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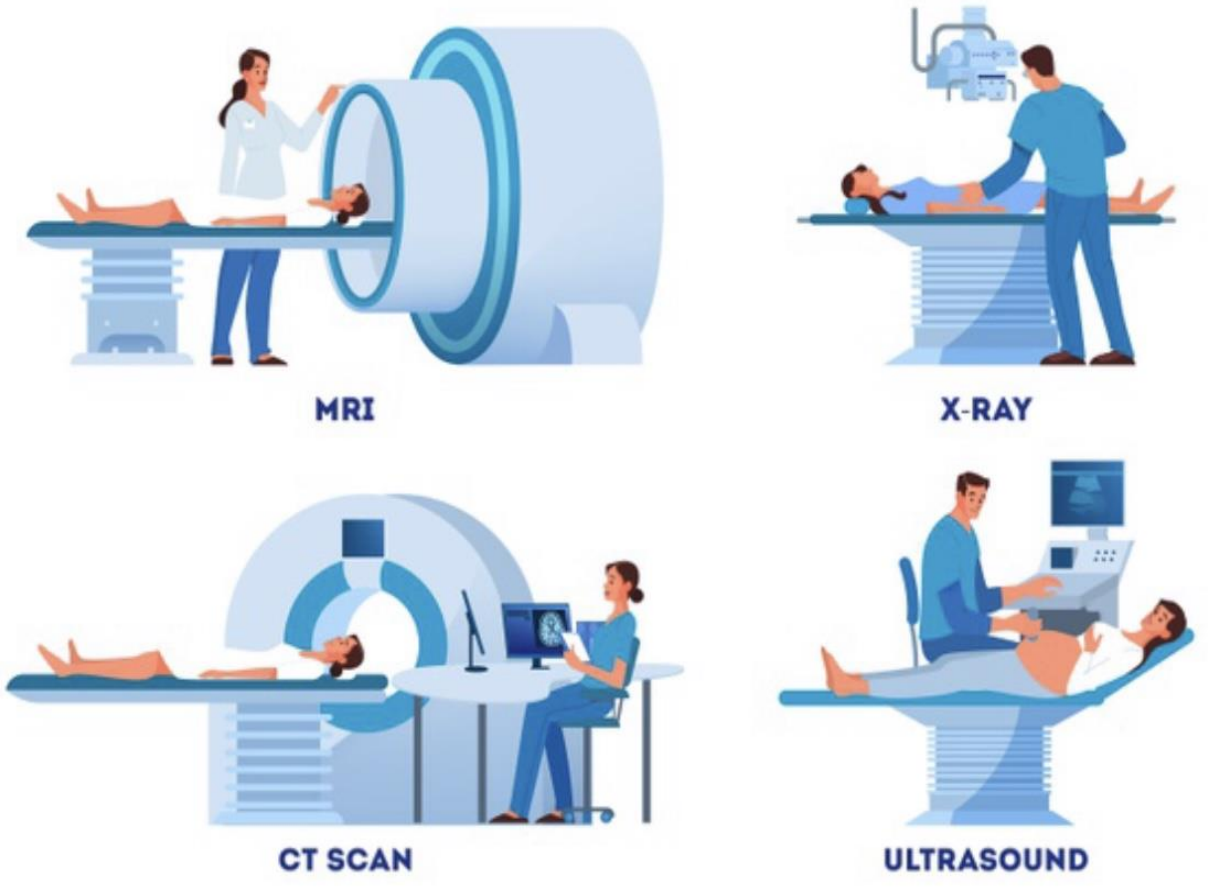
THEORETICAL RADIOLOGY MEDICAL DEVICE TECHNIQUE

(SOPHOMORE)



Formation of the latent image

The radiation exiting the patient and incident on the radiographic film deposits energy in the emulsion primarily by photoelectric interaction with the atoms of the silver halide crystal. This energy is deposited in a pattern representative of the object or part of the anatomy being radiographed. If one observed the film immediately after exposure, no image would be seen. There is, however, an image present, called a latent image.

The latent image is the invisible change induced in the various silver halide crystals. With proper chemical processing the latent image becomes a manifest image Manual & Automatic processing method of radiographic film.

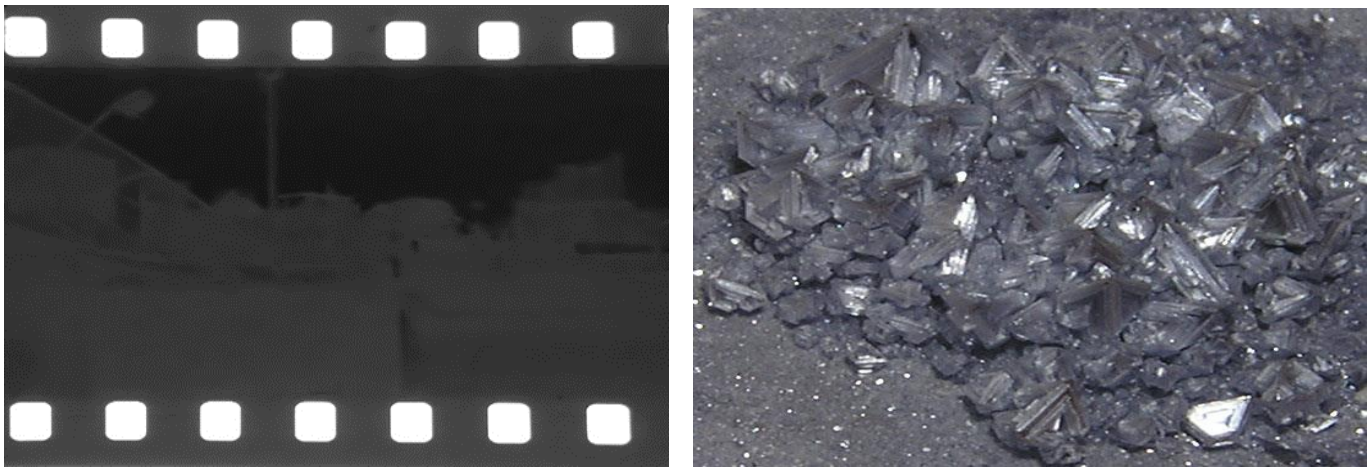


fig (1): The latent image & the various silver halide crystals

NOTE: Processing is the several procedures that collectively transform the latent image into a visible &permanent image. Nearly all radiographic processing is done automatically today, the chemicals involved in both (manual & automatic) are basically the same. But in automatic processing the times for each step are shorter, and the chemical concentrations and temperature are higher.

Manual Processing: The sequence of events in processing a radiograph manually:

- **The first step** in the processing sequence is to wet the film to loosen the emulsion so that subsequent chemical baths can reach all parts of the emulsion uniformly. The wetting agent is water, it penetrates through the gelatin of the emulsion, swelling it and causing it to expand. This step is often omitted in automatic processing, and the wetting agent is then incorporated into the second step, development.

Development is the stage of processing in which the latent image is converted to a manifest image. The principal action during development involves changing silver ions of the exposed crystals into metallic silver.

After development, the film rinsed in an acid solution designed to stop the development process and remove excess developer chemicals from the emulsion. Photographers call this step stop bath, and in processing radiographs, the stop bath is sometimes included in the next step, fixation.

During fixation, the silver halide that was not exposed to radiation is dissolved and removed from the emulsion. The gelatin portion of the emulsion is hardened.

Fixation is followed by a vigorous washing of the film to remove any remaining - chemicals from the previous processing steps.

Finally, the film is dried to remove the water used to wash it and to make the film - acceptable for handling and viewing. The steps of development and fixation are the most important to the processing of radiographic film.

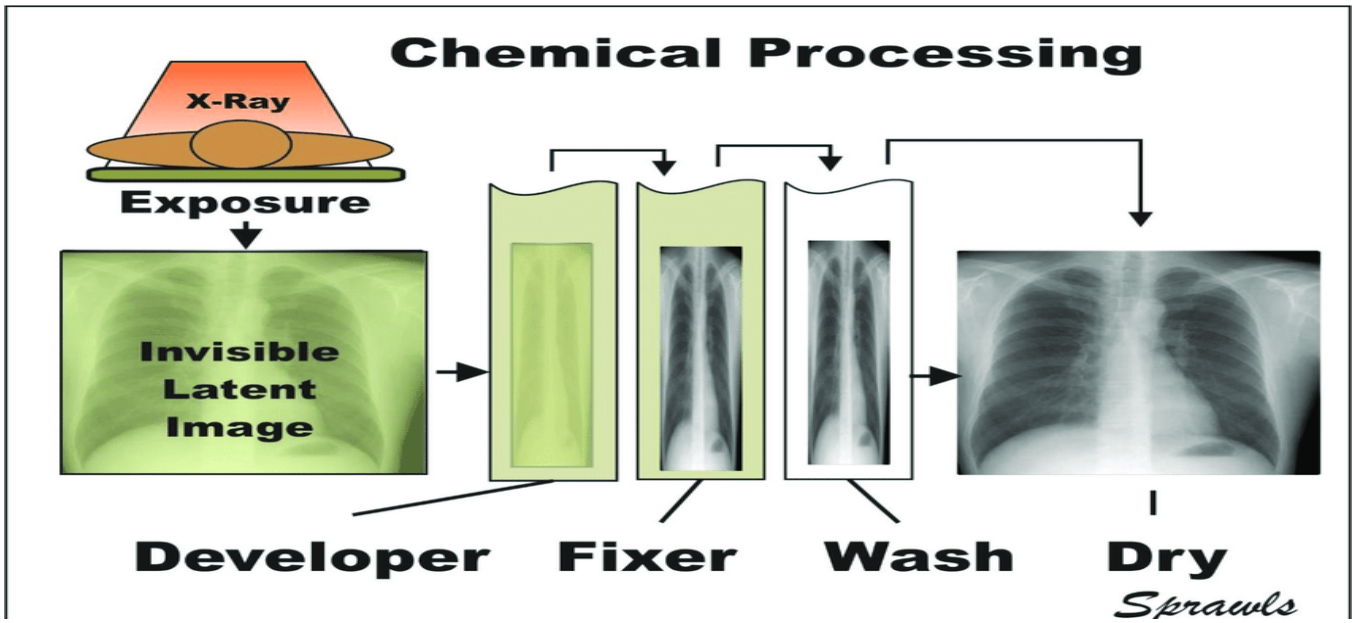
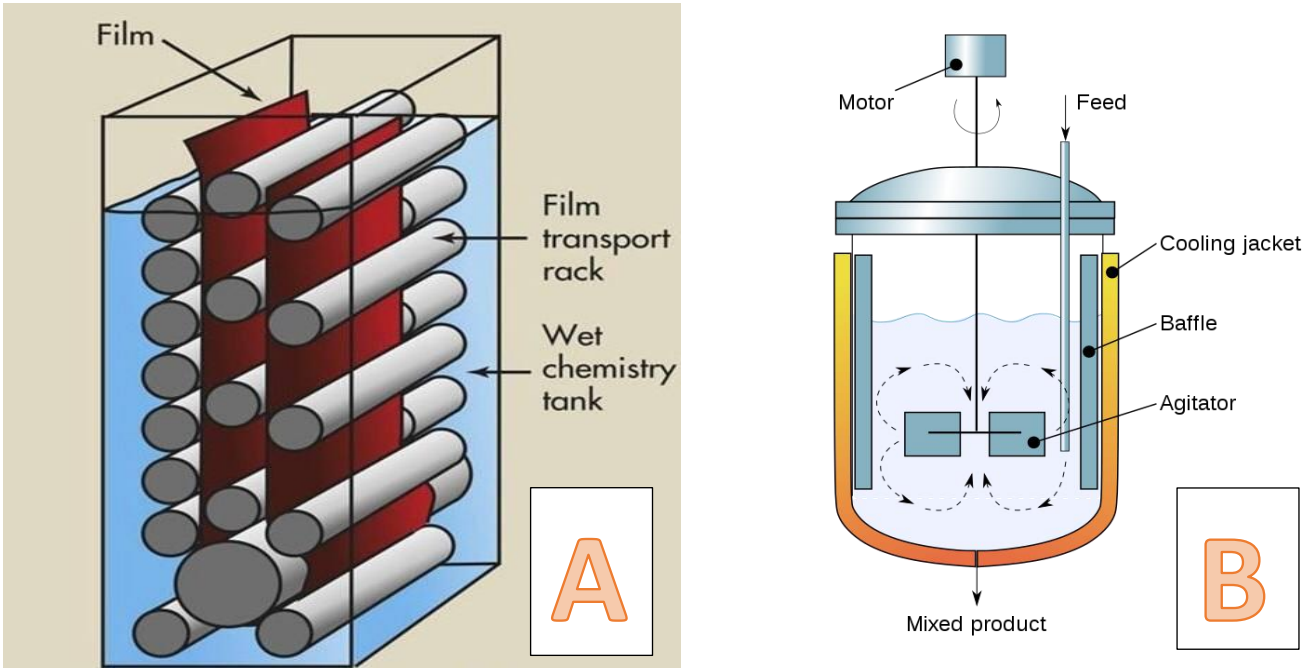


Fig (2): Steps of film processing

processing Automatic: The principal components of an automatic processor are:

The transport system consists of three principal subsystems: rollers, transport racks and Drive motor. From the entrance rollers, the film is transported by rollers and racks through the wet chemistry tanks and drying chamber and finally is deposited in the receiving bin.



Fig(3): A The transport system & B Circulation system

2.The temperature – control system

The three chemistries, developer, fixer & washer require precise temperature control. The developer's temperature is usually maintained at (35o C). wash water temperature is usually maintained at (2.8o C) lower.

3. Circulation system:

Agitation is necessary to continually mix the processing chemistry, to maintain a constant temperature throughout the processing tank. Agitation is provided by a circulation system that continuously pumps the developer and the fixer, keeping each tank in constant agitation. As shown in the figure (3)

4. Replenishment system:

If neither the developer nor fixer were replenished, they would quickly lose chemical balance, the level of solution in each tank would drop, and shorter contact times with the chemistry would result. The replenishment system meter into each tank the proper amount of chemistry to maintain volume and chemical activity.

5. Dryer system:

If a finished radiograph were at all wet or damp, then it would easily pick up dust particles in the air that could result in artifacts, furthermore, a wet or damp film is difficult to handle in a view box. when stored it becomes sticky & is destroyed. The dryer system consists of a blower, ventilation ducts, drying tubes, and an exhaust system, it completely extracts all residual moisture from the processed radiograph so that it drops into the receiving bin dry.

6. Electrical system:

Electrical power must be provided to the thermal & mechanical components of each of the previous systems, this is done through proper wiring of the automatic processor

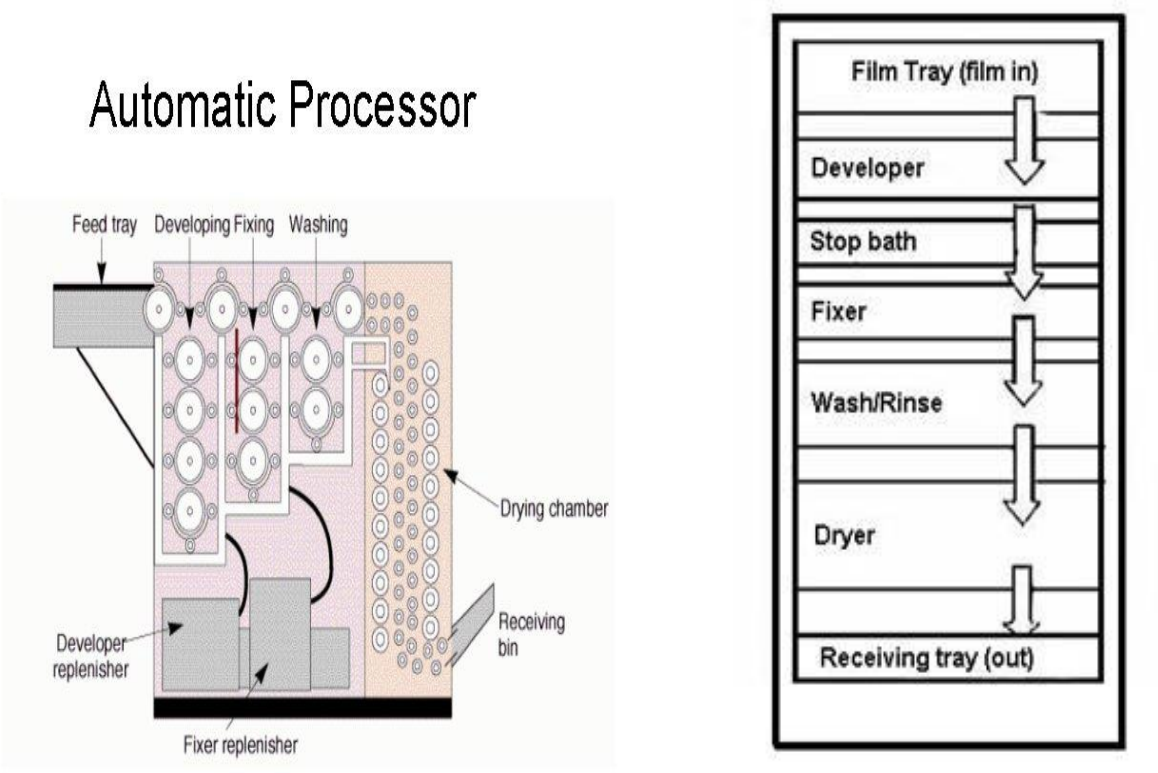


Fig (4) Diagram showing all the processes in the automatic acidification

Table (1): Sequence of event in processing radiograph

Step	Purpose	Approximate Time	
		Manual	Automatic
Wetting	Swelling of the emulsion to permit subsequent chemicals penetration	15 s	--
Development	Production of a manifest image from the latent image	5 min	22 s
Stop bath	Termination of development and removal of excess chemicals from the emulsion	30 s	--
Fixing	Removal of remaining silver halide from the emulsion and hardening the gelatin	15 min	22 s
Washing	Removal of excess any remaining chemicals from the previous processing steps	20 min	20 s
Drying	Removal water and preparation radiograph for viewing	30 min >1hr	26 s 90 s