1.MRI?

Non-invasive, anatomy, physiology of processes, soft tissues

2. DTI?

restricted diffusion of water molecules in tissue, fiber tracts, brain connectivity

3.fMRI, brain activity in real time: detects blood flow and Blood oxygenation level.

4.schizophrenia: (brain volume reduction and loss of neurons): medial pulvinar(pm)

5. Microcomputed tomography (MicroCT): 3d

X-rays are absorbed/attenuated, Sample is rotated

agents to increase contrast and attenuation

bone (bone marrow) vascularization, tumor

6. XFM

Analysis of muti-elemental X-ray, K lines, X-ray fluorescence peaks.

7. different scales, multi-element analysis, resolution, quantitative

Beamtime scarce, low-Z not detectable, no thickness and density

8. (BLI): living organism via a chemical reaction.

trans genetic animal, monitor infection dynamics.

animal disease models

short wavelength, administration route; hair

7.light microscopy - brightfield: incompatible with living cells and organisms.

8.light microscopy – contrast techniques: phase contrast and DIC/ darkfield/ birefringence

9.phase contrast and DIC: phase of the light. Visualize cells in culture.

11. (birefringence microscopy): Detect changes in stereotypic patterns

All: harmless to living material, thin samples and surface

12.Fluorescence microscopy: molecule to absorb light, distinguish structures high spatial resolution Autofluorescence Fluorophores Fluorecent proteins:

Techniques in observing of fluorescence microscopy

16.confocal microscopy: remove out-of-focus information, pixel by pixel and row by row, plane by plane, bleaching and cytotoxicity z-stack

17. Judgements of image: resolution; depth; sensitivity and acquisition speed.

19.spinning disk confocal microscopy: using multiple pinholes (digital camera)

Advantages: fast -> good for living imaging and small sample bleaching

20. light sheet microscopy: thin sheet rotation of samples

large samples; less bleaching and cytotoxicity; imaging from multiple angles of targets

computational resources to decode.

22.multiphoton microscopy: use long wavelength (high concentration and low cytotoxicity) minimizes out of focus light.

STED (overcome the limits resolution of light microscopy): suppress surrounded fluorescence with suppression laser

few fluorophores and fluorescent proteins; expensive

STORM: different fluorophores emit light at different times.

Registration: adjust location

Quantitative approach: colocalization

Judgements: number, location, brightness