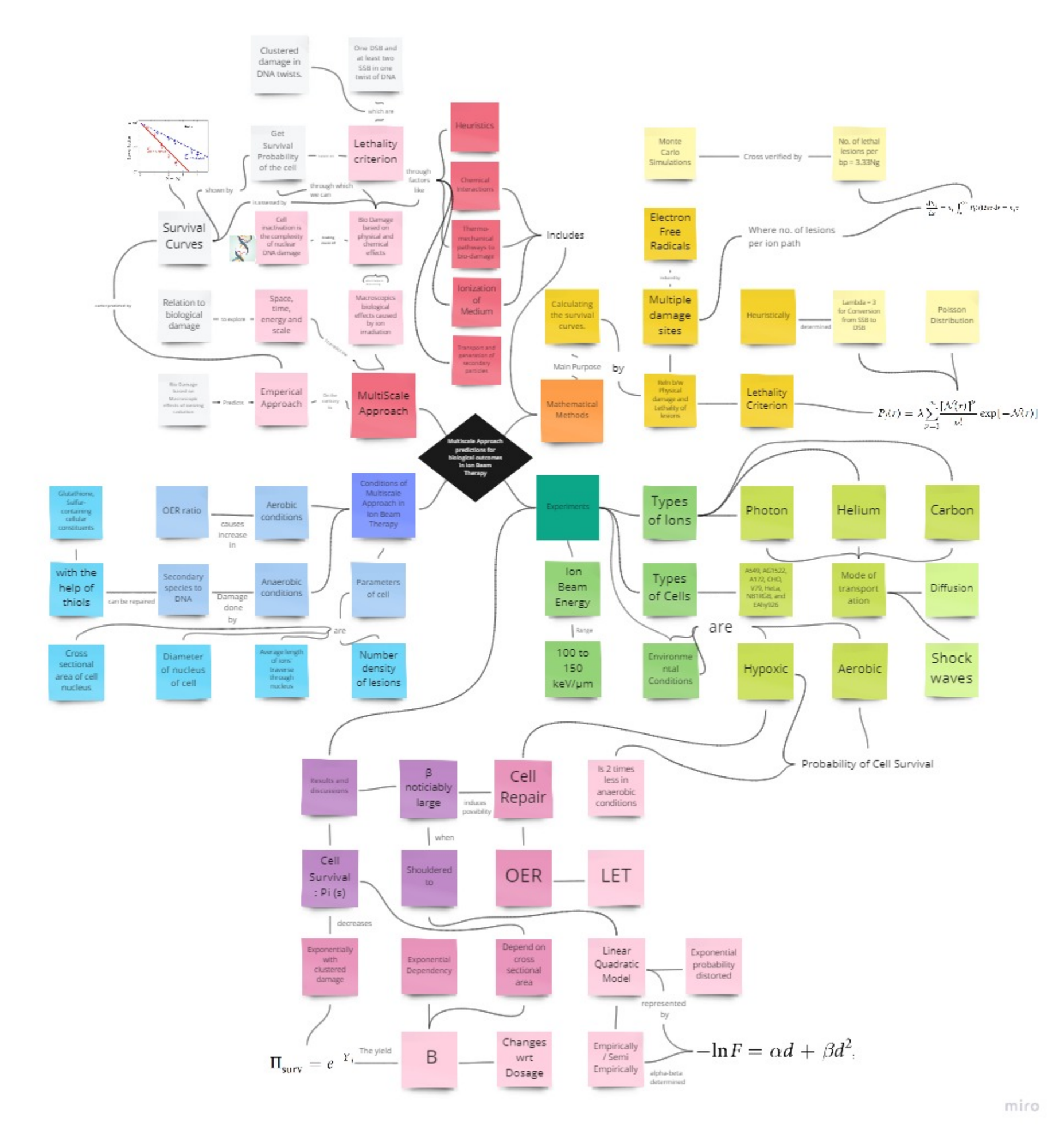
Clustered damage in DNA twists.
One DSB and at least two SSB in one twist of DNA
which are
Get Survival Probability of the cell
based on
Lethality criterion
shown by
Survival Curves
through which we can
is assessed by
through factors like
Heuristics
Chemical Interactions
Thermo-mechanical pathways to bio-damage
Ionization of Medium
Transport and generation of secondary particles
Includes
Cell inactivation is the complexity of nuclear DNA damage
using source
Bio Damage based on physical and chemical effects
Relation to biological damage
to explore
Space, time, energy and scale
Macroscopics biological effects caused by ion irradiation
Bio Damage based on Macroscopic effects of ionising radiation
Predicts
Emperical Approach
Decline contrary to
MultiScale Approach
Monte Carlo Simulations
Cross verified by
No. of lethal lesions per bp = 3.33Ng
Electron Free Radicals
Where no. of lesions per ion path
Calculating the survival curves.
Main Purpose
by
Multiple damage sites
Heuristically
determined
Lambda = 3 for Conversion from SSB to DSB
Poisson Distribution
Relation b/w Physical damage and Lethality of lesions
Lethality Criterion
Mathematical Methods
Multiscale Approach predictions for biological outcomes in Ion Beam Therapy
Experiments
Glutathione, Sulfur-containing cellular constituents
OER ratio
causes increase in
Aerobic conditions
Conditions of Multiscale Approach in Ion Beam Therapy
with the help of thiols
can be repaired
Secondary species to DNA
Damage done by
Anaerobic conditions
Parameters of cell
are
Cross sectional area of cell nucleus
Diameter of nucleus of cell
Average length of ions traverse through nucleus
Number density of lesions
Ion Beam Energy
Range
100 to 150 keV/μm
Types of Ions
Photon
Helium
Carbon
Types of Cells
A549, AG1522, A172, CHO, V79, HeLa, NB1RGB, and EAhy926
Mode of transport ation
Diffusion
are
Environme ntal Conditions
Hypoxic
Aerobic
Shock waves
Probability of Cell Survival
Results and discussions
β noticiably large
induces possibility
Cell Repair
Is 2 times less in anaerobic conditions
when
Cell Survival : Pi (s)
Shouldered to
OER
LET
decreases
Exponentially with clustered damage
Exponential Dependency
Depend on cross sectional area
Linear Quadratic Model
Exponential probability distorted
represented by
$\Pi_{surv} = e^{\gamma_i}$
The yield
B
Changes wrt Dosage
Empirically / Semi Empirically
$-\ln F = \alpha d + \beta d^2$
alpha-beta determined

$$\frac{\mathrm{d}N_l}{\mathrm{d}x} = n_\mathrm{s} \int_0^\infty P_l(r) 2\pi r \,\mathrm{d}r = n_\mathrm{s}\sigma$$

$$P_l(r) = \lambda \sum_{\nu=3}^{\infty} \frac{[\mathcal{N}(r)]^{\nu}}{\nu!} \exp[-\mathcal{N}(r)]$$

$$-\ln F = \alpha d + \beta d^2$$

$$\Pi_{surv} = e^{-Y_l}$$