SRI RAMACHANDRA
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Category - I Deemed to be University) Porur, Chennai
Accredited by NAAC with A++ Grade & Graded by UGC as Category I University

INTERNSHIP CERTFICATE

This is to certify that

G M Jayasri

D/o K Madhan Kuppuraj, has successfully completed Internship in the departments of Faculty of Pharmacy, Human Genetics and Clinical Nutrition, SRIHER (DU), Porur, Chennai, India, during the period 07-May-2024 to 06-June-2024, where she interned in Manufacture and Quality assurance of Pharmaceuticals, trained in basic genetic testing technologies, handled Drosophila Melanogaster and had comprehensive experience in the Food science and Food analysis lab. The training also included nutritional assessment and live interaction with patients in specialities such as General Surgery, Pediatrics, and Obstetrics and Gynaecology.
She evinced great enthusiasm in learning the various facets of each department and carried out all the exercises assigned to her diligently. During her internship, her commitment and performance were commendable.

HoD	HoD	Principal	Pro Vice-Chancellor
Human Genetics	Clinical Nutrition	Faculty of Pharmacy	SRIHER

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INTERNSHIP CERTIFICATE

This certificate is proudly presented to

G M Jayasri

for successfully completing the "Internship on Biotech Techniques" in the Department of Biotechnology, Sri Ramachandra Instititute of Higher Education and Research (Deemed to be University), Chennai, between 06th May and 06th June 2024. She has been trained in basic Molecular Biology techniques such as PCR and Western Blotting, Human Cell Culture and Plant Tissue Culture. She has also been trained in Computational techniques such as Molecular Docking and the work she has carried out is a contribution towards a scientific publication. We are proud to say that she will be one of the authors of the article titled "Computational Characterization of Panax ginseng as Potential Aromatase Inhibitors for Breast Cancer".

Dr. Mahesh Vakamudi
Pro Vice Chancellor
Sri Ramachandra Institute of Higher Education and Research (DU)
Chennai.

Dr. Sudha Warrier
Principal, Faculty of Biomedical Sciences and Technology
Professor and Head
Department of Biotechnology
Faculty of Biomedical Sciences and Technology
SRIHER (DU), Chennai.

A summer to remember

Summer vacation is all about spending time doing fun things such as going to summer camp, going to your grandmother's place or visiting a touristy spot. But for G.M. Jayasri, a student of class 11, it was about learning new things at Sri Ramachandra Medical College, Chennai. She applied for the internship program via email and was accepted as an intern for a month.

She visited four departments — Biotechnology, Human Genetics, Pharmaceutical and Clinical Nutrition Departments.

PHOTO: SPECIAL ARRANGEMENT

The four-week adventure

For the first two weeks, she visited the Pharma and Nutrition department, where she learnt how the receptors of our body induce pain, how various types of food that are recommended for different diseases or conditions and how the pharmaceutics help in relieving it.

From working on lab animals to understanding the chemistry behind the making and manufacturing of pharmaceutics, Jayasri learnt it all. "I was so shocked to know that our daily usage products like soaps, shampoos and a few drinks like Coke, Sprite, etc., have adverse effects on our human body both externally and internally due to their pH levels", she said.

In the third week, she visited the Biotechnology department where she was part of a journal regarding the phytocompounds which help to produce anti-cancer drugs against Breast Cancer. She simulated the phytocompounds and calculated the binding affinity of the compound with the target.

"Observing the breast cancer cells in different animals and observed how our stem cells are cultured, nourished and preserved in cryopreservation tanks was resplendent", she said.

In the last week of her intership, she worked at the Genetics department where she cultured her DNA and observed it on the microscope.

The takeaway from the internship

"Learning does not stop as we get older, because, there's still so much in this world waiting to be unveiled by young minds like ourselves. We should always be humble and down-to-earth. I learnt that even the smallest of things need to be appreciated. In Leonardo da Vinci's words, "Education never exhausts the mind", this programme opened my eyes to the richness of the smaller world living within us", said Jayasri.

"This kind of program opened the doors of diversified opportunities apart from medicine/ BDS/ Engineering. These programs should be a mandatory between high and higher secondary to find out the thought shower of the students and also for the best future of our country," she added.

(The author, GM Jayasri, is a student at DAV Girls Hr Sec CBSE School, Mogappair.)

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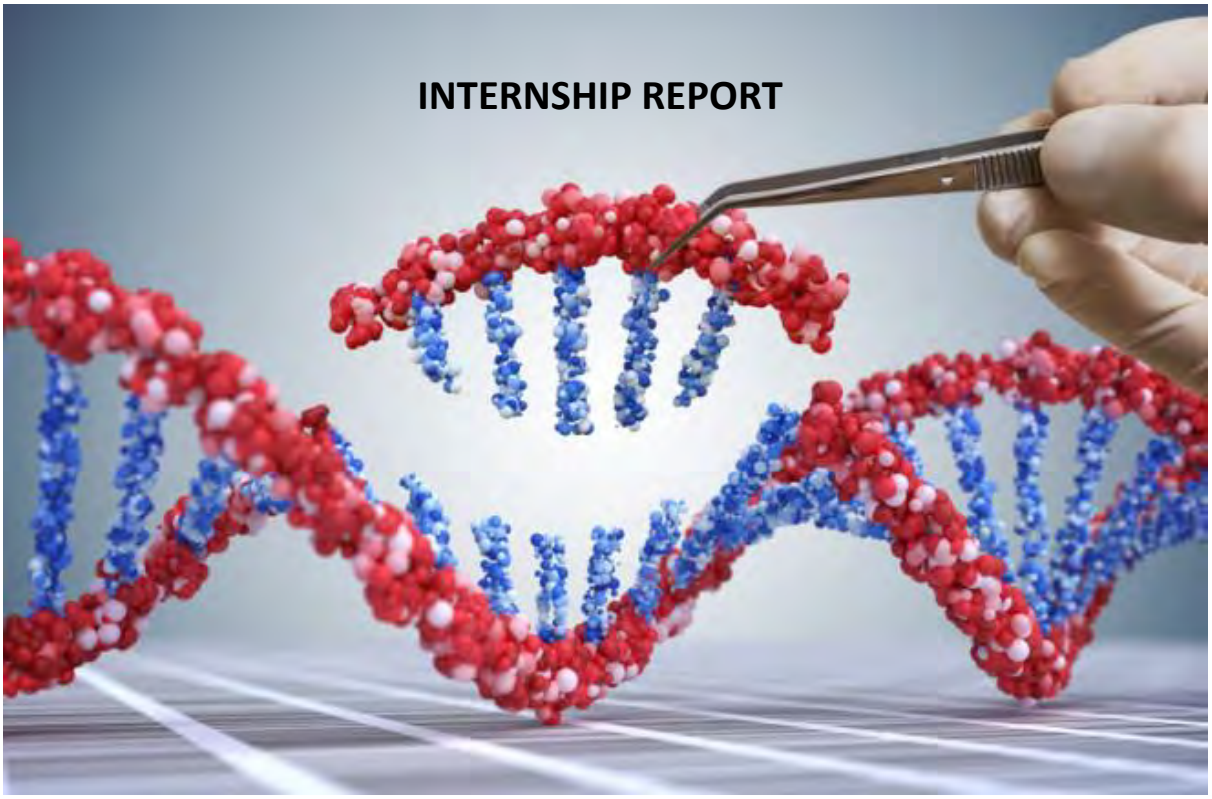

DEPARTMENT OF HUMAN GENETICS

https://www.sriramachandra.edu.in/university/departments.php?cid=5&did=43

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6th June 2024.

A C K N O W L E D G E M E N T

With immense pleasure and deep sense of gratitude, I wish to express my sincere thanks to Dr. P. Venkatachalam, Professor and Head of the Department and Dr. Solomon F. D.Paul, Professor (Department of Human Genetics) and Head (Clinical Research), Sri Ramachandra Institute Of Higher Education And Research University, for their support and consent to undergo internship at the Department of Human Genetics, Faculty of Biomedical Science and Technology, though am being a XI standard school student.

I express my deep gratitude to Dr. Teena Koshy, Associate Professor, Department of Human Genetics and Dr. Andrea Mary F, Assistant Professor, Department of Human Genetics, for teaching me basics, helping me in hands-on experiments especially karyotyping of my own chromosomes, etc. throughout my internship period.

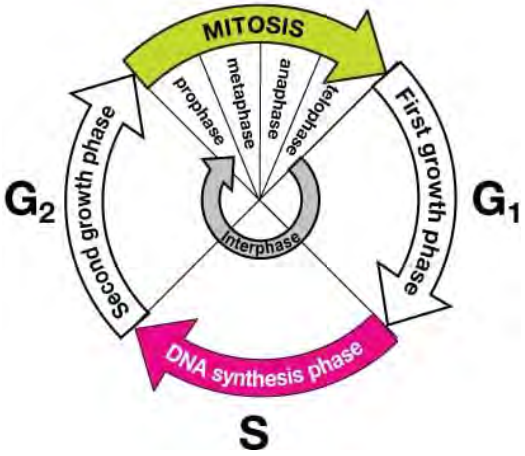
I would also express my thanks to all Ph.D Scholars, Lab Technicians who also guided me through out in conducting experiments in the lab and allowed me to use the world class equipment needed for the internship.

CONTENTS

1. INTERESTING FACTS OF THE HUMAN GENOME:

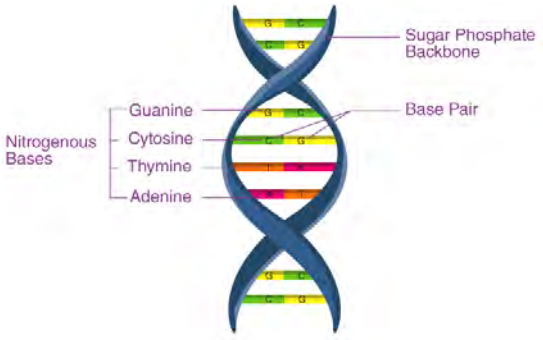
- RBC is not used for studying DNA/chromosome as it enucleated (that is when mature, RBC will not have nucleus). Platelets also cannot be used as it does not have nucleus. Only WBC /lymphocytes are used.
- In order to analyze chromosomes, the sample must contain cells that are actively dividing or capable of being stimulated and subsequently undergo division. In blood, the lymphocytes can be stimulated to undergo mitosis. Most fetal cells actively divide as well

Figure 1: Cell cycle of a dividing



- Chromosomes are a long string of human DNA. In order to see chromosomes under a microscope, chromosomes have to be in their most compact form in a phase of cell division (mitosis) known as metaphase. In order to get all the cells to this specific stage of cell division, the cells are treated with a chemical which stops cell division at the point where the chromosomes are the most compact.
- DNA of a cell will not degrade even when cell dies.

Figure 2: Structure of DNA



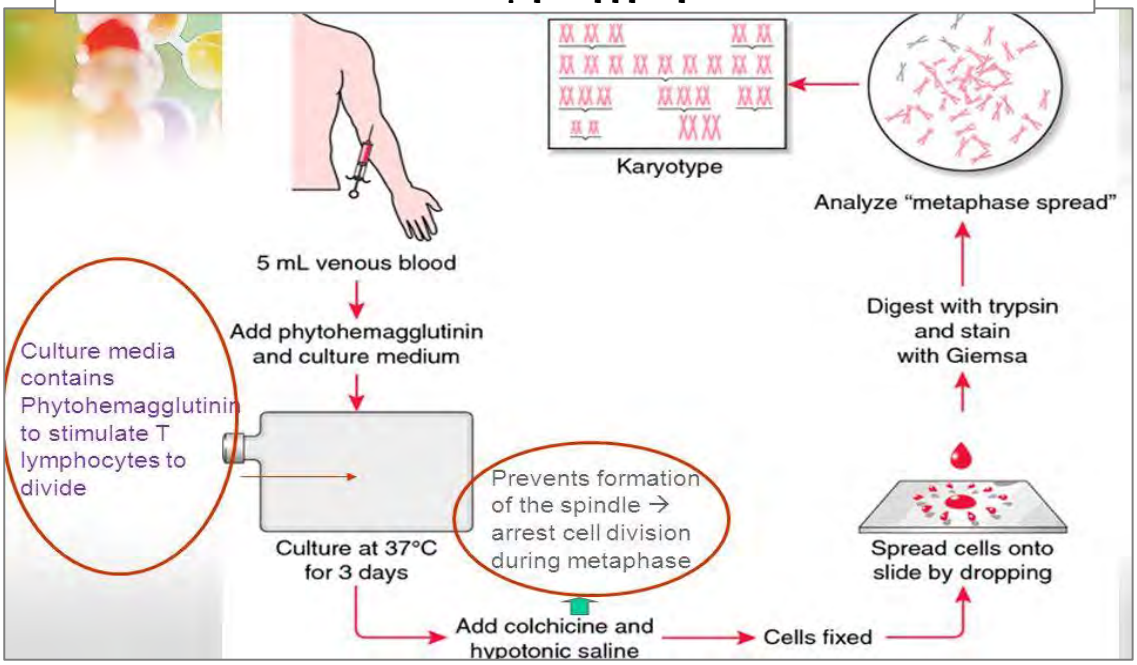
- **Largest gene**- Dystrophin gene. Degenerative neuromuscular Disorder- This disorder is caused by mutations in dystrophin gene located on X chromosome. This mutation prevents body from producing enough or any functional dystrophin. DMD (Duchenne Muscular Dystrophy) weakens the muscle overtime. DMD is irreversible. At birth, they are normal kids. But, as their age becomes ten or twelve, their muscles tend to become weaker. They may find issues in movements and slowly they start to use the wheelchair.
- **Smallest gene**- TRH (Thyroid Releasing Hormone) released by Pituitary Gland which stimulates Thyroid to release its particular hormones. It has 3 amino acids and 12 base pairs making it the smallest gene set.
- **P53 gene**: the p53 gene of human is called as the "guardian of the genome" due to its activities directed at maintaining genomic stability through the repair of damaged DNA.

2. PREPARATION OF METAPHASE CHROMOSOMES FROM PERIPHERAL BLOOD

Principle:

Phytohaemagglutinin (PHA), a lectin derived from the red kidney bean, is a powerful mitogen for human T-cells. When PHA is added *in vitro* to whole blood, mitotic cells can be found after 48 h, with a peak mitotic index at ~64-72 h. The convenience of peripheral blood as a source of human cells, the abundance of mitotic cells, and the simplicity of the cell culture technique make this the most convenient approach to study human chromosomes for both clinical and research purposes. The overall procedure of obtaining metaphase chromosomes from blood is outlined in Figure 3

Figure 3: Overview of the procedure of chromosome preparation from

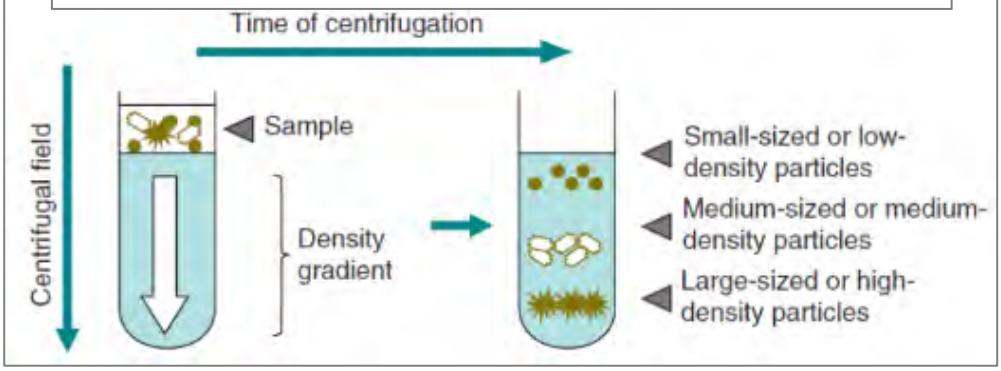


This method of chromosome preparation provides metaphase cells that can be stained by a variety of methods. The most common chromosome staining techniques involve exposing fixed preparations to a protease (e.g., trypsin), followed by an appropriate semipermanent stain. The characteristic banding patterns obtained reflect both structural and functional differences in different parts of the chromosomes. The staining procedure described here provides a Giemsa banding pattern using trypsin with Giemsa stain (i.e., GTG banding). This procedure is reliable and, with only minor modifications, suitable for preparing chromosomes from a variety of human tissues.

Concepts involved in the process

Centrifugation: is a mechanical process which involves the use of the centrifugal force to separate particles from a solution according to their size, shape, density, medium viscosity and rotor speed. The denser components of the mixture migrate away from the axis of the centrifuge, while the less dense components of the mixture migrate towards the axis. Chemists and biologists may increase the effective gravitational force of the test tube so that the precipitate (pellet) will travel quickly and fully to the bottom of the tube. The remaining liquid that lies above the precipitate is called a supernatant or supernate. This principle is used in the process mentioned above several times to separate the cellular components from the solutions like medium, hypotonic solution etc.

Figure 4: Principle of centrifugation and centrifugal force



The centrifuge method is used to separate liquids of different densities.

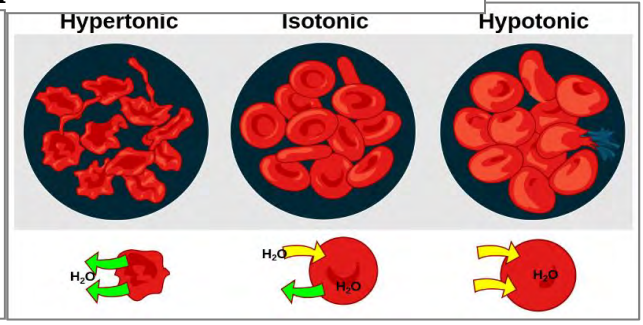
Osmosis: Osmosis is the spontaneous net movement or diffusion of solvent molecules through a selectively-permeable membrane from a region of high water potential to a region of low water potential, in the direction that tends to equalize the solute concentrations on the two sides. This principle is used in the hyptonic treatment of the lymphocytes that allow it to swell and spread the chromosomes. It is also use to swell the RBCs and cause its lysis.

Figure 5: Principle of osmosis as seen with RBCs

Hypertonic: the RBC shivers as water molecules move out of RBC

Isotonic: Normal RBC as in and out of Water is balanced.

Hypotonic: The RBC cells bulge as the water molecules move into the RBC and then leading to lysing of cells



Procedure:

Chromosome preparations were obtained from peripheral blood lymphocytes by a 72 hour culture. Karyotyping was done on GTG banded metaphases according to the ISCN nomenclature (ISCN, 1995).

(I) CULTURE INITIATION:

- The culture medium is prepared by adding 20% of FBS to 80% RPMI-1640 and 100□l of lectin.
- Approximately 1ml of heparinised venous blood sample is added to the complete medium.
- It is then placed in a CO_2 incubator (5%) at 370C for 72 hours.
- 0.1ml of colchicine at the 67th hour was added.
- Incubated for 1 hour

(II) HARVESTING LYMPHOCYTE CULTURE:

- The contents are transferred to a 15ml centrifuge tube.
- It is then centrifuged at 1000rpm for 10 minutes.
- The supernatant is discarded and 10ml of pre-warmed hypotonic solution was added and kept in the incubator for 20 minutes.
- It is again centrifuged at 1000rpm for 10 minutes.
- To the pellet 6 ml of prechilled Carnoy's fixative was added while vortexing.
- It is kept at room temperature for 20 minutes and then centrifuged for 10 minutes at 1000rpm.
- The supernatant is discarded and again treated with the cold fixative and stored in the refrigerator overnight.

(III) SLIDE PREPARATION

- The pellet was adjusted to an appropriate concentration
- Three drops of the pellet were dropped on clean, pre-chilled slides from a height of approximately 10 cm
- Slides were checked under the phase contrast microscope for cell density, spreading and mitotic index
- Specimen slides were aged in a hot air oven maintained at 60°C overnight.

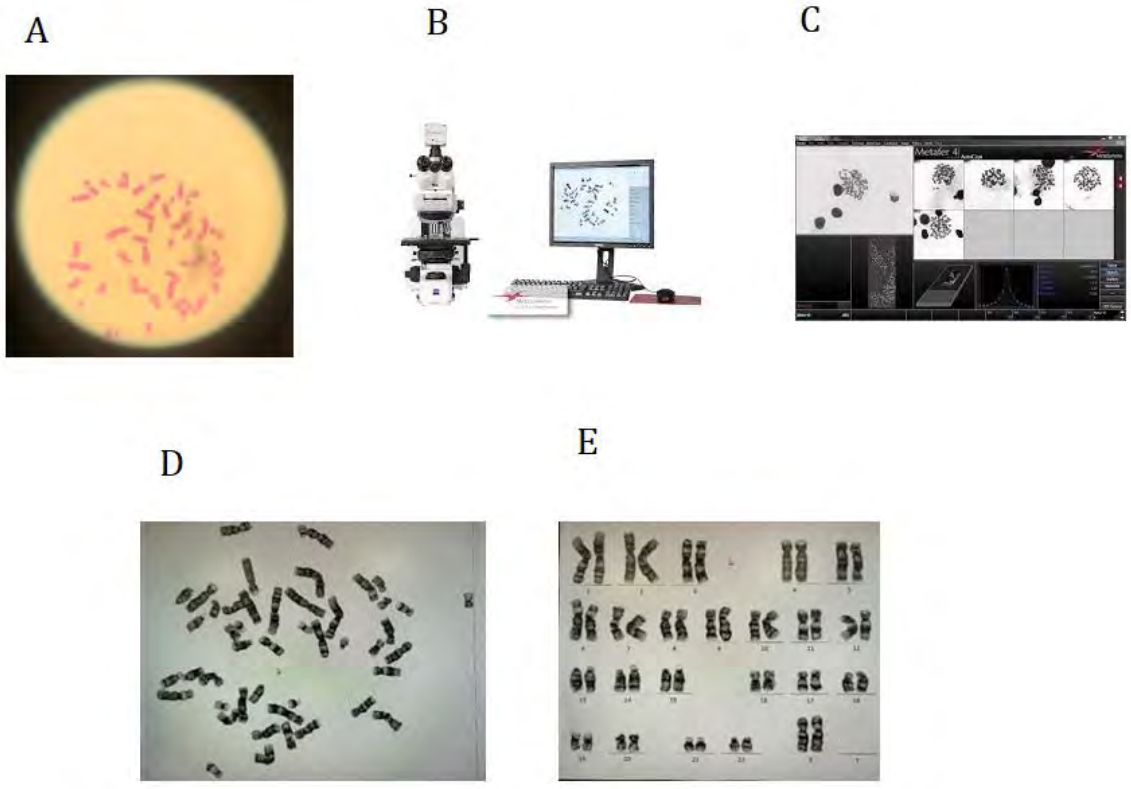
(IV) GTG banding

- Trypsin treatment: 50mg in 50ml of PBS. Agitate for approx 15-20 sec
- Washing : Wash with 1XPBS twice followed by distilled water
- Giesma staining : 5 – 10 minutes
- Wash with distilled water and air dry

(V) Analysis

Metaphase chromosomes were analyzed. Using the Ikaros Karyotyping software karyotyping of captured images was performed.

Figure 6: Processing and Analysis of my chromosomes



A: Microscopic view of my GTG banded chromosomes. B, C: The Ikaros Karyotyping Software D,E: My chromosomes captured and karyotyped

3. GROUPING OF CHROMOSOMES: KARYOTYPING

Chromosome banding is used mainly to identify both normal and rearranged chromosomes. A nomenclature has been developed to standardize the identification of chromosomes and the naming of chromosome bands. The system currently in use is An International System for Human Cytogenetic Nomenclature, referred to as "ISCN". The report includes a chromosome band nomenclature, as well as standard idiograms, which are "diagrammatic representations of a karyotype, which may be based on measurements of the chromosomes". It contains the standard system for numbering human chromosomes and constitutional rearrangements and the banding pattern for normal chromosomes. Figure 7 shows the standard banding (light and dark bands) pattern observed on all the human chromosomes.

Karyotyping is the process of pairing and ordering all the chromosomes of an organism, thus providing a genome-wide snapshot of an individual's chromosomes. Karyotypes are prepared using standardized staining procedures that reveal characteristic structural features for each chromosome. Clinical cytogeneticists analyze human karyotypes to detect gross genetic changes—anomalies involving several megabases or more of DNA. Karyotypes can reveal changes in chromosome number associated with aneuploid conditions, such as trisomy 21 (Down syndrome). Careful analysis of karyotypes can also reveal more subtle structural changes, such as chromosomal deletions, duplications, translocations, or inversions. In fact, as medical genetics becomes increasingly integrated with clinical medicine, karyotypes are becoming a source of diagnostic information.

Figure 7: Human chromosome structure and Classification

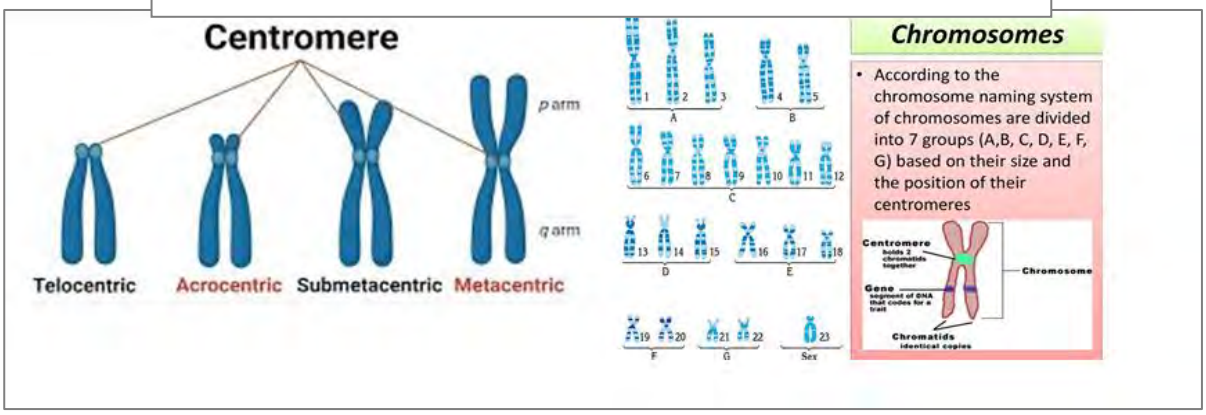
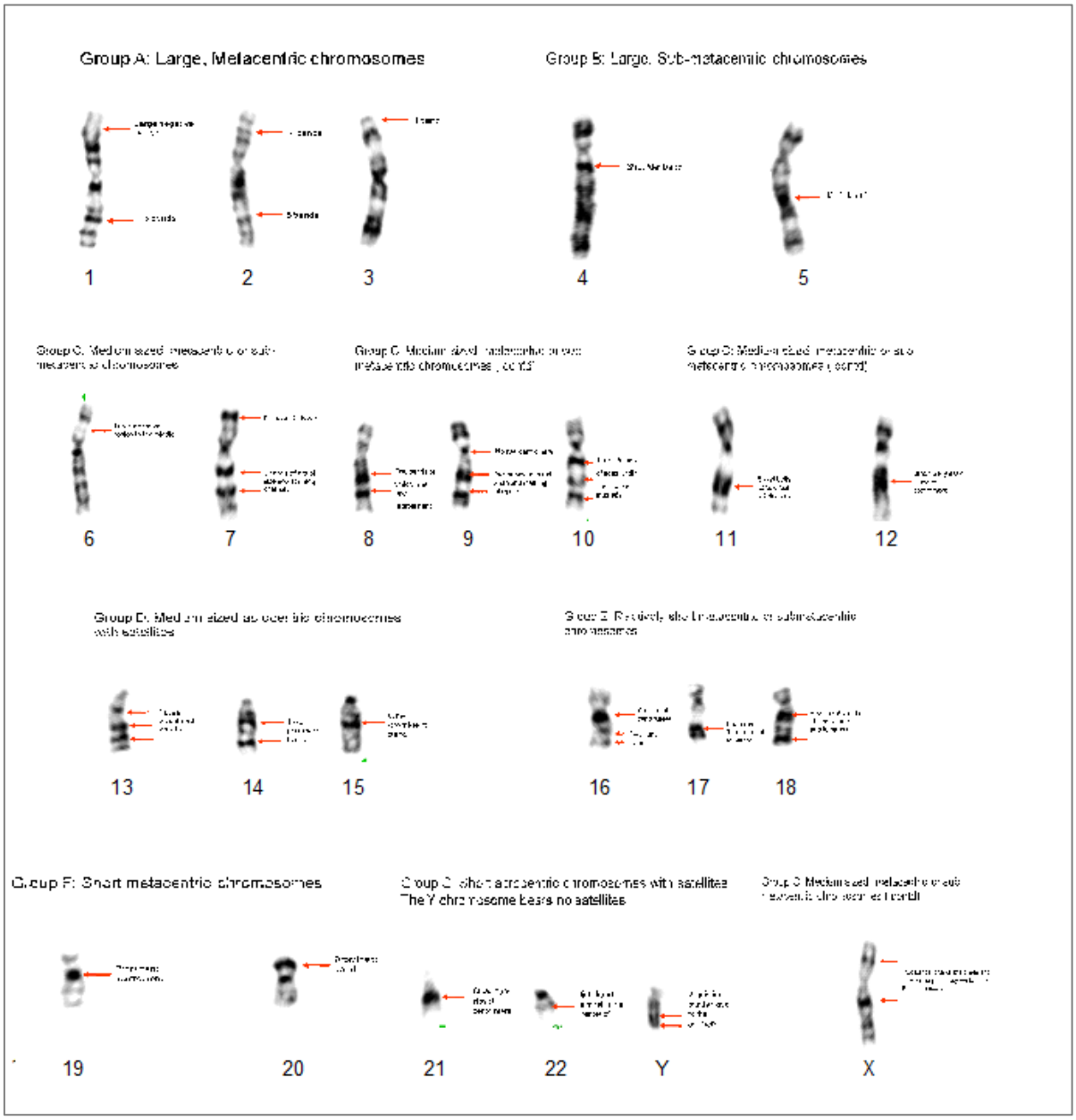


Figure 8: Human chromosome structure and Classification



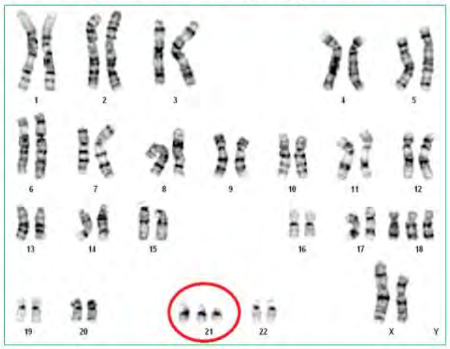
Courtesy: Department of Human Genetics, SRIHER

4. COMMON CHROMOSOME SYNDROMES

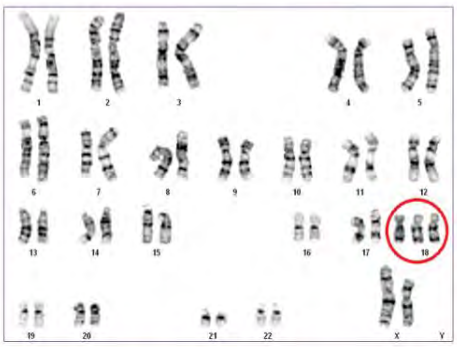
A chromosomal abnormality, or chromosomal aberration, is a disorder characterized by a morphological or numerical alteration in single or multiple chromosomes, affecting autosomes, sex chromosomes, or both. Examples of common chromosome disorders are given in Figure 9.

Figure 9: Common chromosome abnormalities

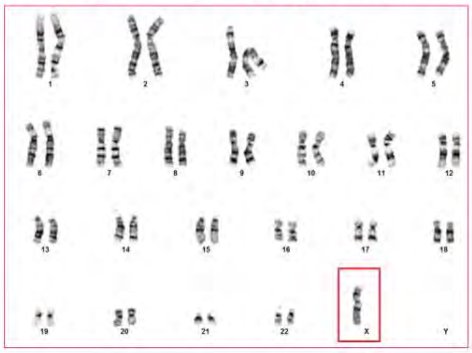
Down's syndrome karyotype- Trisomy 21



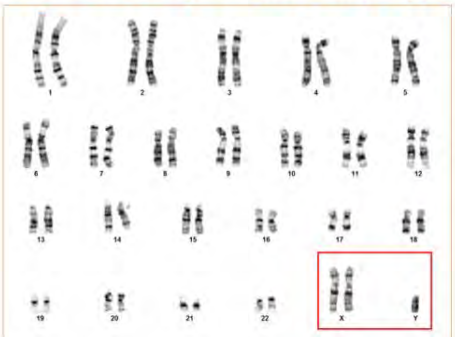
Edward's syndrome karyotype – Trisomy 18



Turner's syndrome karyotype- Monosomy X



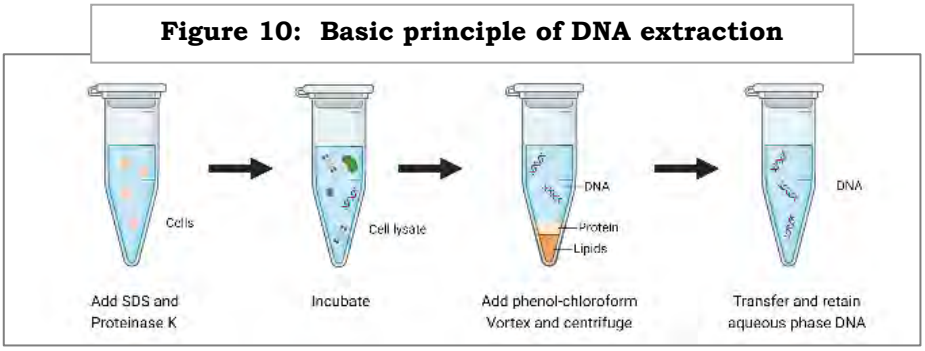
Klinefelter's syndrome karyotype



5. DNA EXTRACTION AND PCR

Medicine is changing daily, and soon, genetics could be playing a major role in the diagnosis and treatment of diseases. A thorough assessment may soon require a detailed look at how genes in a patient's body are being switched on or off. And it all begins with Deoxyribonucleic acid (DNA) extraction followed by polymerase chain reaction (PCR).DNA extraction is the process by which DNA is separated from proteins, membranes, and other cellular material contained in the cell from which it is recovered There are three basic steps in a DNA extraction; breaking the cell and nuclear membranes to expose the DNA along with the cytoplasm within (cell lysis), using detergents and surfactants to break down lipids and proteins and finally ethanol precipitation to concentrate the DNA. DNA analysis often requires focusing on one or more specific regions of the genome. It also frequently involves situations in which only one or a few copies of a DNA molecule are available for further analysis. These amounts are insufficient for most procedures, such as gel electrophoresis.

Figure 10: Basic principle of DNA extraction

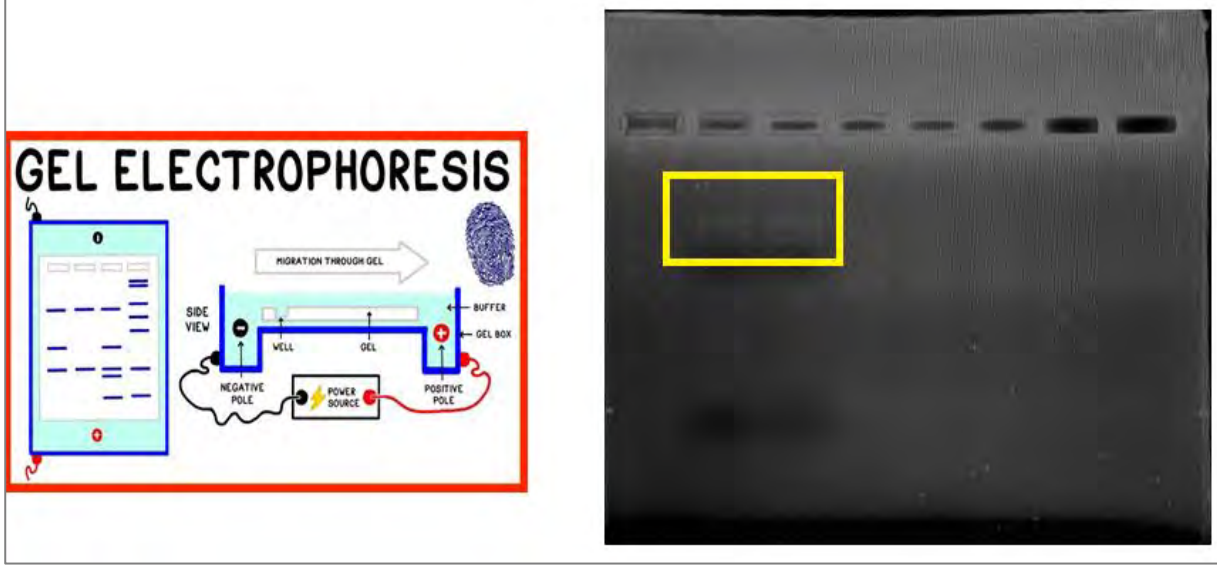


The procedure I observed was using a kit, QIAamp: This simple, low cost spin column procedure yields purified DNA of approximately 20-30 kb that can be used directly in PCR or other enzymatic reactions without further purification. The procedure was performed as follows:

- Added 20 µl protease to 200 µl of blood sample along with 200 µl buffer AL (Automatic Lysis). Incubated in a water bath at a temperature of 56°C for 10 minutes. Mixture turning to black indicates that the cells have lysed.
- Protease is added to avoid degradation of the cell.
- Added 200 µl of ethanol to precipitate the DNA and then vortexed it for a while.
- Then the mixture is centrifuged at 8000rpm for 1 minute after transferring to column tube.

- Added 500 µl AW1(washing agent) buffer. (wash buffers are ionic detergents Eg SDS – Sodium Dodecyl Sulphate)
- Centrifuged the tube for 8000rpm for 1 minute.
- Added 500 µl AW2 buffer (washing buffer).
- Centrifuged the tube for 8000rpm for 3 minutes.
- Added 50 µl of AE (elute buffer) buffer (to elute the DNA and take it out)
- Again, centrifuged at 8000rpm for 1 min
- Electrophoresis done and gel documentation is done and DNA observed.

Figure 11: My DNA observed after gel electrophoresis



PCR is a technique used to rapidly increase the number of copies of one specific region of DNA for further analyses. Typically, the DNA that is used as the starting sample in a PCR reaction is genomic DNA, which would contain all the genes in the organism. PCR uses a special form of heat tolerant DNA polymerase, the enzyme that replicates DNA, and other short nucleotide sequences called primers that base pair to a specific portion of the DNA being copied. A PCR reaction does not copy the entire genome, rather it makes millions of copies of one specific region of interest. PCR has four steps. They are denaturation, annealing, elongation and analyzing with electrophoresis. Primers are used to define the region of the sample DNA, that will be amplified, resulting in many copies in a very short time frame. dNTPs (deoxynucleotide triphosphates) are the essential building blocks of nucleic acid molecules and are needed in PCR test to generate new amplified DNA.

Figure 12 shows the overall procedure for PCR.

Figure 12: The three-step process of the polymerase

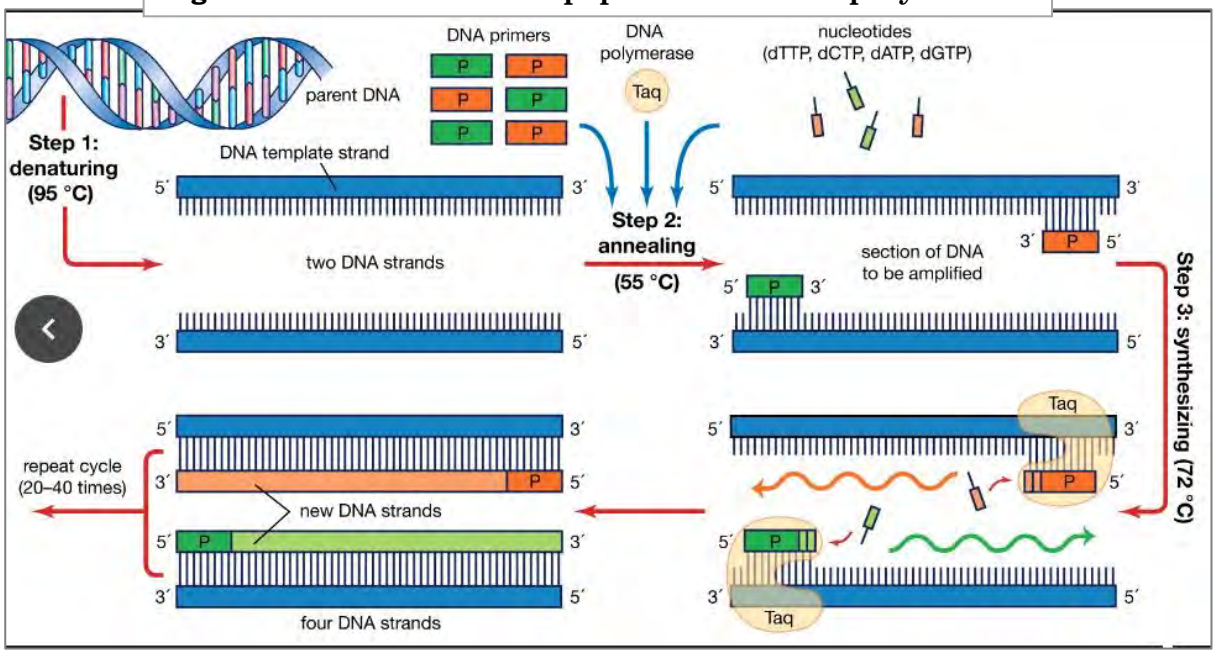


Figure 13: The Thermocycler and micropipettes at the department used for PCR

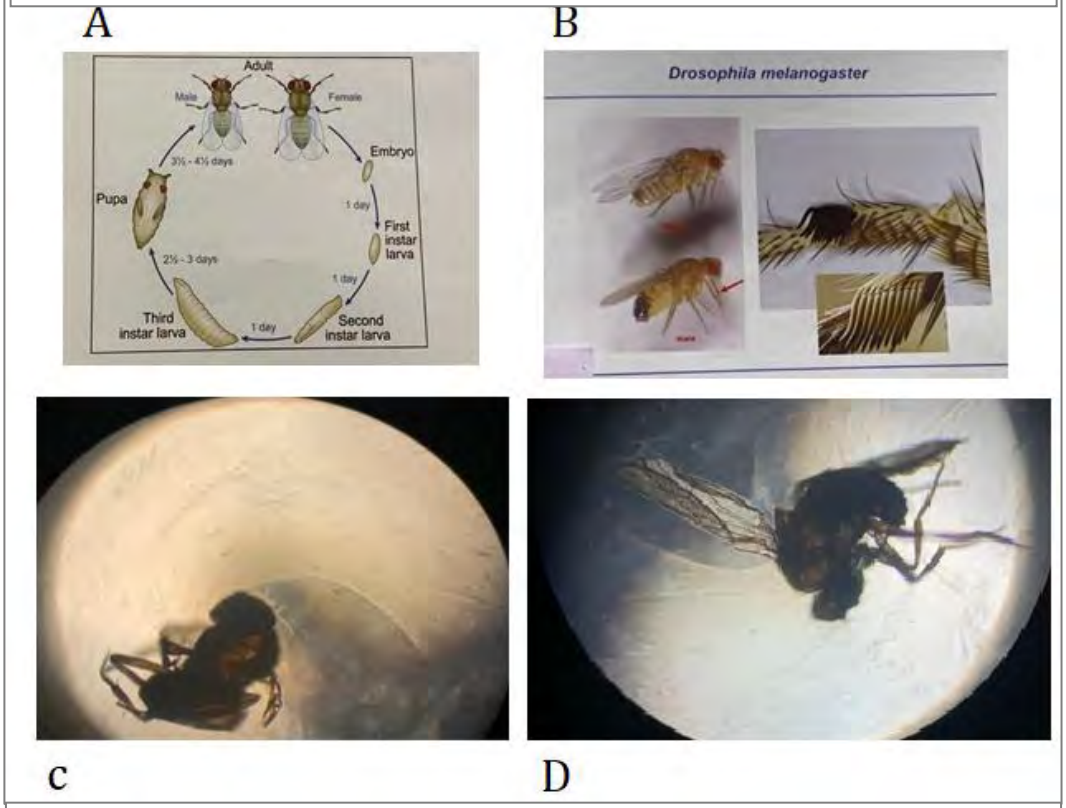
6. *DROSOPHILA MELANOGASTER* AS A MODEL SYSTEM FOR GENETICS

The fruit fly, *Drosophila melanogaster*, is used as a model organism to study disciplines ranging from fundamental genetics to the development of tissues and organs. They are called as Cinderella of genetics. The reason for this name is because of their short lifespan of only 12 days, easy to culture and multiple progenies are generated in a single reproduction.

Drosophila genome is 60% homologous to that of humans, less redundant, and about 75% of the genes responsible for human diseases have homologs in flies. These features allow the fruit fly to be eligible to study complex pathways relevant in biomedical research, including cancer.

The fruit flies are stored in a bottle and kept in the oxygen incubator. Equal amount of male and female flies is kept in the bottle. They are allowed to breed. The larvae of the flies move from the bottom of the flask to the neck of the flask and become male or female flies. Nutrients provided are made in the lab as they are more efficient than store bought.

Figure 14: Features of *Drosophila melanogaster* observed in the Fly Lab



A, B: Lifecycle and adult *Drosophila melanogaster*.

C, D: Vestigial Organ (wings) in black eyed *Drosophila melanogaster*

7. CONCLUSION

The internship at the Department of Human Genetics provided a greater learning experience starting from basics of genetics to the techniques of DNA extraction & chromosome preparation. I also learnt karyotyping of human chromosomes and how it can be used to identify chromosome abnormalities. I was also briefed on a few disorders.

I was able to get hands-on training in the following:

- Chromosome preparation from the culture initiation to slide preparation and GTG banding
- Handling normal Drosophila melanogaster and understanding the role of this model organism to study disciplines ranging from fundamental genetics to medical genetics.
- DNA extraction and PCR

At the end of the internship I understood that genetics explains how biological inheritance is transmitted from generation to generation through DNA. In the field of medicine, genetics has had a very significant impact on the way hereditary diseases are diagnosed, treated, and prevented.

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INTERNSHIP REPORT

DEPARTMENT OF CLINICAL NUTRITION

https://www.sriramachandra.edu.in/university/departments.php?cid=6&did=38

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7th May 2024 to 6th June 2024.

ACKNOWLEDGEMENT

With immense pleasure and deep sense of gratitude, I wish to express my sincere thanks to Dr A.J. Hemamalini, The Head of the Department of Clinical Nutrition, SRFAHS SRI RAMACHANDRA INSTITUTE OF HIGHER EDUCATION AND RESEARCH UNIVERSITY, for her support and consent to undergo internship in the Department of clinical nutrition, though am being a XI standard school student.

I express my deep gratitude to all Associate professors and lecturers, Department of Clinical Nutrition, SRIHER for teaching me basics, helping me in hands-on experiments, visiting the general surgery ward, OBG ward and Paediatric ward during my internship period.

I would also express my thanks once again to Head of the Department, for allowing me to actively participate in the summer camp by name “SNACK 2024” (Special Needs Activity Centre for kids) organised by Vidhya Sudha, school for Special Children. This made me realise about the responsibility of younger generation towards the needy kids and I’m grateful for making me a small part of this camp, to teach kids arts and crafts.

CONTENT

1. FOOD TASTING LAB

Organoleptic evaluation of food is studied.

- Food
- Appearance
- Colour
- Texture
- Taste (Salt restriction specifications)
- Flavour

Food for specific medical conditions:

LIVER CIRRHOSIS (end stage of liver disease with the condition of differed taste bud)

- Breakfast
  - Boiled egg
- Mid-morning
  - Sweet Lassi (to quench excess thirst)
- Dinner
  - Dum aloo sabji with chapathi (minimum oil)

HEPATITIS (inflammation of liver)

- Food should consist of moderate amount of protein and large amount of vitamin C

RENAL STONE (deposition of oxalates in kidney)

- Food without tomato / or less amount of tomato

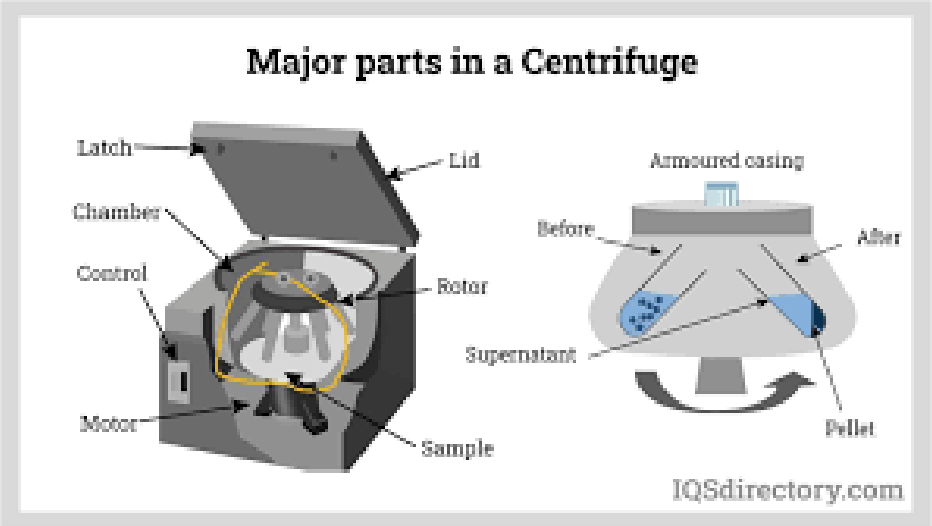
KIDNEY TRANSPLANT

- Lots of fluids should be taken along with food

2. FOOD ANALYSIS LAB

Instruments used:

1. Centrifuge



e.g. used to separate fat from egg yolk

2. Hot air oven for drying glass wares

3. Muffle furnace to turn anything to ash for testing

4. Calorimeter

Various nutrient tested from food:

S. No.	**Food tested**	**Nutrient**
1.	Lemon, Cabbage, Green chilli	Vitamin C
2.	Green leafy vegetables	Potassium
3.	Milk, curd, ash sol	Calcium
4.	Egg yolk	Lipid
5.	Dates, Figs, Green leafy vegetables	Iron

3. GENERAL SURGERY WARD

Malnutrition definition:

Both underweight and overweight are termed as malnutrition.

Body Mass Index= weight in kg / height in m^2.

Asian BMI categories:

BMI value (kg/m^2)	Category
< 18.5	Underweight
18.5 - 22.9	Normal weight
23.0 - 24.9	Overweight
25.0 – 30.0	Grade I Obesity
30.0 - 34.9	Grade II Obesity
35.0 – 40.0	Grade III Obesity
➢ 40	Grade IV Obesity

Generally ideal body weight is calculated as

Ideal body weight = height in cm -100

E.g. height =156cm

then, ideal body weight= 156-100= 56 kg

If there is a weight loss in a patient due to certain medications/illness,

then, % weight loss = (UBWT-CBWT)/UBWT *100%

UBWT - Usual body weight= 60kg

CBWT - Current body weight=56kg

then, % weight loss= (60-56)/60 * 100%= 6.6 %

Patient evaluation steps:

Height measurement:

Stadiometer (for patients who can stand)

e.g. for bedridden patients: measuring tape is used to calculate (but slightly inaccurate)

Weight measurement: weighing scale is used.

- Calculate BMI to find out overweight/obese/underweight
- Ideal body weight %= CBWT/IBWT *100%
- Overweight when the value is 110% to 119.9%
- Obesity > 120%
- Adjusted body weight (ABWT)= CBWT-IBWT*0.25 +IBWT
- ABWT= 58- (43*0.25) +43= 46.7kg

According to the BMI value, patient is counselled with right quantity of food with essential nutrients.

E.g.

- BMI normal—30-35 Kcal/day
- Overweight—20-25 Kcal/day
- Underweight—40-45 Kcal/day

Studying a patient:

Physical (Clinical) assessment of a patient is done.

1. Anaemia signs: eyes tested and non-dominant hand fingers are used for testing Patient found to be non-anaemic

2. Height measurement using stadiometer as well as using measuring tape (for learning purpose)

3. Weight found using weighing scale

4. Patient BMI calculated and found to be in “overweight“ category.

5. Counselling of patient done to eat right quantity of carbohydrates with slight increase in protein (In the form of dhal)

4. PAEDIATRIC WARD

Paediatric ward: the children have low immunity system making their body vulnerable to any kind of disease when too many people visit the wards.

Assessment format in the ward:

SOAP is followed.

S - Subjective

O - Objective

A - Assessment

P - Plan

Objective assessment:

A- Anthropometry – Child's height, weight, BMI calculated
B- Biochemical- blood test reports
C- Clinical evaluation
D- Diet history

CLINICAL EVALUATION:

- Head to toe assessment (anaemia signs in eyes and fingers of non-dominant hand), visible collar bones (underweight and malnourished), lips torn/cracked at the ends (vitamin deficiency), knocked knees (vit D deficiency)
- Height for infants—infantometer is used

1. Weight for infants:

Infant weighing scale is used

Assessment of a girl at the ward:

1. The patient seems to be anaemic (eyes were pale)
2. Underweight and malnourished (visible collar bone and underweight for her age)
3. Delayed puberty
4. Cracked lips severe vitamin deficiency
5. Poor diet history

   Counselling: advised to take nutrient rich veggies, fruits and daily egg is compulsory to meet out deficiencies. Patient is advised to eat at the right time with required amount of carbohydrates.

5. OBG WARDS

(OBSTETRICS AND GYNAECOLOGY WARD)

Wards visited:

- ✓ Pre-natal ward (pregnancy ward)
- ✓ Post-natal ward (after delivery ward)
- ✓ Geriatrics ward

Pre-natal ward (study of a patient)

- ✓ All observational assessments are done and found the pregnant lady (36 weeks pregnant) is mild anaemic.
- ✓ Hence counselling was given to eat lot of green leafy vegetables and importance of eating right amount of nutritious food at right time.

Post-natal ward:

Patient: mother and baby (3 days old)

- All observational assessments are done and both the mother and baby are healthy
- Counselling given regarding eating good amount of nutritious food and lots of fluid (must for lactating mother).
- Exclusive 6 months breast feeding is suggested and should remain happy always as it is good for both mother and baby.

Geriatrics ward:

- ✓ Patient: old woman (recovering from illness and about to be discharged)
- ✓ All observational assessments are done and no specific deviations in BMI or in bio chemical assessments
- ✓ Counselling given regarding eating good amount of nutritious food.

6. SUMMER CAMP SNACK 2024

- ☑ SNACK 2024 (Special Need Activity Centre for Kids) 2024 by Department of clinical Nutrition
- ☑ The summer camp aims at introducing flameless healthy snacks for the kids like salads, bread sandwich, fresh fruit juices, dry fruits laddu, cut fruits with chia seeds and coconut milk etc
- ☑ The summer camp also had activities to engage kids with fun filled activities, games, simple art activities etc.
- ☑ The art activities planned by me are making puppy with origami sheets, fish with origami sheets etc
- ☑ I also encouraged the kids to speak about their favourite cartoon character which aims at improving the public speaking skill.
- ☑ I also actively participated in making the healthy snack for the kids and helped in distributing them among the kids.

7. CONCLUSION

The internship at the department of clinical nutrition gave a greater insight into the importance of nutrition science at the hospitals. The organoleptic evaluation of food and how it is used to suggest diet for the patients with different illness is also learnt. The importance of food analysis in evaluating the nutrients of the food is learnt and the instruments used to do the evaluation were understood. The visit to the general surgery ward, paediatric ward and OBG ward gave hands on experience of how to do subjective and objective evaluation of the patients, and counselling of diet to patients depending on their illness.

The clinical nutrition department aims at preventing the diseases by educating on balanced diet rather than diet correction at the illness stage. Through the diet counselling methods, the department tries to lay a road for quick recovery from illness or at least reduce the sufferings from major illness.

The active participation in the “SNACK 2024”, the special activity summer camp for kids gave greater learning of fireless cooking healthy, nutritious, tasty snacks that can be made for kids.

The summer camp also taught me the various activities that can be planned for kids and bring smiles in kids face.

A WONDERFUL JOURNEY!

G. M. JAYASRI

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DEPARTMENT OF PHARMACY

https://www.sriramachandra.edu.in/university/colleges.php?cid=1

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A C K N O W L E D G E M E N T

With immense pleasure and deep sense of gratitude, I wish to express my sincere thanks to Dr. A. Jerad Suresh, The Principal and Dr. K. Sujatha The Vice Principal, Faculty of Pharmacy, SRI RAMACHANDRA INSTITUTE OF HIGHER EDUCATION AND RESEARCH UNIVERSITY, for their support and consent to undergo internship in the Faculty of Pharmacy, though am being a XI standard school student.

I express my deep gratitude to Dr. J.Srikanth (Department of Pharmacology), Dr Saba Maanvizhi (Department of Pharmaceutics), Dr. Shabna Roupal (Department of Pharmaceutical Chemistry), Dr S.Hemalatha (Department of Pharmacognosy), Dr A. Mohathasim Billah (Department of Pharmacy Practice), Professors of SRIHER for teaching me basics, helping me in hands-on experiments throughout my internship period.

I would also express my thanks to all Ph.D. scholars, lab technicians who also guided me through out in conducting experiments in the lab and allowed me to use the necessary equipment needed for the internship.

CONTENT

1. DEPARTMENT OF PHARMACOLOGY

Scientific study of effects of drugs on living organisms:

1. ADMINISTRATION METHODS:

I. Oral
- Tablet
- Capsule
- Syrups
- Elixir
- Disadvantages
  - Degradation of drugs due to gastric acids
  - Liver metabolises
  - Drug deactivates
  - Excreted)

II. Topical
- External ointments
- Lotion
- Drops

III. Systemic
- Parentral
  - IV (Intra vein)
  - IM (Intra muscular)
  - IP (Drug mixes with blood, immediate onset of action, skipping the first pass stage)

IV. Rectal route
- Suppositories (Drug) (Skips the first pass stage)

V. Vaginal route
- Pessaries

2. Potency:

A concentration of drug required to produce a intended pharmacology action.

3. Pharmacokinetics:

Study of action done by body on drugs (Absorption, Distribution, Metabolism, Excretion).

4. Pharmocodynamics:

Study of action of drugs does to body (Mechanism of action).

5. Types of receptors:

1. Ion channel
2. Chemical messengers
    a. Enzymes
    b. hormones
    c. excess Na+--excitation
    d. K+ -- heart depressant
    e. Mg 2+-- relaxation etc)
3. Nuclear receptor
4. Cytokine

6. Drug discovery process

1. Identification of target
    a. Protein Data Bank
    b. Ligand (Pub Chem)
2. Molecular docking
    a. Software simulation: Study of binding effects.
3. Molecular dynamics
4. Preclinical studies
    a. Test on lab animals
        i. In vivo—whole animal
        ii. In vitro – tissue/organ— Eg. frog heart
5. Drug tested on healthy person and then performed in diseased human to check for efficiency, confirmative safety and then post marketing surveillance [IV given to tail / marginal ears of rabbit]

7. IAEC (Institute of Animal Ethical Community)

- Guidelines for performing euthanasia (Human way of killing animals)
- Anaesthesia: (Inhalation / Injection)
- Physical euthanasia:
    a. Cervical dislocation
    b. Decapitation
    c. Exsanguination
    d. Electrocution and stunning (not commonly used)

ROTA ROD experiment for testing muscle grip is observed

8. ZEBRA FISH IN Pharmacology department:

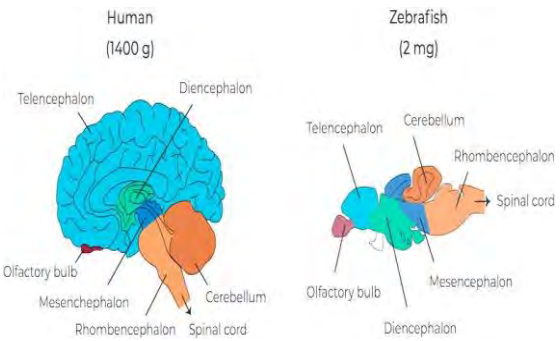
Why zebra fish?

Genes of this fish matches 93% with that of human genes and its cerebellum easy to identify degeneration. Grown in a closed environment

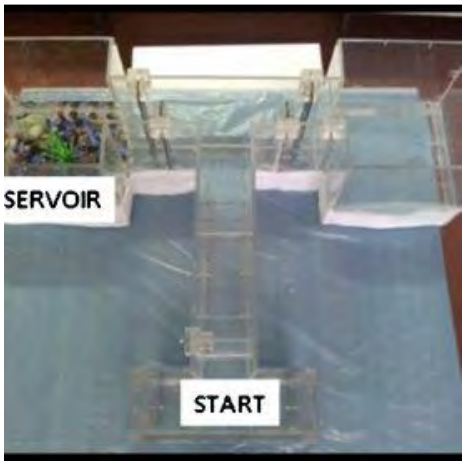
Used for study :

1. Neurotoxicity
    a. due to food & Products
2. Alzeimers disease
    a. loss of memory due to ageing
3. Diabetes
4. Cancer studies
5. Neuro diseases
6. Embryo toxicity

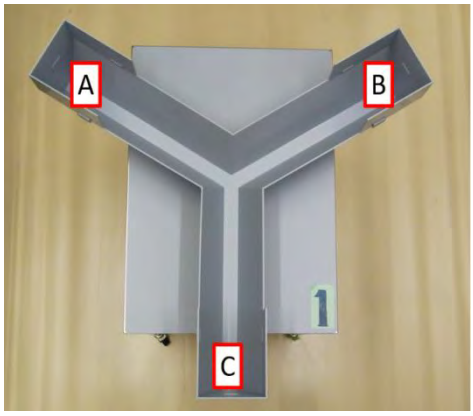
9. Types of Neurobehavioral Analysis



10. T MAZE



11. Y MAZE



2. DEPARTMENT OF PHARMACEUTICS

1. Active Pharmaceutical Ingredient (API)

   Drug having therapeutic action / Medicinal action.

2. Need for different dosage forms of drug:

   a. Accurate amount
   b. Protection from gastric juices
   c. Masking taste and odour
   d. Placement of drugs within tissue
   e. Sustained and controlled release

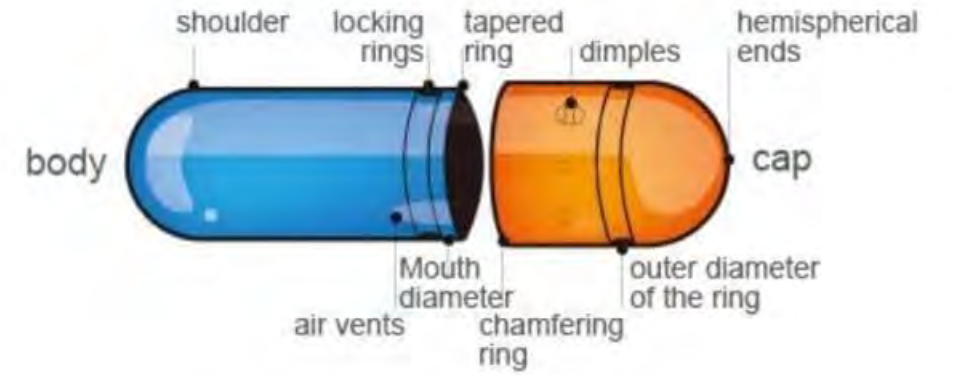
3. General Information:

   a. Fluted bottle package.
      i. Blind people to understand for external use
   b. Plain bottle
      i. Blind people to understand for internal use
   c. Amber coloured bottles
      i. Drug is highly sensitive to sunlight
   d. Sugar coated tablets (for highly bitter drugs)
   e. Most drugs are weakly acidic/ basic - bitter taste
   f. Gelatine and enteric coated -> released only in intestine

Fluted

amber ampule

Ampules & vails

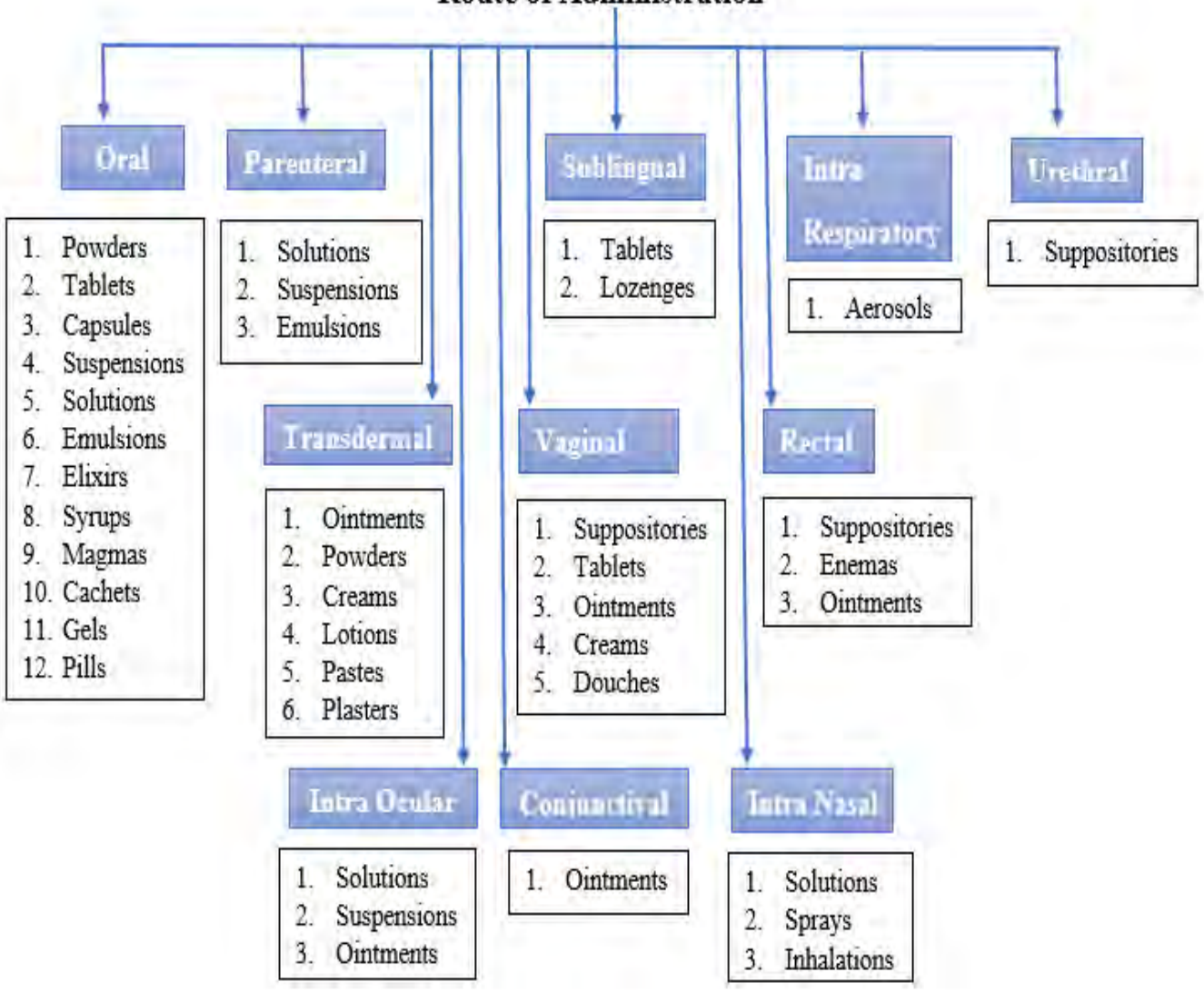


HGC—hard gelatin capsule

SGC—Soft Gelatin Capsule

Classification of Dosage Form

Route of Administration



4. PREPARATION OF CALAMINE LOTION:

Calamine lotion used for treating broken skin esp summer, antiseptic and antistringent. It soothens the skin during summer and Vaseline rehydrates the skin in winter.

- Bentonite (hydrating agent) is added to calamine which hydrates and increases the solubility of calamine.
- Layers of skin – hydrophilic (epidermal, subcutaneous region, endo dermal) & lipophilic (sebaceous gland – hair follicles start)
- Drug has an active ingredient (pharmacological activity) and a base ingredient (therapeutic)

5. Instruments seen in the lab:

- Autoclave—steam/ moist sterilisation to destroy the harmful microbes
- Hot air oven—dry sterilisation

6. Steps in making drug:

- Raw material store (active ingredients)
- Pre-formulation analysis (flow property, angle of repose, uniform dispersion)
- Compression
- Post formulation studies (triability test and disintegration)

3. DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

CHEMISTRY DEALING WITH DRUGS

1. Pharmaceutical chemistry:

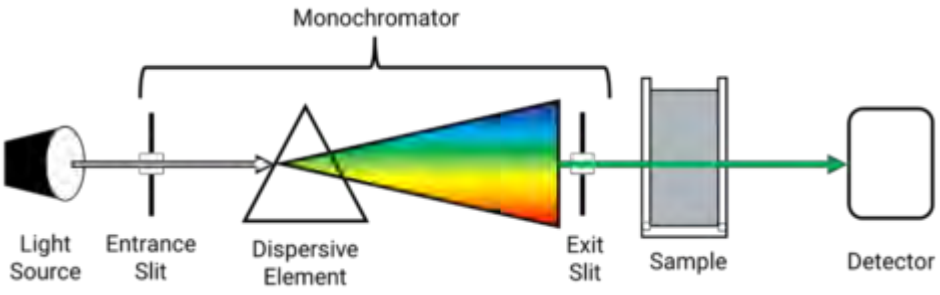
1. Synthetic chemistry – to form a new molecule
2. Analytical chemistry—check whether the compound is 100% pure
   A. Spectro photometer—light is passed through the compound and find the quantity (absorption of light is directly proportional to concentration of particular compounds)
   B. Chromatography –separation of mixture into individual compounds (High pressure liquid chromatography / medium pressure liquid chromatography)

2. Natural product chemistry:

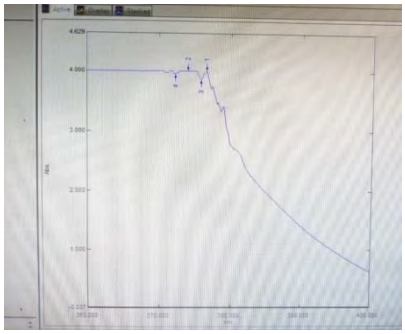
1. Quinine from cinchona bark (Plant source)
2. Marine sources are more useful than plants.
   Sponges and corals @ Gulf of mannar & Australia.

3. LAB VISIT:

1. UV spectrometer (absorption spectra principle is used)



Potassium permanganate ($KMnO_4$) is
tested in the spectrometer and its λ_{max} is observed.



4. Digital PH meter

S. No.	Sample	pH value	Nature of sample
1.	Water	7.46	Neutral
2.	Tropicana (lichi)	4.01	Acidic
3.	Dove soap	7.67	Neutral
4.	Hamam soap	10.12	Base
5.	Sprite	3.84	Acidic

pH values of different samples are tested and tabulated.

Calibration of pH meter: using buffer 7/9

5. Digital melting point meter:

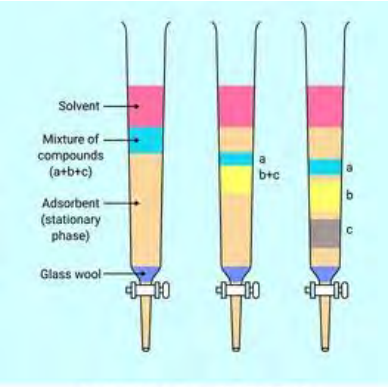
Two samples were tested for melting point using the instrument .

- Benzil (Synthesised in the lab)
  - 68.6 deg. Cel
- Salicylic acid (Market)
  - 158.6 deg. Cel

6. Hot air oven

- Drying purposes
- Sterilisation
- Thermolability of the drug is also tested (drug readily gets destroyed for heat)

7. Column chromatography:

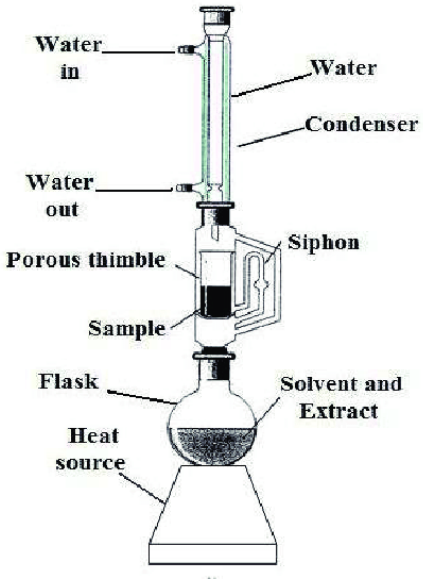


Absorbent used is silica. Solvents used polar, semi polar & non polar to separate the components

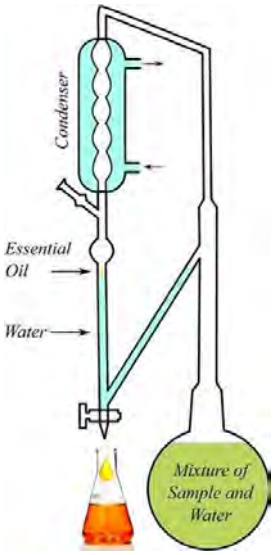
4. DEPARTMENT OF PHARMACOGNOSY

Drug developed from natural source (Plant, animals, etc)

Soxhlet apparatus (extraction)



Clevenger apparatus (for volatile oils)



1. Metabolites:

Primary metabolites:

It is required for function of plants

Eg. carbohydrates in the form of polysaccharides, lipids and protein (Gelatine -animal source)

Secondary metabolites:

Alkaloids (bitter for defence purposes), Keratinoid (Good appearance), terpenoids (volatile oils of plants and has aroma.

Eg. Rose petals, cinnamon leaves)

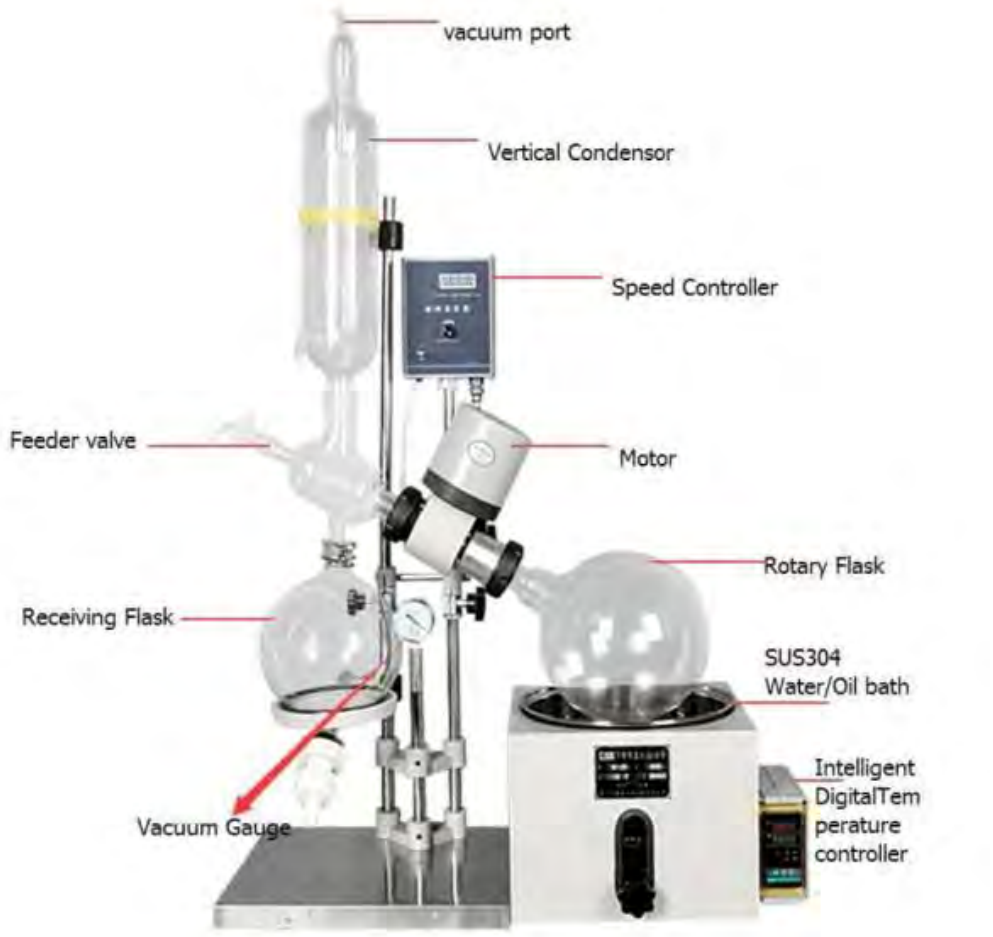
Non polar solvents :

Petroleum ether, chloroform, ethyl acetate, ethanol, acetonitrile (highly polar solvent)

2. General steps for drug from natural source:

1. Fresh plants are dried and then extraction is done
2. Powdered to coarse form to penetrate the solvent
3. Extract the phyto constituents
4. Menstrum (the solvent for drug) added
5. IN vitro screening od drug developed (controlled environment situation)
6. In vivo screening (drug tested on animals)
7. Clinical trial (drug used on healthy human)

3. Rotatory vacuum pump: boiling point of solvents are reduced by rotating them at high pressure in this apparatus.



5. DEPARTMENT OF PHARMACY PRACTICE

Pharmcogenomics is the study of how genes affect person's response to drugs.

Narrow therapeutic range of drugs.

Eg – phenatoin used for epilepsy

When the dose is changed slightly, the toxicity increases in the body of the patient. Pharmacogenomics is useful in identifying the side effect and efficiency of drug on patients.

Pharmacometrics:

Uses software for therapeutic drug monitoring

Pathophysiology:

Deals with how the physiology of the body has changed due to the pathogen

VISIT TO PHARMACY stores:

1. Visited two pharmacy stores and learnt about the drug segregation and placement of drugs at racks, Colour coding used for easy identification of drugs.
2. Visited cold storage for drugs both retail and wholesale and learnt about the temp to be maintained for specific drugs

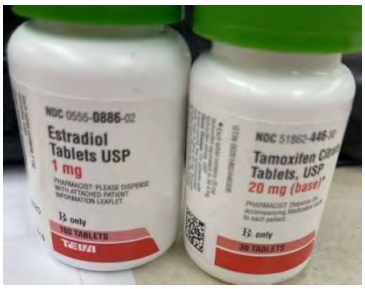
0°C to -20°C

Eg. Polio vaccine and vaginal pessaries.

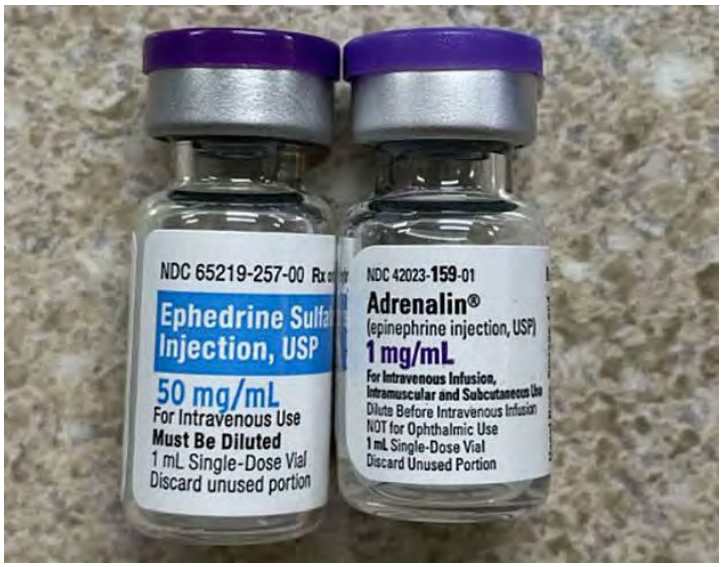
2°C to 8°C

eg. some respules, General anitbiotics, Fenatoyl (drug for fits) and nasal sprays

LOOK ALIKE MEDICINES: Yellow colour code is used.



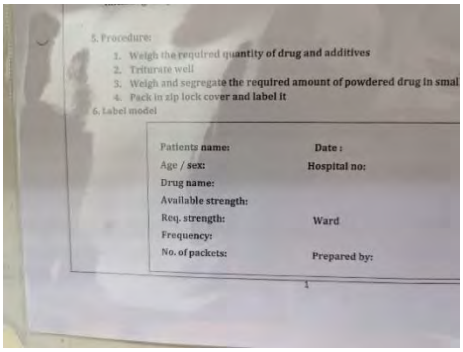
SOUND ALIKE MEDICINES: Orange colour code is used.



Colour code	Used for
Yellow	*Look alike medicine*
Orange	*Sound alike medicine*
Red	*High Alert medicine*
Pink	*Normal*
Green	*Vaccines*
Blue	*Drug with 3 formulations*
Purple	*Drug with more than 4 formulation*

DRUG DILUTION ROOM:

When a drug is needed in lower concentration than the available market concentration, the drug is diluted (using glucose) and prepared here as per doctor's prescription. Laminar flow area is used for working in aseptic environment.

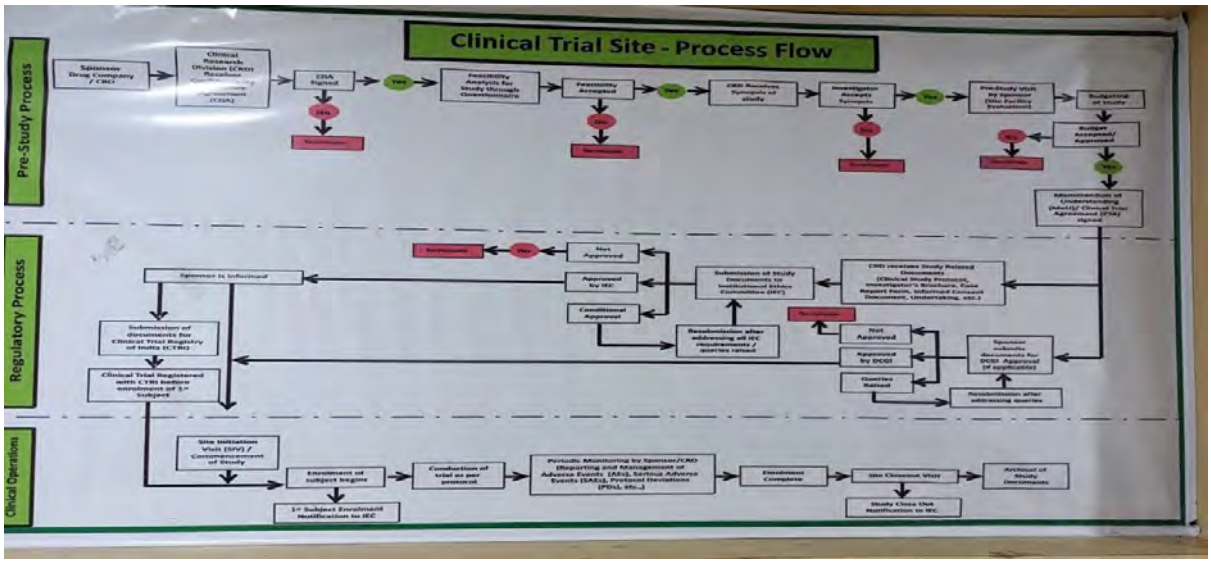


VISIT TO CRF facility:

Central Research Facility is visited and some instruments are seen and their basics are understood.

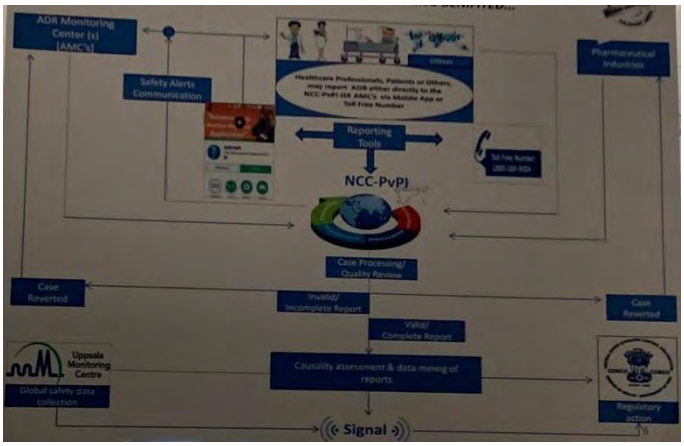
- Centrifuge is used to separate the blood plasma and serum.
- The rotation speed (rpm) and time of rotation can be set.
- HPTLC also seen at CRF.

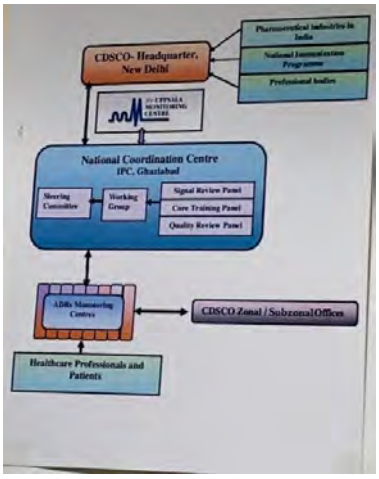
Process flow of clinical trials:

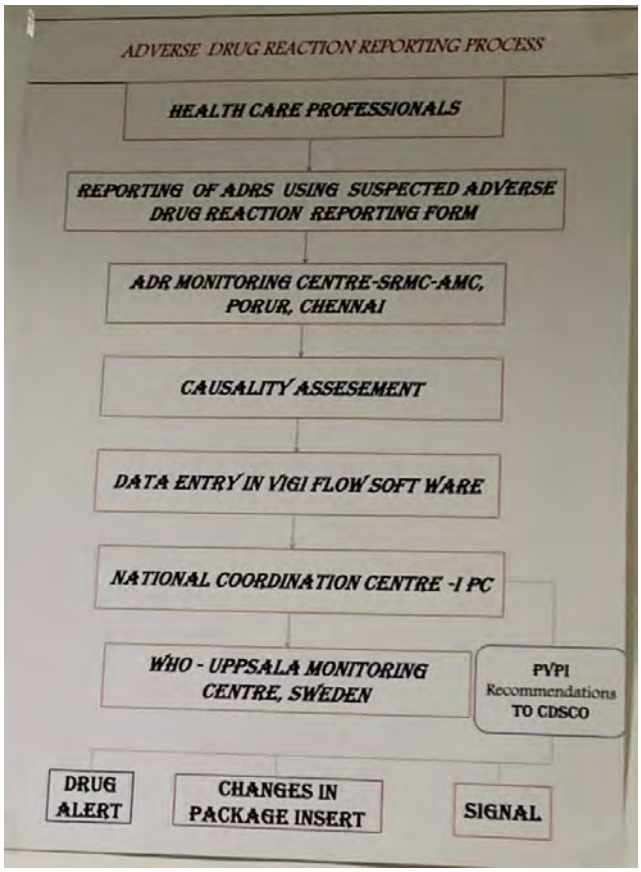


VISIT TO ADR room:

Understood the importance of ADR (adverse drug reaction) report and how it is centralised across the world.







6. CONCLUSION

This internship gave a great exposure towards the various departments of pharma (pharmacology, pharmaceutics, pharmaceutics chemistry, pharmacognosy, pharmacy practice). The hands-on experience of various equipment/instrument, (both the basic and advanced) gave a greater insight of advanced level of research carried out at this department. A complete picture of how drug is developed (from extraction to market release) has been learnt from all departments of pharmacy.

In vivo screening (testing of drugs on animals) has been learnt through software. And the various guidelines followed in real time testing on animals are also learnt. The importance of studying adverse drug reactions (ADR) is also understood and the protocol used to report to WHO centre is also learnt.

A WONDERFUL JOURNEY!

G. M. JAYASRI