बिहार पशु विज्ञान विश्वविद्यालय

BIHAR ANIMAL SCIENCES UNIVERSITY

"Composition of "X-Ray Film" & "Radiographic film processing"

VSR Unit 3

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X-Ray Film

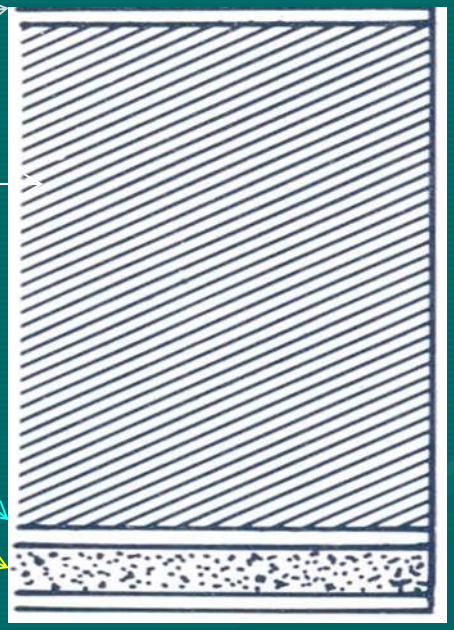
- **Storage of unexposed film**:-

10 – 20 ^{0}C temperature with low humidity (40 – 60%)

Self life less than a year.

Composition of X-Ray Film

- Gelatin
- Emulsion
- Adhesive
- Base
- Adhesive
- Emulsion
- Gelatin



Thickness-0.25mm

Ideal Film Base

- Flexible, Inert, Light wt., Easy to handle
- Transparent
- No undesirable patterns visible on it
- Not absorb too much light during viewing
- Shape and size not changed during storage & developing
- Blue tint-Pleasant to eye.
  - Cellulose triacetate-0.008 inch
  - Polyester-0.007 inch

Emulsion

- Homogenous mixture of Gelatin and Ag-halide
- Advantage of gelatin-Well dispersal of Ag-halide crystal
- Processing solution penetrate without affecting strength or performance
- Prevent clumping
  - Ag-halide

  Ag-iodobromide-AgBr-90-99% and AgI-1-10%
  - Crystal diameter-1-1.5μ

Film Speed

- Film latitude-Range of exposure that produce diagnostically useful range of densities.
- contrast α 1/F. Latitude
  - Wide latitude allow longer gray scale to enable viewing of small changes.
  - ❖ F. Speed-Relative sensitivity of film to a given amount of radiation.

_Fast Film-AgX crystal large, Required less exposure, produce grainy image & lacks definition

- Standard/Medium film-Wide latitude, AgX-Crystal small
- Ultrafast Film-Very less exposure required but narrow latitude & short storage life.

- Screen film-More sensitive to U/V light & Blue range of light (Blue sensitive film)

Green Sensitive film-More sensitive to green range of light emitted by crystals of rare-earth metals (Orthochromic film).

- Non- Screen Film-More sensitive to direct ionising radiation and less sensitive to blue light (Occlusal film-used in intra-oral radiography).

Radiographic film processing

- When x-ray get exposed to radiographic film the resultant image is called latent image.
- Latent image on x-ray film processed in dark room to get final image of part being exposed or radiographed.

Developer Rinser Fixer

Processing solution

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Safe light used in dark room:-

10 watt frosted bulb with colour either yellow, orange or Red (YOR)

(i) Developer

- (a) Developing agent or Reducing agent – Hydroquinone or metol – it reduce the exposed silver halide crystal into metallic silver (Ag++ Ag)
- **(b) Activator**:- Sodium carbonate – It provide alkaline medium for reducing agent and also soften and swell –film emulsion so that reducing agent act on the film.

-Phenicide, Phenidone can also used as hardener

- **Restrainers**:- Potassium bromide – it controls the activity of reducing agent so that fogging of x-ray film does not occurs.

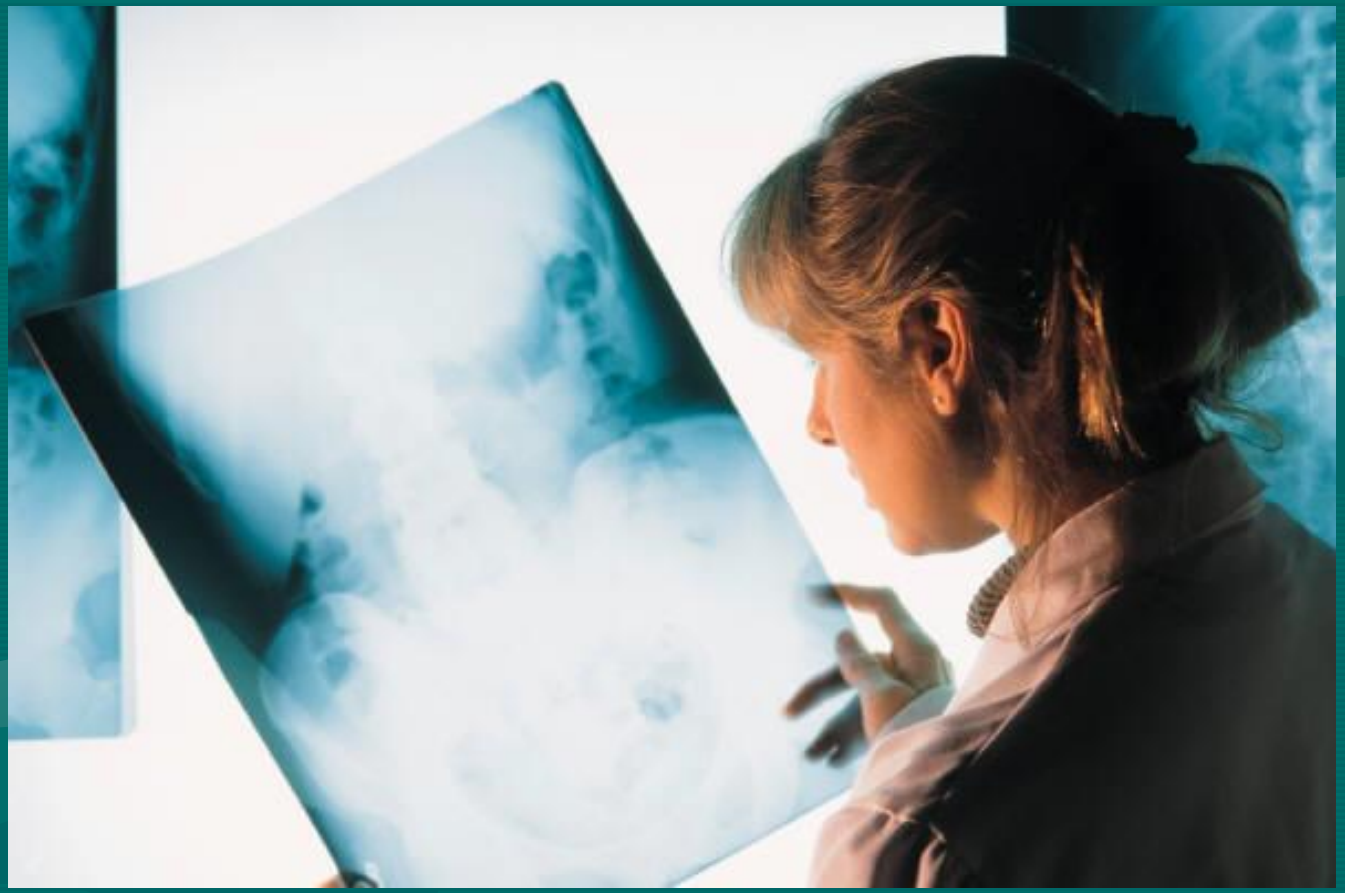
- **Preservative** :- Sodium sulphite (Na_2SO_3) used to prevent rapid oxidation of developing agents.
- Solvent – Water.
- Developing time 4 – 5 minutes at 20^0C.
- At higher temperature developing time less.
- Once developing solution prepared it should never kept for more than 3 months.

Ringer

- Stop bath containing 128 ml of glacial acetic acid in one liter of water.
- Film agitated in ringer for 10 – 30 second.

Fixer

- It remove the unexposed silver crystal so that exposed silver image retained as a permanent record.
- Fixing agent – Sodium thiosulphate or Ammonium thiosulphate- it remove unexposed silver crystal.
- Acidifier - Acitic acid or sulphuric acid act as acidifier to neutralise developer.
- Hardener – Ammonium chloride or Ammonium sulphide – it helps to shrink and harden the film emulsion.

- Preservative - Sodium sulphite.
- Clearing time – Time taken by the fixer to convert a cloudy appearance of film to a clear one.
- Fixing time usually double the developing time i.e. 10 minutes.
- Screen film requires less time for fixation than a non-screen film.

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