DEPARTMENT OF HIGHER EDUCATION (M.P.)

VIRTUAL CLASS PRESENTATION

2017-18

Taxonomic Characters

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Taxonomic Characters

Contents

Introduction

- Characters, used to classify organisms on the basis of similarities and differences.
- is any attribute by which member of a taxon differs.

Importance

- Diagnostic aspects as Indicators or differences
- as indicator of relationship.
- easily produced, variability and representing material
- help in classification of organisms

Characteristics

i. apply to all members of the taxon
ii. qualitative and absolute
iii. observable without special equipment, dissection, or histological preparation
iv. fairly constant
v. fairly indestructible

Role of Taxonomic Characters in Modern Classification:

- Used in Cladistic analysis

Cladistic Analysis:-

is a means to classify organism w.r.t evolutionary history

Types of T.C in Cladistic Analysis

1. Primitive characters:

generates the basic grouping of organisms

e.g. Mammary glands and hair in mammals

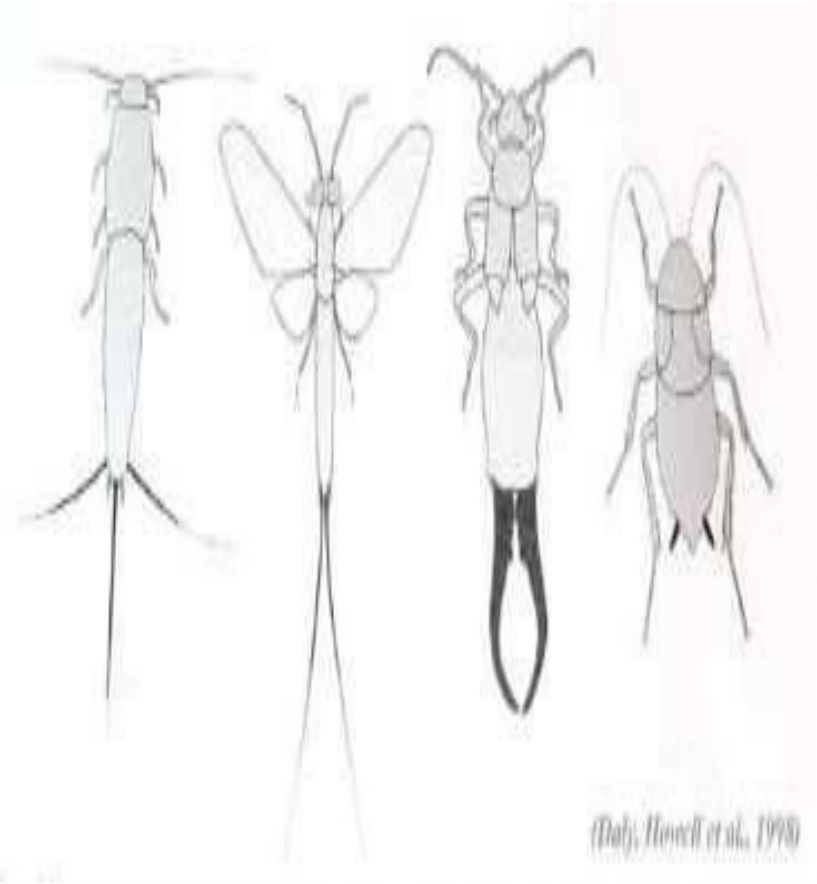
2. Derived characters:

tend to sort organisms by their presence or absence in the organism.

e.g. Modification in appendages.

Primitive Characters

Derived characters



Characters weighting

- "Method for inferring the phyletic information content of a character"
- Two conflicting characters gives the more reliable information

Types of Character weighting

1. A PRIORI (before the analysis)
   e.g. DESCENT WITH MODIFICATION

2. A POSTERIORI (after the analysis)
   e.g. CHARACTER CONGRUENCE

Characters with High Weight

- complexity
- -joint possession of derived characters (apomorphy)
- -constancy
- -consistency
- -not a specific adaptation
- -not affected by ecological shifts

e.g. Morphological & behavioral Characters

Characters with Low Weight

- high variability
- -monogenic or oligogenic characters
- -regressive (lost) characters
- -narrow specializations
- E.g. physiological Characters

Types of Taxonomic characters

❖ 5 basic types:

1. Morphological characters
2. Physiological characters
3. Behavioral character
4. Ecological characters
5. Geographic characters

Morphological Characters

a) General external morphology:-

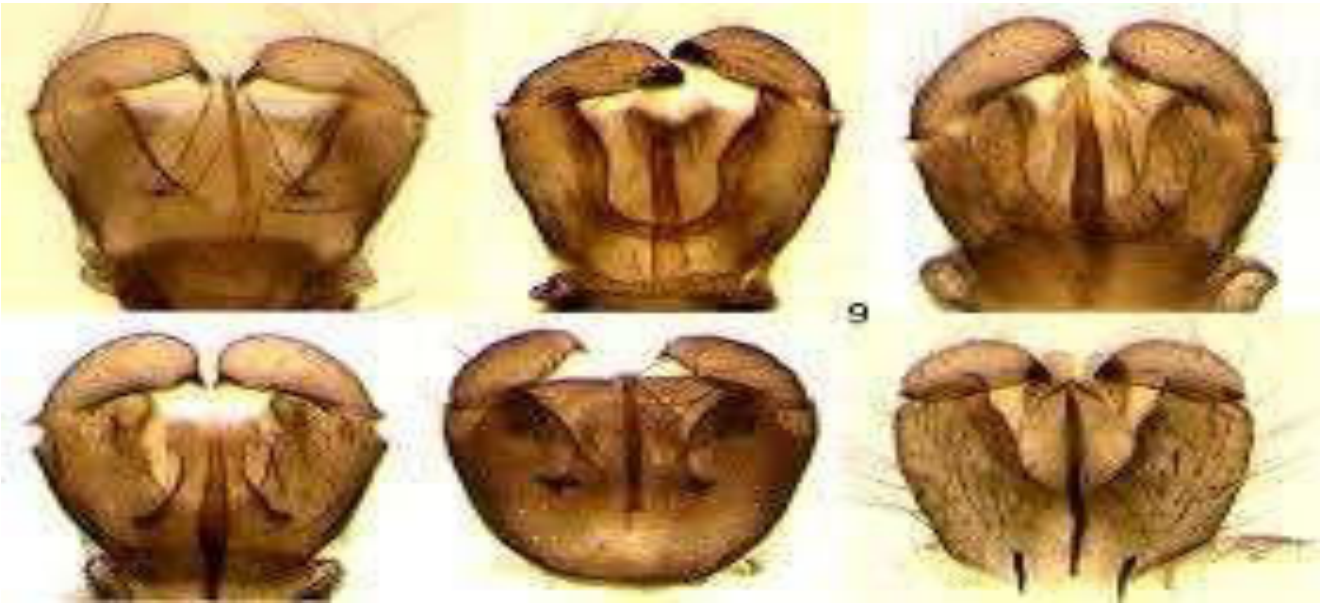
superficial features easy to diagnose

E.g. feathers on birds, scales on reptiles and arthropod's external skeleton

b) Special structures (e.g. genitalia):-

different genital structure of each specie

helps in reproductive isolation



c) ***Internal morphology (anatomy):-***

In higher animals usually anatomically homology

E.g. skull structures of higher animals

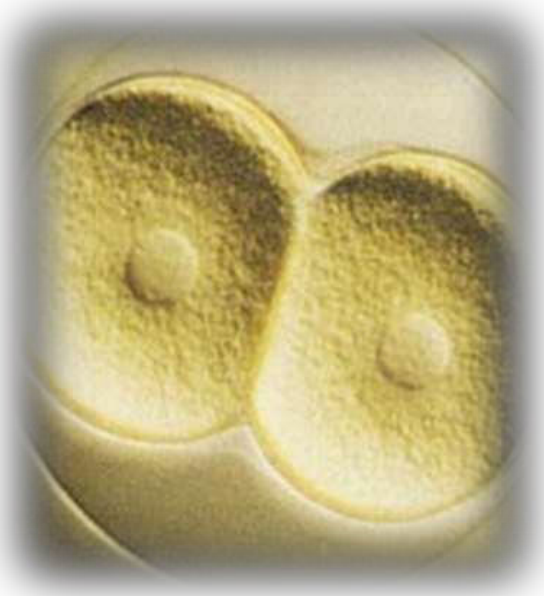
d) ***Embryology:***

1. Cleavage pattern

   e.g. Holoblastic or Meroblastic

2. Blastulation
3. Gastrulation

Holoblastic cleavage



Meroblastic cleavage

Embryonic Development in different species

e) ***Karyology and other cytological factors:-***

chromosome number in a specie helps in finding phylogenetic relationship

e.g. *Drosophila*

Common Name	Number of chromosomes
Buffalo	60
Cat	38
Cattle	60
Dog	78
Donkey	62
Goat	60
Horse	64
Human	46
Pig	38
Sheep	54

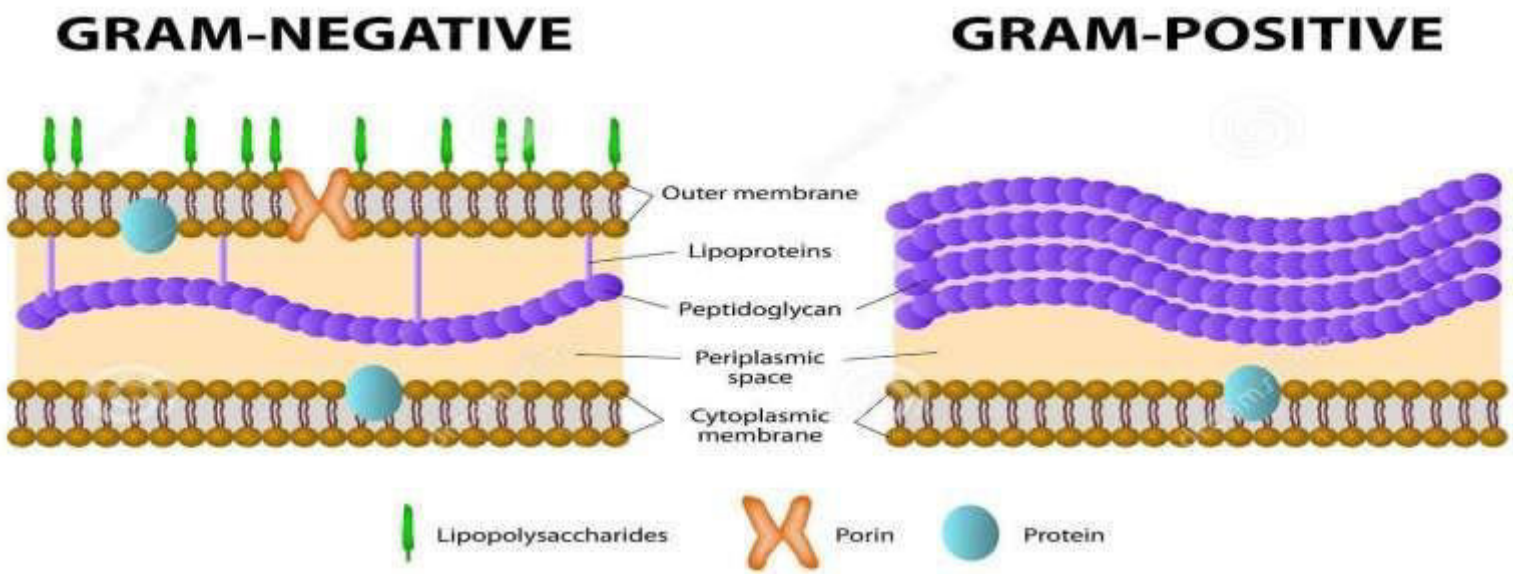
Physiological characters

a) ***Metabolic factors:-***

metabolic activities

helps in finding closely related species

e.g. Gram +ive and Gram –ive bacteria



b) ***Body secretions:-***

forms consistent patterns.

find morphology, numbers, size and structures of secretory glands.

e.g. waxy secretion of scale insects and mealy bugs

Scale insects covered with wax

c) ***Genic sterility factors:-***

- different species cannot reproduce a new young one by matting to each other.
- As a result of matting produce a genetically sterile specie
- They may be totally or partially infertile.

Infertile Species

Horse + Donkey = Mule

64 ch. + 62 ch. = sterile

Behavioral characters

a) ***Courtship and other ethological isolating mechanisms:-***

- matting and reproducing behavior of species
- help in taxonomic classification
- result in reproductive isolation and consequent speciation.
- E.g. Slugs

b) ***Other behavior patterns:-***

- living, eating and nesting behavior.
- E.g. drinking habit of pigeon and sand grouse

Ecological characters

a) ***Habitats and hosts:-***

living place of an organism

can’t share it to others

2 species can’t coexist in one habitat

same species can’t live in same organism

b) Food & Seasonal variations:-

Imp. Character in parasites classification

characteristics may vary depending upon the season

e.g. the plumage of birds, antlers of some mammals, and general breeding coloration

Butterflies in spring are typically larger than those in the fall.

c) Parasites & Host reactions:-

swelling, distortion, and perhaps mechanical injury

insects parasites can alter head size, wing venation, and other structural features

many other structural changes are also occur in host after parasitic attack

Geographic characters

a) ***General biogeographic distribution patterns:-***

- variation over geographic space
- researcher examine any structural change correlate to geography
- characters may exist in some geographic areas because of temperature, light, or other physical influences early in ontogeny

Inadmissible characters

- ✓ characters whose nature disqualifies to be used in numerical taxonomy
- ✓ which are:-

1. Meaningless characters
2. Logical correlated characters
3. Partial correlated characters
4. Invariant characters

Meaningless characters

- not a reflection of genotype of an organism itself
- are variable accordance to the environmental conditions
- is not measured
- E.g. running speed of rabbit

Logical correlated characters

- € Exclude characters which are logically correlated to each other
- € cannot include that characters
- € E.g. cannot use hemoglobin and redness of blood at a time

Partial correlated characters

- not completely but partially dependent to each other
- excluded during classification to avoid any problem.
- E.g. degree of melanization is not used along with skin color

Invariant characters

- vary within entire sample of organisms or taxa
- not add any information about affinities within the sample
- excluded during classification
- E.g. notable instances are seen in *bacteriology*

GAMETOGENESIS
BSc.I Year

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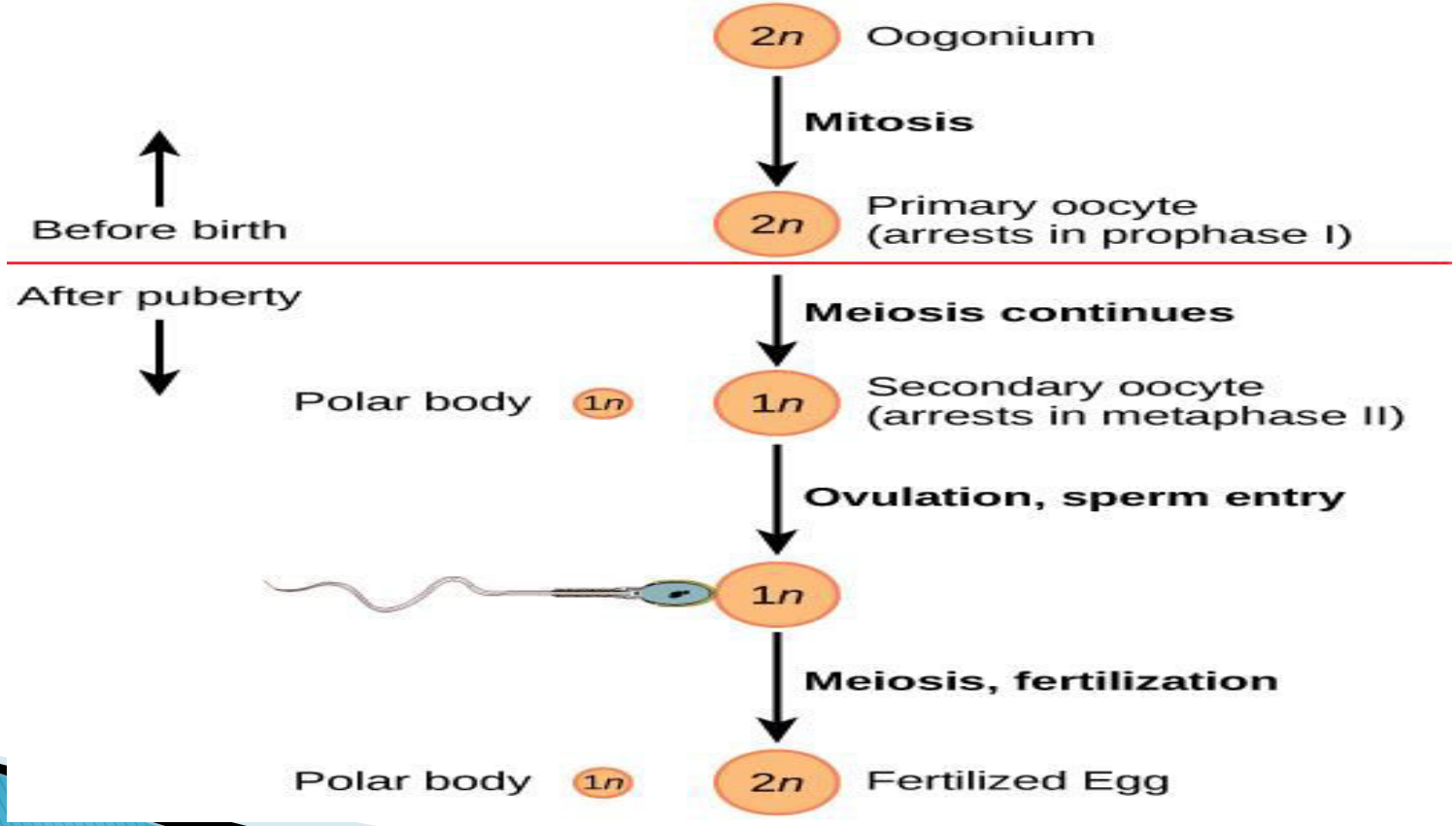
Gametogenesis (Spermatogenesis and Oogenesis)

Gametogenesis, the production of sperm and eggs, takes place through the process of meiosis. During meiosis, two cell divisions separate the paired chromosomes in the nucleus and then separate the chromatids that were made during an earlier stage of the cell's life cycle, resulting in gametes that each contain half the number of chromosomes as the parent. The production of sperm is called spermatogenesis and the production of eggs is called oogenesis.

Oogenesis

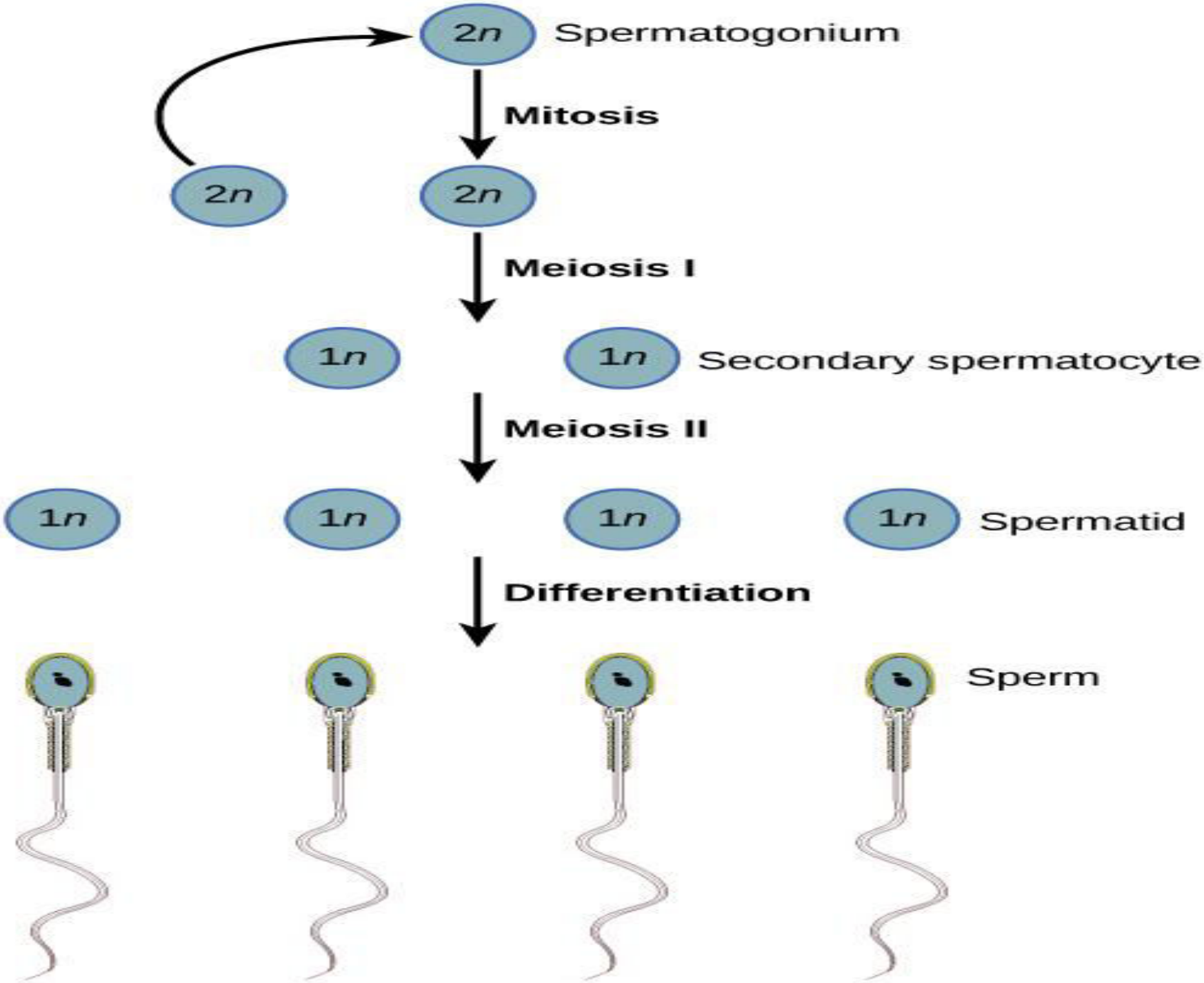
Oogenesis occurs in the outermost layers of the ovaries. As with sperm production, oogenesis starts with a germ cell, called an oogonium (plural: oogonia), but this cell undergoes mitosis to increase in number, eventually resulting in up to one to two million cells in the embryo.



The cell starting meiosis is called a primary oocyte. This cell will begin the first meiotic division, but be arrested in its progress in the first prophase stage. At the time of birth, all future eggs are in the prophase stage. At adolescence, anterior pituitary hormones cause the development of a number of follicles in an ovary. This results in the primary oocyte finishing the first meiotic division. The cell divides unequally, with most of the cellular material and organelles going to one cell, called a secondary oocyte, and only one set of chromosomes and a small amount of cytoplasm going to the other cell. This second cell is called a polar body and usually dies. A secondary meiotic arrest occurs, this time at the metaphase II stage. At ovulation, this secondary oocyte will be released and travel toward the uterus through the oviduct. If the secondary oocyte is fertilized, the cell continues through the meiosis II, completing meiosis, producing a second polar body and a fertilized egg containing all 46 chromosomes of a human being, half of them coming from the sperm.

Spermatogenesis

Spermatogenesis occurs in the wall of the seminiferous tubules, with stem cells at the periphery of the tube and the spermatozoa at the lumen of the tube. Immediately under the capsule of the tubule are diploid, undifferentiated cells. These stem cells, called spermatogonia (singular: spermatagonium), go through mitosis with one offspring going on to differentiate into a sperm cell, while the othr gives rise to the next generation of sperm.


2n
Spermatogonium
Mitosis
2n
2n
Meiosis I
1n
1n
Secondary spermatocyte
Meiosis II
1n
1n
1n
1n
Spermatid
Differentiation
Sperm

Meiosis begins with a cell called a primary spermatocyte. At the end of the first meiotic division, a haploid cell is produced called a secondary spermatocyte. This haploid cell must go through another meiotic cell division. The cell produced at the end of meiosis is called a spermatid. When it reaches the lumen of the tubule and grows a flagellum (or “tail”), it is called a sperm cell. Four sperm result from each primary spermatocyte that goes through meiosis.

Stem cells are deposited during gestation and are present at birth through the beginning of adolescence, but in an inactive state. During adolescence, gonadotropic hormones from the anterior pituitary cause the activation of these cells and the production of viable sperm. This continues into old age.

Department of Zoology
Phylum Protozoa

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Main characteristic features OF PHYLUM PROTOZOA:

1. They are 0.001-5mm, microscopic
2. They are unicellular
2. Free living, symbiotic, commersal, parasites
3. Solitary, colonial (but free)
4. Body assymetrical
5. Body shape stable
6. Locomotion by pseudopodia, flagella, cilia
7. Respiration and excretion from body surface

Main characteristic features:

8. Sexual and asexual reproduction
9. Asexual repro by binary and multiple fission
10. Sexual repro by conjugation of gametes
11. Digestion holozoic, holophytic, saprozoic or parasitic
12. Encystment occurs in adverse conditions
13. Alternation of generation in Life cycle
14. No physiolgical differentiation as all the activities occur in one cell

Classification

- **Sub Phylum 1: Plasmodroma**

1. Locomotion by pseudopodia and flagella, cilia absent

2. Nucleus one or many but all are similar

3. Autotrophic heterotrophic both, 4. No spore formation

- **Class 1: Mastigophora**

1. Locomotion by flagella, 2. Body covered by pellicle

3. Free living or parasite

Sub Class A: Phytomastiginae

Locomotion by flagella, free living. Reserve food in form of paramylon or starch

Chlorophyl and chromatophore present

Sub Class A: Phytomastiginae

Order 1: Chrysomonadina

Small flagella, thin pellicle

Chromatophores of green or yellow color,

Sometimes saprophytic,

In cytoplasma food is present in oil or leucosin

Example : Chrysamoeba, Ochromonas

Sub Class A: Phytomastiginae

Order 2: Chryptomonadina

2 Flagellae develop from 1 basal granule,
Chromatophore brown, red or green,
Holophytic or saprophytic,

Food deposited in form of oil and starch drops,

Fresh water or marine

Example : Chryptomonas, Chilomonas

Sub Class A: Phytomastiginae

Order 3: Euglenoidina

Very organized

1 or 2 Long Flagella

Pellicle thick and strong

Mouth, gullet, vacuoles and stigma present

Holophytic

Food preserved in form of paramylum and oil

Fresh water living

Example : Euglena, Rhabdomonas, Copromonas

Sub Class A: Phytomastiginae

Order 4: Phytomonadina

Generally 2flagella Around this cellulose covering

Mouth absent, Red colored stigma present

Generally a big leaf shaped chromatophore

Nutrition holophytic

Freshwater living

Food stored in form of starch

Example : Chlamydomonas, Volvox, Pandrorina

Sub Class B: Zoomastigina

Chromatophore absent

Holozoic or saprozoic

Order 1: Rhyzomastigina

Example : Mastigamoeba

Order 2: Choanoflagellina

Example : Proterospongia

Order 3: Diplomonadina

Example : Leishmania, Trypanosoma

Sub Class B: Zoomastigina

Order 4: Diplomonadina

Example : Giardia

Order 5: Trichomonadina

Example : Trichomonas

Order 6: Hypermastigina

Example : Trychonympha

Class 2: Sarcodina

Sub Class A: Rhizopoda

Order 1: Lobosa

Example : Amoeba

Order 2: Testacea

Example : Arcella

Order 3: Foraminifera

Example : Polystomella

Order 4: Mycetozoa

Example : Didynium

Class 2: Sarcodina

Sub Class B: Actinopoda

Order 1: Actinophrys

Example : Amoeba

Order 2: Radiolaria

Example : Actinomma

Class 3: Opalinata

Order 1: Opalinida

Example : Opalina

Class 4: Sporozoa

- **Sub Class A : Telosporidia**

Order 1: Gregarinida

Example : Gregarina

Order 2: Coccidea

Example : Eimeria

Order 3: Gaemosporidia

Example : Plasmodium

Class 4: Sporozoa

- **Sub Class B: Piroplasmea**

Order 1: Pyroplasmida

Example : Babesia

Class 4: Sporozoa

- **Sub Class C : Cnidosporidia**

Order 1: Myxosporidia

Example : Myxidium

Order 2: Actinomyxidia

Example : Triactinomyxon

Order 3: Helicosporidia

Example : Helicosporidium

Order 4: Microsporidia

Example : Nosema

Class 4: Sporozoa

- **Sub Class D : Acnidosporidia**

Order 1: Sarcosporidia

Example : Sarcocystis

Order 2: Haplosporidia

Example : Ichthyosporidium

Class 4: Sporozoa

- **Sub Class E : Toxoplasmia**

Order 1: Toxoplasmida

Example : Toxoplasm

Sub Phylum Ciliophora
Class 1: Ciliata

- **Sub Class A : Holotricha**

Order 1: Gymnostomatida

Example : Didinium

Order 2: Trichostomatida

Example : Balantidium

Order 3: Chonotrichida

Example : Spirochona

Order 4: Apostomatida

Example : Polyspira

Order 5: Astomatida

Example : Anoplophrya

Order 6: Hymanostomatida

Example : Paramecium

Class 1: Ciliata

- **Sub Class B : Peritricha**

Order 1: Peritrichida

Example : Trichodina

Class 1: Ciliata

- **Sub Class C : Suctoria**

Order 1: Suctorida

Example : Ephelota

Class 1: Ciliata

- **Sub Class D : Cnidosporidia**

Order 1: Heterotrichida

Example : Nyctotherus

Order 2: Oligotrichida

Example : Strombilidium

Order 3: Hypotrichida

Example : Euplotes

Order 4: Tintinida

Example : Tintinopsis

Order 5: Entodinimorphida

Example : Epidinium

Order 6: Odontostomatida

Example : Saprodinium

Thanks

- Thanks

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VIRTUAL CLASS PRESENTATION

B.Sc. VI semester 2017

Environmental Factors

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INTRODUCTION :- okrkoj.k izR;sd tho ds pkjksa vksj dh ifjfLFkfr;ksa] voLFkkvksa vkSj oLrqvksa dk ,d tfVy ra= gSA ;s okrkoj.k **tSfod (Biotic)** rFkk **vtSfod (Abiotic)** nksuksa izdkj ds gksrs gSaA dksbZ Hkh ifjfLFkfr] inkFkZ ;k 'kfDr tks fdlh tho dks fdlh& u & fdlh :Ik esa izHkkfor djrh gS mls dkjd **(Factor)** dgrs gSaA

Environmental Factors
¼okrkoj.kh; dkjd½

1- tSfod dkjd **(Biotic factor)**
2- vtSfod dkjd **(Abiotic factor)**

ÅfLVax us okrkoj.k ds dkjdksa dks **iakp oxksZa** esa rFkk **Mkcsuek;j us lkr** fuEufyf[kr oxksZa esa foHkkftr fd;k gS %&

1- e`nk] 2- ty] 3- rki] 4- izdk'k] 5- okrkoj.k] 6- vkx] 7 tSfod dkjdA

vtSfod dkjd (Abiotic factor)

vtSfod dkjdksa dks rhu oxksZa esa ck¡Vk x;k gS &
1- tyok;q lEcU/kh dkjd (Climatic factor)
2- LFkykd`frd dkjd (Topographical factor)
3- e`nh; dkjd (Edaphic factor)

(A) tyok;q lEcU/kh dkjd (Climatic factor)

fdlh Hkh Lfkku dh tyok;q] rki] izdk'k] ikuh vkSj vknzZrk ls izHkkfor gksrh gSA

(1) rkiØe (Temperature)

;g **vtSfod dkjd** gS] tks thoks o`f) rFkk forj.k esa ,d **lhekdkjh dkjd** dk dk;Z djrk gSA rkiØe dh **lgu'khyrk 10 &45** Mhxzh lsYlh;l rd gksrh gSA ftl rkiØe ij izk.kh dh xfrfof/k;k¡ vf/kdr gksrh gSa] mls **vuqdwyre rkiØe dgrs gSa]** tks izR;sd thoksa ds fy, vyx& vyx gksrk gSA rkiØe thoksa dh fofHkUu fØ;kvksa dks izHkkfor djrk gS] ftlesa **mikip; tuu] o`f)] fyax vuqikr] Ropk dh o.kZdrk ij rki dk izHkko**

(2) izdk’k (Ligth)

;g Hkh ,d izeq[k **vtSfod dkjd** gS] ftldk thoksa ds ifjo/kZu rFkk forj.k ij izHkko iM+rk gSA ;g ikS/kksa esa izdk'k&la'ys"k.k] ok"iksRltZu] 'olu rFkk o`f) dks izHkkfor djrk gSA

mikip; ij izHkko

izpyu ij izHkko

iztuu ij izHkko

Ropk dh o.kZdrk ij izHkko

n`f"V ij izHkko

(3) ty (Water)

;g Hkh **vtSfod dkjd** gSA ty ds fcuk thou lEHko ugha gSA ikuh **thoksa ds fodkl] forj.k] izdh.kZu rFkk mikip;** dks lh/ks izHkkfor djrh gSaA ty **thonzO; dk yXkHkx 70&90** izfr'kr Hkkx cukrk gS vkSj fofHkUu tSfod rFkk jklk;fud fØ;kvksa dk izeq[k ek/;e gSA blls tyh; rFkk LFkkyh; ifjfLFkfrd ra= izHkkfor gksrk gSA

foyk;d ds :i esa

tyh; tUrqvksa esa ty fu;eu

LFkyh; tUrqvksa esa ty fu;eu

(4) vknzZrk (Humidity)

ok;qe.My esa ty **ok"i** ds :i esa jgrk gSA bls ok;q dh ueh ;k **ok;qe.Myh; vknzZrk** dgrs gSaA

(5) ok;q (Air)

ok;q dk ikS/kksa o tUrqvksa ds thou ij cgqr izHkko iM+rk gSA ikS/kksa dh vusd fØ;k,¡ tSls & **ijkx.k] o`f)] ok"iksRltZu** vkfn ok;q ls izHkkfor gksrh gSaA blh izdkj tUrqvksa dh dqN izxfr vkSj muds LiksjksfLkLV ok;q ds }kjk ,d LFkku ls nwljs LFkku rd igq¡pk;s tkrs gSaA

(6) nkc vkSj izokg (Pressure and Current)

leqnzksa esa nzo LFkSfrd nkc thoksa dk fu/kkZj.k djrk gSA leqnz dh xgjkbZ esa izkf.k;ksa dh la[;k de gks tkrh gSA ty esa nkc rFkk izHkko dk lh/kk izokg iks"kdksa dh lkUnzrk ij iM+rk gSA tyh; tUrq vius vkidks ygjksa vkSj /kkjk ds izfr vuqdwfyr dj ysrs gSaA

(7) xq:Ro (Gravity)

xq:Ro cy i`Foh ds dsUnz ls nwjh ds lkFk ifjofrZr gksrk jgrk gSA ;g ifjorZu mu izkf.k;ksa dks izHkkfor ugha djrk tks Hkwe/; js[kk ls /kzqoksa rd fopj.k djr gSaA xq:Ro dk izHkko izkf.k;ksa dh lajpuk] forj.k rFkk foU;kl ij iM+rk gSA

(B) LFkykd`frd dkjd (Topographical factor)

fdlh Hkh LFkku dk leqnz dh lrg ls Å¡pkbZ] Hkwfe dh <yku] igkM+ksa dh fn'kk ,sls LFkkykd`frd dkjd gksrsa gSa] tks ty rFkk ok;oh; ifjfLFkfr;ksa dks lh/ks izHkkfor djrh gSaA blh dkj.k ;g okrkoj.k ds izeq[k dkjd gksrs gSaA izeq[k LFkkykd`fr dkj.k fuEufyf[kr gSa %&

(1) igkM+ksa dh Å¡pkbZ (Height of mountain)

leqnz dh lrg ls tSls& tSls Å¡pkbZ c<+rh gS] **rkiØe] ok;qe.Myh; nkc] ok;q dh xfr] vknzZrk** vkfn esa Hkh ifjorZu gksrk gSA bu lHkh dkjdksa esa ifjorZu ds dkj.k ikS/kksa ,oa izkf.k;ksa dk fo'k;k fHkUu & fHkUu gksrk gSA

(2) Hkwfe dk <yku (Slope of earth)

Hkwfe dk <yku lw;Z dh fofdj.k dh rhozrk rFkk feV~Vh ds xq.kksa dks izHkkfor djrk gSA nf{k.k fn'kk esa ik;s tkus okys <ykuksa dk rkieku mRrjh fn'kk ds <ykuksa ls vf/kd gksrk gS] D;ksafd bu ij fnu ds le; lw;Z dh fdj.ksa lh/kh iM+rh gSa rFkk FkksM+s le; ds fy, ls fdj.ksa mRrjh <yku ij friNh gksrh gSaA

(3) igkM+ksa dh fn’kk (Direction of mountains)

igkM+ksa dh fn'kk] o"kkZ dh ek=k] ouksa dk ?kukiu] de ?kus ;k e:LFkyh {ks= dk fu/kkZj.k djrh gSA blds dkj.k izkf.k;ksa dk forj.k vkSj thou izHkkfor gksrk gSA

(C) e`nh; dkjd (Edaphic or soil factors)

e`nk ;k Hkwfe dh lajpuk ,oa la?kVu ls lEcfU/kr dkjd e`nh; dkjd dgykrs gSaA

tSfod dkjd (Biotic factor)

izkf.k;ksa rFkk ouLifr;ksa dk thou okrkoj.k ds vuqlkj ,d&nwljs ls izHkkfor gksrk gSA fofHkUu fØ;k,¡ tSls& **iks"k.k] iztuu] ifjo/kZu] ijkx.k] chtksa dk forj.k] ijthfork vkSj lgthfork** vkfn buds vkilh lEcU/kksa ls izHkkfor gksrs gSaA Lo;a euq"; izkf.k;ksa rFkk ouLifr;ksa ds thou dks fdlh& u& fdlh :i esa izHkkfor djrk gSA

1& ,d gh tkfr ds fofHkUu lnL;ksa ds chp ds lEcU/k dks **vUr% tkrh;** lEcU/k dgrs gSaA

2& fofHkUu tkfr;ksa ds chp ds lEcU/k dks **vUrtkZrh; lEcU/k** dgrs gSaA ;s vUrtkZrh; lEcU/k gh tSfod dkjd dgykrs gSaA izkf.k;ksa esa vUrtkZrh; lEcU/kksa dks fuEufyf[kr rhu oxksZ esa foHkkftr fd;k x;k gS %&

lgthfork (Symbiosis)

fojks/krk (Antagonism)

fu"izHkkfork (Neutralism)

(A) ldkjkRed ikjLifjd fØ;k,¡

(1) lgthfork (Symbiosis)

;g nks tkfr ds lnL;ksa ds chp dkf;Zdh lEcU/k gksrk gSA ftlds vUrxZr ,d ;k nksuksa tkfr ds lnL; ykHkkfUor gksrs gSaA ;g nks tkfr ds lnL;ksa ds chp ikjLifjd ldkjkRed fØ;k gS tks vkokl] iks"k.k] vk/kkj] vkJ;] lqj{kk] ifjogu ds fy, gksrh gSA **;g lEcU/k vLFkk;h] ;k LFkk;h] fodYih ;k vfodYih izdkj dh gksrh gSA nksuksa tkfr ds lnL; fujUrj ;k vfujUrj izdkj ls lEcfU/kr gksrs gSaA** lEidZ rFkk lEcU/k ds vuqlkj lgthfork rhu izdkj dh gksrh gSa %&

1& lgksidkfjrk] 2& lgHkksftrk] 3& lg;ksx

lgksidkfjrk %& rhu izdkj ds lEcU/kksa dks n'kkZrs gSa %&

ikS/ks & ikS/ks

izk.kh& izk.kh

ikS/ks & izk.kh

lgHkksftrk %& dk okLrfod vFkZ gksrk gS& ,d gh est ij Hkkstu djukA ;g nks fHkUu tkfr ds nks thoksa ds chp ,slk lEcU/k gS] ftlesa ,d tkfr dk tho ykHkkfUor gksrk gSA

lg;ksx %& ;g izksVkstkskvk ls ysdj mPp oxZ ds tLrqvksa ds chp ik;k tkrk gSA blls

(B) fojks/krk ;k udkjkRed (Negative) ikjLifjd fØ;k,¡

fojks/krk ,d udkjkRed ikjLifjd fØ;k gSA blesa ,d tkfr ds tho dks YkkHk gS rks nwljs tho dks fdlh u fdlh :i esa gkfu gksrh gSA fojks/krk pkj izdkj dh gksrh gS %&

1& izfrthfork] 2& ijthfork] 3& ijHkf{krk]

4& izfrLi/kkZA

(C) fu“izHkkfork (Neutralism)

blesa nks ;k vf/kd tkfr ds thoksa ds ,d lkFk jgus ,d ,d& nwljs ds Åij dksbZ izHkko ugha iM+rk] fu"izHkkfor dgrs gSaA **mgkgj.k &** fxygjh rFkk jksfcu i{kh ,d lkFk ,d gh isM+ ij jgrs gSa] ysfdu nksuksa Hkkstu ;k vkJ; ds fy, ,d&nwljs dks izHkkfor ugha djrs vkSj LorU= thou thrs gSaA

THANKING YOU

Biological Rhythms

Animals

Dr. Shahina Parveen
Govt. Dr S.P.M. Sci. & Comm. College, Bhopal

DEFINITIONS

- Biological clock is an internal timing system which continues without external time clues, and controls the time of activities of plants and animals
- Period of the rhythm the time it takes to complete one cycle of activity
- Phase shift when the onset of the period of the rhythm is changed either earlier or later. This occurs when you travel around the earth into different time zones. It can be artificially induced by controlling the light and dark periods

DEFINITIONS CONT….

- Free running period this is the time when the clock is running without any clues from the environment, so it ‘runs free’
- Entrainment this is the resetting of the clock on a regular basis, forcing it to take up the period of the environment
- Zeitgeber – the environmental agent that resets the biological clock eg light or temp

DEFINITIONS CONT….

- Circa – because each of the rhythms is not exactly the time length stated, eg daily is not 24 hours, their names start with **circa** (which means ‘about’)
- Photoperiod – the responses of plants and animals to the lengths of day and night

Biological Timing responses to the abiotic world

- All organisms respond to various cues
- The responses can be:
  - Annual cycles – yearly changes of the season
  - Daily – night and day
  - Lunar – monthly, often related to the moon
  - Tidal – related to the ebb and flow of the tides
- It is to an individual's advantage to synchronise its activities to these rhythms
- There are three basic ways to do this

SYNCHRONISING TO RHYTHMS

- *Exogenous* - A rhythm that is control by the external, environmental stimulai detected by the organisms

- *Endogenous* – A rhythm that is controlled by an internal biological clock

- *Combination* – of both endogenous and exogenous

ENDOGENOUS

- Sometimes it is hard to tell if a rhythm is endogenous or exogenous. It is endogenous if it can be shown that one of the following criteria apply:
  - The rhythm may have a frequency that is not exactly the same as the period of an external environmental factor, eg light, temperature etc
  - The period of the endogenous rhythm usually deviates from the natural rhythm when studied under constant laboratory conditions
  - The rhythm may persist when the organism is moved from one part of the world to another

Biological Clocks

- The existence of circadian and circannual rhythms means that animals must have a way of keeping track of time
- They have an internal clock which lets them predict and prepare for changes to come
- The biological clock in animals is found in the hypothalamus of the brain
- It is
  - Sensitive to environmental cues
  - Can be stopped and reset
  - Is very accurate
  - Is inherited

Biological Clocks Cont…

- Biological clocks are used for:
- Control of the daily rhythms of the body
- Reproduction timing
- Preparing for migration by eating of plenty of food
- Preparing for winter by storing of food, increasing thickness of coat and hibernating
- Navigating by the sun or stars

Circadian Rhythms

- Animals are active at different times of the day
- Diurnal – active during the day, inactive at night
- Nocturnal – active at night, inactive during the day
- Crepuscular – active at dawn and dusk
- Arrhythmic – no regular pattern – tend to be found were changes in the microclimate are negligible

EXAMPLES OF CIRCADIAN RHYTHMS

- Periods of activity
- Periods of sleep
- Physiological processes
- Endocrine system rhythms
- Temperature changes
- Heart rate rhythms
- Pain rhythms
- Alcohol metabolism rhythms
- Times of births and deaths, etc

CIRCAMONTHLY RHYTHMS

- Some animals synchronise their behaviour with the phases of the moon
- Changes associated with tidal patterns are also considered circamonthly (lunar)
- The spawning behaviour of some marine worms is synchronised by the moon so that the egg and sperm are released at the same time
- Grunion fish also work on this method of spawning, using the tides

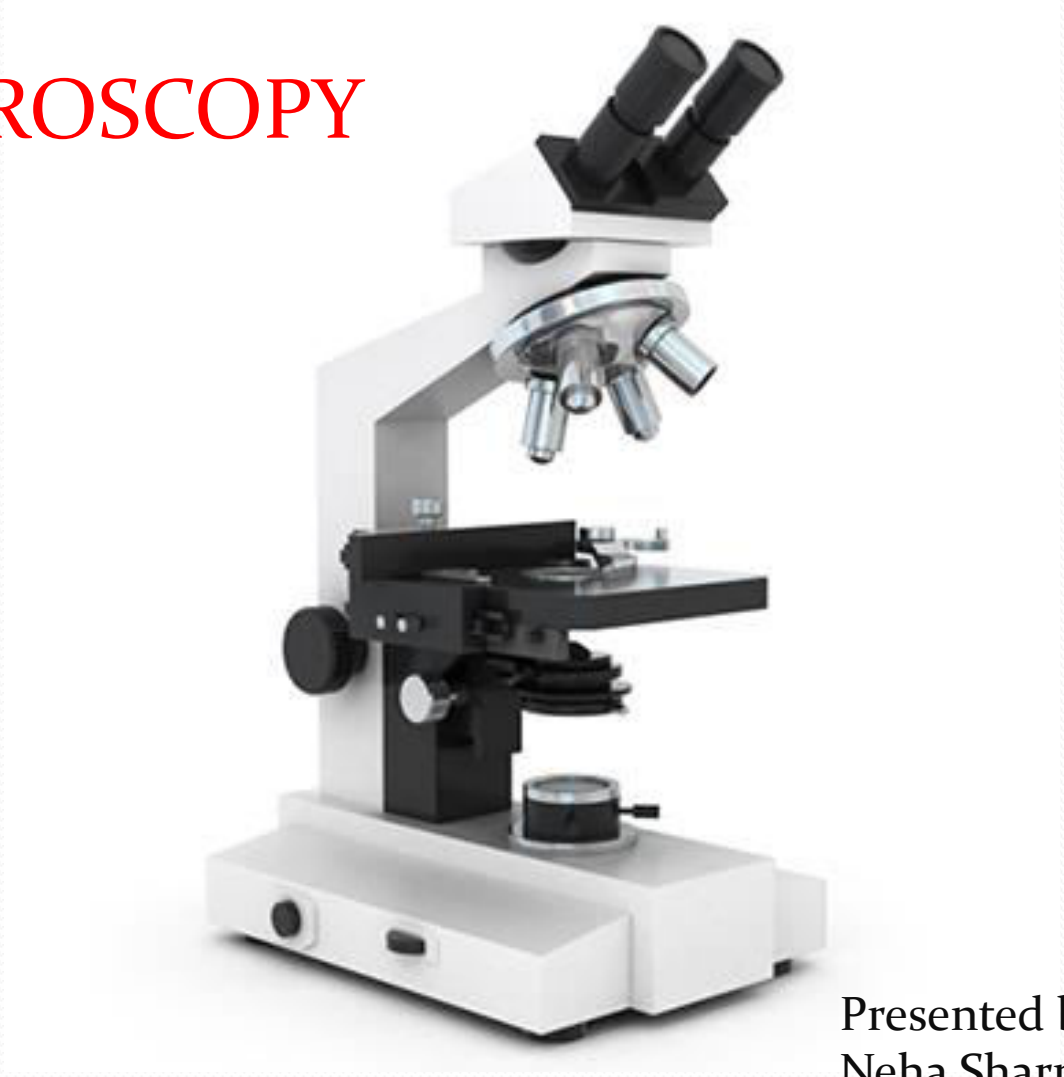
Circannual Rhythms

- These result from the rotation of the earth around the sun
- Also a factor is seasonal changes caused by the tilt of the earth and the seasons produced as it rotates around the sun
- Examples of circannual rhythms are:
- Migration to and from breeding sites
- Hibernation
- Reproduction cycles
- Hibernation
- Aestivation

CIRCANNUAL RHYTHMS CONT….

- Hibernation - This is the way some animals survive over winter by slowing their metabolic rate
- Aestivation – this is a form of hibernation over summer when the weather gets too dry or temperature gets too hot
- Reproduction – the method by which most animals reproduce when conditions are most favourable, ie spring

MICROSCOPY



Presented by
Neha Sharma
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DEFINITION

- A microscope (Greek: *micron* = small and *scopos* = aim).
- MICROSCOPE - An instrument for viewing objects that are too small to be seen by the naked or unaided eye.
- MICROSCOPY - The science of investigating small objects using such an instrument is called microscopy

HISTORICAL BACKGROUND

1590 - Hans Janssen developed first microscope.

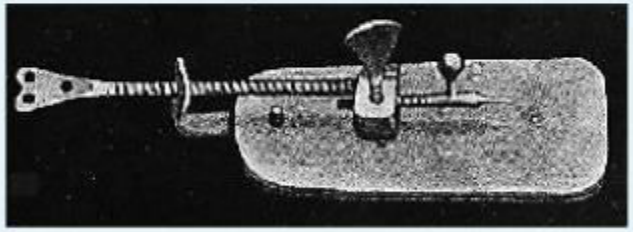
1609 - Galileo Galilei developed first compound microscope

1620 - Christian Huygens, another Dutchman, developed a simple 2-lens ocular system .

Anton van Leeuwenhoek
(1632-1723)

- Anton van Leeuwenhoek is generally credited with bringing the microscope to the attention of biologists.
- 1661 - He discovered bacteria, free-living and parasitic microscopic protists, sperm cells, blood cells, microscopic nematodes etc.
- He is the father of Microscopy

Anton von Leeuwenhoek



Microscope used by Anton von Leeuwenhoek

Principle:

- A simple microscope is used to obtain small magnifications. It is usually to used for study of microscopic algae, fungi and biological specimen.

- Light from a light source (mirror) passes through a thin transparent object. A biconvex lens magnifies the size of the object to get an enlarged virtual image..

- **Parts of a Simple Microscope:**
- The parts of a simple microscope are of two categories as follows:
- (i) Mechanical parts
- (ii) Optical parts

COMPOUND MICROSCOPE

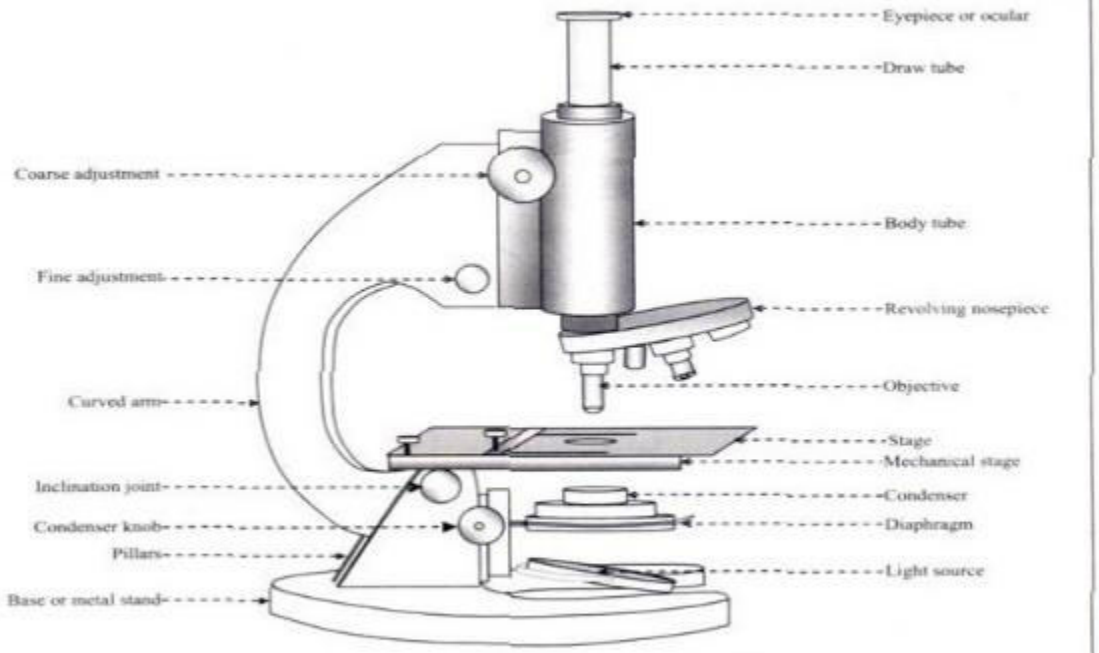


Figure 4.6: A compound microscope

TERMS RELATED TO MICROSCOPE

- ***MAGNIFICATION***
  - **Degree of enlargement**
  - **No of times the length, breadth or diameter, of an object is multiplied**
  - ***RESOLUTION* – Ability to reveal closely adjacent structural details as separate and distinct**
  - ***LIMIT OF RESOLUTION (LR)* – The min distance between two visible bodies at which they can be seen as separate and not in contact with each other**

BRIGHT FIELD MICROSCOPE

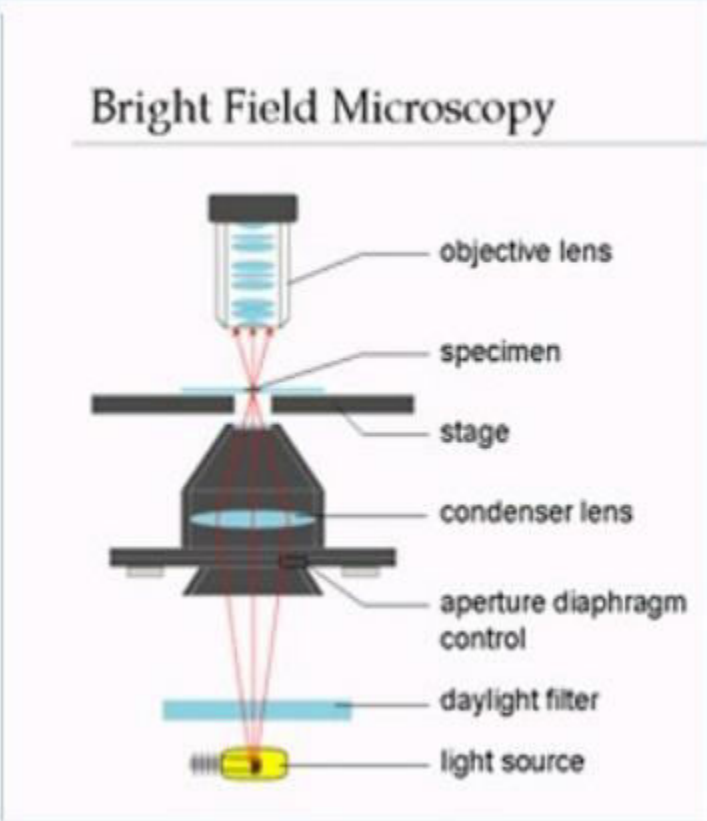
PRINCIPLE

- In bright-field microscopy a specimen is placed on the stage of the microscope and the microscope's light source is aimed at a lens beneath the specimen. This lens is called a condenser.
- The condeser usually contains an aperture diaphragm to control and focuslight on the specimen; light passes through the specimen and the is collected by an objective lens situated in a turret above the stage.

- The objective magnifies the light and transmits it to an oracular lens or eyepiece and into the user's eyes. Some of the light is absorbed by stains, pigmentation, or dense areas of the sample and this contrast allows you to see the specimen.

- For good results with this microscopic technique, the microscope should have a light source that can provide intense illumination necessary at high magnifications and lower light levels for lower magnifications

RAY DIAGRAM OF BRIGHT FIELD MICROSCOPE



ADVANTAGES

- Bright field microscopy is very simple to use with fewer adjustments needed to be made to view specimens.
- Some specimens can be viewed without staining and the optics used in the bright-field technique don't alter the colour of the specimen.
- It is adaptable with new technology and optional pieces of equipment can be implemented .

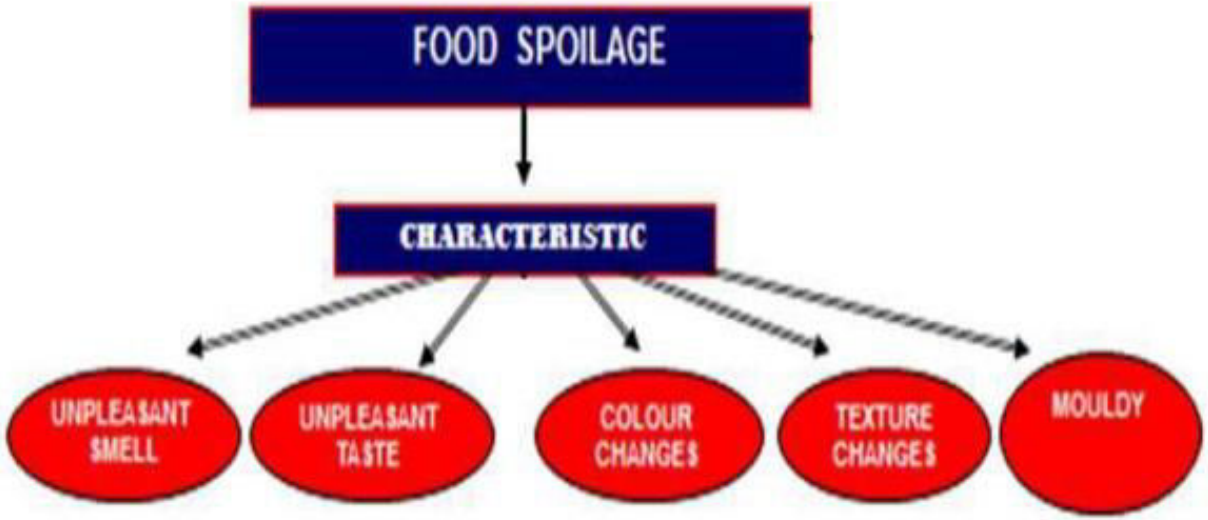
Food Spoilage

Presented by

Neha Sharma
Biotechnology

Food spoilage

- Food spoilage is defined as damage or injury to food rendering in unsuitable for human consumption.
- Food must be considered spoiled if it is contaminated with pathogenic microorganisms or various poisonous agents, such as pesticides, heavy metals etc.


FOOD SPOILAGE
CHARACTERISTIC
UNPLEASANT SMELL
UNPLEASANT TASTE
COLOUR CHANGES
TEXTURE CHANGES
MOULDY

Causes of food spoilage

- **(a). Growth and activity of microorganisms** Bacteria, yeasts and molds are microorganisms that cause food spoilage. They produce various enzymes that decompose the various constituents of food.
- (b). Enzyme activity: Action of enzymes found inherently in plant or animal tissues start the decomposition of various food components after death of plant or animal.
- (c). Chemical reactions: These are reactions that are not catalysed by enzymes.,e.g. oxidation of fat

Causes of food spoilage cont…

- (d). Vermin. Vermin includes ants, rats, cocroaches, mice, birds, larval stages of some insects. Vermin are important due to:

  (i). Aesthetic aspect of their presence,

  (ii) Possible transmision of pathogenic agents,
  (iii). Consumption of food.
- (e). Physical changes. These include those changes caused by freezing, burning, drying, pressure, etc.

a. Physical spoilage

- moisture loss or gain

b. Chemical spoilage

- Oxidation of fat
- Browning of fruits and vegetables

Different stages of enzymatic browning

Microbial spoilage of food

- Bacteria, yeasts and molds are the major causes of food spoilage.
- They produce various enzymes that decompose the various constituents of food.
- Molds are the major causes of spoilage of foods with reduced water activity e.g dry cereals and cereal product
- Bacteria spoil foods with relatively high water activity such as milk and products.

c. Microbial spoilage

- Growth of microorganisms
- Enzyme production

Sources of microorganisms in food

The primary sources of microorganisms in food include:

1. Soil and water
2. Plant and plant products
3. Food utensils
4. Intestinal tract of man and animals
5. Food handlers
6. Animal hides and skins
7. Air and dust

Sequence of events in food spoilage

Microorganisms have to get into the food
from a source or more

↓

Food environment should favour the growth of microbes

↓

Food need to be stored under the growth condition
for a sufficient length of time

- To allow sufficient number necessary to cause spoilage or changes in food.
- To allow the produced enzyme to spoil the food.

Common Causes of Food Spoilage

- Inadequate storage temperatures
- Prolonged storage times
- Improper ventilation
- Cross contamination
- Excessive delays between receiving and storing

Classification of food by ease of spoilage

Foods can be classified into three groups based on ease of spoilage:

I. **Stable or non perishable foods.**

Foods which do not spoil unless handle carelessly.
Example: Sugar, flour and dry beans.

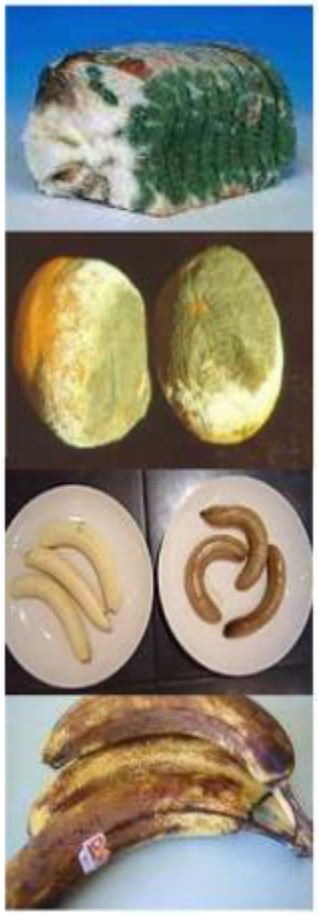
II. Semi perishable foods.

If these foods are properly handled and stored, they will remain unspoiled for a fairly long period.

Examples: potatoes, apples and nuts.

III. Perishable foods.

This group includes most of our important daily foods that spoil readily unless special preservative methods are used. Examples: meats, fish, milk, vegetables, eggs and etc.



Spoilage Signs

- **Odor**:
  - Breakdown of proteins (putrefaction)

    e.g. "rotten egg" smell

- **Sliminess**

  -due primarily to surface accumulation of microbial cells

  -also be a manifestation of tissue degradation

- **Discoloration**
  - Mold on bread, blue and green mold on citrus fruit and cheese

Spoilage Signs…

- **Souring**
  - Production of acid

    e.g. sour milk from production of lactic acid

- **Gas formation**
  - Meat becomes spongy
  - Swollen or bubbling packages and cans

Meat Spoilage

Meat spoilage…

Sources of contamination

- Cutting board contamination
- Conveyor belts
- Temperature
- Delay between storage and distribution
- Fecal contamination from intestines

Meat spoilage…

- **Storage temperature** is the single most important control factor for meat spoilage.

- Several genera of **molds** grow on the surface of meat and can cause spoilage like Penicillium, Mucor, Cladosporium, Alternaria, but cannot grow on meat stored below 5°C.

Meat spoilage…

- Interestingly, meat spoilage (including poultry and fish) occurs **without any significant breakdown of the primary protein structure**.

- Instead, spoilage bacteria utilize glucose, free amino acids or other simple nitrogenous compounds to attain population of about **10^8 CFU/cm^2**, at which point the organoleptic quality of the meat will clearly reveal it is spoiled.