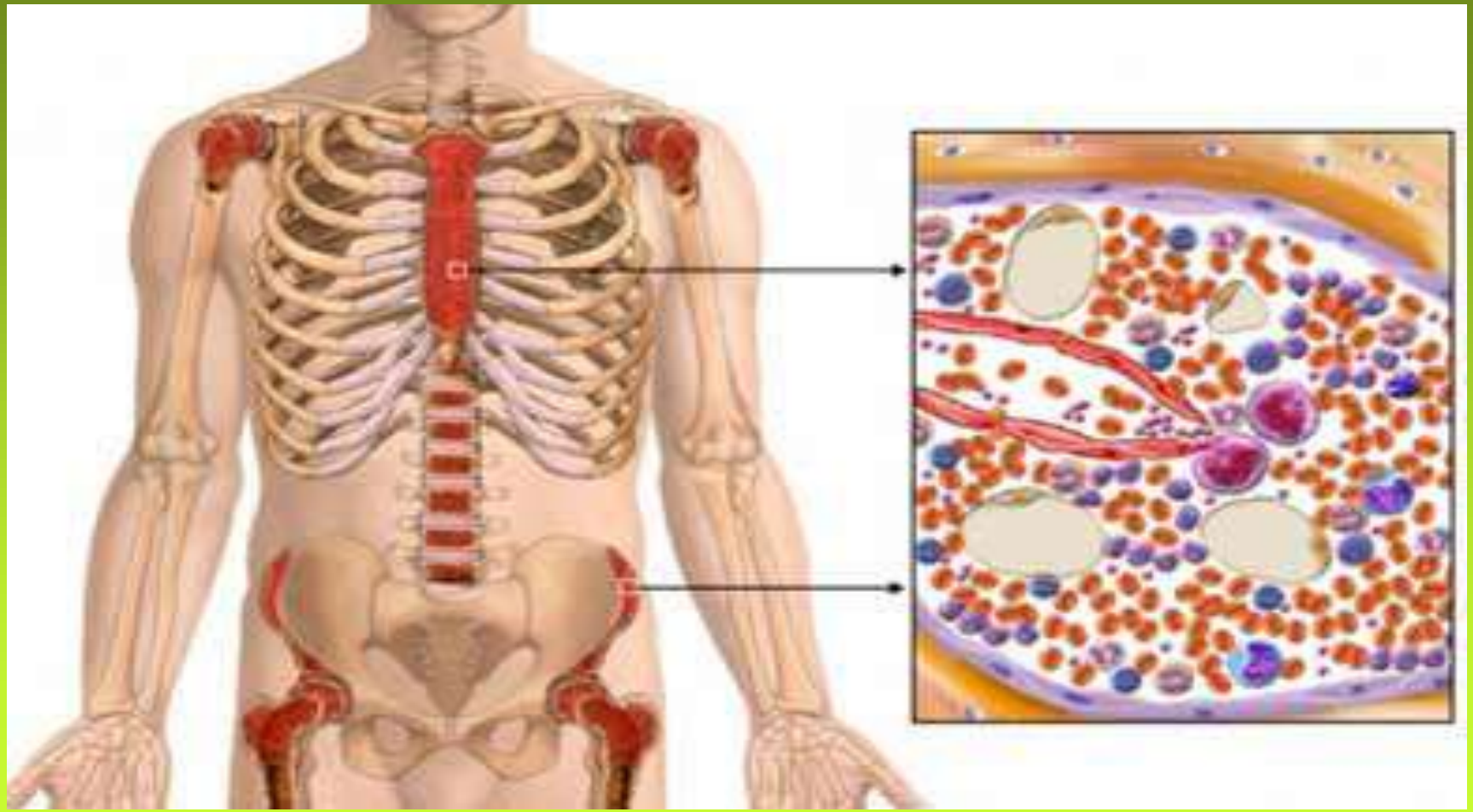
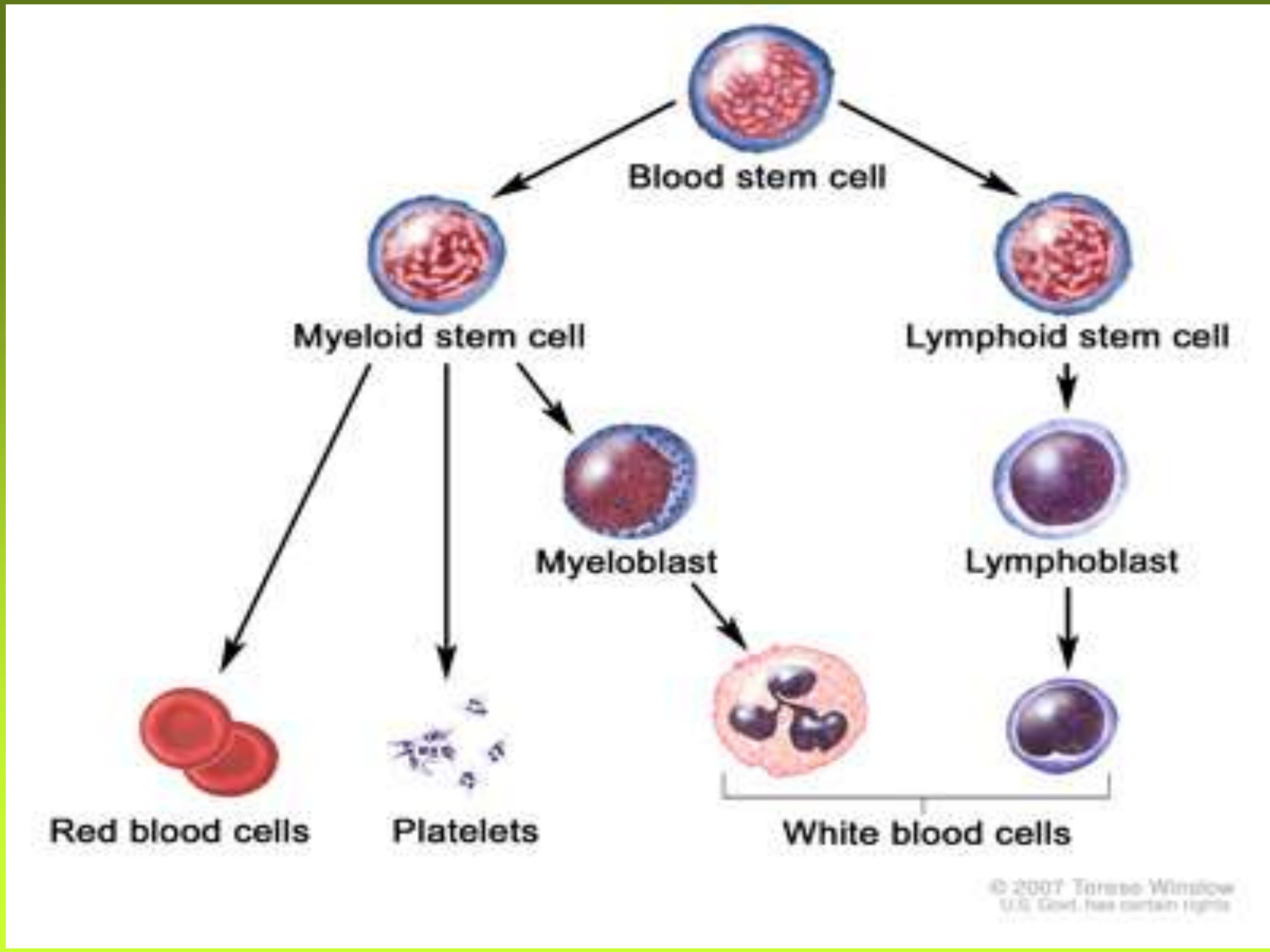
Intricacies and importance of nutrition planning for bone marrow transplant patients

Dr Revathi Raj

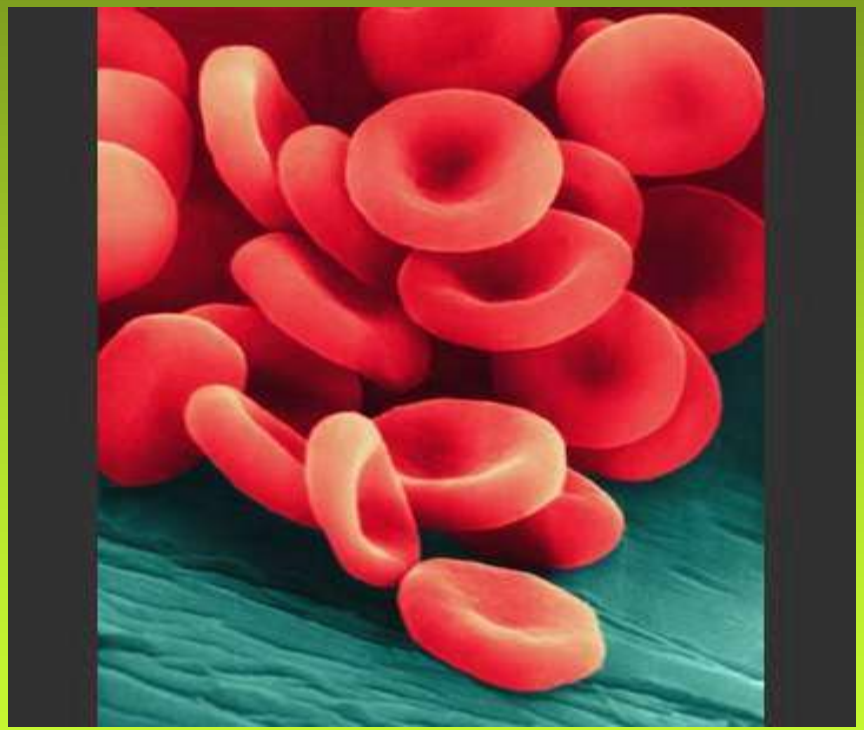
Apollo Hospitals, Chennai

What is bone marrow?

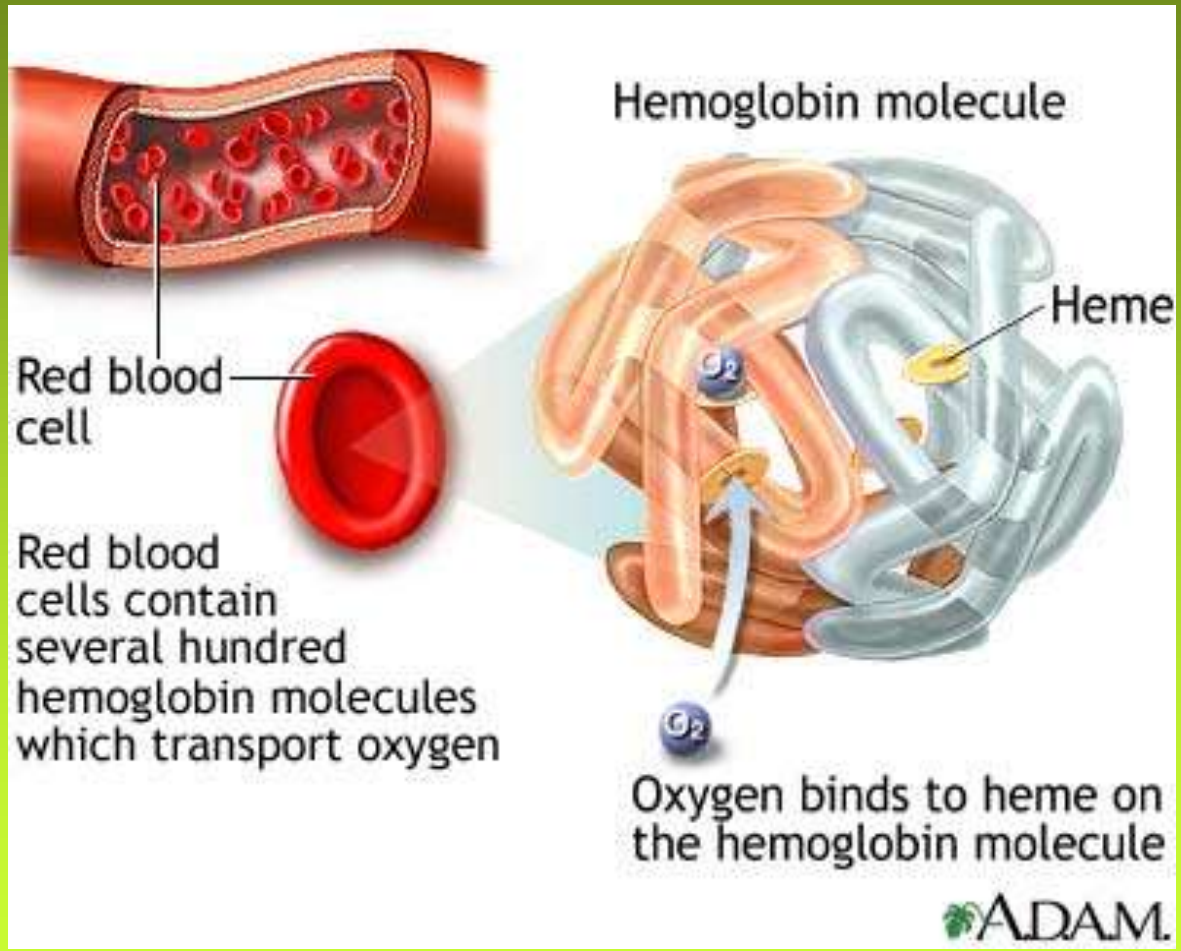


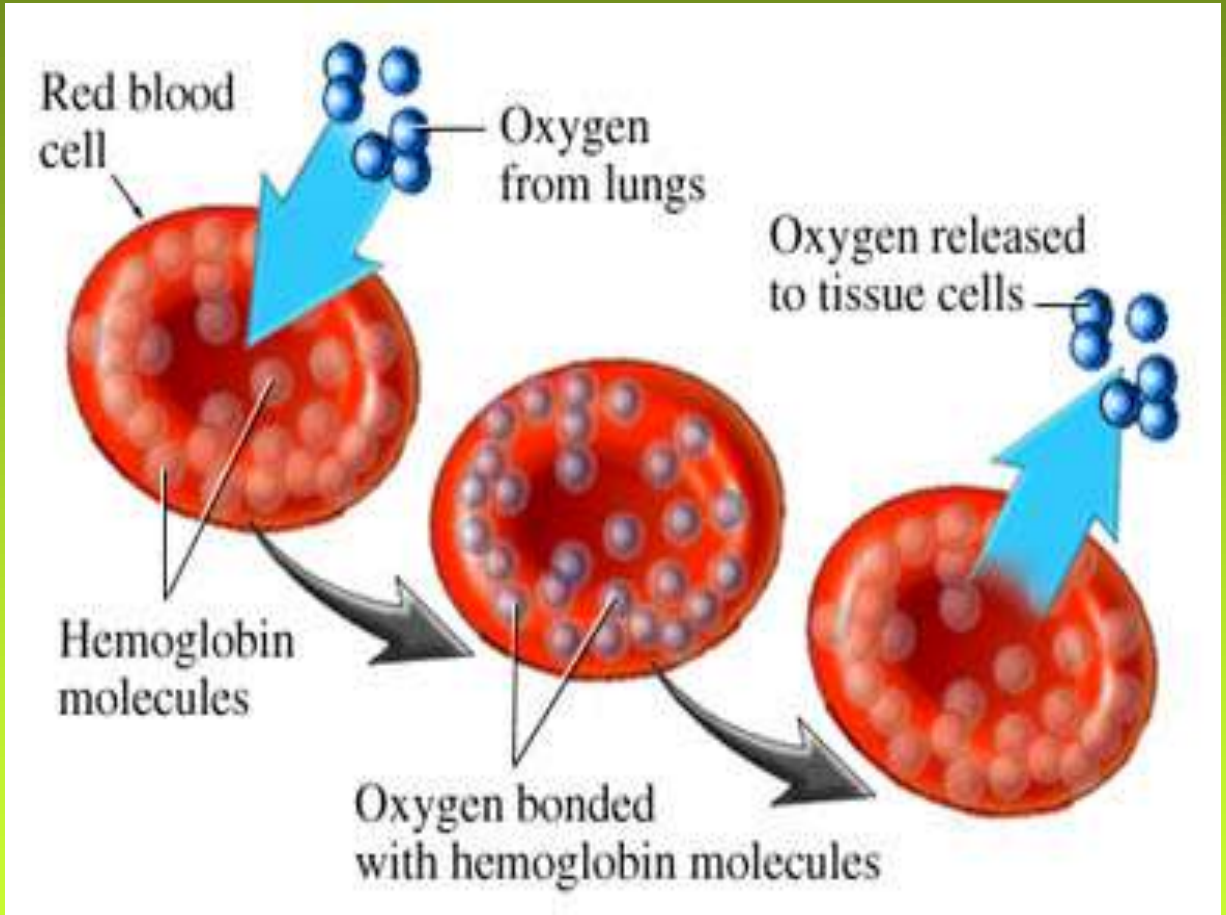

Blood stem cell
Myeloid stem cell
Lymphoid stem cell
Myeloblast
Lymphoblast
Red blood cells
Platelets
White blood cells

Red blood cells



Red blood cells carry oxygen




Red blood cell
Oxygen from lungs
Oxygen released to tissue cells
Hemoglobin molecules
Oxygen bonded with hemoglobin molecules

White blood cells

- Help fight infections
- WBC – 4000 TO 11000
- 50% NEUTROPHILS AND LYMPHOCYTES

The Invaders

- Bacteria
- Fungi
- Viruses
- Parasites

Our 1st Line of Defense...

- The Integumentary System…
  - Skin
  - Mucous membranes
  - Mucous
- Provide a physical barrier preventing microbial access

White blood cells come in…

- The Innate Immune system
- The Adaptive Immune System

Innate immunity

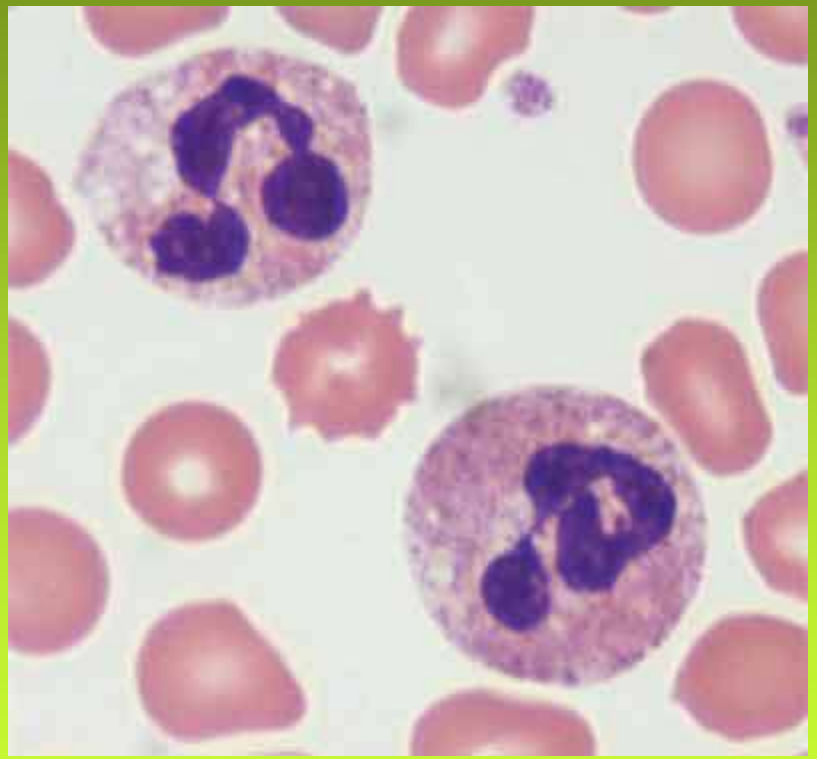
- Phagocytes are able to launch the first strike…

- Help from the ADAPTIVE IMMUNE System results in a coordinated successful defense

What are phagocytes ?

- Neutrophils

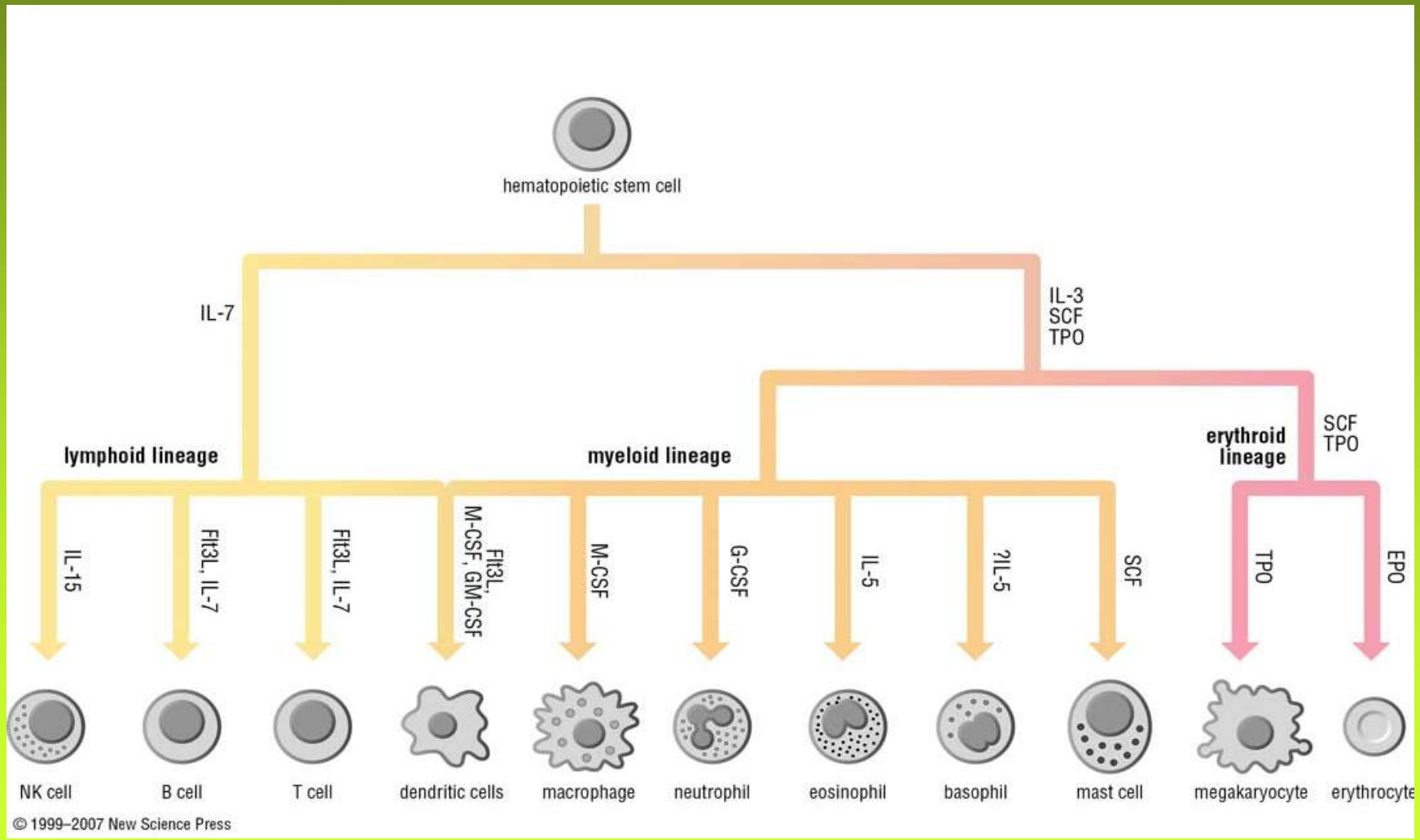
- Ingest small foreign invaders



Adaptive Immune System

- T lymphocytes - help signal immune cells into action
- B lymphocytes [B cells] - make antibodies

Our knights in shining armour!



NEUTROPENIA

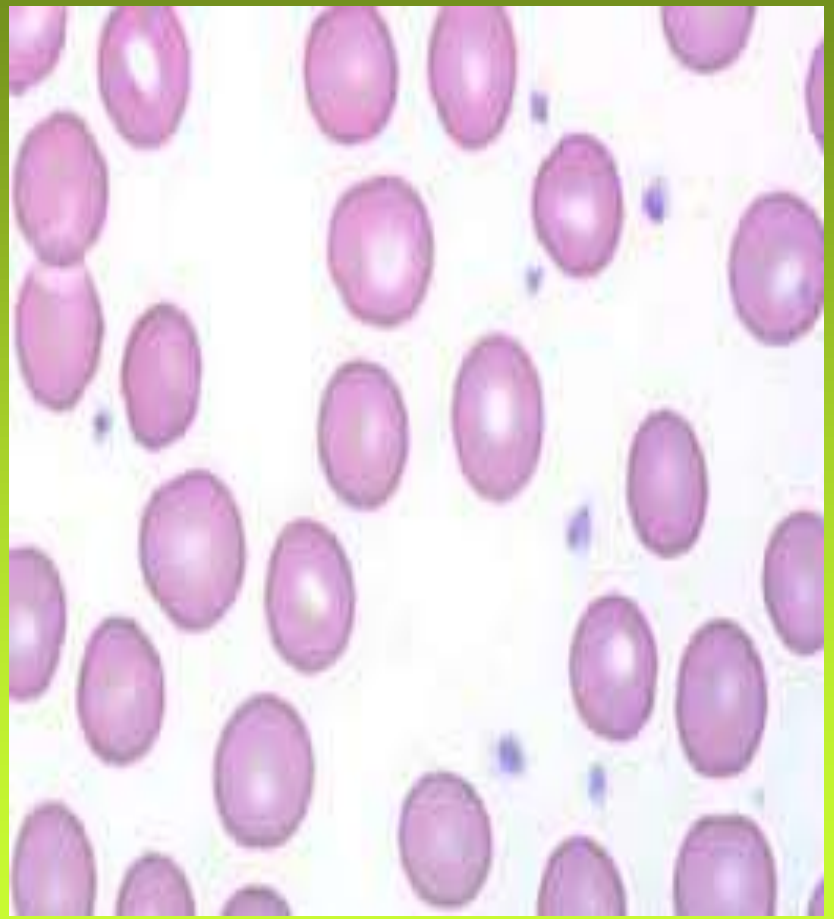
- ABSOLUTE NEUTROPHIL COUNT LESS THAN 1000

LYMPHOPENIA

- ABSOLUTE LYMPHOCYTE COUNT LESS THAN 1000

Platelets

- Help blood to clot
- 1.5 to 4 lakhs



What happens at our ward?

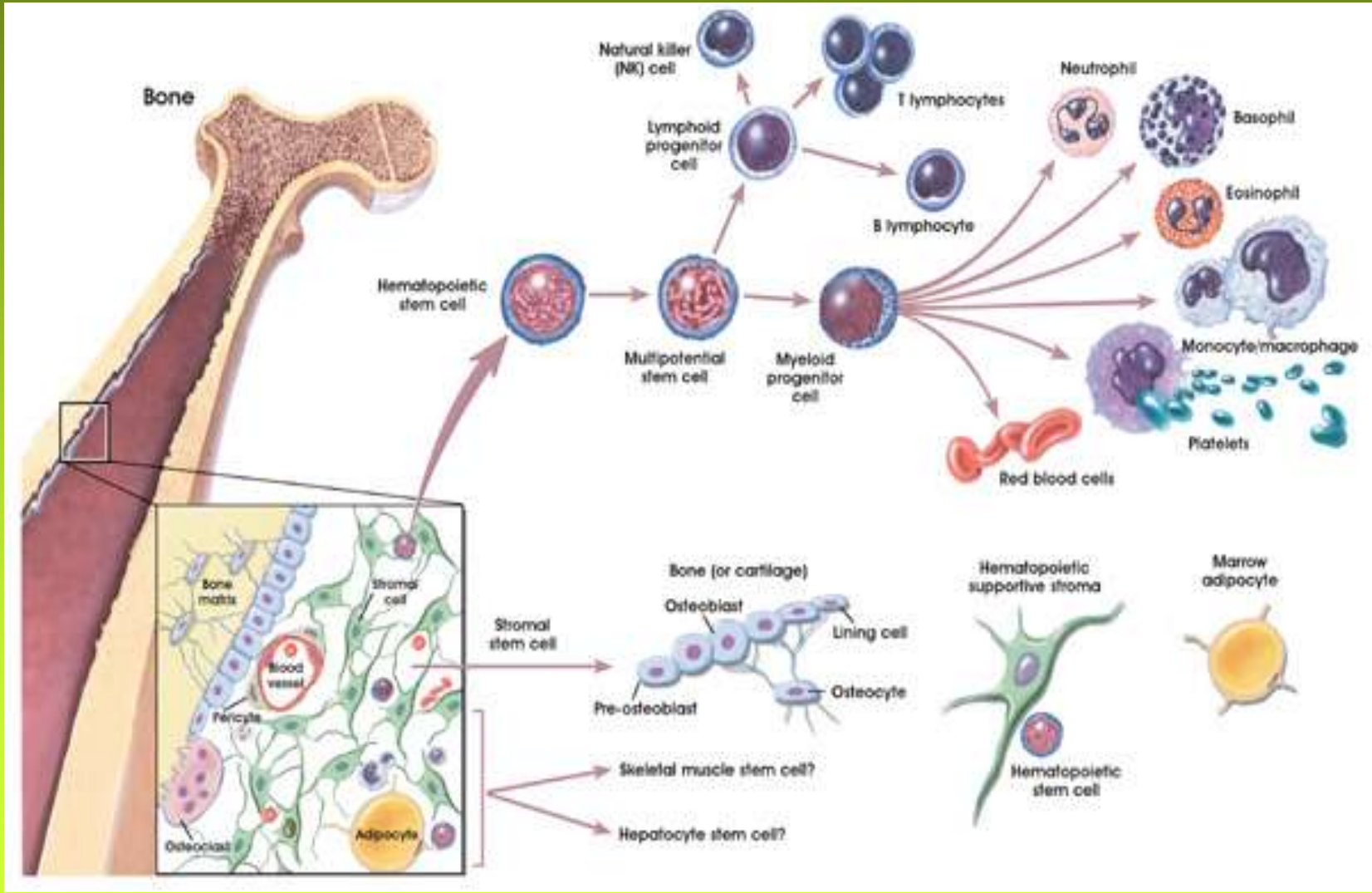
- High dose chemotherapy for various cancers

- Haematopoietic stem cell transplantation

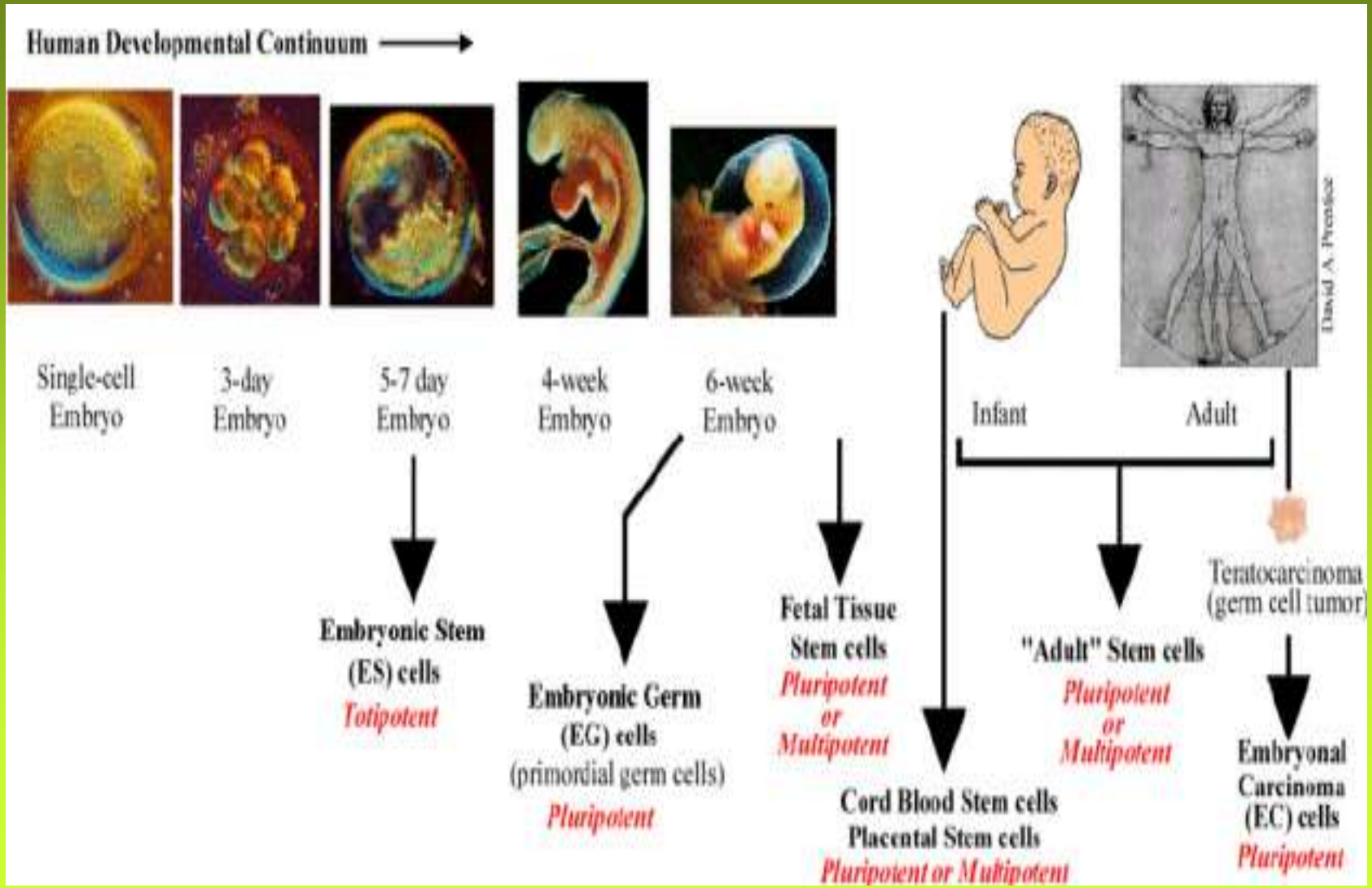
Fast growing cells

- Blood cells
- Hair cells
- Mucosa of the gut

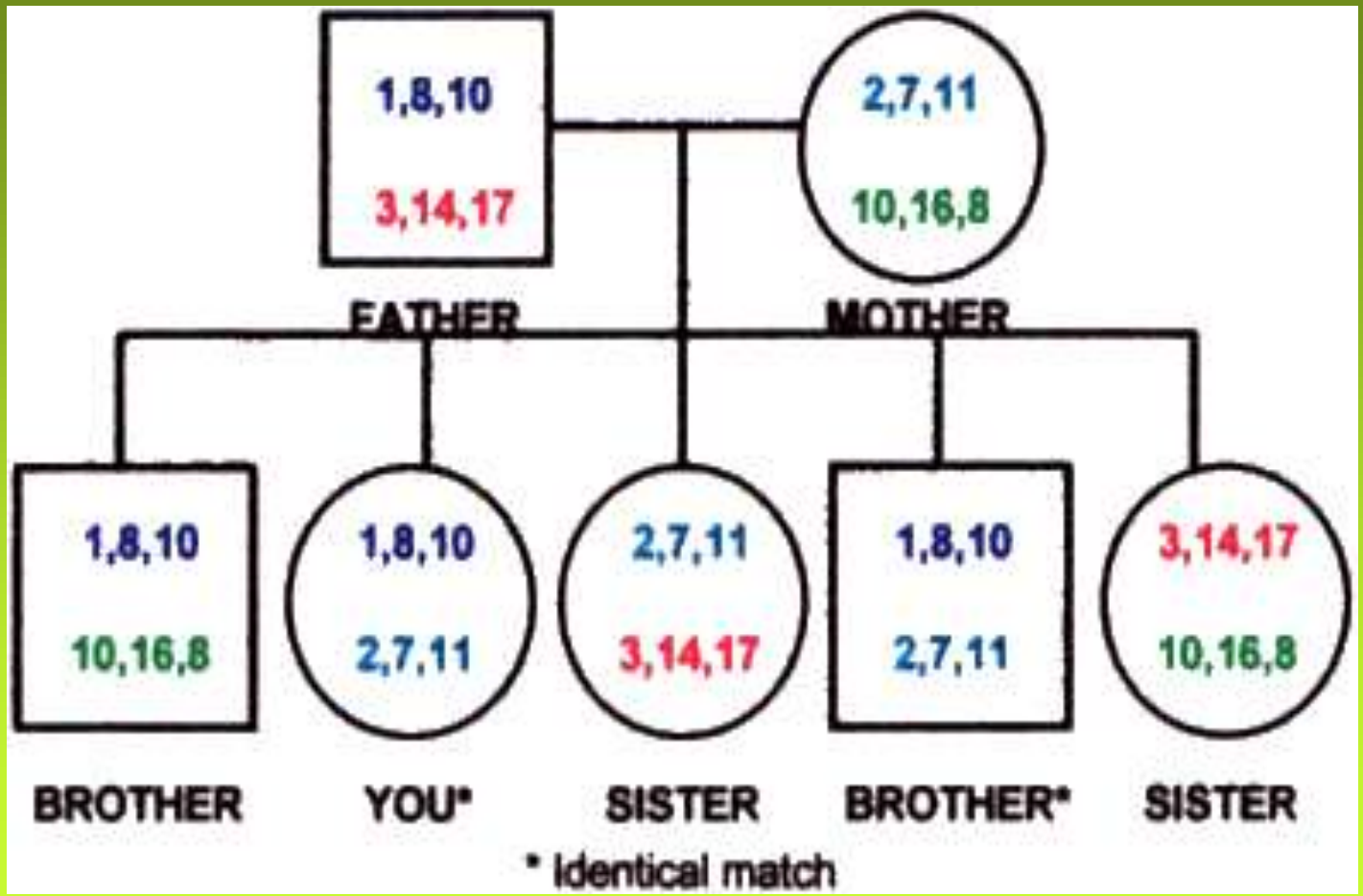
Haematopoietic stem cells…



Stem cell sources…



HLA TYPING


1,8,10
3,14,17
2,7,11
10,16,8
FATHER
MOTHER
1,8,10
10,16,8
1,8,10
2,7,11
2,7,11
3,14,17
1,8,10
2,7,11
3,14,17
10,16,8
BROTHER
YOU*
SISTER
BROTHER*
SISTER
* Identical match

Conditioning

- High dose chemotherapy
- Total body radiotherapy


SURGICAR

Bone marrow harvest

Peripheral blood stem cells

Cord blood stem cells

A view of the BMT unit…

In the BMT unit..

- Mucositis
- Vomiting, loose stools
- Hepatotoxicity
- Infections

Supportive care

Graft versus host disease

- Pea soup diarrhoea
- Villous atrophy

Before and after….

Case 1

- 11yr male - 2009 AML, ICU, intubated
- Normal wt 36.2kg but after ICU 27kg
- Severe mucositis with perianal ulcer
- SCT minimal symptoms
- Admission wt 32.5kg

Case 2

- 11 month old baby with immune deficiency and poor nutrition from chronic diarrhoea
- Starting unrelated cord transplantation
- Weight 4.2 kg
- Unable to tolerate full nasogastric feeds

Case 3

- 58 yr male MM diagnosed 2009
- Admission wt 61kg
- Day 40 post SCT wt 50kg
- Malnourished, fungal infection, fatigue
- Depressed thinks he’s dying
- Remains in hospital, electrolyte derangement

Why is nutrition important?

- Haematological malignancies have a varied impact on nutritional status
- Some patients have short episodes of nutritional depletion
- Others are admitted acutely and deteriorate rapidly

- Increasing aggressive anti-neoplastic regimens used
- Malnutrition is a negative complication

How does malnutrition occur?

- Reduced oral intake pre-admission
- Multiple courses of treatment
- Weight loss
- Under-nutrition

- Treatment side effects -Nausea, vomiting, diarrhoea, mucositis, taste changes, fear of eating, depression, fever, inadequate hospital food, increased metabolism, malabsorption

- Long in-pt admission

Nutritional complications

- Tissue stores become depleted of essential vitamins and minerals
- Low protein/energy stores reduce resistance to infection
- Low protein reduced oncotic pressure - oedema

- Leaky gut increases food-borne infection risk
- Bad bacteria translocate to lungs - chest infection, pnuemonia
- Pressure sores & poor wound healing

Effects of poor nutrition

- Hospital stay increased
- Drug bill increased
- Medical complications increased
- Recovery is prolonged

Why should we care?

- Patients malnourished during treatment poorer survival rates 3 yrs post BMT
- Critical phase of engraftment, nutrition should be provided

- Biological responses - time & success of engraftment, occurance & severity of mucositis, GVHD, VOD
- Mattsson et al (2006) concluded poor oral intake after SCT causes severe acute GVHD
-

- Pt outcome affected by nutritional status
- The cost of good nutrition is small the benefits huge

Reducing malnutrition risk

- Screen at each admission & during hospital stay
- Weight/height (kg/m2) - BMI

When to act?

- BMI below 20
- Ongoing side-effects
- Patient for multiple treatments
- Dietetic assistance and advice on weight gain

How do we make our nutritional decision?

- Calculate nutritional requirements
- Diet history
- Medical & social issues evaluated
-

- Weight charts x 1-2 wk
- Stool, fluid, temperature charts
- Biochemistry - daily

Resources

- Extras menu – good for younger patients
- Food record chart – essential to provide serial view of intake, content, preferred times, deterioration or improvement in intake
- Helpful flexible catering
- Motivated ward staff – encouraging patients, making supplements

- Written advice: nausea, vomiting, diarrhoea, taste
- Changes - clean diets, high protein energy, soft,supplements etc
- Dedicated nutritional supplement round the clock
- Positive reinforcement

Nutritional supplements

- Wide variety – what and when to use?

Nourishing drinks

- Resource, ensure, pediasure, novasource peptide

Powdered energy drinks

- They can be easily mixed into yoghurts, rice pudding, fruit juice or jelly to increase the protein and calorie content.

- Aminorich granules

Why NG?

- Patients can be fed overnight/day from small volumes to 100% of their requirements
- Reducing stress on having to eat at each meal time

- Semi-elemental feeds are excellent to assist with treatment related side effects,

  diarrhoea, nausea, healing of mucositis and

  speedy recovery

- If a food record chart indicates that food and supplements are not meeting nutritional requirements symptoms are ongoing or predicted to be severe (allo BMT)

TPN

- TPN does not use the GUT (God Uses This) = bacterial translocation

TPN

- TPN historically most common form of feed used in transplant patients
- Side effects of its own (↑ LFT's)
- It is costly
- We rarely use TPN (severe mucositis)

Neutropenic diet

- The most common vectors for food borne infectious epidemics are undercooked poultry and eggs and freshwater sources.
- Campylobacter, shigella and salmonella are the most common micro-organisms

They are NOT the common causes of Neutropenic infections.

- The majority of infections are caused by organisms present in the patients natural GI Flora and so, bacterial translocation can occur if GI peristaltic action is not maintained due to poor nutritional intake

- Utensils should be considered as another sources of infection

NEUTROPENIC DIETARY ADVICE

- Food safety/handling advice and avoidance of high risk foods
- Ensure food is thoroughly cooked
- Avoid re-heating practices
- Good food safety, handling, hygiene practices are essential to prevent contamination or recontamination of foods during food preparation and cooking processes
- Wash all fruit and vegetables adequately

- •Avoid high risk foods: live / bio yoghurts, probiotics, soft cheese
- Avoid raw/undercooked eggs, shellfish, pate/fish paste and raw meat/fish
- Avoid eating out / takeaways
- Use all food within their sell by/best before dates
- Avoid the use of microwaves for cooking foods; can be used for defrosting when followed by conventional cooking methods

- Nuts and seeds: no restrictions in cooked foods
- Beans Peas and Lentils: ensure well cooked
- Fats and oils - REDUCED
- Fruit and vegetables: avoid salad, raw vegetables and berries, ensure good quality (no damage or over-ripeness), wash well, core/peel, limit to well cooked products

- Processed Foods: ensure cooked adequately and follow manufacturers instructions
- Eating out and Takeaways: Avoid
- Herbs, Spices and pepper: avoid
- Miscellaneous: avoid using foods from large packages, or products from universal jars to minimise airborne cross bacterial contamination

Drinking Water Recommendations

- Filtered clean water
- Bottled water should be avoided in huge cans – small bottles only
- At home – boil water for 20 minutes, cool and use

- Avoid vitamins during chemotherapy phase
- Antioxidants not recommended during chemotherapy
- Oral glutamine helps reduce infections
- No advantage of IV glutamine
- No benefits of omega or other fatty acids
- Zinc supplements help with mucositis/diarrhoea

Bone Marrow Transplant patients

- 6 months post discharge maintain good food hygiene practices

Summary

- Multidisciplinary efforts are essential in providing the patient with nutritional support
- Good nutritional status improves patients side effects, recovery and survival outcome and it should be an integral part of patient treatment

Work together to improve standards of care

Thank you!

References

1 . Muscaritoli et al, Nutritional & metabolic support in Haem malignancies & HSCT 2005

2 . Mattsson J, et al, Poor oral nutrition after allogenic SCT correlates significantly with severe GVHD. BMT 2006 Nov;38(9)

3. Professional consensus statement for the use of clean diets in immunocompromised patients. Wendy Rees 2005. BDA.