma/X/Red cells Feed	!
Bile	! X	!	!	!
Pancreas	!	! X	!	!
Stomach mucosa	!	! X	!	!
Small Intestinal Mucosa	!	! X	!	!
Thyroid gland	!	! X	!	!
Bones	!	!	! X	! X/Feed/
White connective tissue, tendons	!	! X	!	!
Skin	!	!	! X	!

SURVEY ON ANIMAL BY-PRODUCTS AVAILABILITY
FOR INDUSTRIAL/MEDICAL USE

(1) Name of Abattoir Kamuning Abattoir
Address of Abattoir Quezon City

(2) Present average daily volume of slaughter

Large Animals 5 - 10 Hogs 150 - 200

(3) Abattoir Classification

Service abattoir (allows clients to use abattoir)

Government owned X Privately Owned _____

Non-Service abattoir (Slaughter's own animals only)

Government owned _____ Privately Owned _____

Accreditation : B

Name of Owner Quezon City

(4) Type of Stunning

Large Animals

Hogs

_____ Captive Bolt

_____ Electrode

X Pitthing

X Striking the head

_____ Striking the head

_____ Others

_____ Others

(5) Type of Beeding

Large Animals

Hogs

X Stiking knife

X Stiking knife

_____ Hollow knife

_____ Hollow knife

(6) Type of Dressing

Large Animals

Hogs

_____ On Floor

X On Floor

X On Rail

_____ On Rail

_____ On Platform

_____ On Table/Platform

(7) Type of Viscera Handling

Large Animals

 X On Floor
 On Table
 On Lavatories

Hogs

 X On Floor
 On Table
 On Lavatories

(8) Meat Inspection

Veterinarians

 Government Employed
 National Government
 Local Government
 Private Employed

Meat Inspectors

 2 Government Employed
 1 National Government
 1 Local Government
 Private Employed

(9) Abattoir Cleaning

 During Operation
 X After Operation
 None at All

(10) Abattoir Disinfection

 Daily
 X Once a Week
 Once a month
 None at All

What is the disinfectant used Lysol

(11) Vermin/Pest Control

 Doors availability
 Doors effectively closed
 Windows screened
 Others openings screened

Walls

 X Concrete
 Wood

(12) Availability of Separated Tripery aside from the
Floor Area

 Available: Approx. Area Sq. M.

/8:00pm
/7.14.88
ok..eric

(13) Large Animals By-Products collection

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Thyroid gland		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Hides				X/Leather

(14) Hog By-Product collection/Utilization

	Discarded	Not removed	Collected for Food	Industrial Use
:Blood			X	
:Bile	X			
:Pancreas		X		
:Stomach mucosa		X		
:Small Intestinal Mucosa		X		
:Thyroid glar		X		
:Bones		X		
:White connective tissue, tendons:		X		
:Skin		X		

*7.14
***7:00
ok...e

ESTIMATED DRUG REQUIREMENT & ACTUAL CONSUMPTION, by Major Therapeutic Class, 1985 & 1987
(in millions of pesos)

THERAPEUTIC CLASS	REQUIREMENT ^A				CONSUMPTION ^B				REQUIREMENT-CONSUMPTION	
	1985 Pvalue	%	1987 Pvalue	%	1985 Pvalue	%	1987 Pvalue	%	1985 Pvalue	1987 Pvalue
SYSTEMIC ANTI-INFECTIVES	1,845	4.59	2,278	4.39	1,611	25.39	2,278	24.44	234.6	- .014
RESPIRATORY SYSTEM	1,948	4.85	2,236	4.31	1,065	16.78	1,448	15.52	883.2	787.94
ALIMENTARY TR. & METABOLISM	.646	1.61	678	1.31	1,025	16.16	1,531	16.42	-378.6	-852.74
CENTRAL NERVOUS SYSTEM	2,627	6.54	5,233	10.09	489	7.71	706	7.57	2,138	4,527.16
CARDIOVASCULAR SYSTEM	12,892	32.07	13,557	26.13	356	5.52	643	6.89	12,532	12,914
DERMATOLOGICALS	445	1.11	103	0.20	286	4.51	458	4.92	159	-355.3
BLOOD & BLOOD FORMING ORG	14,350	35.70	17,557	33.84	374	5.90	605	6.49	13,975.3	16,951.9
GENTTO-URINARY & SEX HORM.	33	0.08	77	0.15	191	3.01	270	2.89	-158	-193
MUSCULO-SKELETAL SYSTEM	312	0.78	388	0.75	169	2.66	327	3.50	144	61
SYSTEMIC HORMONES	2,048	5.10	2,837	5.47	113	1.78	168	1.81	1,935	2,668
SENSORY ORGANS	9	0.02	11	0.02	104	1.64	125	1.34	- 94.4	-113.9
PARASITOLOGY	2,396	5.36	5,557	10.71	80	1.27	107	1.15	2,316	5,449
CYTOSTATICS	-	-	-	-	13	0.22	18	0.19	- 13.8	- 17.8
OTHERS	639	1.59	1,367	2.63	466	7.34	640	6.86	174	727
TOTAL	40,193	100	51,879	100	6,344	100	9,324	100	(+23,212) (- 645)	(+44,087) (- 1,533)

^A Based on Est number of Cases, Current Standard Therapy, & Current Prices listed in PIMS

^B Based on IMS Reports