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Expt. No. 1Page No. 1NUTRITION

Nutrition has been derived from Latin word 'NUTRITIC'
Means nourishment.

"The science of foods, nutrients and other substances therein, their action, interaction & balance in relationship to health and disease; the processes by which the organism ingests, digests, absorbs, transports and utilizes nutrients and disposes off their end products".

FOOD

Substances consumed, other than water and drugs for maintaining the health, well being and vitality of individual.

food $\xrightarrow[\text{baking}]{\text{cooking, boiling, frying}}$ diet.

NUTRIENTS

Chemical factor present in a food item which determines the quality of food and in turn the health of individual. eg protein, fat, carbohydrate, vitamins, minerals.

So, NUTRITION is that branch of science, which deals with study of a dynamic process, in which the consumed food is utilized for nourishing the body.

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Page No. 2ROLE OF NUTRITION IN MAINTAINING HEALTH.

1. Many common symptoms and diseases can often be prevented with better nutrition.
2. Nutrition can mitigate harmful effects of many genetic errors.
3. Nutrition is effective in collective medicine for many common health problems.
4. Nutrigenomics - by analyzing individual's genotypes at birth, disease susceptibilities can be shown & categorized into nutrition and lifestyle choices available to individual.

CLASSIFICATION OF FOODS.

1. By ORIGIN.
 - (i) Animal origin.
 - (ii) Plant origin.
2. By CHEMICAL COMPOSITION
Proteins, Fat, carbohydrates, vitamins, Minerals.
3. By FUNCTION
 - (i) Energy yielding - cereals, sugars etc.
 - (ii) Body building - Pulses, meat, milk etc.
 - (iii) Protective - Milk, eggs, liver etc.

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GROUP		Body weight (kg)	ENERGY / DAY (Kcal)
<u>Infant</u>			
0-6 months		5.4 kg	500 / day
6-12 month		3.4 kg	80 Kcal / kg / day
<u>Children</u>			
1-3 yr		12 kg	1240 / day
4-6 yr		18 kg	1690 / day
7-9 yr		26 kg	1350 / day
<u>Adolescent</u>			
10-12 yr	Male	35 kg	2130 / day
	Female	31 kg	1940 / day
13-15 yr	Male	47 kg	2450 / day
	Female	46 kg	2060 / day
16-18 yr	Male	57 kg	2640 / day
	Female	50 kg	2060 / day
<u>Adult</u>			
Male	Light / sedentary work	60 kg	2320 Kcal / day
	moderate "	60 kg	2730 Kcal / day
	Heavy work	60 kg	3430 Kcal / day
Female	Sedentary work	55 kg	2900 Kcal / day
	moderate "	55 kg	2230 Kcal / day
	Heavy "	55 kg	2850 Kcal / day
<u>Pregnancy</u>			
Lactation		55 + wt. gain	+ 350 Kcal / day
0-6 month		55 + wt. gain	+ 600 Kcal / day
6-12 month		55 + wt. gain	+ 520 Kcal / day

CLASSIFICATION OF NUTRIENTS

Micro nutrients - They are required in small quantities varying from micrograms to milligrams. Eg - vitamins, Minerals.

Macronutrients - They are required in large quantities.
Proteins $\rightarrow$ 7-15%
Fats $\rightarrow$ 10-30%
Carbohydrates $\rightarrow$ 65-80%.

Reference MAN.

18-29 yrs age

60 kg wt.

8 hrs work/day

8 hrs sleep

4-6 hrs sitting

2 hrs walking

Height - 1.73m

BMI - 20.3

Energy - 45Kcal/day.

Reference WOMAN

18-29 yrs age

55 kg wt.

8 hrs work/day

8 hrs sleep.

4-6 hrs sitting

2 hrs walking

Height - 1.61m

BMI - 20.2

Energy - 40Kcal/day.

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PROTEINS

- The word 'protein' by derivation means which is of first importance.
- In Indian diet, they contribute about 7-15% of total energy intake.
- They are complex organic nitrogenous compounds, composed of carbon, hydrogen, oxygen, nitrogen and sulphur.
- They constitute about 20% of body weight of an adult.

ESSENTIAL AMINO ACIDS

- Proteins are made up of amino acids
- 20 amino acids are needed by body, out of which 9 are essential.
- These are proteins or amino acids which human body can't synthesize and they must be obtained from dietary proteins. These are -
Leucine, Isoleucine, Lysine, Methionine, Phenylalanine, Threonine, Valine, Tryptophan, Histidine.

functions -

1. formation of niacin from tryptophan.
2. Action of Methionine as a donor of methyl group for synthesis of choline, folates and nucleic acid.
3. Cystine and tyrosine are essential for premature babies.
4. New tissue can't be formed unless all EAA are

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Food	PROTEIN (g/100g of food)
<u>Animal foods:</u>	
Milk	3.2 - 4.3
Meat	18.0 - 26.0
Egg	13.0
Fish	15.0 - 23.0
<u>Plant foods:</u>	
Cereals	6.0 - 13.0
Pulses	21.0 - 28.0
Vegetables	1 - 4
Fruits	1 - 3
Nuts	9.5 - 29.0
Soyabean	43.2
<u>Others</u>	
Oils and fat	Nil
Sugar + jaggery	Nil

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present in diet.

- Protein is "biologically complete" if it contains all the EAA.
- Egg proteins are best among food proteins because of high biological value and digestibility.
- Used as "Reference protein".

PLANT SOURCES → Pulses, cereals, beans, nuts, oil seeds, cakes etc.

- They are poor in essential amino acids.

SUPPLEMENTARY ACTION OF PROTEINS

- Man derived proteins from food sources, animals & vegetables.
- Cereal proteins are deficient in Lysine and threonine and pulse proteins in methionine. These are LIMITING AMINO ACIDS.
- When two or more of vegetarian foods are eaten together their proteins supplements one another and provide a protein comparable to animal protein in respect to EAA.
- With proper planning, it is possible for a vegetarian to obtain high grade protein, at low cost, from cereals, pulses and vegetables.

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This is supplementary action of Proteins and is basis of counselling people to eat mixed diets.

PROTEIN METABOLISM

1. Proteins have to be replaced everyday: they are not stored in human body.
2. Body proteins are constantly being broken down into their constituent amino acids and used later for protein synthesis. Reutilisation of amino acids is Major contributory factor to economy of protein metabolism.
3. Amount of protein as well as pattern of specific proteins is maintained constant. For maximum utilisation of dietary proteins, calorie intake should be adequate.

EVALUATION OF PROTEINS

Parameters are -

1. Digestibility coefficient.
2. Biological value.
3. Net-Protein utilisation (NPU)
4. Amino acid score.
5. Protein efficiency ratio.
6. Protein energy ratio.

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1. Digestibility Coefficient (DC)

→ It is % age of ingested protein that is absorbed in Blood stream.

2. Biological value (BV)

→ It is % age of Nitrogen retained out of nitrogen absorbed from diet.

$$BV = \frac{\text{Nitrogen retained}}{\text{Nitrogen absorbed}} \times 100$$

3. NPU

(Net Protein Utilization)

→ It is "proportion of ingested protein that is retained in the body under specific conditions for maintenance and growth of tissues.

→ It is of more practical value as it is product of BV and Digestibility Coefficient divided by 100.

→ It is directly related to dietary intake of Nitrogen. If NPU is low, protein requirement is high and vice-versa. NPU value of 50 is considered satisfactory.

$$NPU = DC \times \frac{BV}{100} \quad \text{OR}$$

$$NPU = \frac{N_2 \text{ retained in body}}{N_2 \text{ intake}} \times 100$$

→ 1 gm of protein is assumed to be equivalent to 6.25gms of N_2 .

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Essential

AMINO ACIDS	FAO / WHO / UNU 2007	
	mg / kg/d	mg / g protein
Histidine	10	15
Isoleucine	20	30
Leucine	39	59
Lysine	30	45
Methionine	10	16
Cysteine	4	6
Methionine + Cysteine	15	22
Threonine	15	23
Phenylalanine + Tyrosine	25	38
Tryptophan	4	6
Valine	28	39
Total EAA	184	277
Total Protein	0.66 g / kg/d	
safe level of Protein (Mean + 1.96 x SD)	0.83 g / kg/d	

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ASSESSMENT OF PROTEIN NUTRITION STATUS

- Test suggested to assess state of protein nutrition – Arm muscle circumference, the creatinine-height index, Serum albumin & transferrin, total body N₂.
- At present time best measure is serum albumin concentration. It should be $> 3.5 \text{ g/dl}$, a level of 3.5 g/dl is mild degree of malnutrition; 3.0 g/dl is severe malnutrition.
- Serum albumin & transferrin assess ability of liver to synthesize proteins.

PROTEIN REQUIREMENTS

- ICMR in 2010 recommended $1.0 \text{ g protein/kg body weight}$ for an Indian adult, assuming NPU of 65 for dietary protein.
- Daily allowances recommended by ICMR for various population groups.

FATS

- Fats are solid at 20°C .
- They are called OILS at room temperature.
- They are essential concentrated sources of energy.
- They contain – Carbon, hydrogen, oxygen and composed of fatty acids.

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Recommendations for dietary fat intake for Indians (2010)

Age / Gender / Physiological Groups	Physical Activity	Minimum level of total fat (%E)	Fat from food other than visible fats	visible fat	
				%E	g/d
Adult Man	Sedentary	20	10	10	25
	Moderate				30
	Heavy				40
Adult Woman	Sedentary	20	10	10	20
	Moderate				25
	Heavy				30
	Pregnant woman	20	10	10	30
	Lactating woman				30
Infants	0-6 months	40-50	Human Milk		15
	7-24 month	35	10	25	25
Children	3-6 years				25
	7-9 years				30
Boys	10-12 years	25	10	15	35
	13-15 years				45
	16-17 years				50
Girls	10-12 years				35
	13-15 years				40
	16-17 years				35

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functions.

1. one gram of fat yields 9 kcal energy.
2. Fats improve palatability of food.
3. They are essential for absorption of vitamins A, D, E, K.
4. Fats support heart, kidney, intestinal viscera.
5. Under skin, they provide insulation against cold.

CLASSIFICATION.

SIMPLE LIPIDS - eg. Triglycerides.

COMPOUND LIPIDS - Phospholipids

DERIVED LIPIDS - cholesterol.

99% of adipose tissue is in form of Triglycerides.

Fatty Acids.

On hydrolysis fats yield fatty acids and glycerol.

fatty acids are-

Saturated - eg. lauric acid, palmitic acid and stearic acid.

Unsaturated - eg. MUFA (oleic acid), PUFA (linoleic acid), α -linolenic acid.SOURCESANIMAL $\rightarrow$ Ghee, Butter, Milk, cheese, eggs, meat, fish, oils (visible fats). $\rightarrow$ They are poor sources of essential fatty acids (EFA'S) but good sources of retinol and cholecalciferol.

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DIETARY SOURCES OF EPA

Essential fatty acids	Dietary source	Percent content
Linoleic acid	Safflower oil	73
	corn oil	57
	Sunflower oil	56
	Soyabean oil	51
	Sesame oil	40
	Groundnut oil	39
	Mustard oil	15
	Palm oil	09
	Coconut oil	02
Arachidonic Acid	Meat, eggs	0.5 - 0.3
	Milk (fat)	0.4 - 0.6
Linolenic acid	Soyabean oil	7
	leafy green	varied
Eicosapentaenoic acid	fish oil	10

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Which are lacking in vegetable fats.

VEGETABLE → Edible oils like groundnut, gingely, Mustard, Cottonseed, sunflower, Coconut oil.

→ They are rich sources of EFA.

Other sources — Cereals, pulses, nuts etc. (Invisible fats)

Hydrogenation

It is a process of converting liquid oils into semi-solid and solid fat under optimum temperature and pressure — "Vanaspatti".

→ Unsaturated fatty acids are converted to saturated fatty acids during hydrogenation.

→ EFA content is drastically reduced.

→ Since vanaspatti is lacking fat soluble vitamins, it is fortified by vit A & D, by Govt. regulation to extent of 2500 IU of vit-A & 175 IU of vit. D per 100 grams.

REFINING

→ It is removing fatty acids (free) and rancid materials.

→ It improves only quality and taste.

ESSENTIAL FATTY ACIDS.

→ They are important for growth and dermal integrity.

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- Linoleic, Linolenic, Arachidonic acids are examples.
- vegetable oils are good sources of EFA's.
- Animal fats are poor sources of EFAs.
- Deficiency of these causes Phenoderma, a nutritional deficiency of skin.

FATS & DISEASE

1. Obesity
2. Phenoderma
3. Coronary heart disease
4. EFA and CHD mortality are inversely related.
5. Cancer of colon and breast - incidence high with diets rich in fats.
6. Skin lesions of Kwashiorkor and those induced by EFA deficiency are similar.

RDA of fats (WHO + ICMR)

- 20% of total energy is 10 to 20 g of fats per day is recommended daily allowance.
- About half of this, i.e. 10% of energy will come from invisible fats present in food.
- Children need more dietary fat compared to adults.
- When more than 40% calories are drawn from fats they raise serum cholesterol.
- Unsaturated fats and marine fish lower serum cholesterol.

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PHRENODERMA

- Deficiency of EFA is associated with rough & dry skin called 'phrenoderma' or 'toad skin'.
- It is characterised by horny papular eruptions on posterior and lateral aspects of limbs and back and buttocks.

Treatment → Administration of linseed oil or safflower seed oil which are rich in EFA's & B-complex.

- Diets rich in EFA's will also reduce blood cholesterol.
- RDA of EFA's is 5 grams.
- In pregnancy, lactation & infancy it is doubled.

CHOICE OF COOKING OILS

- variety of oils should be used.
- Mixture of 2 or more oils with different composition is required.
- Recommended mixture is PUFA + MUFA.
Eg- Sunflower / safflower / Corn oil + Groundnut oil / mustard oil.

CARBOHYDRATES

- It is third Major Component of food, which is main source of energy, providing 4 kcal/grams.

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- It is essential for oxidation of fats and synthesis of certain non-essential amino acids.

SOURCES

1. Starch - It is basic to human diet & found in cereals, roots and tubers.
2. Sugars - They comprise Monosaccharides (glucose, fructose, galactose), disaccharides (sucrose, lactose, mannose). These free sugars are highly water soluble and assimilated easily. Free sugars and starch constitute a key source of energy. Polysaccharides (starch and cellulose) are not sweet and insoluble in water.
3. Cellulose - It is indigestible component of carbohydrates with scarcely any nutritive value. It contributes to dietary fibre.

FUNCTIONS

1. They serve as main source of energy. 1 g yield $\rightarrow$ 4 kcal of energy.
2. It is essential for oxidation of fat.
3. It is stored as glycogen in liver and muscle. This reserve is exhausted when person starves.
4. Excess carbohydrate is stored as fat in body.
5. It acts as structural unit of nervous system, as cerebroside.
6. It adds flavor and texture to food and increases

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Classification of foods According to GI is -

CLASSIFICATION	GI Range	EXAMPLES
Low GI	55 or less	most fruits & vegetables (except potatoes, watermelon & sweet corn), whole grain, pasta foods, beans, lentils.
Medium GI	56-69	Sucrose, basmati rice, brown rice
High GI	70 or more	Corn flakes, baked potato, some white rice varieties, white bread, Candy bar & syrupy foods.

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palatability.SOURCES

Main sources are cereals, pulses, fruits, roots and tubers.

Sugar, jaggery and honey are 100% carbohydrates.

→ Carbohydrate reserve (glycogen) of a human adult is about 500gm.

→ If dietary carbohydrates do not meet energy needs of body, protein and glycerol from dietary and endogenous sources are used by body to maintain glucose haemostasis.

RECOMMENDED INTAKE

→ Its recommended intake is placed to contribute between 50-80% of total energy intake.

→ Daily requirement is nearly 400-500gm.

GLYCAEMIC INDEX

It is defined by area under two-hour blood glucose response curve (AUC) following ingestion of a fixed portion of test carbohydrates (usually 50g) as a proportion (%) of AUC of standard (either glucose or white bread).

Low glycaemic index foods - Some foods containing different fractions of soluble and insoluble fibres

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Different dietary fibre fractions in selected Indian foods

Food Group	Food Item	Fibre Content g/100g edible protein			Soluble (% Total Dietary fibre)
		Crude fibre	Total dietary fibre	Soluble	
Cereals	Rice	0.12	4.11	0.92	22.4
	Wheat	0.13	12.48	2.84	22.7
	Bajra	1.2	11.33	2.19	19.3
	Maize	2.7	11.54	1.65	14.2
	Jawar	2.6	9.64	1.64	17.0
	Ragi	3.6	11.85	0.89	7.50
Pulses, dhals	Lentil	0.7	10.31	2.04	19.8
	Chick pea	1.2	15.30	2.56	16.7
	Pigeon pea	0.9	9.14	2.33	25.4
	Green gram	0.18	8.23	1.69	20.5
Vegetables	Cluster bean	3.2	3.7	1.6	28.0
	Brinjal	1.3	6.3	1.7	27.0
	Cabbage	-	2.8	0.8	28.6
	Cauliflower	1.2	3.7	1.1	30.3
	Bhendi	1.3	3.6	1.0	26.9
Roots & Tubers	Potato	0.4	1.7	0.6	33.5
	Carrot	1.2	4.4	1.4	30.6
	Onion	0.6	2.5	0.8	32.0
Green leafy vegetables	Spinach	0.6	2.5	0.7	28.0
	Amaranth	1.0	4.0	0.9	22.5
Fruit	Orange	0.3	1.1	0.5	45.5
	Banana	0.4	1.8	0.7	38.9
	Apple	1.0	3.2	0.9	28.1
	Tomato	0.8	1.7	0.5	28.5

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favour slow release of sugar into small intestine and its absorption into blood.

High glycaemic index foods - These have readily digestible and absorbable sugars.

This concept has practical utility in management of diabetes and control of obesity.

Carbohydrates and Disease

1. High intake of sweets, eg. sucrose rich food predisposes for obesity.
2. High intake of sucrose causes sharp rise in blood glucose, which exerts more work on β -cells of islets of Langerhans in pancreas. This leads to exhaustion of β -cells and thus DIABETES.
3. Sucrose favours growth of bacteria in oral cavity, which produce acid causing corrosive effect on dental enamel leading to development of DENTAL CARIES.

DIETARY FIBRE

→ These are remnants of edible parts of plants and analogous carbohydrates that are resistant to digestion and absorption in human small intestine with complete or partial fermentation in human large intestine.

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TYPE & SOURCE

They are found in vegetables, fibrous fruits (pineapple), beans, whole grains. It is hardly found in animal foods.

Functions

- They bind cholesterol of food and prevent its absorption and eliminate it through stools, reducing serum cholesterol levels. It is associated with reduced risk of atherosclerosis.
- Low fibre diet is associated with less fecal volume and constipation, so higher concentration of carcinogens ingested in food. Bowel mucosa exposed to this high concentration of carcinogens for a longer duration predisposes for cancer of colon.
- They act as a scavenger in vehicle to remove tissue debris and other unwanted material from intestine through stools.
- It facilitates normal peristaltic movement of intestine.
- Soluble fibres prevent gall stones and obstructive jaundice. It also slows down of absorption of glucose, so good for diabetes.
- An average diet should include 40g of fibres per day.

FAT SOLUBLE VITAMINS

Vitamins are organic compounds categorised as essential

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RDA for vitamin A in Indians (micro gm/day)

GROUP	RETINOL	BETA CAROTENE
Adult Man	600	4800
Adult Woman	500	4000
Pregnant women	800	6400
Lactating women	850	7600
Infants (0-6 months)	375	1600
Infants (7-12 months)	400	2100
Children	400-500	3200 - 4000

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nutrients which are required by body in small amounts.

Fat soluble vitamins are -

Vitamin A, Vitamin-D, Vitamin-E, Vitamin-K.

Vitamin A

It is available in 2 forms -

1. Preformed vitamin - Retinol (milk, butter, eggs, fish)
2. Provitamin - Betacarotene (green leafy vegetables, yellow and orange coloured vegetables).

→ It is stored in Liver.

Deficiency is a Public Health problem in 40-60% of developing countries.

functions → It is essential for vision (normal).

- It maintains integrity and normal functioning of glandular and epithelial tissue lining mucosa and skin.
- It supports skeletal growth.
- It boosts immunity & protects against infections.

Sources - Animals - Eggs, liver, butter, cheese, fish, meat.

Plant - Green leafy vegetables, papaya, Mango, carrots.
Fortified foods - Vanaspathi, processed milk.

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Retinol content of selected foods.

Retinol Equivalents (RE) (mcg/100g)			
Halibut liver oil	900,000	Carrot	1,167
Cod liver oil	18,000	Spinach	607
Liver, ox	16,500	Amarnath	515
Butter	825	Green leaves	300
Margarine	900	Mango, ripe	313
Cheese	350	Papaya	118
Egg	140	Orange	25
Milk, cow	38	Tomato	84
Fish.	40		

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Deficiency features - NYCTALOPIA or Night Blindness.
It is inability to see / stumbling in dim light, poor dark adaptation, due to damage to rod cells of retina.

→ Corneal Ulceration present with xerosis and iris prolapse.

KERATOMALACIA → Cornea may become soft and may burst open.

BITOT'S SPOTS → These are triangular, pearly white or yellowish, foamy spots on either side of cornea.

DRYNESS OF CONJUNCTIVA is also there.

→ Infants on breast feed do not exhibit deficiency signs.

→ Deficiency could be due to poverty, ignorance, faulty feeding habits, predominant rice eating habits devoid of carotene.

→ Over dosage leads to nausea, vomiting, headache, anorexia, irritability.

Prevention of deficiency → Diet improvement.

→ Intake of green leafy vegetables.

→ Short cut method by NIN is administration of 66,000 mcg of retinyl palmitate in oil by mouth every 6 months to pre-school children.

→ Sugar fortified by vit-A.

→ Govt. launched a National vit-A prophylaxis program.

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VITAMIN D FUNCTIONS

ORGAN	FUNCTIONS
INTESTINE	Absorption of Ca + P
BONE	Stimulates mineralization, enhances bone metabolism affects collagen maturation (PTH)
Kidney	Increases tubular reabsorption of phosphate
OTHERS	Permits normal growth

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In 1970 for blindness prevention for school children in endemic states. Cost works out of 50 ps per child per year.

Vitamin - D3 CHOLECALCIFEROL

- It is made by human skin on exposure to sunlight.
- It is found in nature in animal fats & fish liver oils. D-2 is made by plants.
- It is converted to 25-HCC in liver. Then it is transported to kidney to transform to 1,25 OHCC which is 3-5 times more active than vit D.

Functions

functions are in intestine, bone, kidney and in growth.

Deficiency

It leads to abnormal calcium haemostasis resulting in defective mineralization of matrix of growing long bones resulting in rickets in children & osteomalacia in adults.

Causes - Faulty economy, growing urbanization, reduced physical activity, low exposure to sunlight.

- In endemic areas of fluorosis excess of fluoride in water is associated with Rachitic bone deformities & vit. D deficiency in young.

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DIETARY SOURCE OF VITAMIN - D

	µg/per 100g		µg/per 100g
Butter	0.5-1.5	shark liver oil	30-100
Eggs	1.25-1.5	cod liver oil	200-750
Milk, whole	0.1	halibut liver oil	500-10,000
Fish fat	5-30		

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NON-CALCITROPIC EFFECTS - Osteoporosis, Psoriasis, Diabetes, hypertension, Arthritis, Multiple sclerosis, Cardiovascular disease.

Prevention → Health Education at community level emphasizing on regular exposure to sunlight.

- fortification of foods milk and oils.
- Periodic dosing of young children with vit. D.

Sources → Sunlight → vit. D is generated in skin by action of UV rays on 7-dehydrocholesterol.

- Practice of applying oil to body and exposing to sunlight is good Indian custom.
- Air pollution has filtering effect on UV rays. In dark skinned races, skin can filter off to 95% UV rays.

Food sources → Salmon, Sardines, Shrimp, egg yolk, milk (fortified), yogurt (fortified), cereal (fortified), Orange juice (fortified)

REQUIREMENTS

RDA by WHO in 1988 is 100 units has revised to 200 units in 2004 for adults males.

- IFAS (Institute of Food and Agricultural Sciences) Children and teens → 600 IU.

Adults up to age 70 → 600 IU.

Adults over age 70 → 800 IU.

Pregnant / breast-feeding women - 600 IU.

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"HYPERVITAMINOSIS - D"

- Excessive intake lead to - Anorexia, Nausea, vomiting, Thirst and drowsiness.
- Patient may lapse into cardiac arrhythmias, renal failure, coma due to excess Ca absorption.
- It mobilise Ca from bones.
- It is dangerous in pregnant woman.

VITAMIN-E (TOCOPHEROL)

functions → It is strong antioxidant, maintains cell membrane integrity, DNA & prostaglandin synthesis.

Sources → foods rich in PUFA - vegetable oils, wheat germ oil and Egg yolk, Nuts, Meat etc.

Deficiency → leads to habitual abortions, testicular dys-trophy, Myocardial degeneration & fragility of RBCs.

RDA → US authorities have recommended 12 mg/day.

VITAMIN - K.

It is available in 2 forms - K₁ phylloquinone and K₂ quinone.

Sources - Green leafy vegetables, soyabean oil, eggs, meat etc

functions - Essential for clotting factors formation.

→ synthesis eg. osteocalcin, a bone protein made by osteoblasts.

Deficiency - leads to poor blood clotting

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ROA - US authorities recommend intake of 120 μ g - Males
+ 90 μ g females.

- Giving 0.5 - 1 mg parenteral dose or oral 1-2 mg dose to new born is common practice to avoid haemorrhages because of prematurity, mothers receiving anticoagulant therapy or
- Complicated labour.

B GROUP OF VITAMINS

Vitamin B1 - Thiamine

Vitamin B2 - Riboflavin

Vitamin B3 - Niacin

Vitamin B5 - Pantothenic Acid

Vitamin B6 - Pyridoxine

Folate

Vitamin B-12

THIAMINE (B1)

- It is water soluble vitamin and essential for utilization of carbohydrates.

- TPP (Thiamine Pyrophosphate), coenzyme of co-carboxylase activates transketolase, enzyme involved in direct oxidative pathway of glucose.

Sources - whole grain cereals, wheat gram, yeast, pulses, oilseeds etc.

- Milk is important source for infants.

- Cereals contribute 60-85% of total supply of thiamine.

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DIETARY SOURCES OF THIAMINE

foods of vegetable origin	mg/100g	foods of animal origin	mg/100g
Wheat (whole)	0.45	Milk, cow's	0.05
Rice, raw P -Pounded	0.21	Egg, hen's	0.10
Rice milled	0.06	Mutton	0.18
Bengal gram dal	0.48	Liver, sheep	0.36
Almonds	0.24		
Gringelly seeds	1.01		
Ground nut	0.90		

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Thiamine Loses - Rice milling process, washing and cooking of rice, prolonged storage of fruits and vegetables, destroyed in toast and cereals cooked with baking soda.

Deficiency - (i) Beri-Beri
Occurs in 3 forms -

- (i) DRY form characterized by nerve involvement.
- (ii) WET form characterized by heart involvement.
- (iii) Infantile Seen in infants between 2 to 4 months of age.

Wernick's encephalopathy - seen in alcoholics, characterized by ophthalmoplegia, polyneuritis, ataxia & mental deterioration.

Prevention - 1. Educating people to eat balanced diet.
2. Mixed Diet containing thiamine rich food.
3. Stop alcohol.

Recommended Allowances → Baby Content is placed at 30 mg & if more is given, it is lost in urine.

→ Patients on regular hemodialysis routinely be given supplements.

→ It should be given prophylactically to people with persistent vomiting or prolonged gastric aspiration and on long fast.

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DIETARY SOURCES OF RIBOFLAVIN

Food of animal origin	mg/100g	food of vegetable origin	mg/100g
Liver, sheep	1.70	Whole cereals	0.10 - 0.16
Milk, cows	0.19	Milled cereals	0.03 - 0.08
Egg, hen	0.40	Pulses	0.21 - 0.32
Meat	0.14	Leafy vegetables	0.15 - 0.30

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RIBOFLAVIN

Functions - cellular oxidation and maintain integrity of mucocutaneous structure.

- Cofactor in number of enzymes.
- Involved in antioxidant activity and required for metabolism of other vitamins as B6, Niacin & K.

Sources - Richest source - Milk, eggs, liver, kidney, green leafy vegetables. Also present in - Meat and fish.

Poor source - cereals and pulses.

- Deficiency → ANGULAR STOMATITIS, occur in malnourished children, cheilosis, glossitis and nasolabial dyssebacia,
- Hypo-riboflavinosis have stable functional defects - impaired neuromotor function, wound healing & increased susceptibility to cataract.

Requirement - 0.6mg / 1000kcal of energy intake.

NIACIN OR NICOTINIC ACIDS (B3)

Functions - Metabolism of carbohydrates, fats and proteins.

- Normal functioning of skin, intestinal & Nervous system

Sources → liver, kidney, meat, poultry, fish, legumes &

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- ground nut.
- Milk is poor source but its proteins are rich in tryptophan which is converted in body to niacin.
- In cereals as maize, it occurs in "bound form".

Deficiency → PELLAGRA.

Characterized by 3 D's - Diarrhea, Dermatitis & Dementia.

- Dermatitis is found on surface of body exposed to sunlight as back of hands, lower legs, face and neck.
- Mental changes occurs as depression, irritability and delirium.

Prevention → Good mixed diet containing milk and meat.

- Avoidance of total dependence on maize.
- Modern knowledge & opportunities for economic growth, agricultural and social development can eliminate it.

Requirement → 6.0 mg / 1000 kcal of energy intake.

PANTOTHENIC ACID (B5)

- It has a role in biosynthesis of corticosteroids.
- Human body contains 18-35 mg of pantothenic acid per 100 ml in cells.
- Daily requirements - 10 mg
- All food contributes to dietary intake.
- About 3 mg are excreted in urine.

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FREE FOLATE	BOUND FOLATE
Rapidly absorbed in man —	— Availability is uncertain.

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PYRIDOXINE

It exists in three forms - Pyridoxine, Pyridoxal and Pyridoxamine.

function → Metabolism of amino acids, fats and carbohydrates.

Sources → Milk, liver, meat, egg yolk, fish, whole grains, cereals, legumes and vegetables.

Deficiency → Peripheral neuritis.

→ Riboflavin deficiency impairs optimal utilisation of Pyridoxine.

→ INH, an antituberculosis drug is recognized antagonist, and patients receiving this are provided with supplement of Pyridoxine.

Requirement → Adults - 2 mg/day, pregnancy and lactation - 2.5 mg/day.

FOLATE

Recommended Name - Folate

Alternative Name - Folic acid

Pharmaceutical preparation - Folic Acid.

It occurs as free folates and bound folates.

functions - synthesis of nucleic acids and normal development of blood cells in marrow.

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PSM I PRACTICAL RECORDS

Intake values of folate recommended by
ICMR

	per day
Healthy adults	200 mcg
Pregnancy	500 mcg
Lactation	300 mcg
children	80-120 mcg

REQUIREMENT OF VITAMIN B-12

	per day
Normal Adults	1 mcg
Pregnancy	1.2 mcg
Lactation	1.5 mcg
Infants & children	0.12 mcg

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Sources - Green leafy vegetables, milk, meat, dairy products, eggs, liver, fruits, cereals.

Deficiency → May occur from a poor diet, found in pregnancy and lactation.

→ Megaloblastic anaemia, glossitis, cheilosis, GI disturbances

→ Severe deficiencies may cause infertility or even sterility.

→ Administration of folic acid antagonists in pregnancy may produce abortions or congenital malformations.

Requirement → Body stores are less (5-10 mg) so deficiency develops quickly.

→ Requirements are greater in conditions where there is rapid cell multiplication.

→ During pregnancy, supplementation increases birth weight of infants + decrease incidence of low birth weight babies.

VITAMIN B-12

It is complex organo-metallic compound with Co-atom.

• Functions → It cooperates with folate in synthesis of DNA and helps in synthesis of fatty acids in myelin.

Sources → Liver, kidney, meat, fish, eggs, milk, cheese

→ It is not found in foods of vegetable origin.

→ Synthesized by bacteria in colon.

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PSM I PRACTICAL RECORDS

DIETARY SOURCE OF VITAMIN-C

mg/100g

Fruits

Amla	600
Guava	212
Lime	63
Orange	30
Tomato	24

Germinated Pulses

Bengal gram	16
-------------	----

Vegetables

Cabbage	124
Amaranth	33
Cauliflower	56
Spinach	28
Brijal	12
Potatoes	17
Raddish	15

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Deficiency → Megaloblastic anaemia, demyelinating neurological lesions in spinal cord + infertility.

VITAMIN - C (Ascorbic Acid)

It is most sensitive to heat. Man, monkey and guinea pig only requires this.

- Functions → Potent antioxidant and tissue oxidation.
- formation of collagen which is supporting matrix for all blood vessels and connective tissues and bones and cartilage.
 - Absorption of iron by reducing ferric iron to ferrous.
 - Inhibits nitrosamine formation by intestinal mucosa.

Sources → Dietary sources → fresh fruits, green leafy vegetables. Traces - fresh meat and fish, germinating pulses, roots, tubers.
Guava - cheap and rich source.

Deficiency → Deficiency leads to SCURVY.

Signs - Swollen and bleeding gums.

- Subcutaneous bruising or bleeding into skin or joints.
- Delayed wound healing.
- Anaemia and weakness.

Requirement → 40mg/day for adults.

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MINERALS

These are required for growth, repair and regulation of vital body functions.

- (i) Major elements - Ca, P, Na, K, Mg.
- (ii) Trace elements - Required in quantities less than few milligrams/day. Eg. Fe, I, F, Zn, Cu, Co, Cr, Mn, Mo, Se, Ni, Si, V.
- (3) Trace contaminants with no known functions - Pb, Hg, Ba, B, Al.

Major ElementsCalcium

- Constitutes 1.5-2% of body weight of adult human.
- 98% of Ca is in bones and 10mg/dl in blood.

functions → formation of bones & teeth, coagulation of blood, muscle contraction, cardiac action, milk production, electric and chemical messages relay, keep membranes of cell intact, metabolism of enzymes & hormones etc.

Sources → Natural sources - Milk and milk products - Cheese, curd, skimmed milk, buttermilk, Eggs, fish,
Dietary sources → Green leafy vegetables, Cereals, millets.

Drinking H₂O → 200mg/day
fruits → Sitaphal.

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Absorption $\rightarrow$ 20-30% of dietary Ca is normally absorbed.
Absorption enhanced by vit D + decreased by Phytates, oxalates + fatty acids.

Deficiency $\rightarrow$ No clear cut disease deficiency.

Requirements $\rightarrow$ 600 mg/day
Higher in adults, children, expectant + Nursing mothers.

Phosphorus

$\rightarrow$ Body contains 400-700g as phosphates + found in bones + teeth.
Sources - vegetables

Deficiency $\rightarrow$ Rare

Requirement $\rightarrow$ Equal to Ca intake in most age groups.

Infancy ratio - 1:1.5 (P:Ca)

function $\rightarrow$ formation of bones and teeth + all Metabolism.

SODIUM

found in all body fluids.

Content in human body $\rightarrow$ 100g of Na ion.

Sources - Many foods, during cooking (NaCl)

Lost from body $\rightarrow$ sweat and urine.

Depletion: Muscular cramps

Requirements: 5g/day

Excess: Hypertension.

Potassium

Content in human body: 250gm.

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Source: Widely available in foodstuffs.
Functions: Vasoactive, increases blood flow, sustains metabolic needs of tissues.
Requirements: Na:K ratio - 1:1 (mmol) in diet.

Magnesium

Constituent of bones and present in all body cells.
Content in human body: 25g
Functions: Normal Ca & K metabolism.
Deficiency: Occurs in chronic alcoholics, liver cirrhosis, toxemias of pregnancy, PEM & malabsorption syndrome.
Requirements: 340 mg/day for adults.

TRACE ELEMENTS

IRON

Adult human has 3-4g iron, out of which
→ 60-70% is in blood (Hb): circulating iron.
→ 1-1.5g: Storage Iron
1 gm Hb has 3.34 mg iron.

Function → formation of Hb, brain development and functions, regulation of body temperature and muscle activity, Catecholamine Metabolism.
It is essential for binding O_2 to blood cells, Central function is "OXYGEN TRANSPORT" + "CELL RESPIRATION".

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PSM I PRACTICAL RECORDS

	Haem Iron	Non Haem Iron
Absorption	Better absorbed	Poor absorption
Sources	Liver, meat, fish poultry	cereals, leafy vegetables, legumes, Nuts, oil seeds, jaggery, dried fruits.
Bioavailability		Poor

Iron in ferrous state
↓
absorbed.

Duodenum & upper SI

↓ Transported as plasma ferritin
Liver, Spleen, Bone marrow,
Kidney.

ANAEMIA

	g/dl (venous blood)	MCHC (%)
Adult males	13	34
Adult females, Non pregnant	12	34
Adult females, Pregnant	11	34
children, 6 months - 6 years	11	34
children, 6 - 14 years	12	34

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Sources - Haem-iron and Non-haem iron
→ cooking in iron vessels.

Absorption - Duodenum and upper small intestine in ferrous state.

- Absorption is influenced by -
- Iron reserves in body.
 - Inhibitors - phosphates.
 - Promoters - Ascorbic acid and ascorbic rich food.
 - Disorders of duodenum & jejunum.

Iron loss → 1 mg and 12.5 mg per 28 days, cycle in menstruation.

- Haemorrhage, Basal losses, I.D.U.S.

ANAEMIA

It is considered when Hb levels are below normal range

Iron deficiency Anaemia - MCHC < 34, RBC hypochromic

Early anaemia - 10-11 g/dl.

Anaemia - < 10 g/dl.

IODINE

- Required for synthesis of thyroid hormones (T_3 & T_4)
- Adult human body contains 50 mg Iodine and blood level is 8-12 μ g/dl.

Sources → Sea foods, cod liver oil, egg, milk, vegetables, Cereals.

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PSM I PRACTICAL RECORDS

SPECTRUM OF IODINE DEFICIENCY DISORDERS IN ORDER OF INCREASING SEVERITY

DISORDERS	LEVEL OF SEVERITY
GOITRE	Grade (i) Grade (ii) Grade (iii) Multinodular
HYPOTHYROIDISM	Varying combinations of clinical signs
Subnormal intelligence Mental deficiency Hearing defects Speech defects	variable severity
Strabismus	Unilateral
Nystagmus	Bilateral
Spasticity	Muscle weakness
Neuromuscular weakness	spastic diplegia spastic quadriplegia
Endemic cretinism	Hypothyroid cretinism Neurological cretinism
Intrauterine death	

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	90% from food eaten + remaining from drinking water.
	Requirements → Adults - 150 µg/day. Pregnant women - 250 µg/day.
	Deficiency → GOITRE. Goitrogenous lead to goitre. sources - food, water, cabbage, cauliflower.
	→ Hypothyroidism, retarded development, increased rate of abortion and still birth, Neurological cretinism, Myxoedematous cretinism.
	→ <u>fluorine</u>
	→ 96% found in bones and teeth.
	→ Essential for mineralisation of bones and formation of teeth.
	Sources (i) drinking water (ii) foods: sea fish, cheese, tea.
	Deficiency/ Excess: Excess - Dental / skeletal fluorosis - Prevents dental caries.
	Requirements → In water → 0.5-0.8 mg/lt. In temperate countries → 1-2 mg/lt.
	→ <u>Zinc</u>
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functions - synthesis of insulin by pancreas, immunity, Antioxidant.

source - flesh food, liver, fish, milk, cereals & pulses, nuts, lost in milling.

Deficiency → growth failure, sexual infantilism, loss of taste, delayed wound healing.

- Spontaneous abortion and congenital malformations.
- Milder forms - low birth weight, intrauterine growth retardation and preterm delivery.
- It reduces clinical attacks of malaria.

Requirements - Man - 12 mg/day, women - 10 mg/day, children - 10 mg/day, infants - 5 mg/day.

COPPER

Content in body → 100-150 mg.

Deficiency (excess → rare, Neutropenia).

Hypocupramia - occurs in nephrosis, Wilson's disease & PEM & infants fed on cows milk for long periods.

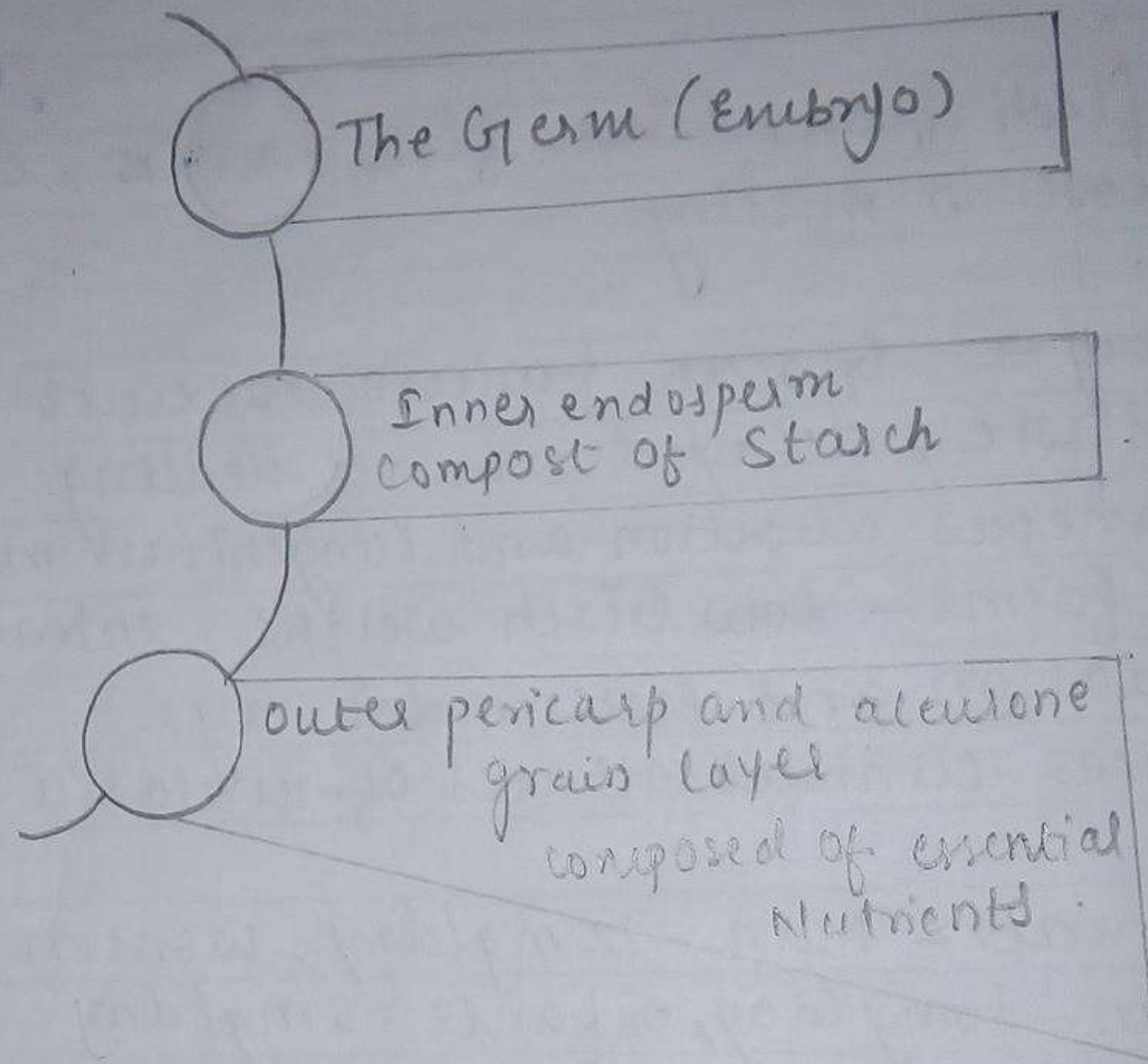
Hypocupremia - Associated with severe acute chronic infections.

Requirements - 2.0 mg/day.

Cobalt

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PSM I PRACTICAL RECORDS

RICE GRAINHOT SOAKING PROCESS

Soaking paddy in hot water for 3-4 hrs.
this swells rice grain



Draining water and soaking same paddy in
Container for 5-10 mins,



Paddy is dried and home pounded or
milled.

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- Ingested preformed as a part of vit. B₁₂ molecule.
- May produce goitre and useful for 1st stage of hormone production.

Chromium

- Total body content - < 6mg.
- Carbohydrate & insulin function.

Selenium

- Administered in children with kwashiorkor.
- Deficiency in PEM.

Molybdenum

- Excess - bony deformities.
- Deficiency - mouth & oesophageal cancer.

CEREALS

- Energy giving foods, bulk of daily diet.
- Contributes to proteins, minerals & B-group vitamins
of Rice, wheat, maize.

RICE

- Staple food for more than half human race, contains 6-9% proteins.
- Rich in lysine and B-group vitamins.
- Devoid of vit. A, D & C.

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PSM I PRACTICAL RECORDS

	Raw rice milled	Whole wheat	Maize dry
Protein (g)	6.8	11.81	11.1
Fat (g)	0.5	0.5	3.6
Carbohydrate (g)	78.2	78.2	66.2
Energy (Kcal)	345	346	342
Thiamine (mg)	0.06	0.45	0.42
Niacin (mg)	0.19	3.0	1.8
Riboflavin (mg)	0.06	0.17	0.1
Minerals (g)	0.6	1.5	1.5

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Milling of rice - Deprives rice of its valuable nutrients

Result - polished or white rice.

Deficiency disease - beri-beri

Washing and cooking - Washing in large quantities lead to loss of vit. + minerals and also by cooking.

Parboiling - Partial cooking of rice in steam preserves nutritive quality of rice.

Hot Soaking process is recommended.

Disadvantage - Peculiar smell or off flavor.

RDA - 460 gm - Sedentary male.

410 gm - Sedentary female.

WHEAT

→ Protein content is 9-16%, limiting amino acids - lysine and threonine.

→ RDA - 460 gm - sedentary male.

410 gm - sedentary female.

→ Consumed in form of whole grain wheat flour or atta.

→ Maida / white flour represents 70% of extraction wheat is poorer in nutrition.

→ Rich in vitamin 'B'.

MAIZE

→ Limiting amino acids - Tryptophan and lysine.

→ Excess causes - Pellagra.

→ Taking Niacin as supplement with maize prevent Pellagra.

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PSM I PRACTICAL RECORDS

NUTRITIVE VALUE OF PULSES (values per 100g)

Pulses	Energy (Kcal)	Proteins (gm)	Fat, Ca, Fe (g) (mg) (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vit. C (mg)
Bengal gram	360	17.1	5.3, 202, 4.6	0.30	0.25	2.9	3
Black gram	347	24.0	1.4, 154, 3.8	0.42	0.20	2.0	0
Red gram	335	22.3	1.7, 73, 2.7	0.45	0.19	2.9	0
Soyabean	432	43.2	19.5, 240, 10.4	0.73	0.39	3.2	0
Green gram	348	24.5	1.2, 75, 3.9	0.47	0.21	2.4	0
Pearl dry	315	19.7	1.1, 75, 7.05	0.47	0.19	3.4	0
House gram	321	22.0	0.5, 287, 6.77	0.42	0.12	1.5	1

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PULSES (Legumes)

It means "poor man's meat".

These are types of grains called dals.

Bengal gram, Red gram, Green gram, Black gram, Masur etc.

- Pulses have 20-25% proteins.
- Poor in Methionine and cysteine and rich in lysine.
- In raw states, they contain anti-nutritional factors
- They are adulterated with Kesari dal

Bengal gram (Chana dal)

- Nutritive value is improved by - Germination & fermentation.
- Limiting amino acids - methionine & Cysteine.
- Rich in Lysine

Red gram (Turar or arhar dal)

- Limiting amino acid - methionine & Cysteine.
- It is feared to contaminate - Khesari dal

(Lathyrus)

- Long term contaminated consumption causes Neurolathyrism & osteolathyrism.
- Toxin → β -oxalyl amino alkaline (BOAA).
- Endemic states → MP, UP, Bihar, Odisha.

Rajma

- Limiting AA - methionine & Cysteine.

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- Nutritive value: P: 22.3g/100g ; F: 19.3g/100g ; E: 346 Cal/100g.

Soyabean

- Richest among pulses containing 40% proteins, 20% fat & 4% minerals.
- Limiting AA - methionine, queen of all legumes.
- Nutritionally rich, high protein, high iron content.
- Rich in Carotene, lysine & folic acid.
- Oil is rich in α -linolenic acid & linoleic acid.

Soyachunks

Made from soya flour after extraction of oil.

Ground Nuts

- Nutritive value: P- 26.7% F- 40.1% Calories 367/100g.
- Rich in Niacin, Iron, Ca, P.

IMPROPER STORAGE CAUSE

- If not properly stored can result in fungal infestation producing mycotoxins called as aflatoxins, as hepatotoxins and carcinogenic.
- fungal infestation causes health hazard known as Aflatoxicosis.
- It is rich in MUFA.

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PSM I PRACTICAL RECORDS

NUTRITIVE VALUE OF MILK COMPARED
(value per 100 grams)

	Buffalo	cow	Goat	Human
Fat (g)	6.5	4.1	4.5	3.4
Protein (g)	4.3	3.2	3.3	1.1
Lactose (g)	5.1	4.4	4.6	7.4
Calcium (mg)	210	120	170	28
Iron (mg)	0.2	0.2	0.3	
Vitamin C (mg)	1	2	1	3
Minerals (g)	0.8	0.8	0.8	0.1
Water (g)	81.0	87	86.8	88
Energy (Kcal)	117	67	72	65

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MILK

→ It is best and most complete food and good source of proteins, fats, sugar, vitamins and minerals.

Pasteurization → It is heating of milk to such temperature and for such time period which is sufficient to destroy pathogens present in milk.

Methods → 1. Holder (vat) Methods
2. High temperature short time Method (HTST)
3. Ultra high temperature Method (UHT).

Tests of pasteurization.

1. PHOSPHATASE TEST

Raw milk contains phosphatase that get destroyed on heating at 60°C for 30 mins.

2) Standard Plate Count.

30,000 bacterial count should be there per ml of pasteurized milk.

3) Coliform Count.

Coliform organisms are absent in 1 ml of milk (pasteurized)

MILK BORNE DISEASES

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1. Infection of animals transmitted to man :	
1 ^o Importance	2 ^o Importance
TB	Cow pox
Streptococcal infections	Foot + mouth disease
Staphylococcal enterotoxin	Anthrax
Poisoning	Tick-borne encephalitis
Salmonellosis	
Q fever	
2. Infections 1 ^o to man transmitted through milk :	
Typhoid and paratyphoid, Shigellosis, Cholera, Enteropathogenic, E. coli, Non-diarrhoeal diseases.	
Proteins in Milk.	
All EAA present.	
Milk protein — CASEIN, Lactalbumin and Lactoglobulin.	
NPU - 75	
Fats in milk — More % age of linoleic acid and oleic acid.	
- Vitamin A and D.	
Milk is ideal food — Good source of proteins, fats, sugars, vitamins and minerals.	
Skimmed milk — Milk from which fat has been removed	
Toned Milk — Blend of natural milk and reconstituted	
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NUTRITIVE VALUE OF SOME COMMON FRUITS.
(per 100g of edible portion)

Name	Calories	Calcium (mg)	Iron (mg)	Carotene (µg)	Vit C (mg)
<u>Fresh fruits</u>					
Banana	104	10	0.5	124	7
Grapes	71	20	1.5	0	1
Guava	51	10	0.27	0	212
Mango	74	14	1.3	2,210	16
Orange	48	26	0.32	2,240	68
Papaya	32	17	0.5	2,740	57
Sitaphal	104	17	4.31	0	37
Amla	58	50	1.2	9	600
<u>Dry fruits</u>					
Dates	317	120	7.3	44	3
Raisins	308	87	7.7	214	1
Almonds	655	230	5.09	0	0
Cashew Nut	596	50	5.81	0	0
Ground Nut	567	90	2.5	37	0

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ted milk in fixed properties.

EGG

12% of egg is made of shell, 58% egg white and 30% egg yolk.

Nutritive value

Proteins - 13.3 g/100g, Fats - 13.3 g/100g, Minerals - 1.0 g/100g,
Carbohydrates - Nil, Energy - 173 Kcal/100g - All vitamins except vitamin 'C'.

- It is "Reference Protein" as it contains all essential AA and in right proportions.
- NPU - 100.

FRUITS

- Protective foods and good source of vitamins and minerals.
- Mangoes and papaya - good source of carotene.
- Intake leads to alkaline urine, cellulose assists in bowel movements.
- Daily requirement is 85 grams.

GREEN LEAFY VEGETABLES

- Rich sources of carotenes, Ca, Fe & vitamin C.
- Good sources of Riboflavin, folic acid and micronutrients.
- RDA - 40 gms for adult.
- High in water content and dietary fibres and low

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Calorific value.

COMMUNITY NUTRITION PROGRAMS

- (1) Prophylaxis against nutritional anaemia.
- (2) Vit. A prophylaxis program.
- (3) Control of Iodine deficiency disorder.
- (4) Special Nutritional Program.
- (5) Balwadi Nutritional Program.
- (6) Integrated child development services Program.
- (7) Mid day Meal Program.

SHAKIR TAPE

Mid upper arm circumference measuring tape (MUAC)
It is circumference of left upper arm and measured at midpoint between tips of shoulder and elbow.

Cut off values → for 6-59 month old -

< 11.5 cm - Red zone - Severe acute Malnutrition.

11.5 - 12.5 cm - yellow zone - Moderate acute Malnutrition.

12.5 cm or more - Green zone - Mild or No malnutrition.

↓

SHAKIR TAPE.

↓

Advantages of tape - It is age independent criterion.

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- It is not affected by edema.
- Simple to use and only single person can use it.
- Easy to transport.

CONCENTRATED VITAMIN A SOLUTION (100ml)

Conc. of vit. A - 1,00,000 IU/ml.

Oil used - Arachis oil (peanut oil).

Recommended doses - 9 doses till 5 yrs of age.

Dosage Schedule - (1) 1st dose - 1ml at 9 months.

(2) 2nd dose - 2ml at 16-24 months.

(3) 3rd, 4th, 5th, 6th, 7th, 8th, 9th doses -
2ml - At 6 monthly interval beginning 6
months after 2nd dose.

Minimum gap - 6 months as liver can store enough for
6-9 months.

AIM - To decrease prevalence of vit A deficiency below
0.5%.

GROWTH CHART

It is a visible display of child's physical growth and
development.

Uses → Growth monitoring and diagnostic tool.
- Planning health services & health policy
making.

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DOSAGE OF CO-TRIMOXAZOLE ORAL
SUSPENSION

Age	Dosage
8-12 yrs.	10 ml every 12 hrs
6 months - 5 yrs	5 ml every 12 hrs
6 weeks - 5 months	2.5 ml every 12 hrs

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- Educational tool.
 - Evaluation of child health services.
 - Teaching importance of adequate feeding, deleterious effects of diarrhoea.
- Separate charts are there for boys and girls.
- Birth - 5 yrs of age is assessed -
- 0: Normal zone of weight for age.
 - 2SD - Under nutrition
 - 3SD - Severely underweight zone.
- Objective is to keep child in normal zone.

Alternative Method -

1. Height for age.
2. Weight for Height.
3. Arm circumference.

CO-TRIMOXAZOLE ORAL SUSPENSION.

- It is used to treat certain bacterial infections and travelers diarrhoea.
 - It is in sulfonamides.
 - It stops growth of bacteria.
 - Sml contains -
- Trimethoprim 1P 40mg
- Sulphamethoxazole 1P 200mg.

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ORS

Age	Dose
Below 2 yrs	50-100 ml
2-10 yrs	100-200 ml
Above 10 years	As much able to drink.

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ORAL REHYDRATION SALT (ORS)

Each 20.5 gm Contains -

NaCl IP - 2.6 g

Dextrose anhydrous IP - 13.5 g

KCl IP - 1.5 g

Sodium citrate IP - 2.9 gm.

How is it Reconstituted?

Contents dissolved in 1L drinking water.

Prepared solution used within 24 hours.

Solution freshly made and not boiled.

Role of each Constituent

Glucose - facilitates absorption of Na + H₂O

- Na & K replace loss of essential elements in diarrhoea.

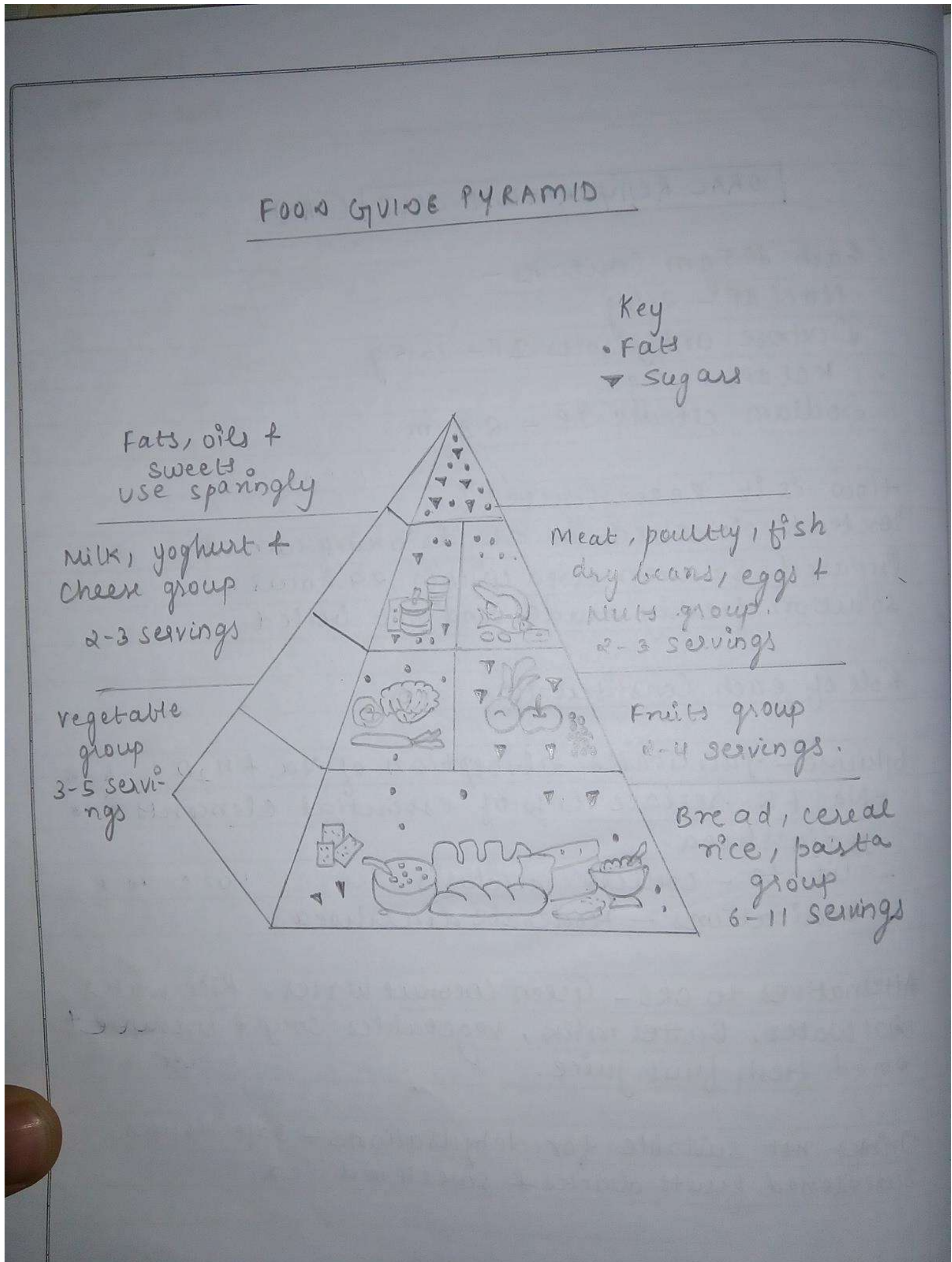
- Citrate - corrects acidosis.

- Indications - Moderate diarrhoea.

Alternatives to ORS - Green coconut water, Rice water, dal water, Buttermilk, vegetables soup & unsweetened fresh fruit juice.

Drinks not suitable for dehydration - Soft drinks, Sweetened fruit drinks & sweetened Tea.

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BALANCED DIET

It is defined as one which contains a variety of foods in such quantities and proportions that need for energy, amino acids, vitamins, minerals, fats, carbohydrates and other nutrients is adequately met for maintaining health, vitality and general well-being and also make small provision for extra nutrient to withstand short duration of leaness.

Principles - Daily requirements should be met of proteins is 10-15% of daily energy intake.

- Fat requirement should be limited to 15-30% of daily energy intake.
- Carbohydrates rich in natural fiber constitute remaining food energy
- Requirements of micronutrients should be met.
- A Nutritional Education guide "The Food Guide Pyramid" emphasis food from 5 major food groups.
- Each provide some but not all nutrients required.
- food in one group can't replace those in another.

ASSESSMENT OF NUTRITIONAL STATUS

It can be assessed by random and representative sample of population covering all ages and both sexes in different socioeconomic group.

Nutritional assessment methods.

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1. Clinical Examination — Physical signs as angular stomatitis, Bitot's spots, calf tenderness etc.
2. Anthropometry — Height, weight, skin fold thickness, arm circumference.
3. Bio-chemical evaluation — Hb, stool, urine examination.
4. Functional assessment
5. Assessment of dietary intake.
6. Vital and health statistics — Morbidity & mortality data
7. Ecological studies — food balance sheet, socio-economic factors, health and education services.

FOOD STANDARDS

- (A) CODEX APPARATUS
- (B) IFA STANDARDS
- (C) THE AGMARK STANDARDS
- (D) BUREAU OF INDIAN STANDARD
- (E) FRUIT PRODUCT ORDER

Food Borne disease.

These are infectious or toxic in nature, caused by agents that enter body through ingestion of food.

Classification

(A) FOOD BORNE INTOXICATIONS

Lathyrism, Botulism, Aflatoxin, Ergot, Heavy metals, Asbestos etc.

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(B) FOOD BORNE INFECTIONS

- (a) Bacterial disease - Typhoid, Brucellosis, Paratyphoid fever.
- (b) Viral disease - Viral hepatitis, Gastroenteritis.
- (c) Parasites - Taeniasis, Ascariasis.

EPIDEMIC DROPSY

It occurs in contamination of mustard oil with argemone oil. Toxic interferes with oxidation of pyruvic acid. Symptoms consist of sudden, non-inflammatory bilateral swelling of legs with diarrhoea.

FOOD FORTIFICATION

It is process where by nutrients are added to foods in relatively small quantities to maintain or improve quality of diet of a group, community or population.

AIM - 1. Reinforce usual dietary intake of nutrients.
2. Prevent nutritional deficiency.

Criteria - Vehicle fortified must be part of regular diet.

- Amount of Nutrient added must not be hazardous.
- Don't undergo any noticeable change in Physical appearance.

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→ Cost must not raise price of food.

Common PROGRAMMES - 1) Fluoridation of water.
2) Iodization of salt.
3) Fortification with vit. A and D
4) Twin fortification of salt.

FOOD HANDLING TIPS

- Never eat raw meat, poultry, sea food or eggs.
- Cook raw material in 165°F to kill any bacteria. Refrigerate.
- Refrigerate perishable food, store canned goods in a cool dry place for use within a year.
- Keep work areas clean and use plastic or other non-porous cutting board.
- Keep pets away from food.
- Thoroughly heat the left overs.
- Don't take chances if you suspect any problem throw food out.

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ENVIRONMENT.

Environment implies all the external factors - living and non living, material and non-material which surround man.

Three components are -

- (i) Physical - water, air, soil, housing etc.
- (ii) Biologic - Plant & animal life.
- (iii) Social - Customs, culture, habits etc.

WATER.

Much of ill health which affect humanity, can be traced to lack of safe wholesome water supply. Water is not only a vital environmental factor but also play a role in socio-economic development.

Safe and wholesome water

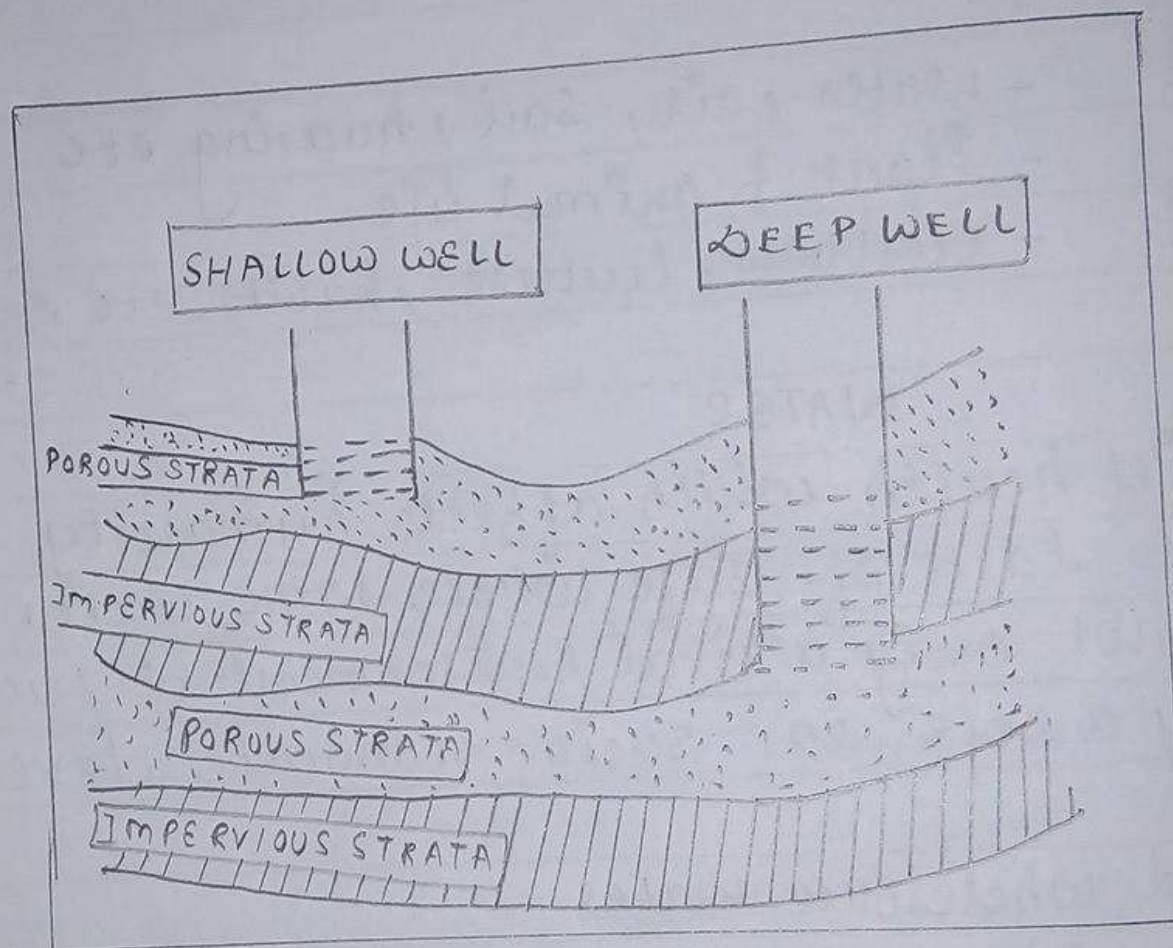
Water that is -

- free from pathogenic agents.
- free from harmful chemical substances.
- Pleasant to taste.
- Usable for domestic purpose.

Requirement - A daily supply of 150-200 lt per capita is considered as an adequate supply to meet needs for urban domestic purpose.

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Shallow and deep wells .

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Uses - (1) Domestic use (2) Public Purposes (3) Industrial Purposes (4) Agricultural purposes (5) Power production.

Sources - (1) Rain

(2) Surface water

- impounding reservoirs, Rivers, streams, tanks, ponds and lakes.

(3) Ground water,

Shallow wells, deep wells, springs.

WELLS

Wells are important source of water supply
They are of two kinds -

1. SHALLOW WELLS.

→ They tap subsoil water. They yield limited quantities of water and water is notoriously liable to pollution unless care is taken in well construction.

2. DEEP WELLS.

→ It taps water from water bearing stratum below the first impervious layer in ground. They are machine dug and may be several hundred meters deep.

→ They furnish safest water.

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① Definition

② chemical quality

③ Bacteriological quality

④ yield

shallow well
Taps the water from above the 1st impervious layer.

Moderately hard.
often grossly contaminated.
usually goes dry in summer

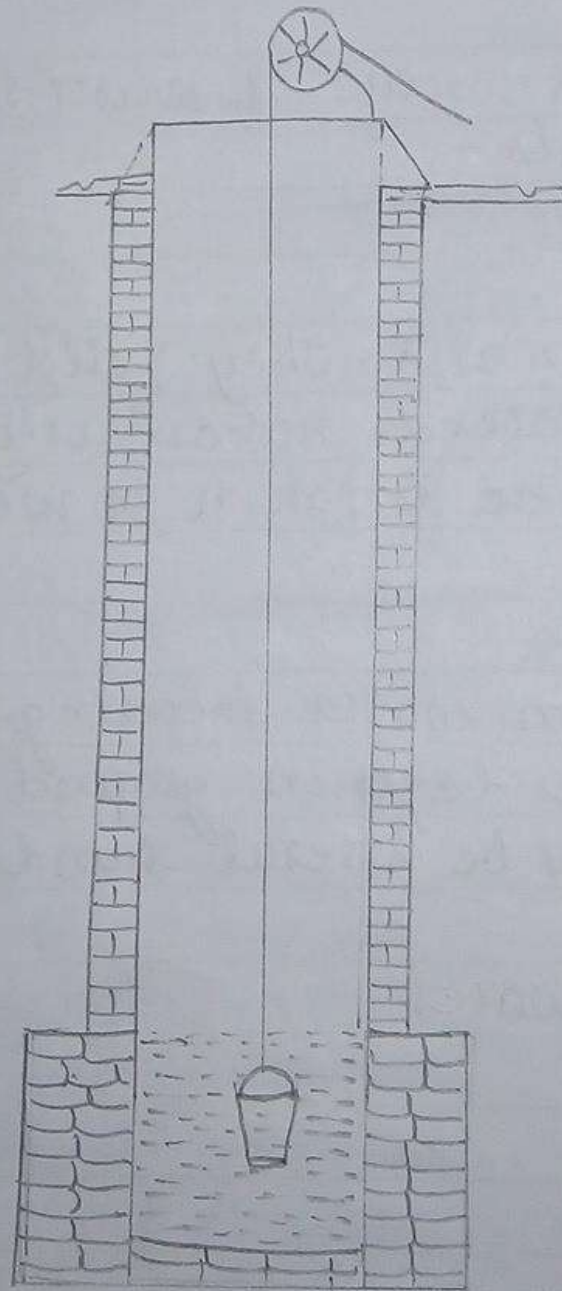
Deep well.

Taps the water from below the 1st impervious layer.

Much hard

Taps purer water

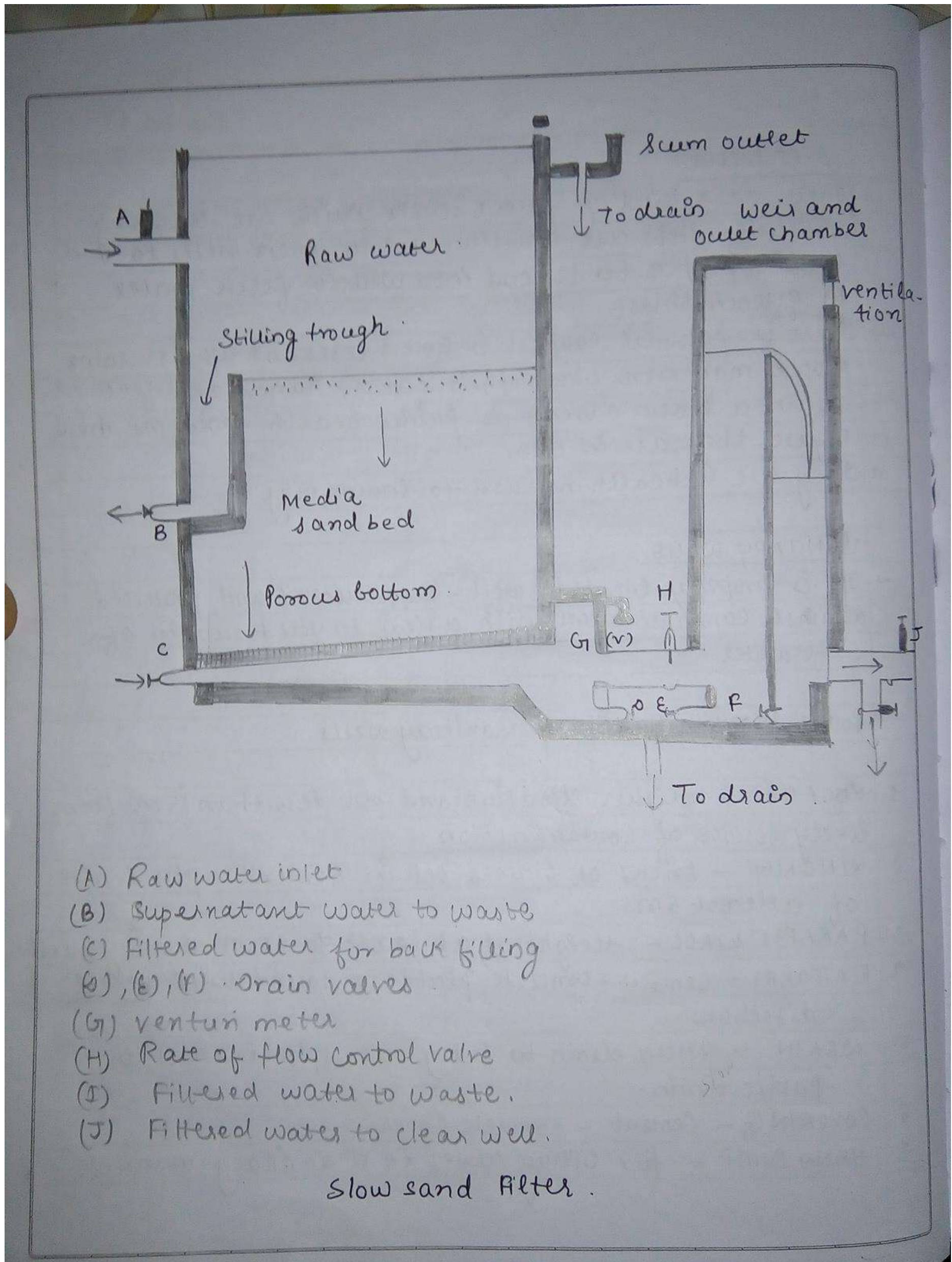
Provides a source of constant supply



→ Sanitary open well

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<u>STEP WELLS</u>	
→ They are a kind of pucca wells which are becoming absolute. Steps are constructed into these wells to enable people to descend into well to fetch water or quench thirst.	
→ There is personal contact between user and water. Some people may even wash their faces, hands and feet. Guinea Worm disease is public health problems there where these are in use.	
→ They are a health hazard to community.	
<u>SANITARY WELLS</u>	
→ It is properly located, well-constructed and protected against contamination with a view to yield supply of safe water.	
<u>Points for construction of sanitary wells</u>	
1.	LOCATION - Higher elevation and not less than 15m from likely source of contamination.
2.	LINING - Bricks or stones set in cement upto depth of atleast 6m.
3.	PARAPET WALL - Height of at least 70-75cm above ground
4.	PLATFORM - Cement-concrete platform round well in all directions.
5.	DRAIN - Pucca drain to carry out spilled water to public drain.
6.	COVERING - Cement-concrete cover.
7.	HAND PUMP - for lifting water in a sanitary manner.
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8. CONSUMER RESPONSIBILITY - Basic precautions at individual & family level should be observed.
9. QUALITY - Physical, chemical & bacteriological quality of water, should confirm to acceptable standards of quality of safe and wholesome water.

TUBE WELLS

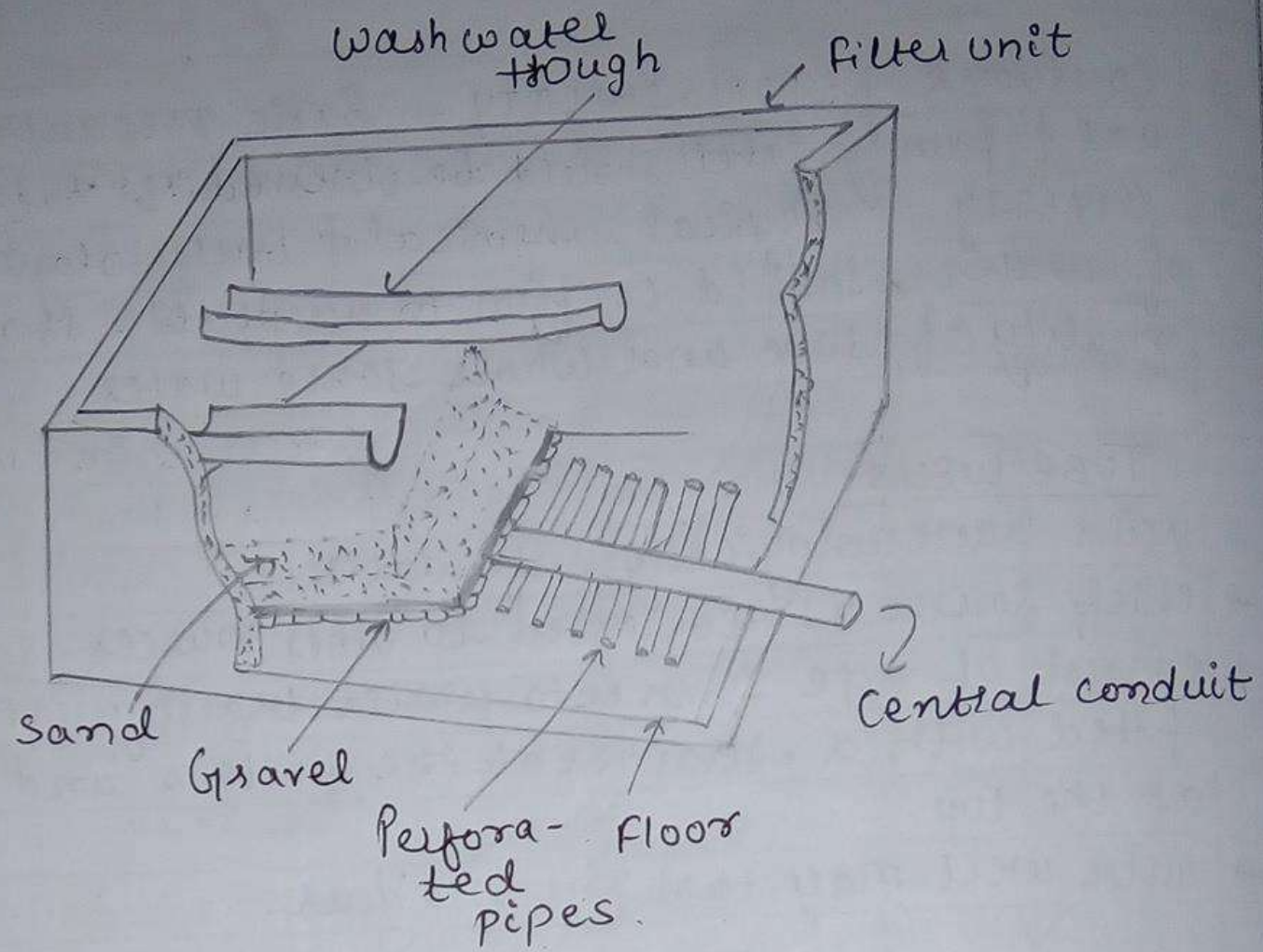
- yield bacteriologically safe water.
- chief source as compared to other sources.
- consist of pipe sunk into water bearing stratum & fitted with a strainer at the bottom and handpump at the top.
- Tube well may last for 5-10 years.

PURIFICATION OF WATER

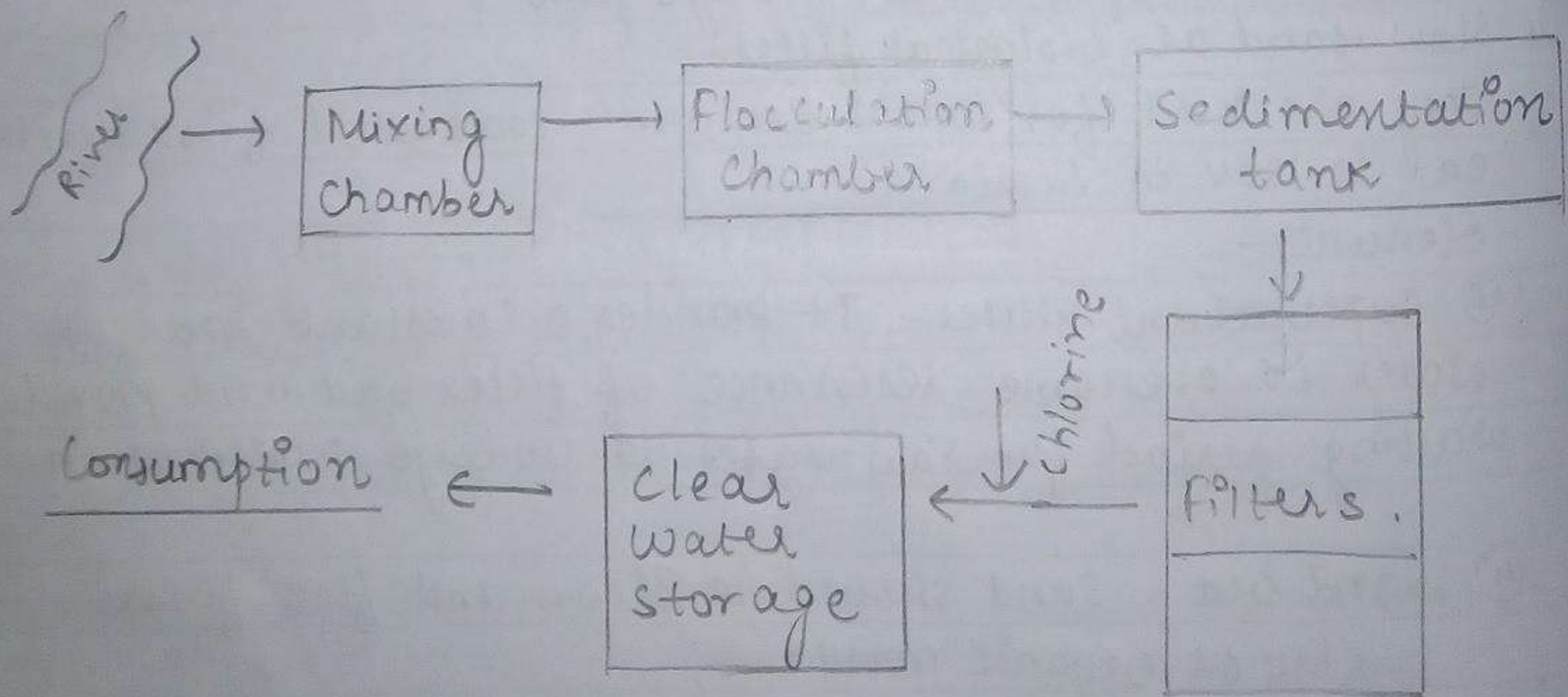
- (i) Purification of water on large scale
- ①. Slow sand or biological filters.
- They are used for water treatment was used first developed in 1804 in Scotland.
- Elements -
- ① Supernatant water - It provides a constant head of water to overcome resistance of filter bed and provides waiting period for raw water to undergo purification.
 - ② Sand bed - sand should be clean and free from clay or organic matter.
 - ③ Under-drainage system - It consist of porous

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Rapid sand filter



Rapid sand filtration plant

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pipes which provide outlet for filtered water and supporting filter medium above.

(4) Filter control — Filter is incorporated with certain devices to maintain constant rate of filtration.

(2) Rapid Sand or Mechanical filters.
They are of 2 types — gravity type or pressure type.

(i) Coagulation — Raw water is treated with coagulant as alum.

(ii) Rapid mixing — It provides thorough dissemination of alum through out the bulk of water.

(iii) Flocculation — It forms thick, copious, white, flocculant precipitate.

(iv) Sedimentation — Coagulated water is led to sedimentation tanks.

(v) Filtration — Partially clarified water is subjected to rapid sand filtration.

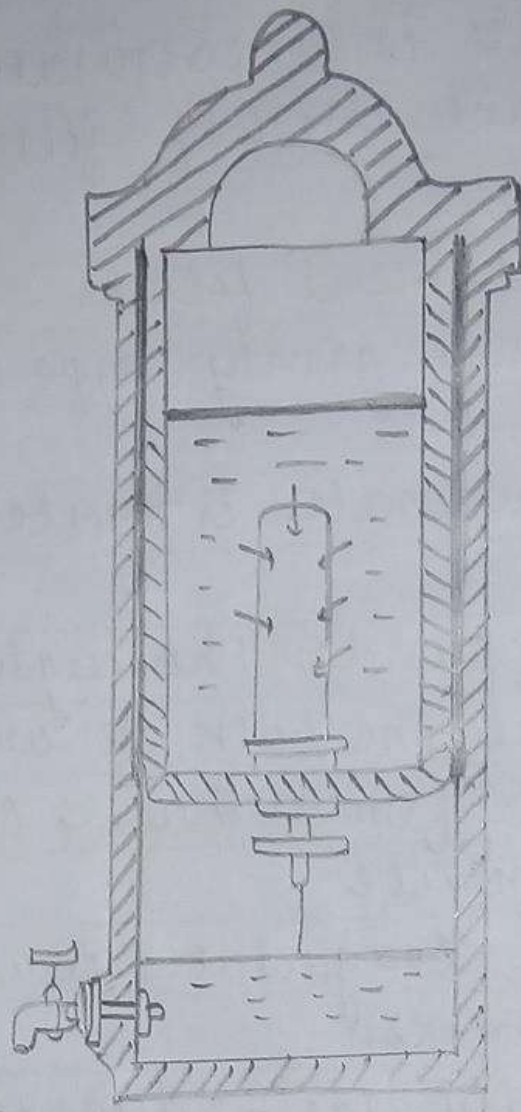
(3) Bleaching powder / Chlorinated lime.

Characteristics — white amorphous powder and has a pungent smell of chlorine.

Mode of action — chemical disinfectant, bacteriocidal and virucidal.

Usage → 5% bleaching powder is used and suitable for disinfection of feces and urine within one hour.

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Berkefeld Filter

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(A) Orthotidine - Arsenite (OTA) test

- Modification of OT Test.
- Avoids errors due to presence of other elements like Mn, Fe etc.
- Allows reading of free and combined Cl₂ separate.

(ii) Purification of water on small scale.

Filtration → Water can be purified through ceramic filters as pasture chamber load filter, Berkefeld's filter and "Katady's filter". Essential part is candle made of porcelain in chamberland type of k infus

- Only clean water should be used with with ceramic filters though they are effective in purifying water they are not quite suitable for widespread use under indian

HOROCK'S APPARATUS

Components → 1 Black cup, 6 white cups, 1 spoon (2 gram), stirring rod, pipette, starch iodide solution.

Procedure → Fill water in black glass upto making
→ Add 2 grams of bleaching powder - 6 white cups are filled with water to be tested → using

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pipette provided add 1 drop of stock solution in 1st glass; 2 drops in 2nd glass → 6 drops in 8th glass → water in each cup → after waiting for half an hour is stirred using separate rod for each cup → after waiting for half an hour 2-3 drops of starch iodide solution is added in each white cup.

Interpretation → Blue color indicates presence of free residual chlorine.

First cup which develops blue color gives an estimate of bleaching powder needed to disinfect 450 L (100 gallons) of water to provide 1 ppm of chlorine.

chloroscope / chlorinometer.

It is used to determine amount of excess or residual chlorine in water after chlorination it consists of-

- (1) Orthotoluidine reagent (OT reagent)
- (2) standard test tubes - and disks
- (3) Empty test tubes.
- (4) Plastic / metal container.

Procedure - (1) Take water to be tested and add it upto mark in empty test tubes.

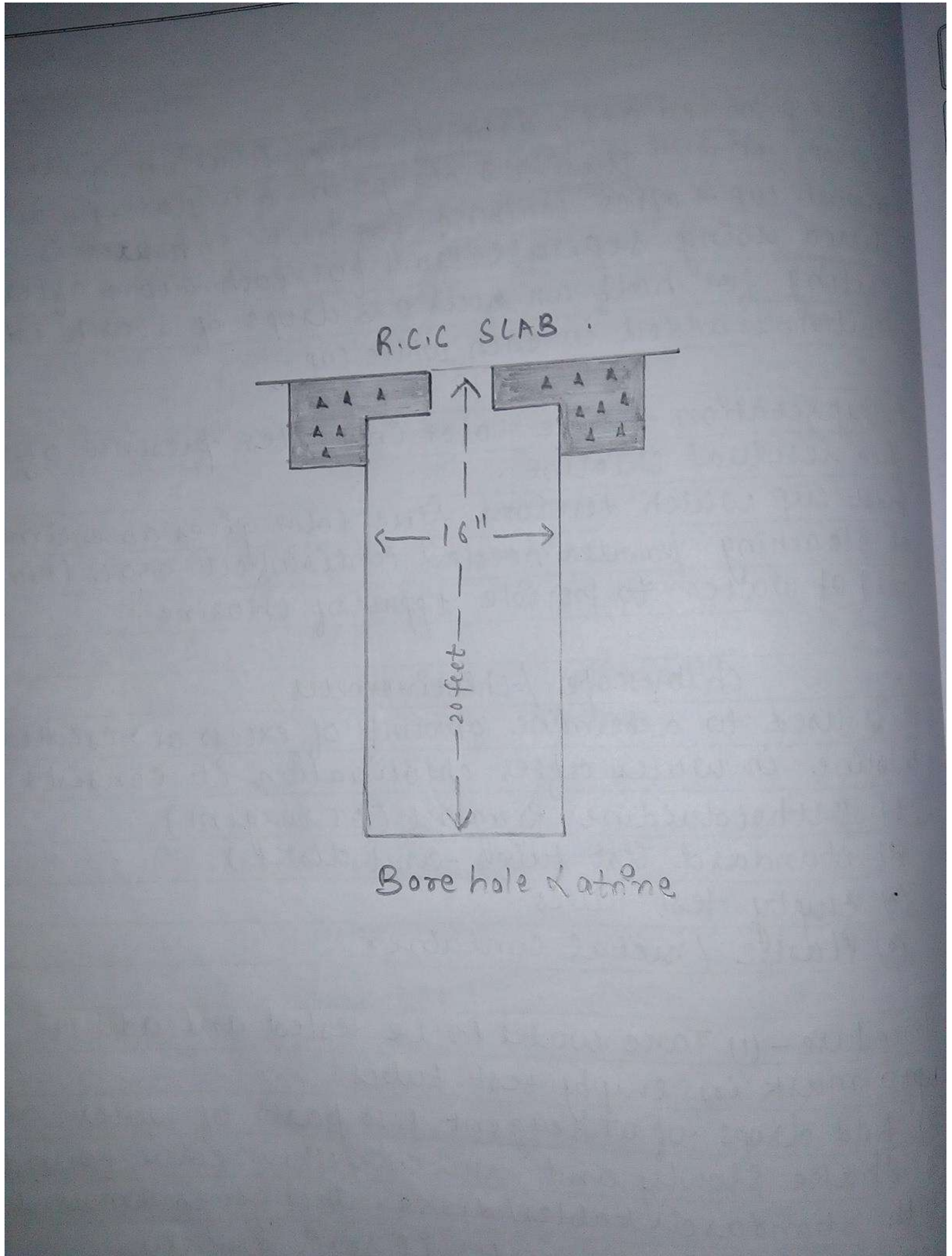
(2) Add drops of OT reagent 1:10 parts of water.

(3) Shake slowly and match yellow color found with standard tables/disks. This gives amount of residual chlorine in water if read quickly.

(4) After 15-20 minutes color developed is due to free + combined chlorine.

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WASTE DISPOSAL METHOD

Bore Hole Latrine

- It was introduced by Rockefeller foundations in 1930's in campaigns of hookworm control.
- A circular hole is dug vertically in ground by an, which is 20 feet deep and 16 inches in diameter.
- In loose and sandy soil, hole is lined with bamboo matting to prevent caving in of earth in hole and suitable enclosure is put up for privacy.
- For family of 5-6 members it serves for more than a year when contents of bore hole reaches within 50cm of ground level, squatting plate is removed and hole is closed with earth.
- A new hole is dug and used in same way.

Advantages - Sweeper is not required.

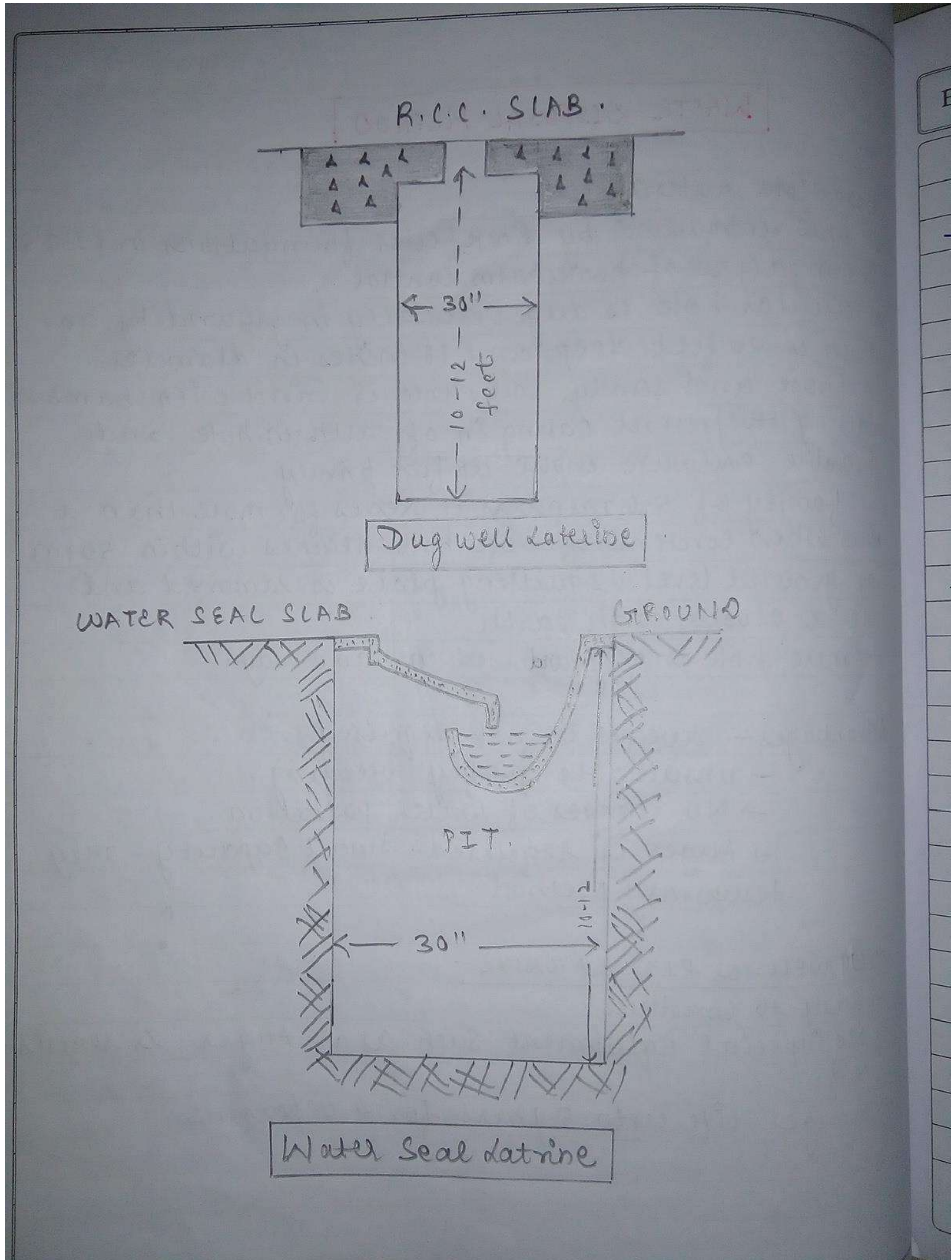
- unsuitable for fly breeding.
- No danger of water pollution.
- Auger is required - small capacity - only temporary method.

Big Well or PIT LATRINE -

- Easy to construct.
- No special equipment such as an Auger is required.
- longer life upto 5 years for 4-5 persons.

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Introduced in 1949-1950.

→ Concrete Squatting platform is placed on top of pit and enclosed for privacy.

Mode of action - Anaerobic digestion.

When filled up new one is constructed.

Water seal latrine.

Advantages - Night soil is sealed off from flies by water unknown.

→ It eliminates nuisance of smell.

→ Once the latrine is flushed night soil is not visible.

→ More acceptable to rural area.

RCA type - Research cum Action type.

Pan - It receives night soil by a vine + washed water - width is 5 inches - front position 48 inches - widest position.

Squatting plate - made of impervious material so that it can be washed.

Trap - Bent pipe, about 7.5 cm in diameter and connected with pan.

Connecting Pipe - Connect Trap to pit.

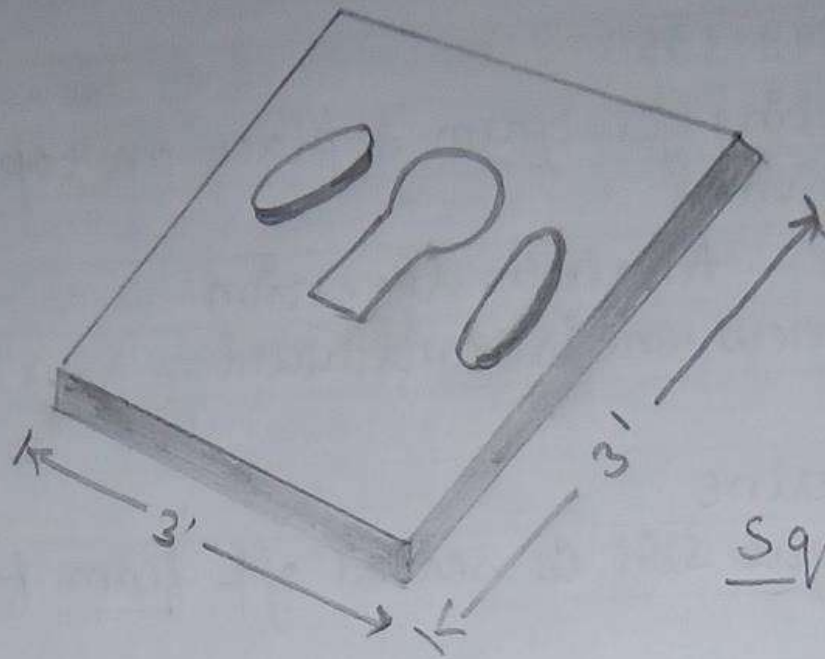
Superstructure for privacy and shelter.

Maintenance - by health education of people who use it.

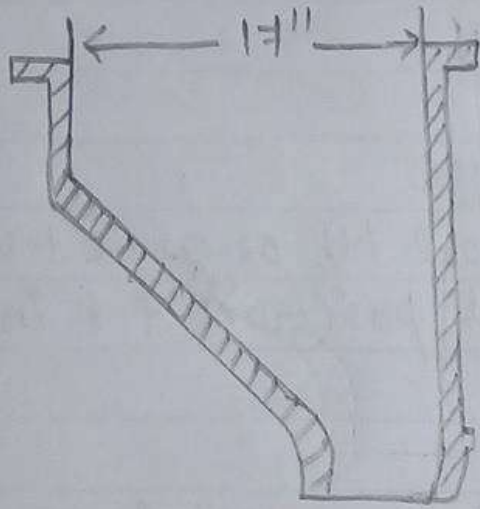
Shallow trench latrine.

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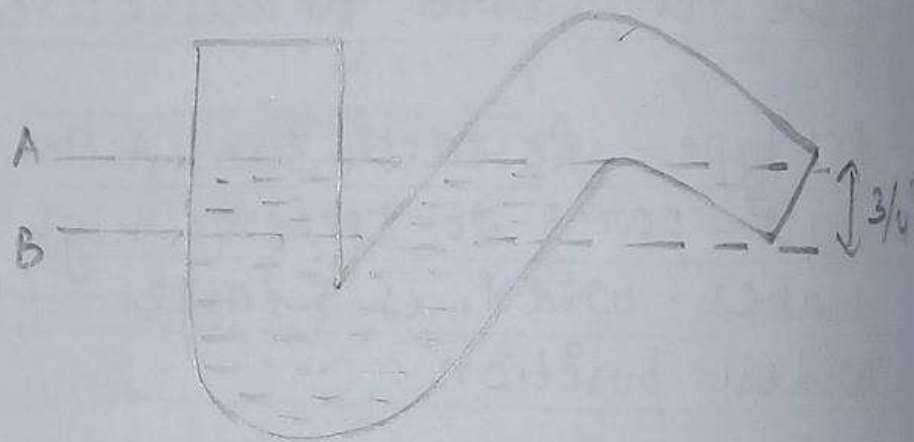
RCA Latrine



Squatting Plate



Latrine Pan



Trap

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- Trench is 30 cm wide and 90 - 150 cm deep.
- length depends on number of users.
- It is rudimentary arrangement of short period.
- When trench is filled to 30 cm below ground level and compared.

Deep Trench Latrine

- It is intended for camps of longer duration.
- Trench is 1.8 to 2.5 m deep and 75-90 cm wide.
- Superstructure is built for privacy and protection.

INSECTICIDES

- (i) BHC - Benzene hexachloride or Hexachlorocyclohexane or gamma xane or hexidol.

Characteristics - White or chocolate colored powder - musky smell, irritant to eyes, nose and skin, composed of isomers of which gamma isomer is most active constituents.

Mode of action - Contact Poison.

Dosage of Application - 40-50 mg / sq. feet

Uses - used against - (i) Lice (ii) Fleas (iii) ticks (iv) Bugs (v) flies.

Period of effectivity - Action best for 3 months.

- (ii) DDT. Dichloro diphenyl Trichloroethane
- Organochlorine Compound.

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Characteristics - White amorphous powder, mild but not unpleasant smell, contains para-para isomer which is most active fraction.

Mode of action - Contact poison and acts on nervous system of insects.

Dosage of application - 5% of suspension of SST at dosage of 100-200 mg / sq. foot area.

(3) Malathione

Organophosphorous Compound.

Characteristics - yellow or clear liquid, unpleasant smell.

Mode of action - Contact poison.

Dosage of application - 100-200 mg / sq. feet every 3 Months.

Uses - used against (i) Adult mosquito (ii) Fleas (iii) Ticks (iv) Bugs (v) Flies.

Period of efficiency - 3 months of minimum residual action.

(4) Abate (Temephos).

Organophosphorous Compound

Characteristics - Brown viscous fluid.

Mode of action - Contact poison.

Dosage - Not greater than 1.0 ppm.

Uses - Against mosquito larvae.

Period of efficiency → Residual action for months only.

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Paris - Green

- Copper aceto-arsenite compound
- Characteristics - Emerald green microcrystalline powder.
- Used against - ST resistant insects - flies, mosquitoes & other insects.

Fenthion (Baylax)

Characteristics - slight smell of garlic, insoluble in water.

Mode of action - Contact poison.

Dosage - 20-40% fenthion.

Uses - Larva of *C. fatigans* (culex) and other insects.

STERILISATION, DISINFECTION AND DISINFECTING AGENTS.

Sterilisation - Process by which an article, surface or medium is freed of all living microorganisms either in vegetative or spore state.

Disinfection - Process of destruction of pathogenic organism.

Natural Agents -

- ① Sunlight - Natural source, UV radiations, eg - linen, bedding etc
- ② AIR - Exposure to air drying / evaporation - kill bacteria.

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PHYSICAL AGENTS

- 1) Burning → Also called as incineration, done in an incinerator. Eg - Contaminated dressing, logs & swabs.
- 2) Hot air / Dry heat → Done in hot air oven at temperature of $160-180^{\circ}\text{C}$ for 2 hours. Eg - Glassware, sharp instruments, swabs, dressings etc.
- 3) Boiling → Boiling for 5-10 minutes at 90°C will kill bacteria but not spores or viruses.
→ Done in boilers, addition of 1% soap and 0.3% washing soda enhances effect of boiling.
Eg - Linen, bedpans etc.
- 4) Autoclave → Two types are available -
Gravity Displacement type and High vacuum sterilizers.
→ It works on same principle as domestic pressure cooker. Mechanism - 121°C under 15 lbs pressure for half an hour will kill all microbes including spores.
Eg - Linen, metal instruments, syringes etc.
- 5) Radiations.
 - (i) Non-Ionising Radiation.
→ Low energy type, included infrared and UV rays.
→ ERR - Rapid mass sterilization of prepacked syringes and catheters.
→ UVR - Disinfection of enclosed areas as entryways, OT, Labs etc.

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(ii) Ionising Radiation.

High energy type, includes γ rays, x-rays, highly lethal to DNA and other cellular contents and used for sterilization of plastics, syringes, swabs etc.

6. Cold sterilization

→ Sterilization is carried out at low temperature with help of chemicals, radiation, membranes and all other means excluding high temperature.

CHEMICAL AGENTS

Ideal qualities of a good chemical disinfectant:

- Have wide spectrum of activity, rapid action, Be active in presence of organic matter, Nontoxic.
- Not bleach or stain, odourless, readily miscible in water and have fair power of penetration.

1. ALCOHOL.

- Ethyl alcohol and Isopropyl alcohol are commonly used.
- Methylated spirit is used for handwashing.
- 70% alcohol is lethal in a period of seconds to all non-sporing bacteria.
- most effective skin antiseptic - alcoholic solutions of chlorhexidine and iodine.

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2. ALDEHYDE -

formaldehyde - Aqueous solution - Bactericidal, sporicidal.

Gaseous form - fumigation of OT & wards.

Tablet form - sterilisation of cotton and gauze.

Glutaraldehyde - Bactericidal, fungicidal, sporicidal & lethal effect on viruses, used for sterilisation of heat sensitive instruments.

3. Halogens and their compounds

Chlorine and chlorine compounds - as bleaching powder, hypochlorites, chlorine tablets etc.

→ mode of action - bactericidal and disinfect water supplies, food & dairy industries etc.

Iodine - Bactericidal, fungicidal, viricidal and lethal to spore bearing organisms.

Iodophore = iodine + solubilising agents/carrier
Eg. Betadine solution.

4. Phenol and related compounds.

Phenol - or carbolic acid (Not effective disinfectant)

Crude Phenol - PHENOL + CRESOL.

- most commonly used, very effective against gram +ve and gram -ve organism.

Eg. Mopping of floors, cleaning of drains.

CRESOL - derived from coal-tar and is all purpose

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disinfectant.

Cresol - Emulsified
etc. with soap

Cresol emulsion. Eg. Dylsol, Izal

CHLORHEXIDINE - 0.5% Alcoholic / Aqueous solution -
used as effective hand lotion. Eg - Hexachlorophane -
hand disinfectant, soap etc.

DETTOL - CHLOROXYLENOL

→ Highly effective against streptococci, 5% effective for
disinfection of instruments and plastic equipment.

5. QUATERNARY AMMONIA COMPOUNDS

CETRIMIDE - "CETAVALON" - Bactericidal, acts against
many Gram +ve organism.

SAVLON - CETAVALON + CHLORHEXIDINE → SAVLON

Savlion 1:6 in spirit used for disinfection of clinical
thermometers.

6. OXIDIZING AGENTS

POTASSIUM PERMANGANATE - Disinfection of aquarium,
swimming pools, fruits & vegetables.

HYDROGEN PEROXIDE - Surface disinfectant used for
cleaning wounds and discharging ulcers.

PARACETIC ACID - Hydrogen peroxide + Acetic acid →
Paracetic acid. Effective against bacteria, fungi +
yeast.

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yeast.

7. Metallic Salt.

→ Metals as silver ions, zinc ions have anti-infective activity.

→ Inactivation of bacteria on stainless surfaces by zeolite ceramic coating containing silver and zinc ions has been seen.

8. LIME :- cheapest disinfectant, as lime wash it is used for heating walls.

→ As a deodorant it is sprinkled in cattle sheds and in public places near public urinals and garbage bins.

MISCELLANEOUS INACTIVATING AGENTS

→ Pasteurization - Boiling at 70°C for 30 minutes. eg Milk

→ Microwave - Radio frequency waves used at a frequency of 2450 MHz. eg. Soft contact lenses, dental instruments, Urinary catheters etc.

→ Flushing and washer disinfectors - Automated closed equipment used to disinfect objects like bed pans, anesthesia tubes, surgical instruments etc.

→ Ozone is also used as inactivating agent.

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CONTRACEPTION

Contraceptive Methods are preventive methods to help women avoid unwanted pregnancies.

Methods

1. SPACING METHODS

- Barrier Method.
- Intrauterine device - NON-MEDICATED, MEDICATED.
- Hormonal Methods - ORAL PILLS, DEPOT FORMULATION.
- Post-Conception method - MTP.
- Behaviour Method.

2. TERMINAL METHODS

- Male Sterilization.
- female Sterilization.

BEHAVIOUR METHODS ,

1. Rhythm Method / Calendar method

Ogino Knows theory - safe period are 1st and Last 7 days of a menstrual period and unsafe period is 8-18 days.

Advantages → low cost, lack of side effects.

Drawback → difficult to predict safe period.

Failure rate - 9%. - Compulsory abstinence, not applicable during postnatal period, need high motivation and cooperation.

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Lactational Amenorrhea

frequent intense sucking



Prolactin released

disrupt secretion of GnRH



Interfere with release of LH and FSH disrupt follicular development



Anovulation and

amenorrhea

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2. STANDARD DAY METHOD / (Ritumala method)
 - Day 1-7 are infertile days.
 - Day 8-19 days are fertile period, from 20th day infertility is considered resume infertile period.
 - Failure rate - 2/100 MY
3. CERVICAL MUCOUS METHOD (Billing method)
 - Based on observation of changes in characteristics of cervical mucus at time of ovulation.
 - Cervical mucus is watery, clear, smooth, slippery, profuse and elastic during ovulation under influence of estrogen. After ovulation, under effect of Progesterone mucus gets thickened and lesser in quantity. Intercourse is safe during dry days immediately after menses and till mucus is detected.
4. Basal body temperature method.
5. Withdrawal method.
6. Lactational amenorrhoea.
 - These methods are not suitable for women -
 - Irregular cycles, during adolescence, lactation and premenopausal, operated for cervical surgery procedure, vaginal infection, Abortion recently, non-cooperative couples.

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BARRIER METHOD

Male - condom.

Female - femshield, today/vaginal sponge, vaginal diaphragm / cervical cap.

MALE CONDOM

latex, Vylex, polyurethane, polyisoprene.

Failure rate - 3/Hwy.

Advantage - good protection against STIs, simple to use, No side effect, inexpensive, no need medical supervision etc.

Disadvantage - slip off, tear off, during coitus, interfere with local sensation, new condoms to be used before each sexual act, allergic to latex.

DIAPHRAGM

Physical barrier.

Advantage - minimum risk of side effects.

No medical contraindications

① → A trained person is required initially for determination of correct size and teaching correct methods of use.

→ Not protect against HIV.

Contraindication - immediately after delivery, lack of vaginal tone.

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failure rate $\rightarrow$ 6-12 HWY

Other variants $\rightarrow$ cervical cap, vault cap, rimule cap, spermicides.

SPERMICIDAL GEL & VAGINAL PESSARY

$\rightarrow$ chemical barrier method

$\rightarrow$ Advantage - Easy to use, not affect future fertility, not interfere with local sensation.

$\rightarrow$ Contents - Nonoxynol, octoxynol, menfegol.

$\rightarrow$ Disadvantage - High rates of failure, use immediately before intercourse, repeat before each sexual act, mild irritation in vagina.

Failure rate - 6/HWY.

Intra Uterine Devices

Two types - Non medicated or inert and medicated or bioactive.

(a) Second generation IUDS - copper bearing.

(b) Third generation IUDS - Hormone containing.

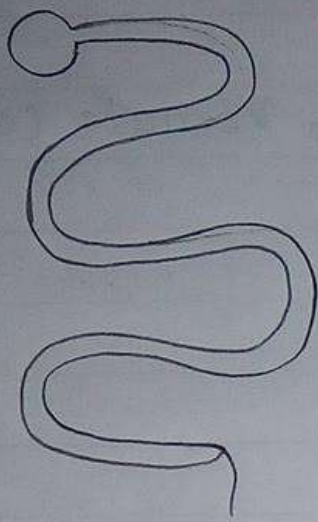
(i) Non-Medicated / Inert IUDS -

Induced foreign body reactions and mild inflammatory changes in endometrium and release of prostaglandin in uterine fluids which lead to incapability of ovum.

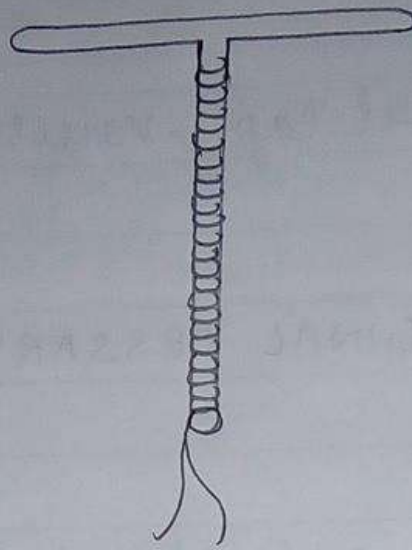
Lippes loop - double S-shaped loop, available in 4 sizes A, B, C, D.

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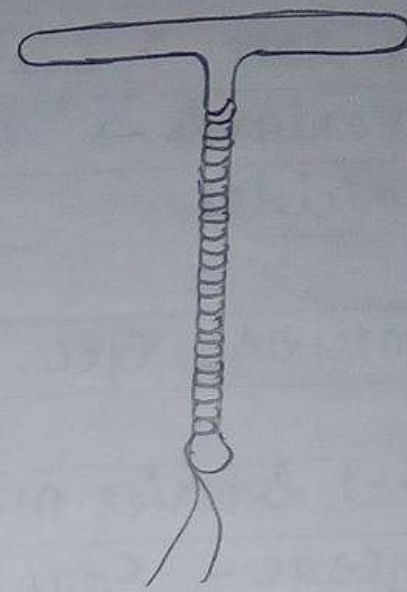
PSM I PRACTICAL RECORDS



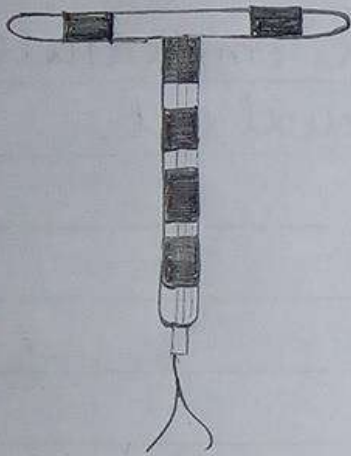
Lippes Loop



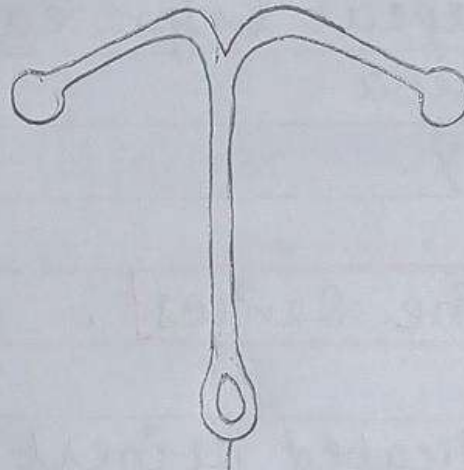
Cu-T 200B



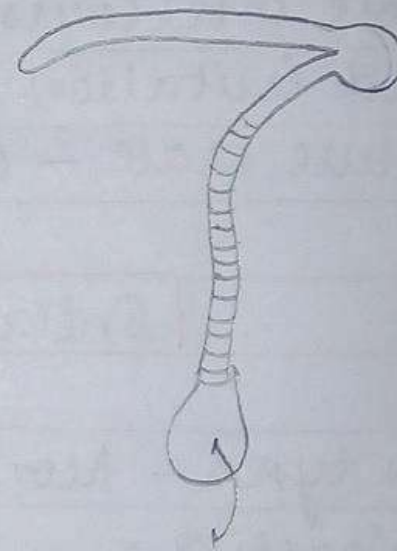
Cu-T 380A



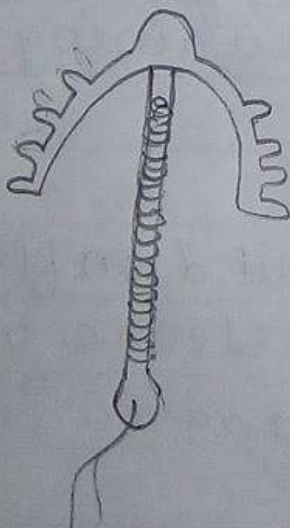
Cu-T 220C



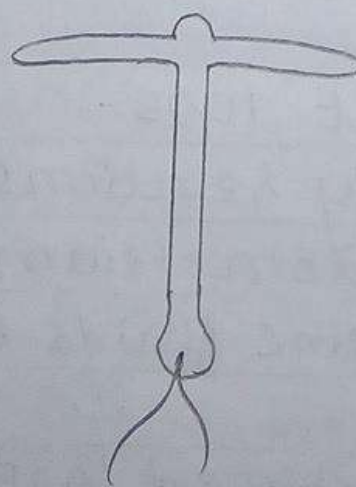
Nova T



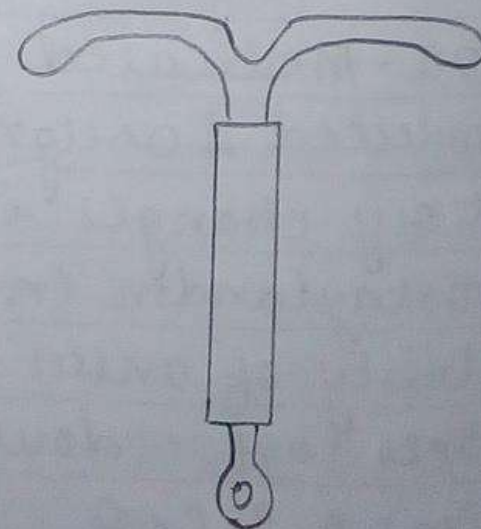
Copper 7



Multiload 375



Progestasert



Levonorgestrel IUD

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failure rate - 3/HWY.

- ② 2nd Generated IUCOS - Consist of copper or silver containing IUCOS. Copper brings about enzymatic and metabolic changes in endometrium and secretion and also produce changes in cervical Mucus eg -
T-Cu 2206, T-Cu 380 - Ag, NovaT-g
Multiload Cu 250/375

Progesterone Containing IUCOS:

- causes changes in decidualization with atrophy of endometrial glands, inhibits implantation
- Alters cervical mucus causing inhibition of sperm penetration of capacitation.

Advantages → simplicity of insertion, long term effectiveness highly effective, used as emergency, cost effective and reversible.

Disadvantages → Need to be replaced after stipulated time, trained person is required for insertion, need to follow up for initial few months.

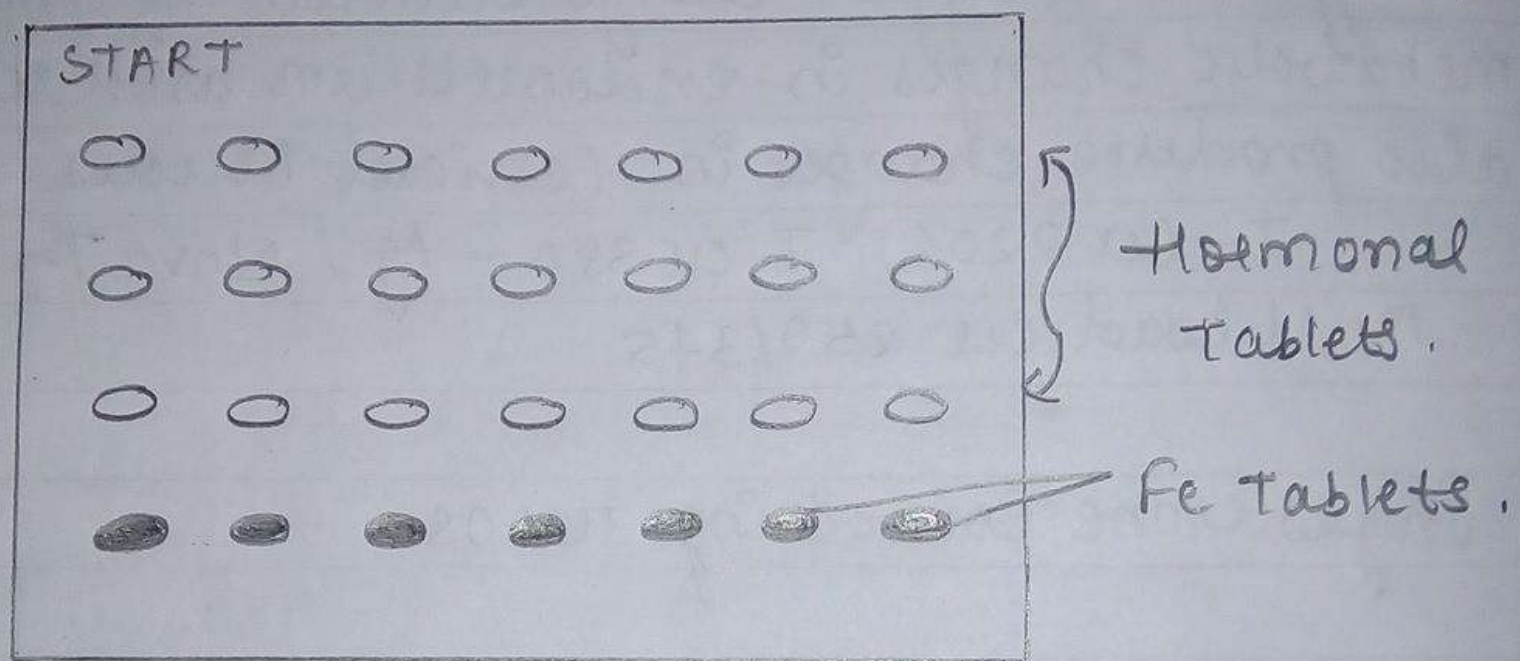
- No protection against HIV, STIs, heavy bleeding, Anaemia
Uterine perforation, menorrhagia, low back pain.

ORAL CONTRACEPTIVES

Action - It accepts fertilization.

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PSM I PRACTICAL RECORDS



OCP
(Oral Contraceptive Pills.)

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- It prevents ovulation process.
- Interferes with implantation.
- It does not effect placental functioning.

Combined OCP can be -

Monophasic - same estrogen and Progesterone in 21 Tablets.

Biphasic - 1st 10 tablets contain one dosage, other 12 tablets have some other estrogen and Progesterone.

- Least 7 tablets contain 60 mg iron elemental.

- Mala D and Mala N have same composition as ethinyl estradiol 0.03 mg & lero ergesterol - 0.15 mg.

Non-Contraceptives benefit.

Ovarian cancer.

Uterine cancer.

Fibroid

Ovarian cyst

PIO

WUB

Benign breast disease

Ectopic pregnancy

Endometriosis.

Side effect of OCP -

- Breast tenderness

- Weight gain, aggravation of migraine

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PSM I PRACTICAL RECORDS

Name	Progestin	(mg)
(A) With EE 0.02 mg Loestrin 1/20 Femilon	Norethisterone acetate Desogestrel	1.00 0.15
(B) With EE 0.03 mg Eugynon 30 Microgynon, Ovural L Triquilar (varying EE and levonorgestrel) Primovlar 30, Mala O, Choice Novelon Yasmin	Levonorgestrel Levonorgestrel Norgestrel Desogestrel Drospirenone	0.125 0.15 0.30 0.15 3.00
(C) With EE 0.50 mg and less progestogenic Eugynon 50, Ovulation Ovural B Ovural, Primovlar 50 Minovlar Ed Orlest Orthonovin 1/50	Norgestrel Levonorgestrel Norethisterone acetate Norethisterone	0.50 0.125 1.00 1.00
(D) With EE 0.05 mg and more progestogenic Orgalutin Norlestrin 2.5/50 Gynovlar 21 Anovlar 21	Dynestrol Norethisterone acetate - - - - - -	2.50 2.50 3.00 4.00

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bleeding disturbances.

Absolute contraindication.

- Hypercholesterolemia
- Hypotension
- Thrombophlebitis
- Pregnancy.
- Liver diseases
- Benign breast cancer
- Unknown vaginal bleeding.

Other preparations of combined contraceptives -

Transdermal patch, vaginal ring.

Progestone only pills

Contains very low dose of a progestin without any estrogen dose called as "minipills". It is beneficial for those who can't be comfortable with estrogen eg - Smoker, Uterine fibroid etc.

Mechanism of action - Thickening cervical mucosa.
• prevention of ovulation.

Failure rate - 0.3/Hwy.

Contraindications - Breast feeding, blood loss in deep veins, breast cancer, severe liver disease, infection, Taking barbiturate, Carbamazepine, phenytoin, primidone

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Sifampin or Letonair.

Cent chroman → Non steroid oral contraceptive

- Active ingredient - orelloxifene
- selective estrogen receptor modulator (SERM)
- Has antiestrogenic activity on endometrium and inhibits implantation.
- First 3 months one tablet twice a week, after 3 months one tablet once a week till contraception is desired.
- Side effects - Delay in menstrual cycle in some.
- Failure rate - 1.8 to 2.8/HWY

Progestin only injectables -

Norplant-1 - It has 6 rods each containing 36 mg of levonorgestrel.

Norplant-2 / 15 mg → It has 2 rods each having 15 mg and release drug at same dose as Norplant-1.

Implaxon → It has a single rod containing 68 mg of 3 keto. It is replaced after 3 years.

Mechanism -

Norplant - Thickening of cervical mucus, causing endometrial atrophy, suppressing LH Surge.

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