Vitamin D and Breast Cancer Prevention

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UK Breast Cancer Statistics

- Breast Cancer
  - 48,000 cases 2008
  - $75,000 cost/case (US/NIH:2008)
  - Total Cost/year: $3,600,000,000

20% Potential Prevention (up to 75%)
9600-38,400 people wouldn't get it
Cost savings/year (20%): $720,000,000

Aging of UK Population

- 15% over 65 in 2010
- 40% expected over 65 in 2030

Where's the budget?

Technology and Cancer

- Benefits of all this spending are marginal.

- Cutler shows that since 1960
  - Life expectancy has increased 6.97 years
  - Increase from cardiovascular disease changes—almost all HTN 4.88 years
  - Increase from cancer change 0.19 years

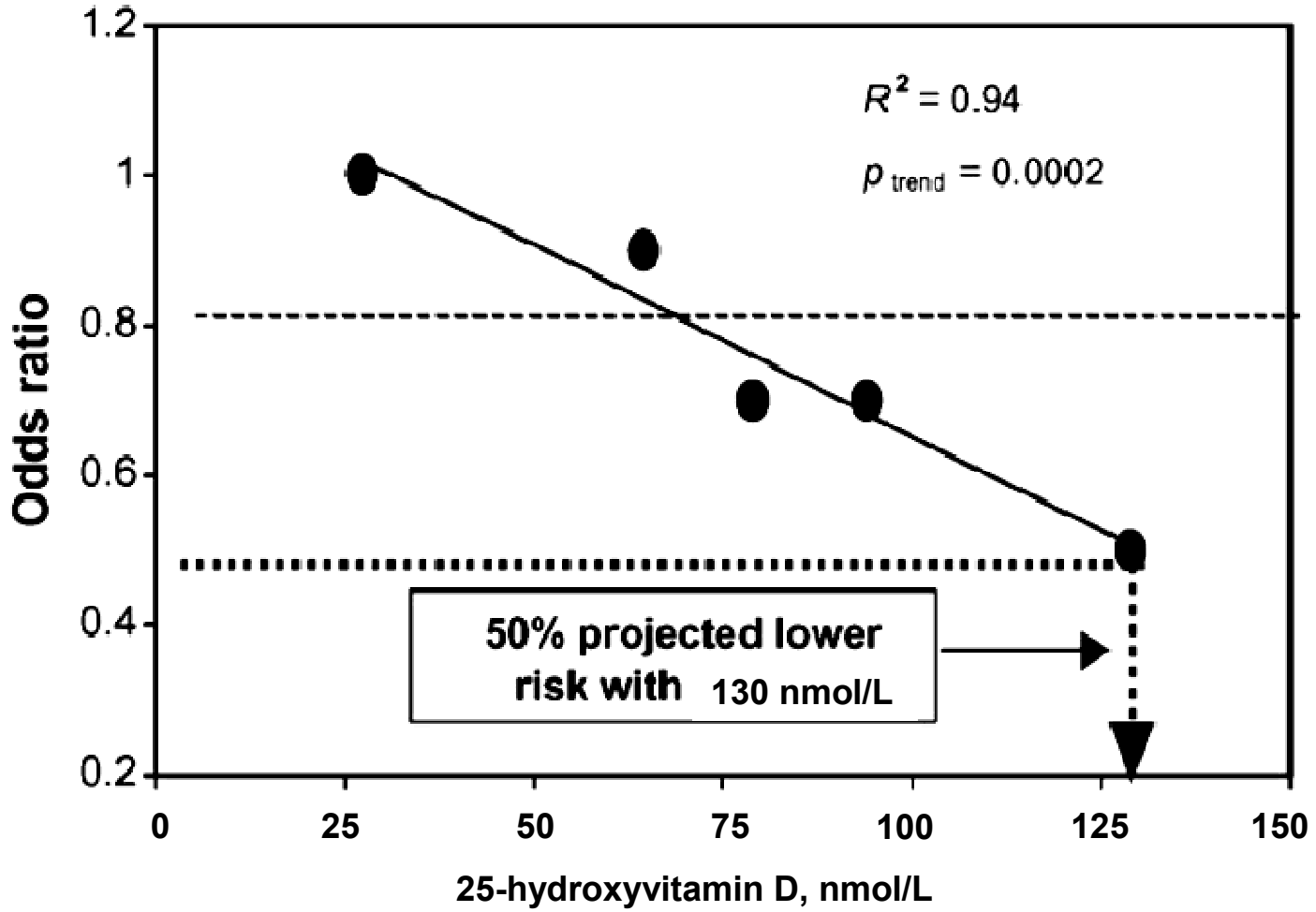
Technology and Cancer

- Increase over 40 years of average life expectancy because of cancer treatment is:

10 weeks of life

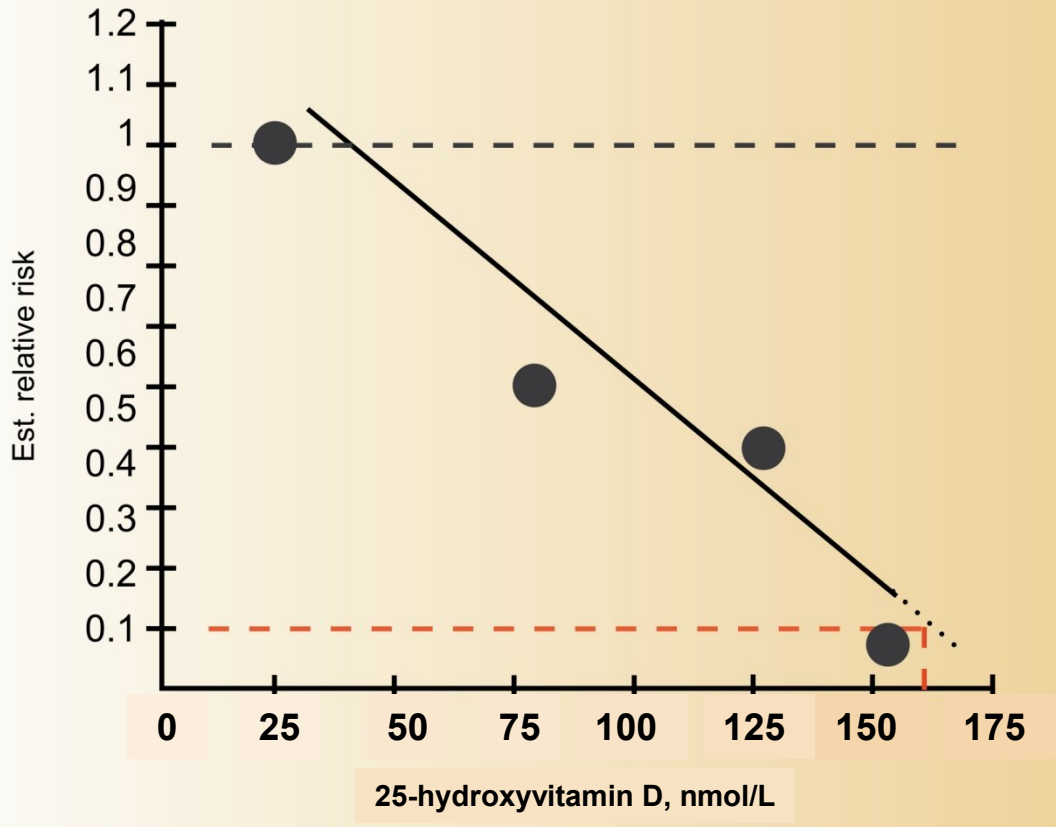
Ezekiel J. Emanuel, M.D., Ph.D. NIH

Meta-analysis of breast cancer risk



Dose–response gradient of risk of breast cancer according to serum 25-hydroxyvitamin D concentration, pooled analysis.

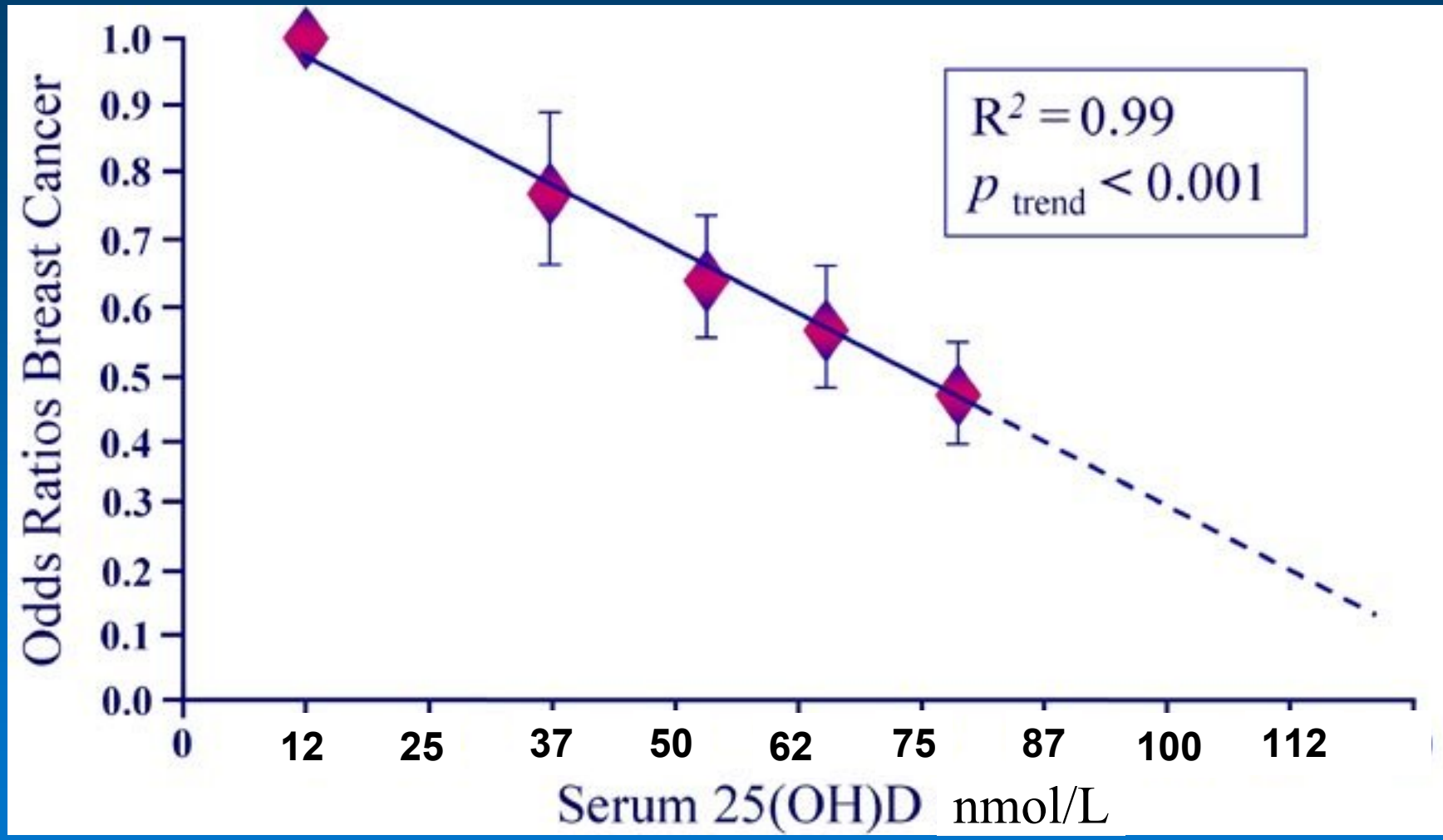
80% Breast Cancer Incidence Reduction



Source: Garland et al. (2007) based on data in Lowe et al. (2006)

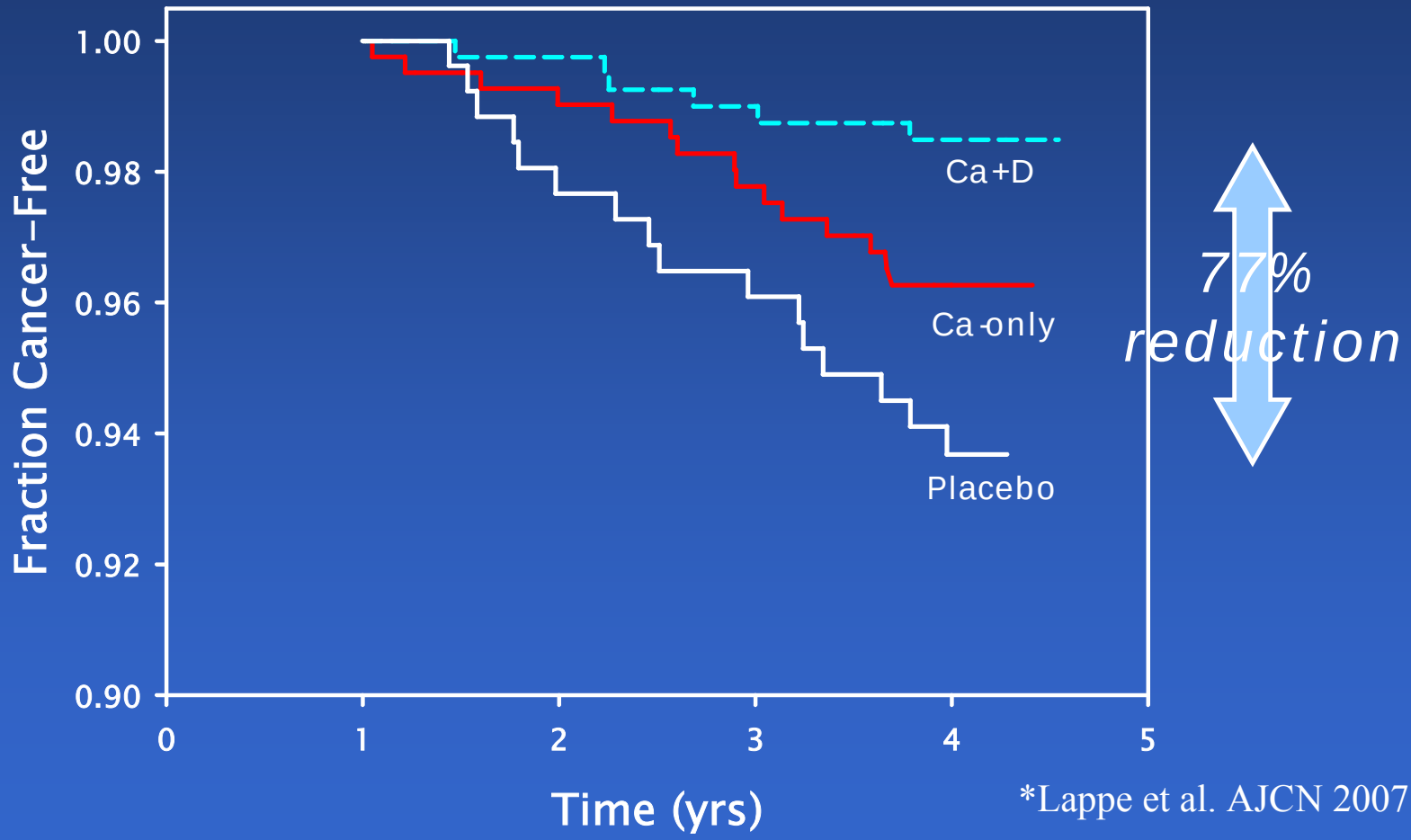
Breast Cancer Dose Response Risk Reduction

Garland, et al. Meta-Analysis of Dose Response, 2008



1. Lowe LC, et al. Plasma 25-hydroxy vitamin D … Eur J Cancer. 2005;41:1164-9.
2. Bertone-Johnson, E.R. et al. Cancer Epidemiol Biomarkers Prev. 2005; 14: 1991-7.
3. Abbas S, et al. Serum 25-hydroxyvitamin D and risk of breast…Carcinogenesis. 2008;29:93-9.
4. Woolfe B. [Methods for combining 2x2 tables.] Ann Hum Genet 1955;19:251-5.

VITAMIN D & CANCER*



*Lappe et al. AJCN 2007

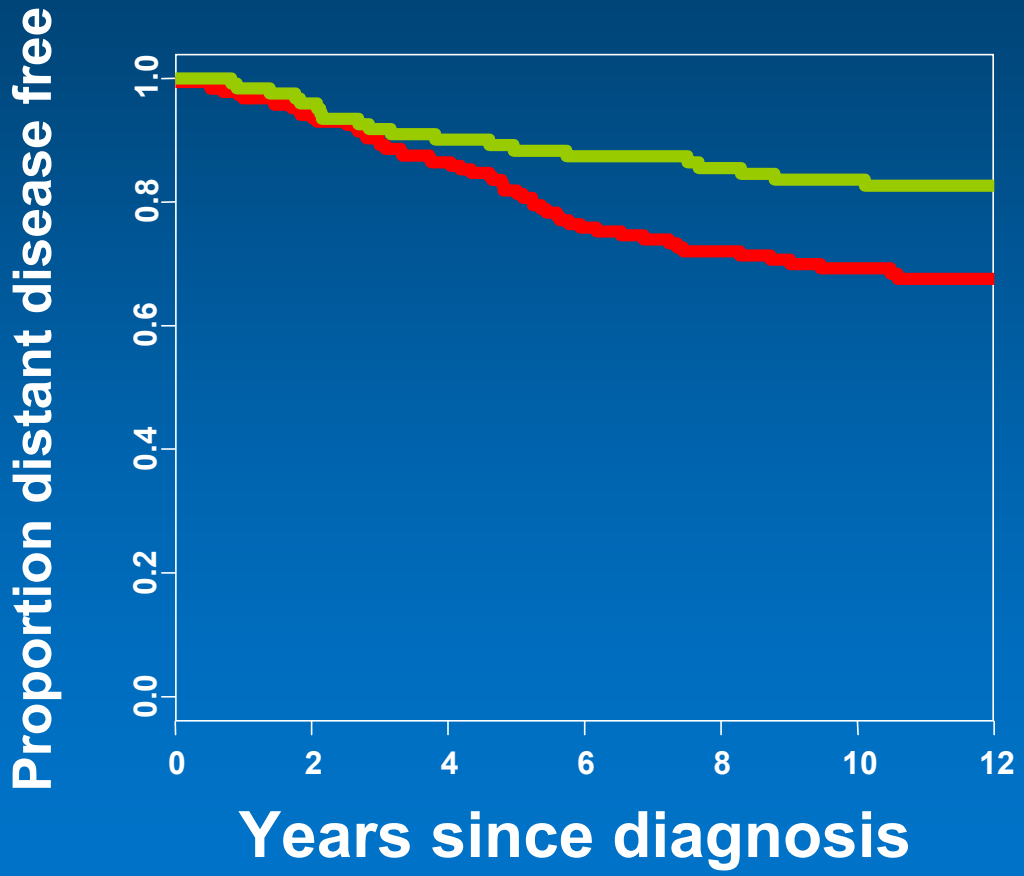
Slide from R.P. Heaney, MD

CANCERS BY TREATMENT (YRS 2–4)

Site	Placebo (n=266)	Ca+D (n = 403)
Breast	7 (2.6%)	4 (1.0%)
Colon	2 (0.7%)	0 (0.0%)
Lung	3 (1.1%)	1 (0.2%)
Marrow/Lymphoma	4 (1.5%)	2(0.5%)
Other	2 (0.7%)	1 (0.2%)
Total*	18 (6.8%)	8 (2.0%)*

* P < 0.05

Distant Disease-Free Survival Breast Cancer



Serum level ≥ 75 nmol/L

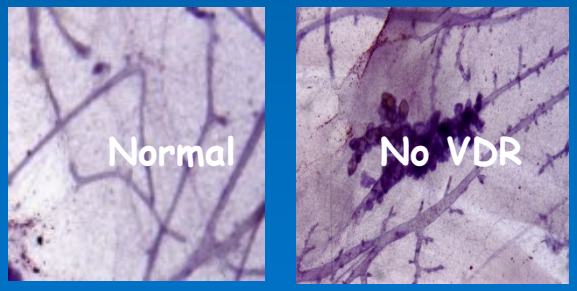
Serum level < 50 nmol/L

Higher D: 50% less likely to spread

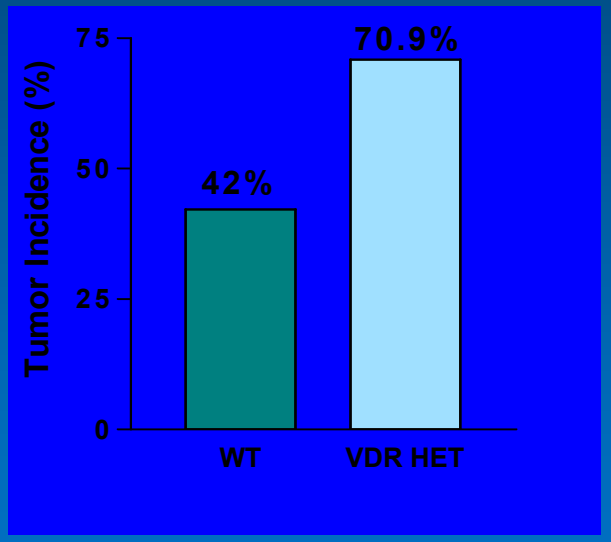
Overall Survival VITAMIN D DEFICIENCY IN BREAST CANCER

Goodwin PJ, Ennis ME, Pritchard KI, Koo J, Hood N
Mount Sinai Hospital, University of Toronto, Canada

Mice Without Vitamin D Receptors Have High Risk for Cancer Development



Early Stage Cancer



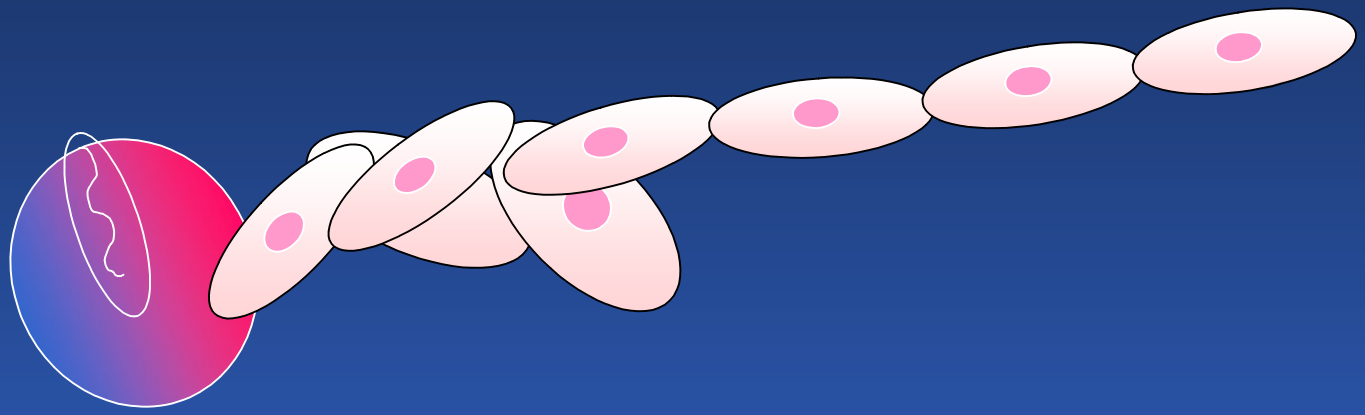
Slide courtesy of J.Welsh, PhD

DINOMIT - Theory of Breast Cancer

Cedric F. Garland, Dr. P.H.

- Disjunction – Loss of Tight Junctions
- Initiation – Genetic variation
- Natural selection – Competition for growth
- Overgrowth – Palpable mass and invasion
- Metastasis – Remote colonization
- Involution – Growth inhibition
- Transition – Coexistence with normal tissue

Micro-Darwinian carcinogenesis and Vitamin D deficiency induced D-volution

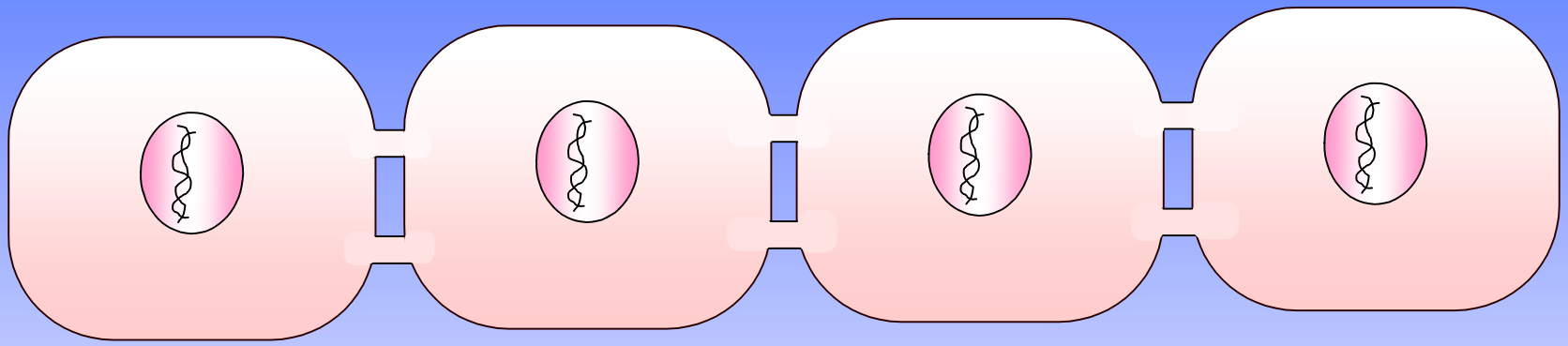


In vitamin D deficiency, the first lesion is harm to the intercellular junction.

This unleashes natural selection.

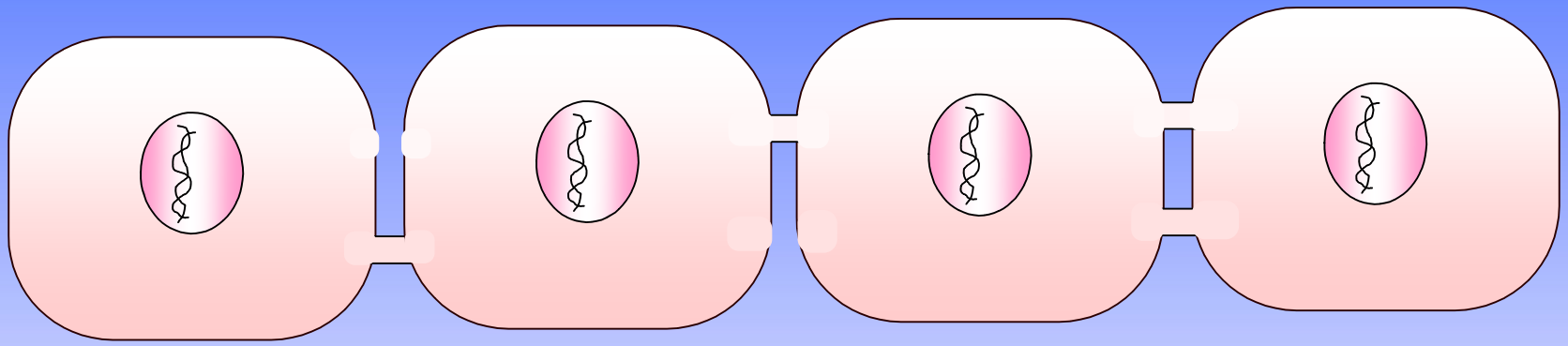
Natural selection is the engine of growth of the cancer.

DINOMIT



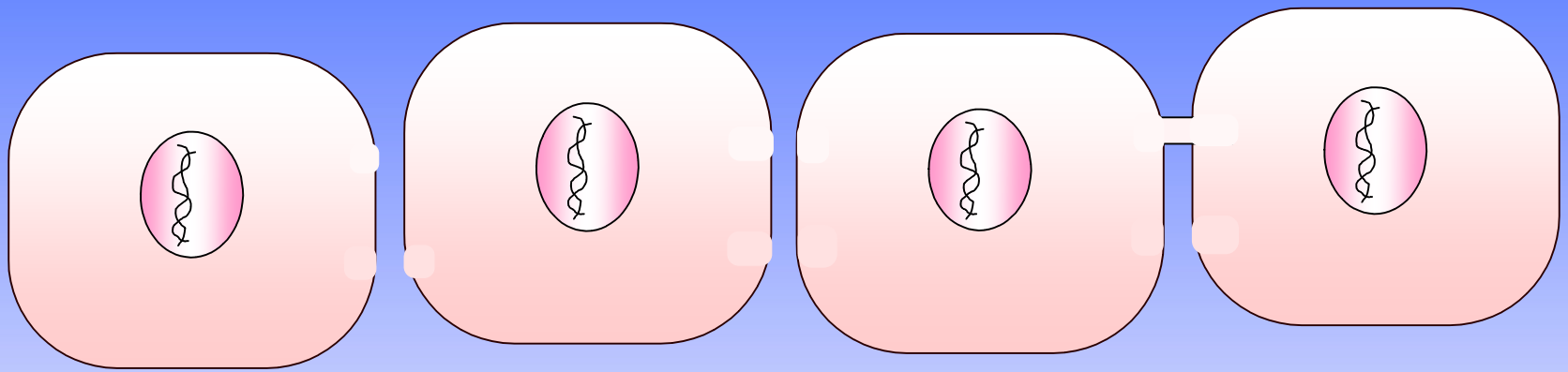
Normally adherent cells

DINOMIT



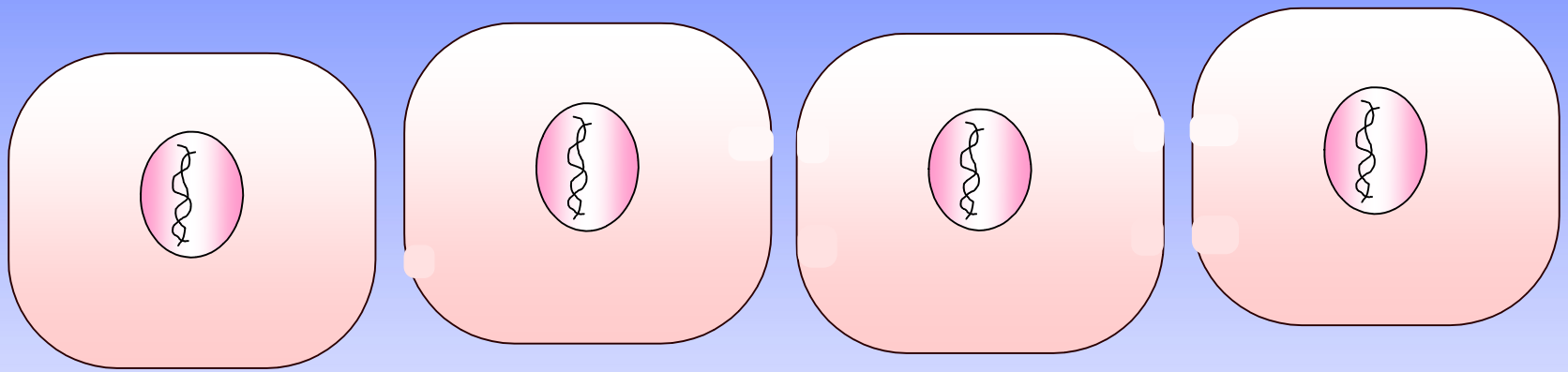
Decoupling: Loss of tight junctions

DINOMIT



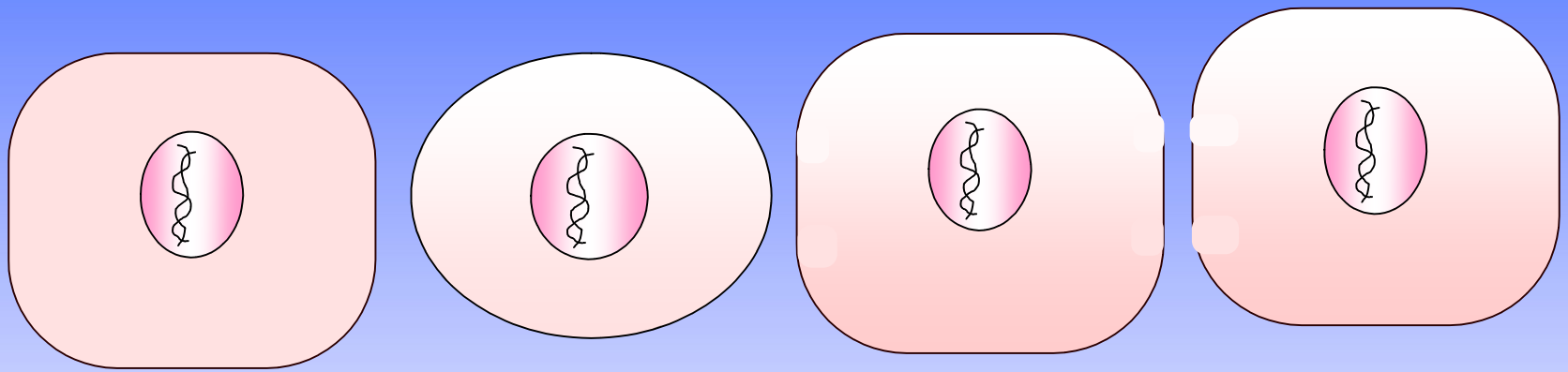
Decoupling advances

DINOMIT



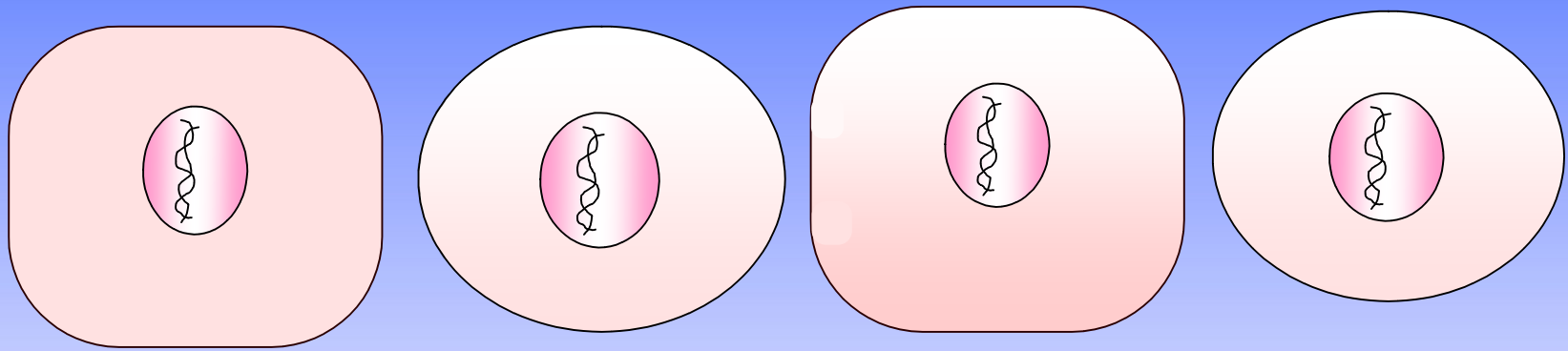
Decoupling becomes complete

*D*INOMIT - Disjunction



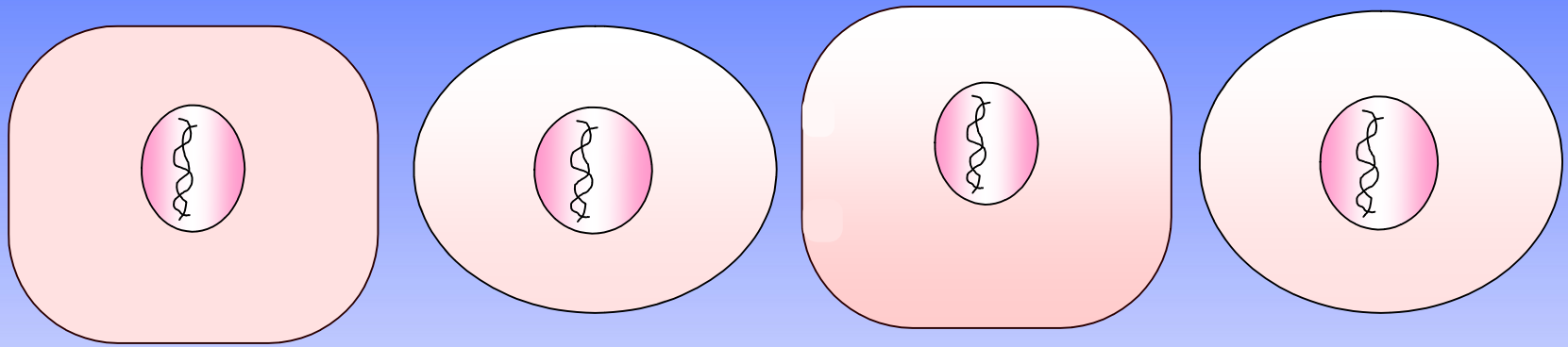
Mild Dysplasia due to loss of tight junctions

D/NOMIT - Initiation



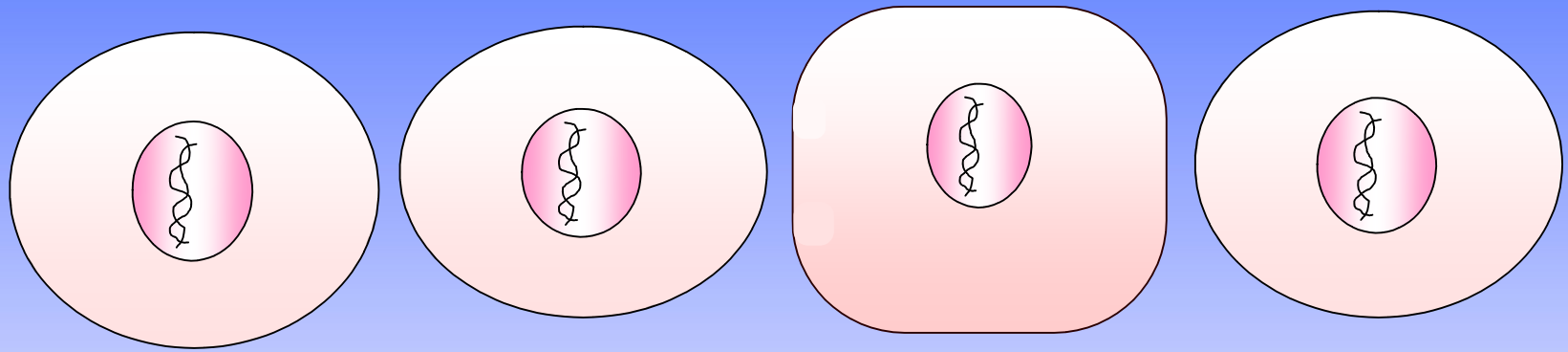
DNA variation due to infidelity of reproduction or carcinogens

D/NOMIT - Initiation



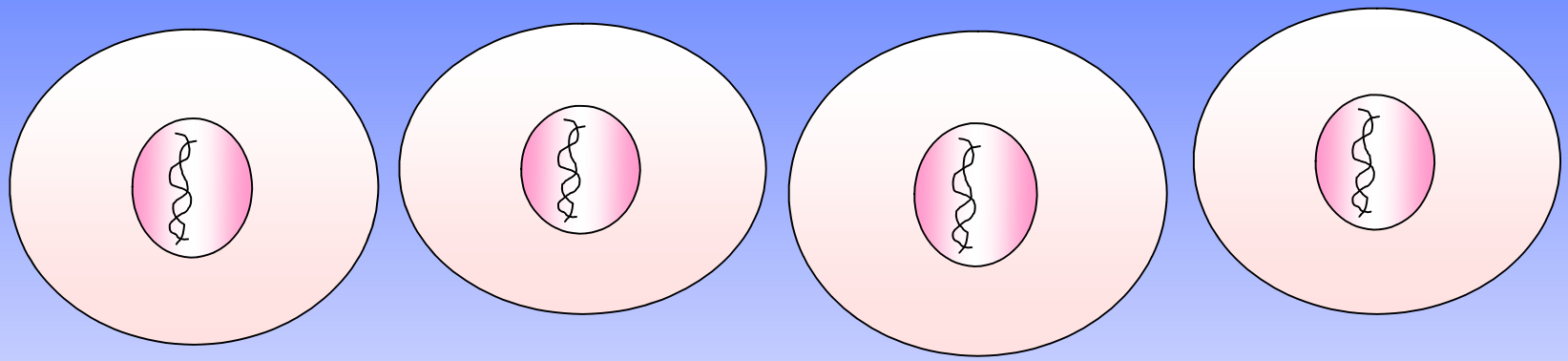
Continued variation in DNA and epigenetics

D/NOMIT - Initiation



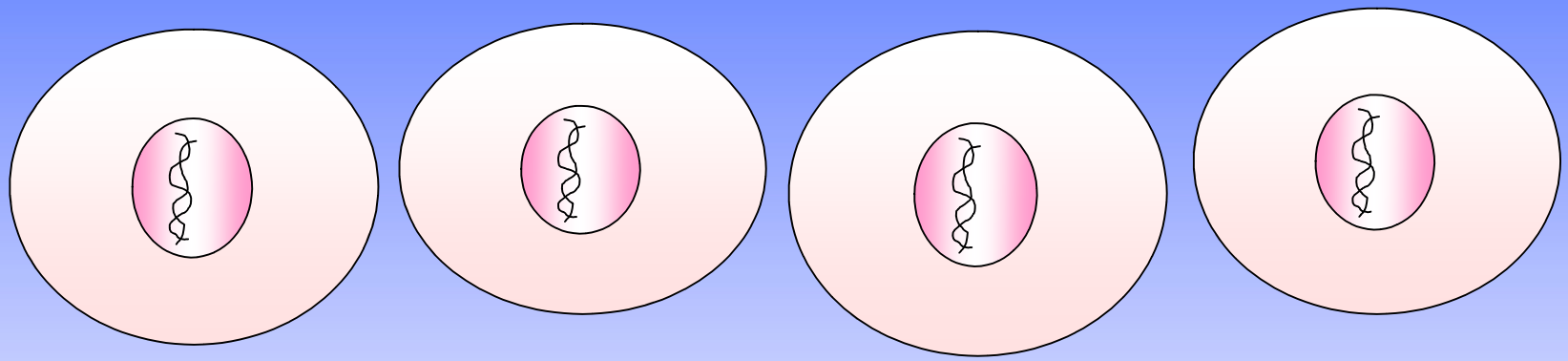
Continued variation in DNA and epigenetics

DI*N*OMIT - Natural Selection



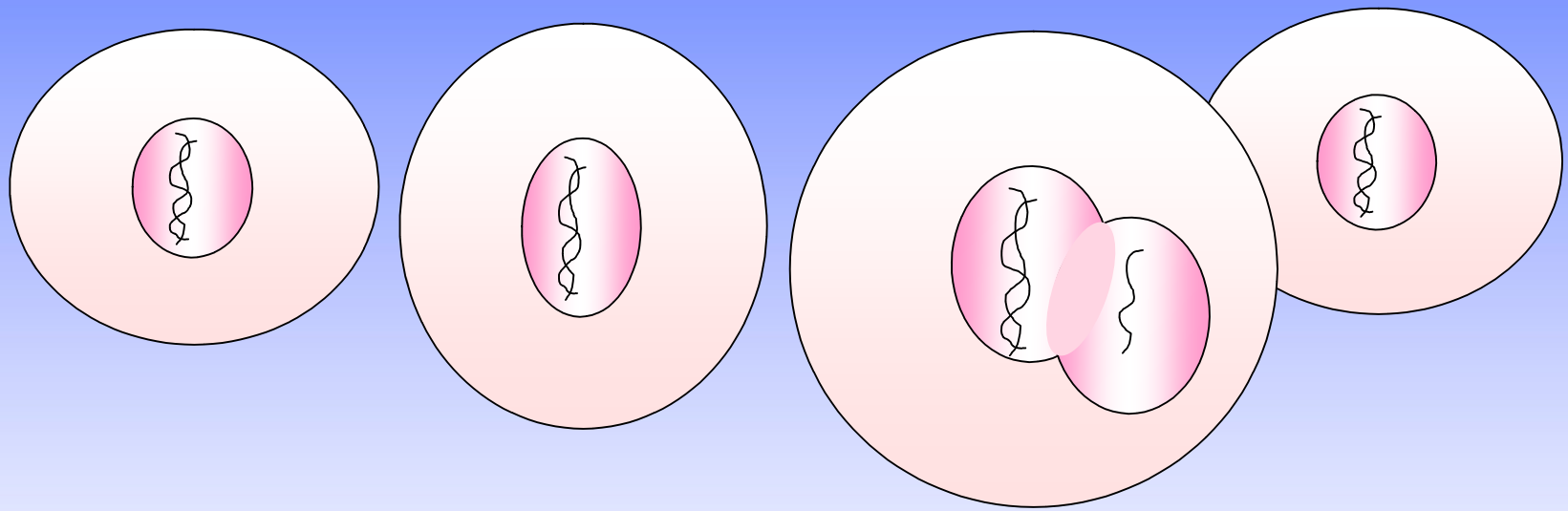
Natural selection >> rapidly reproducing clones

DI*N*OMIT - Natural Selection



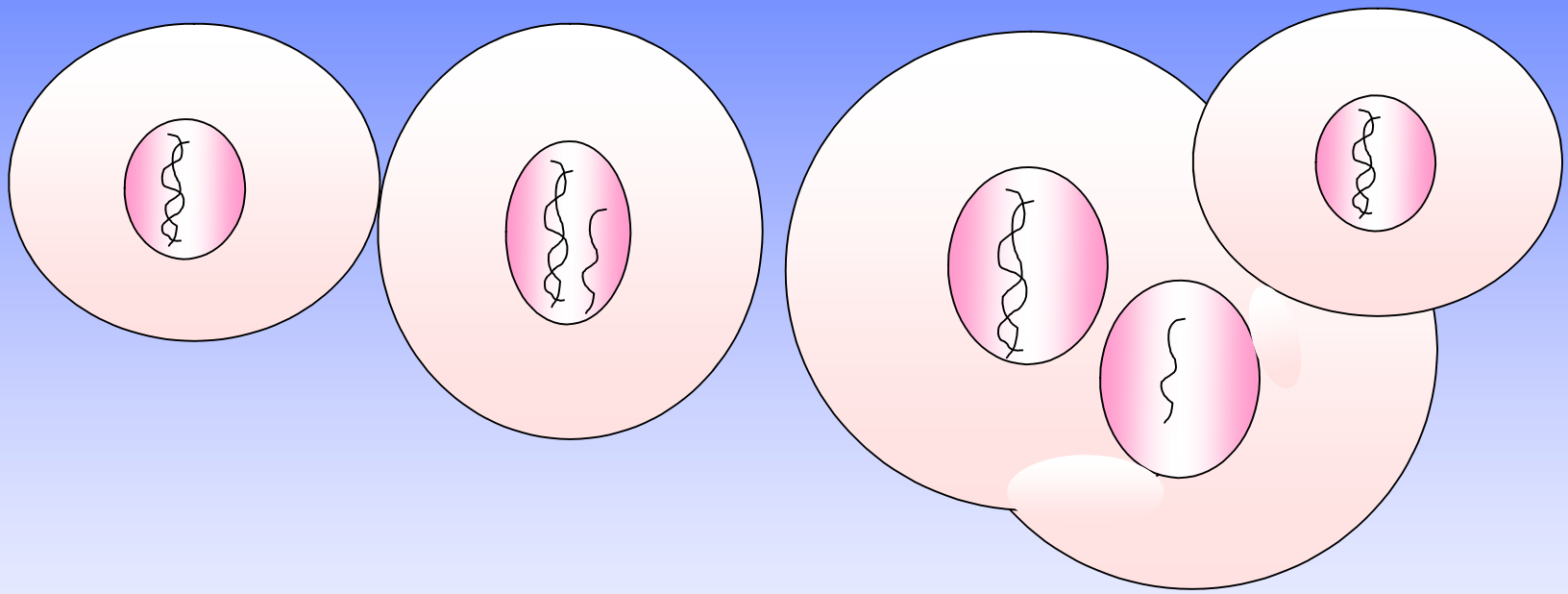
Natural selection >> rapidly reproducing clones

DINOMIT - Overgrowth



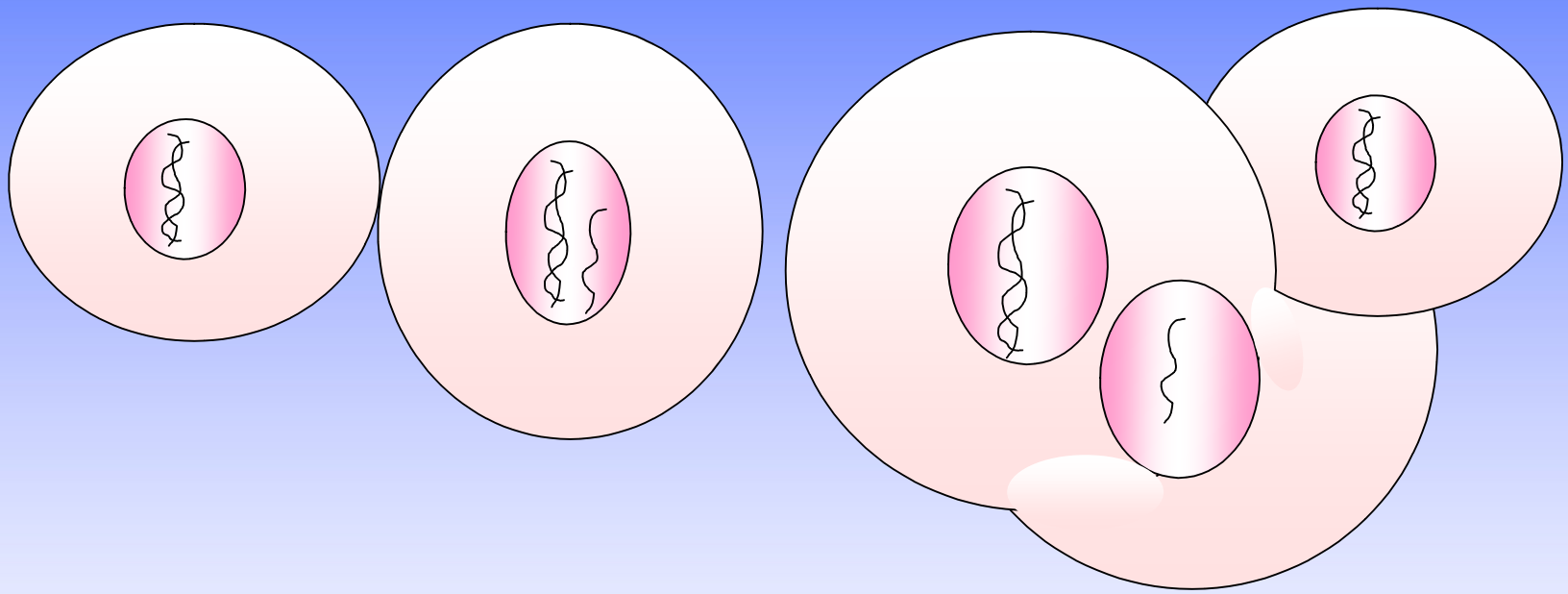
New clone rapidly mitotic

DINOMIT - Overgrowth



Infidelity of DNA and epigenetics

DINOMIT - Overgrowth



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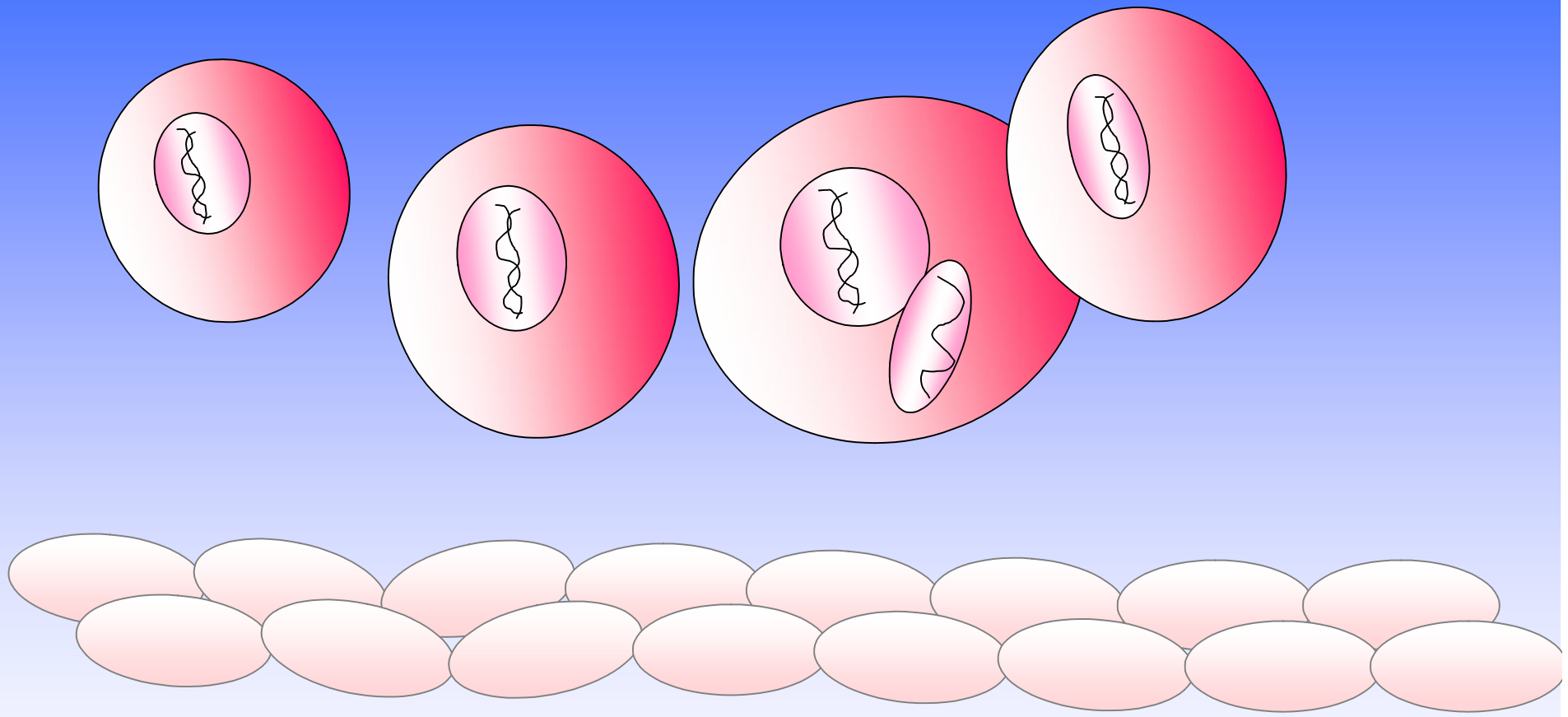
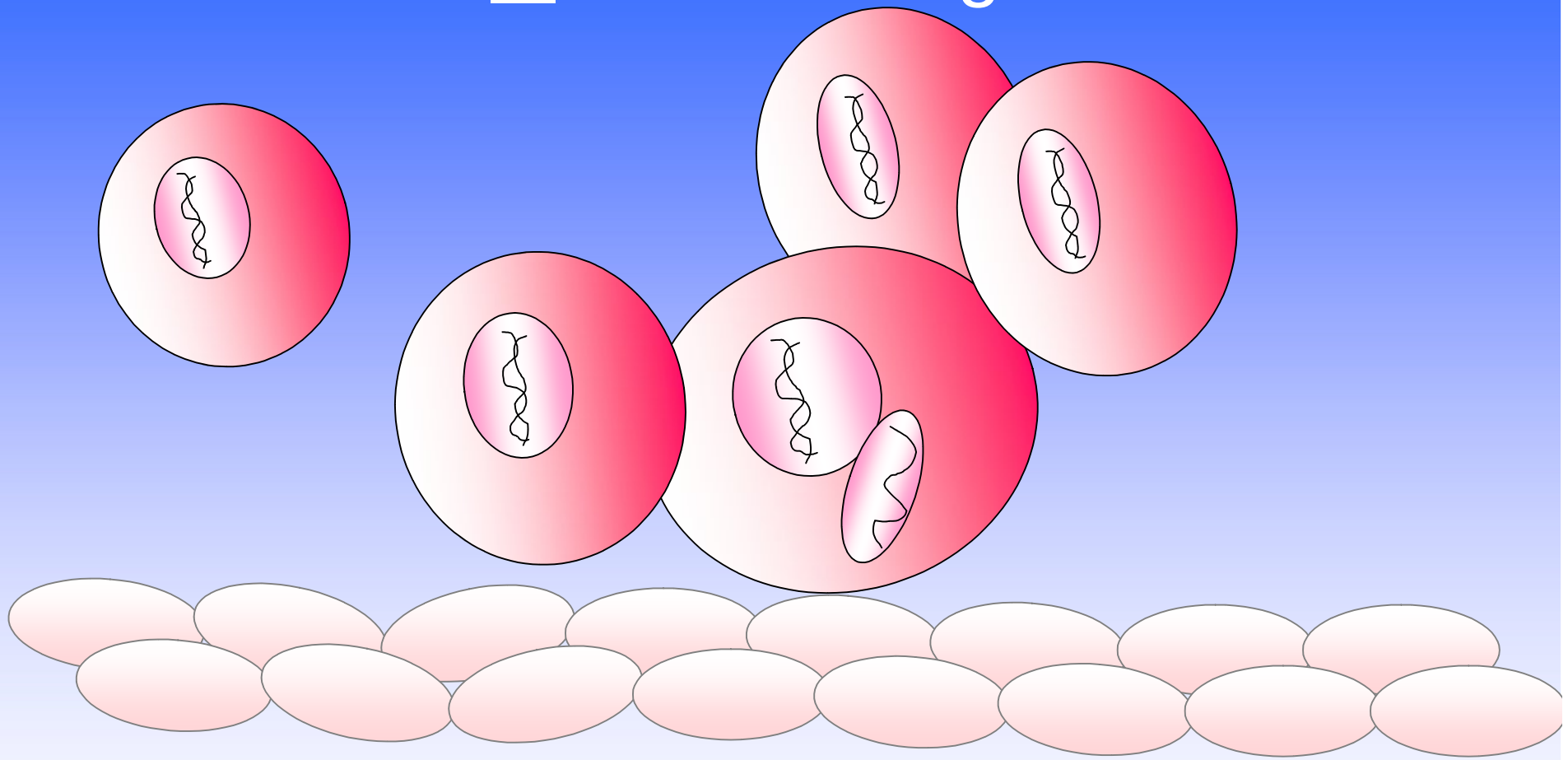


Overgrowth creates crowding

DINOMIT - Overgrowth



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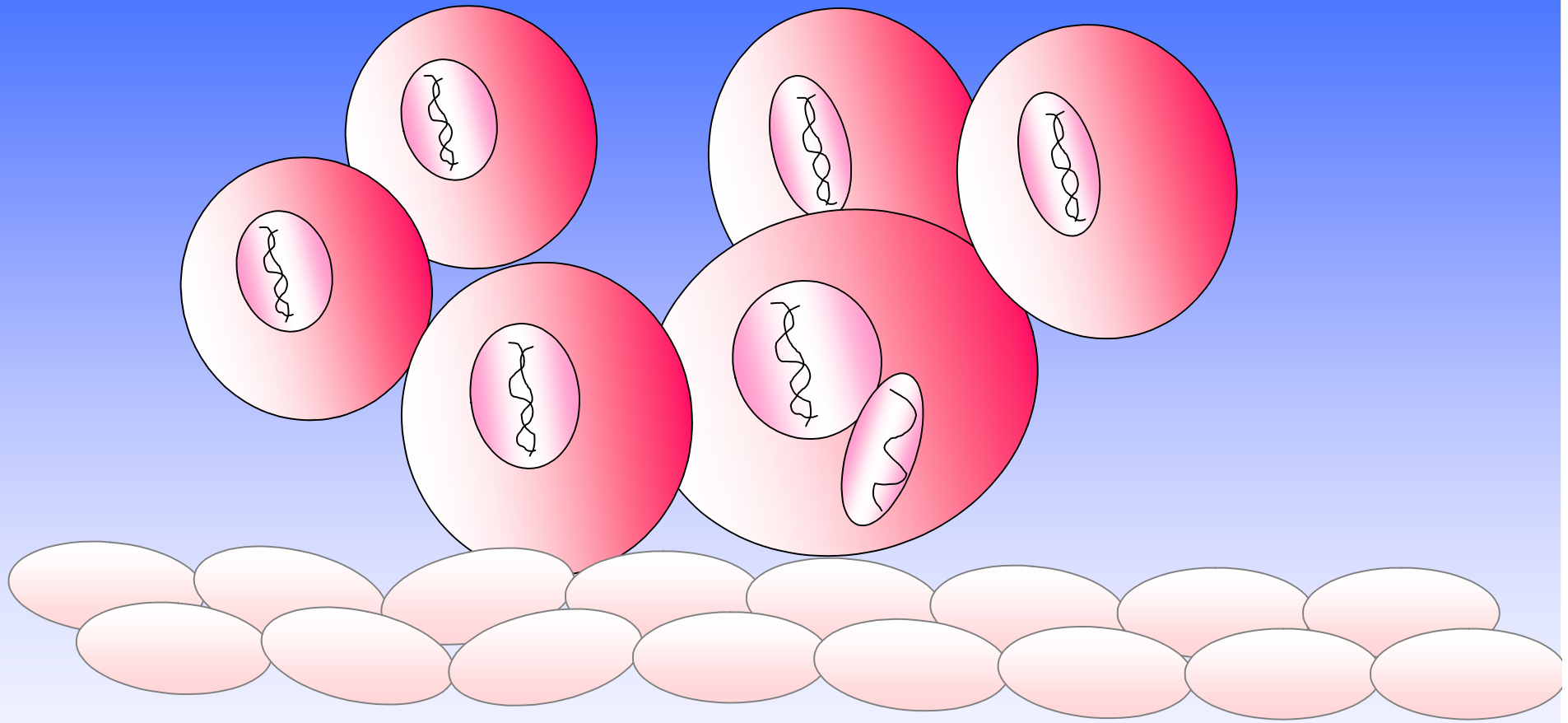
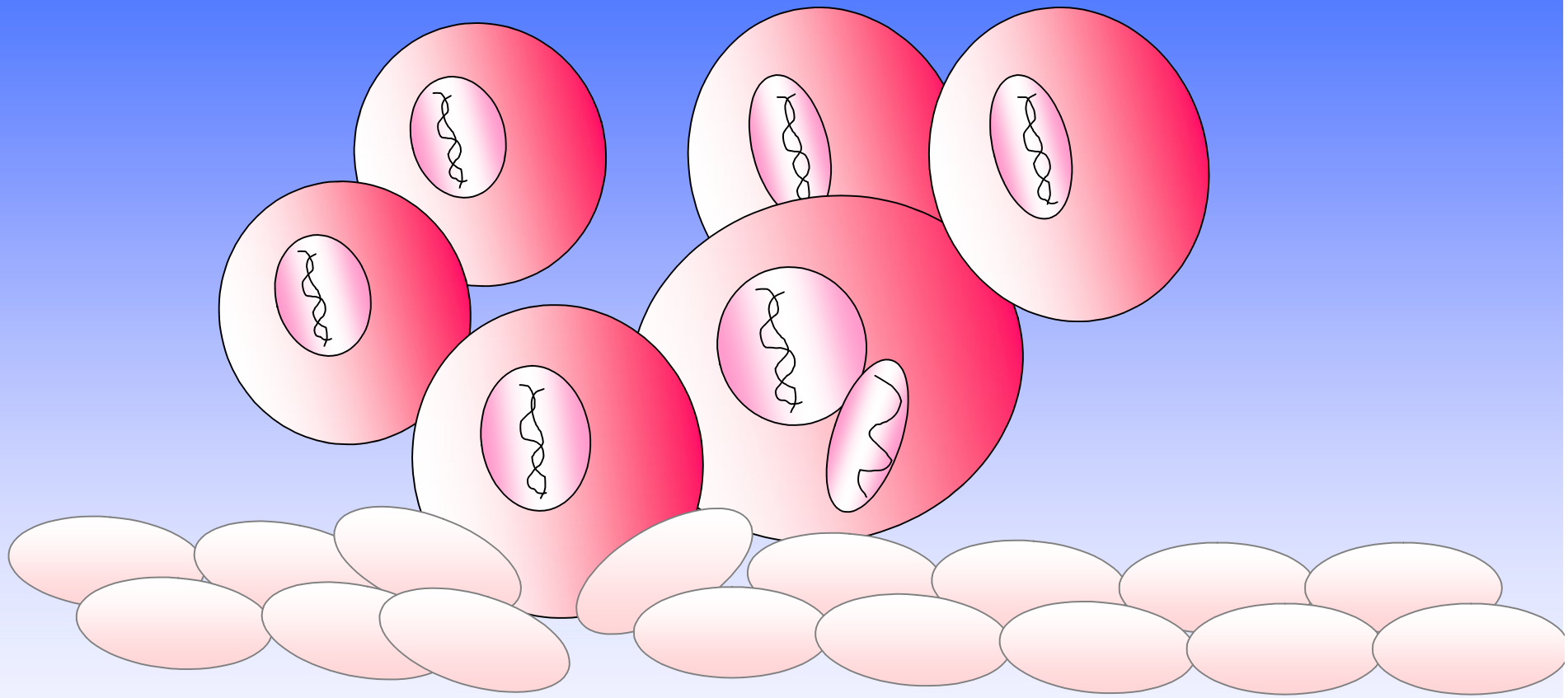


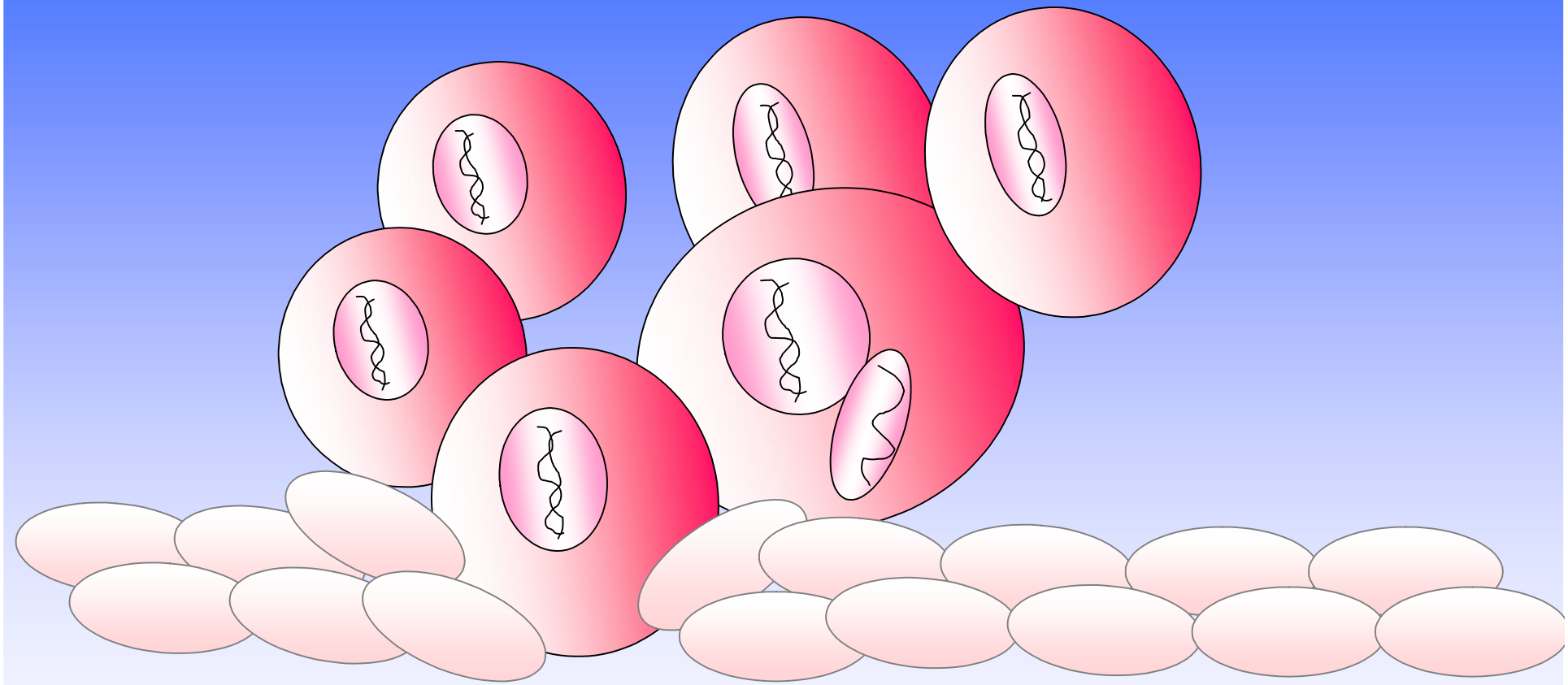
Beginning penetration of basement membrane

DINOMIT - Overgrowth



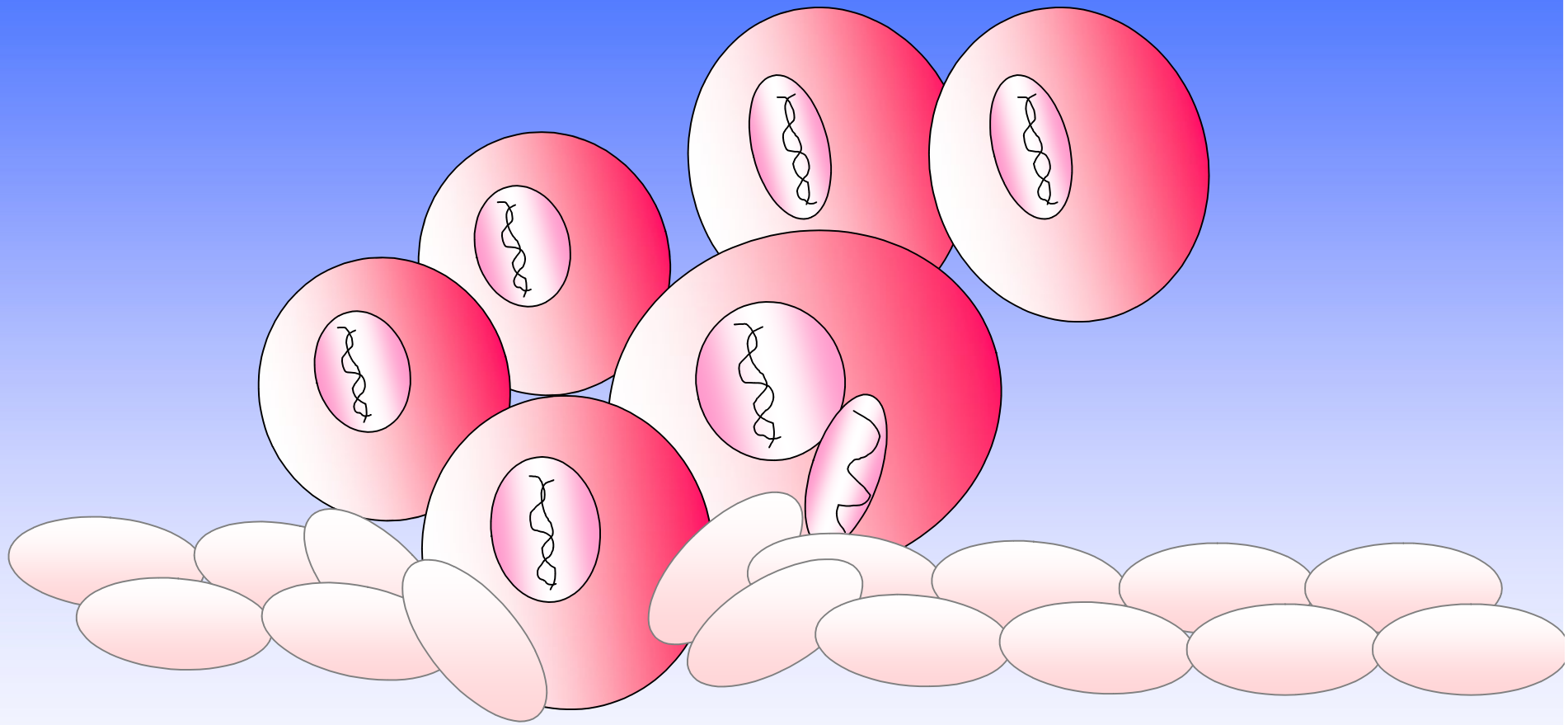
Ongoing penetration of basement membrane

DINOMIT - Overgrowth



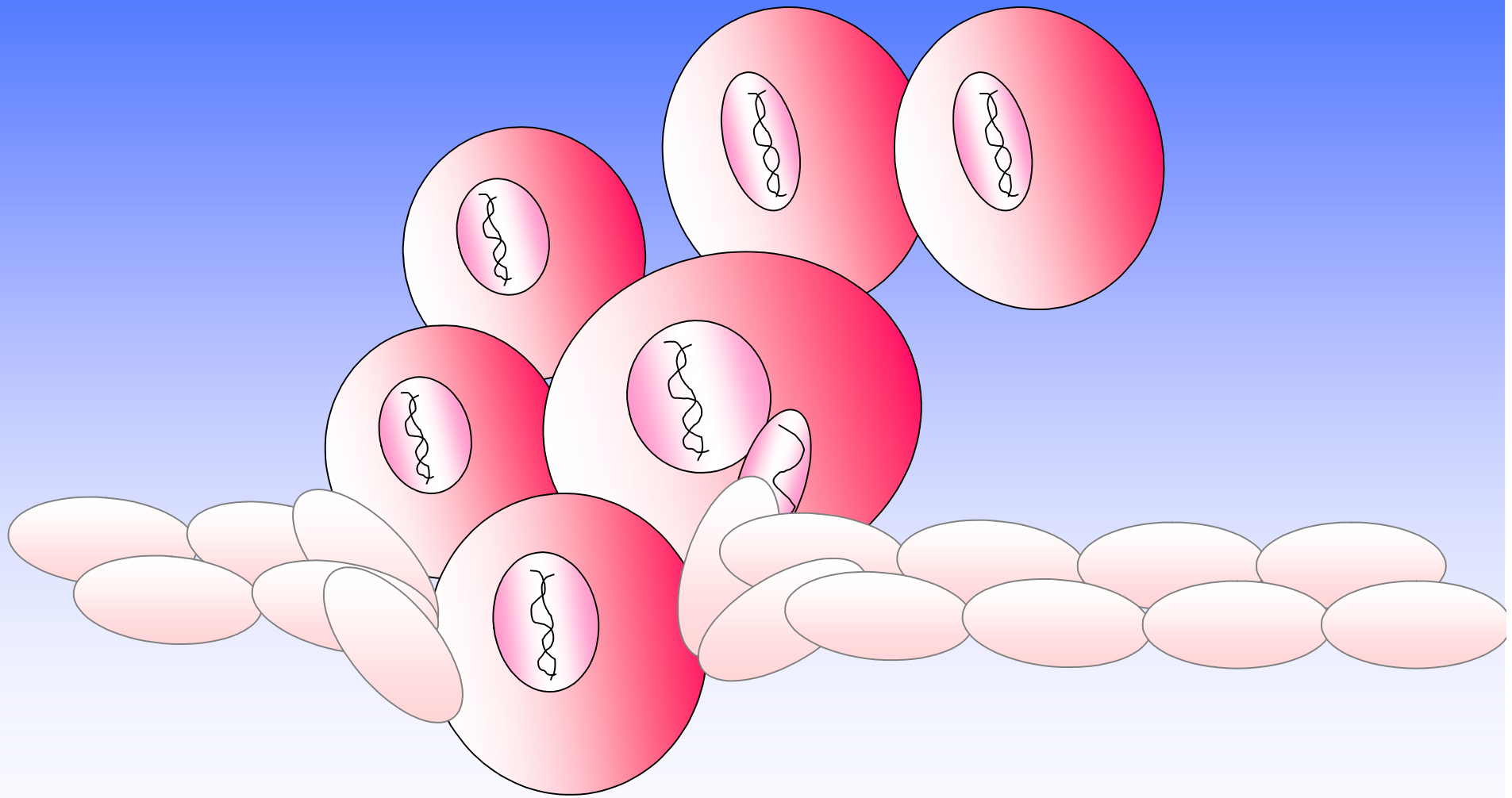
Fuller penetration of basement membrane

DINOMIT - Overgrowth



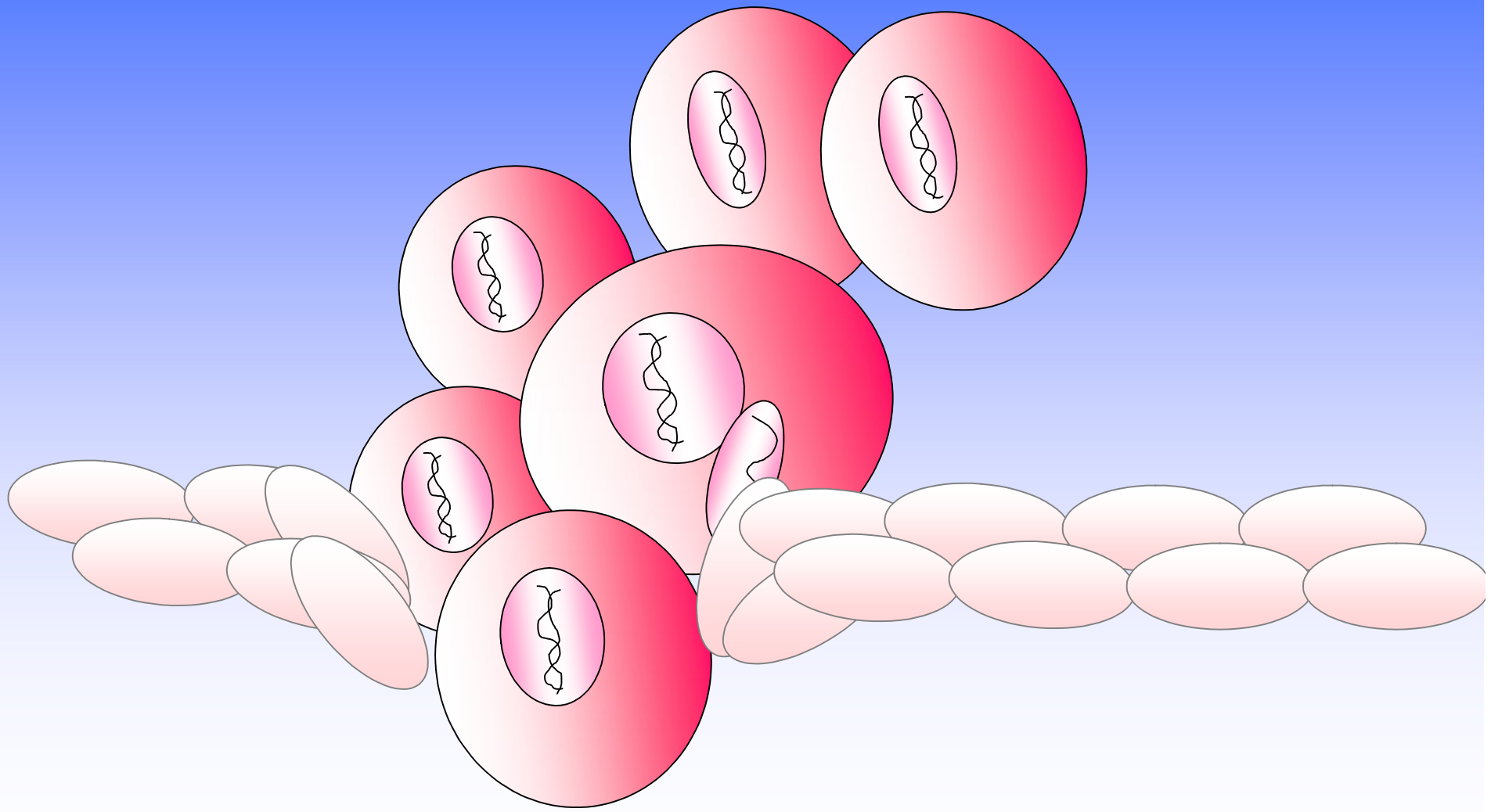
Penetration of basement membrane continues

DINOMIT - Overgrowth



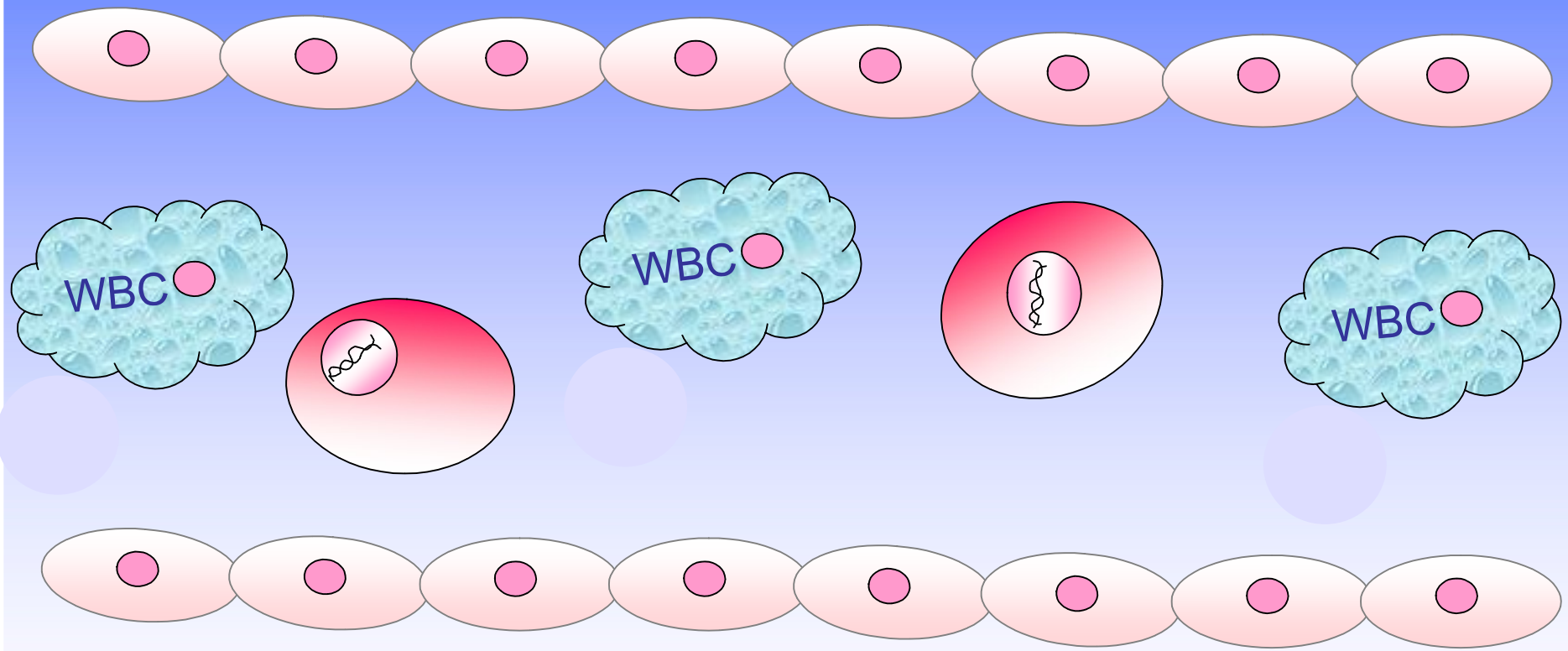
Penetration of basement membrane continues

DINOMIT - Overgrowth



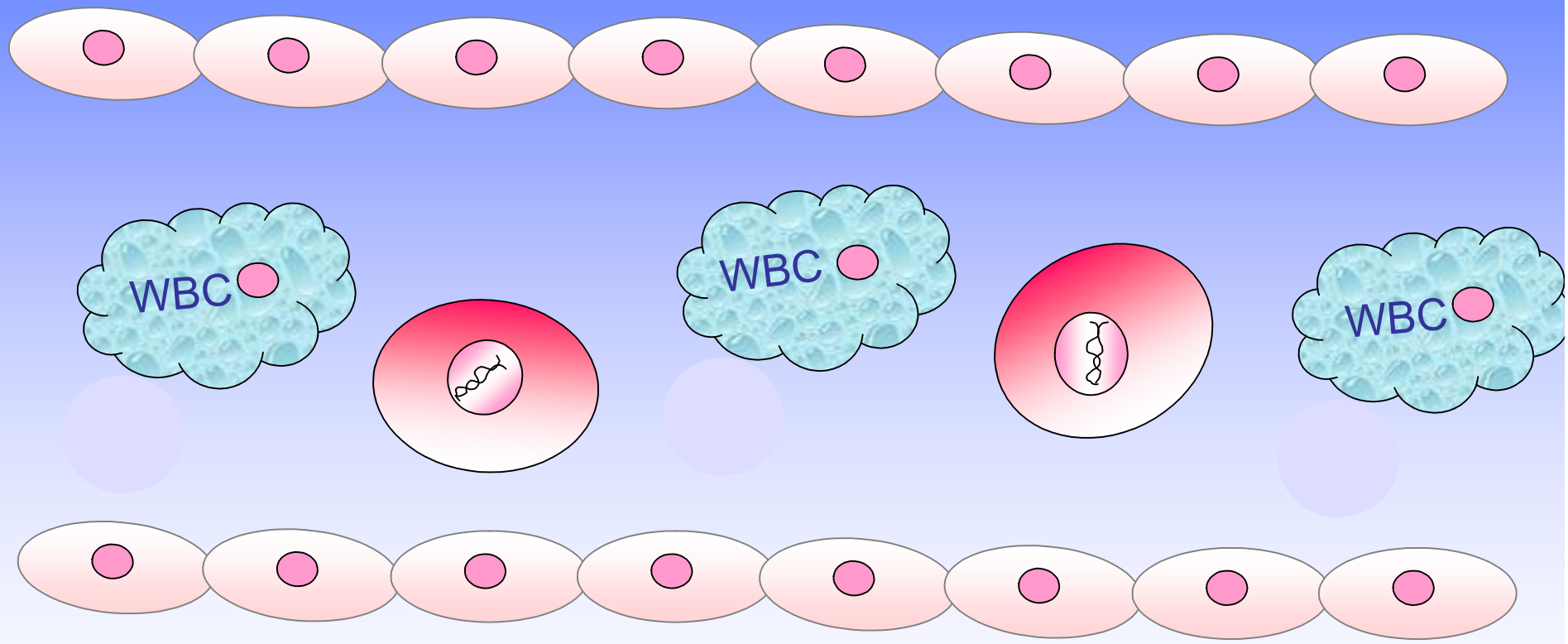
Penetration of basement membrane continues

DINO*M*IT - Metastasis



Malignant cells enter lymphatic circulation

DINO*M*IT - Metastasis



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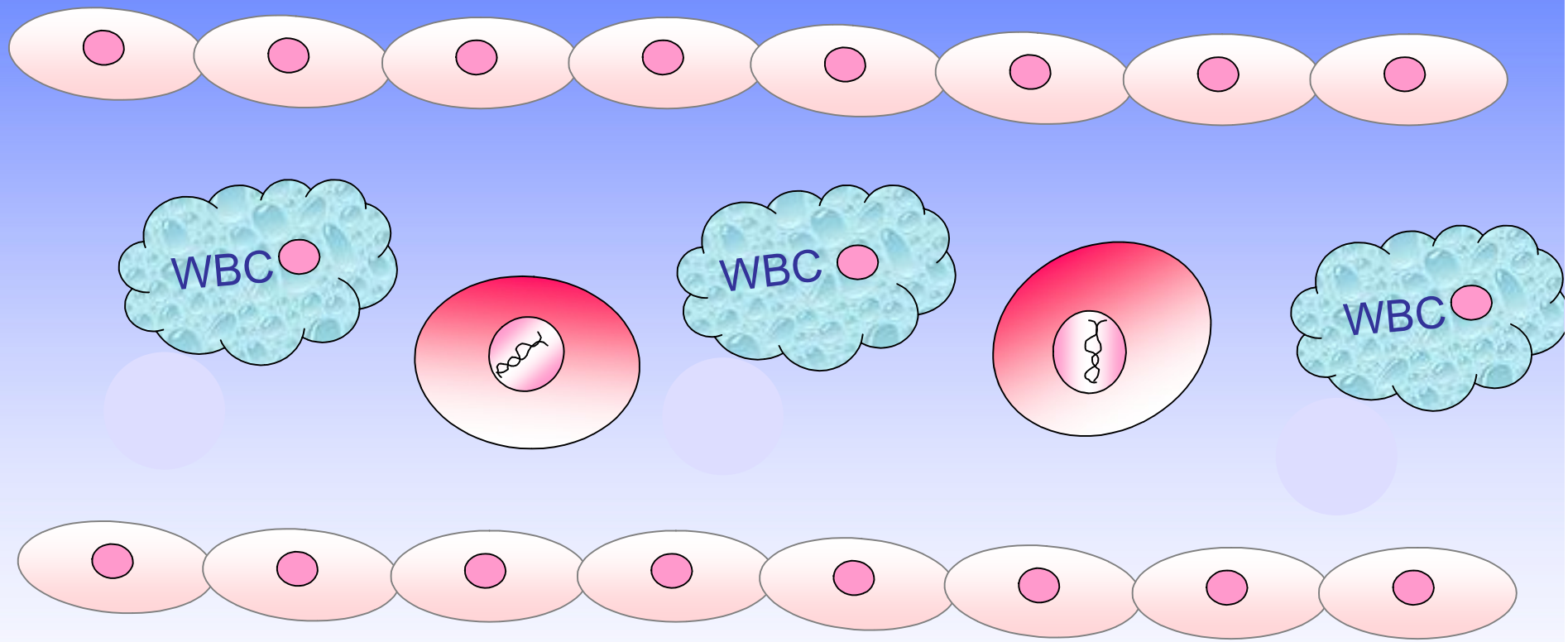

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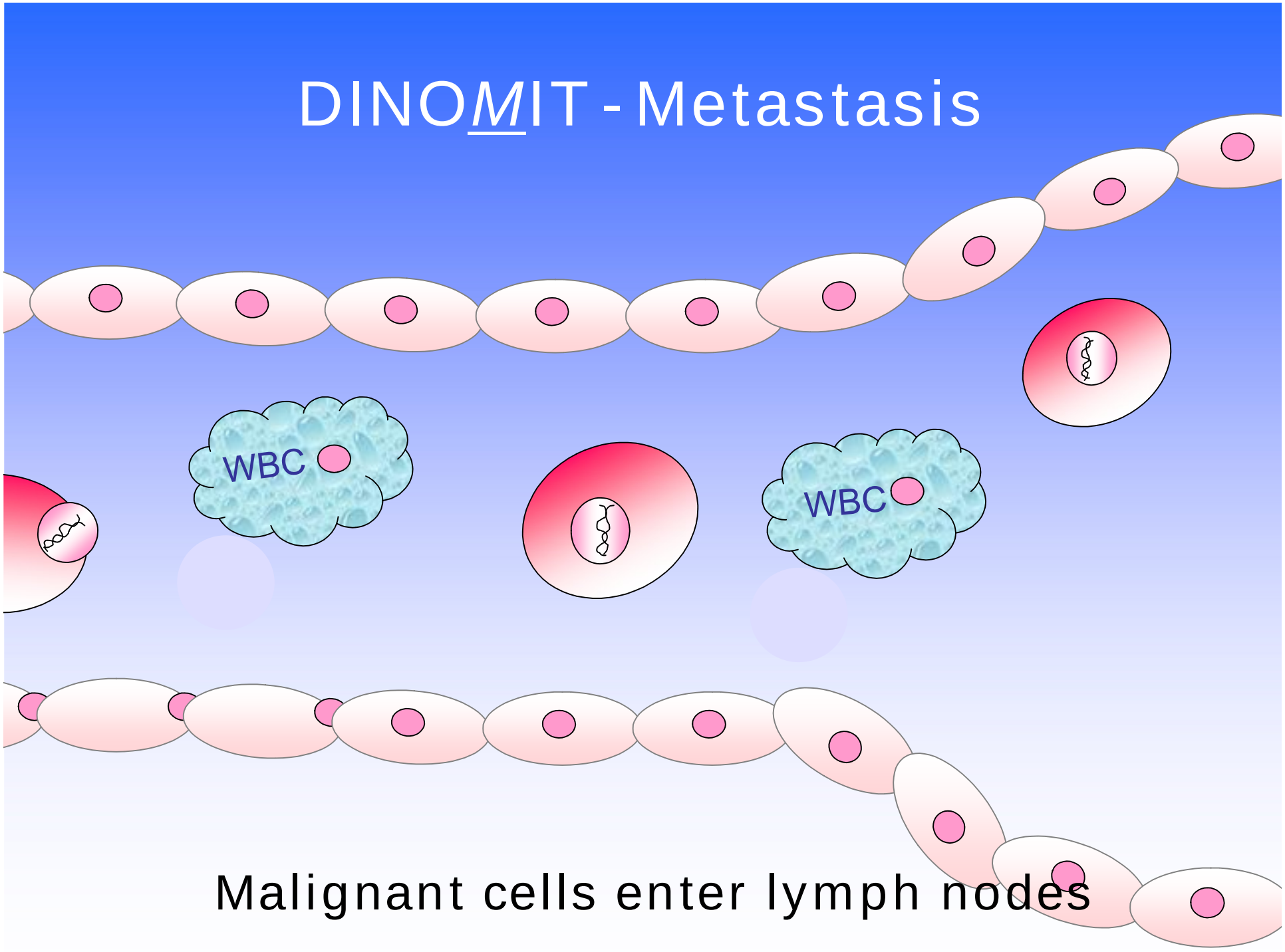
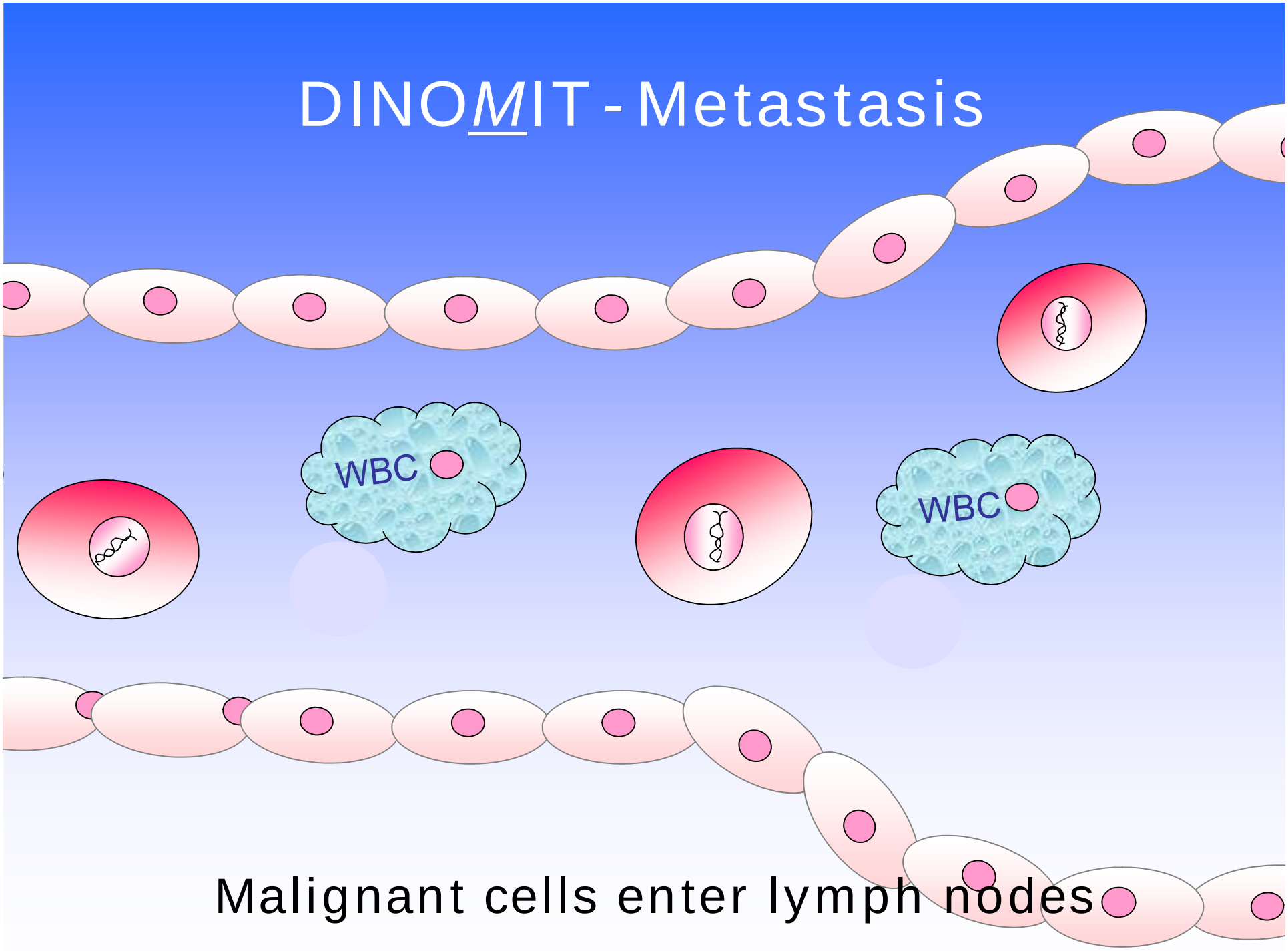


Malignant cells enter lymph nodes

DINO*M*IT - Metastasis



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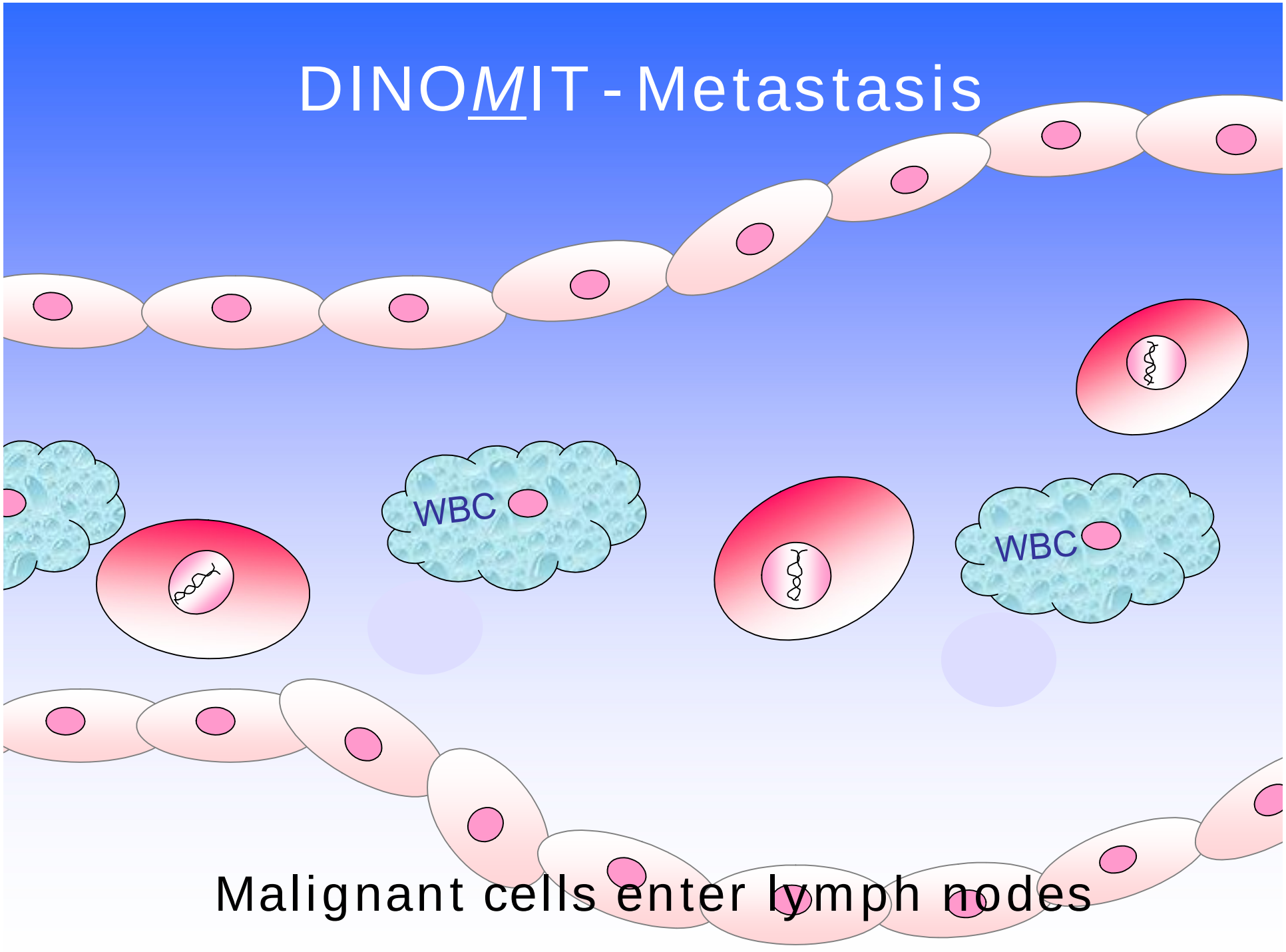

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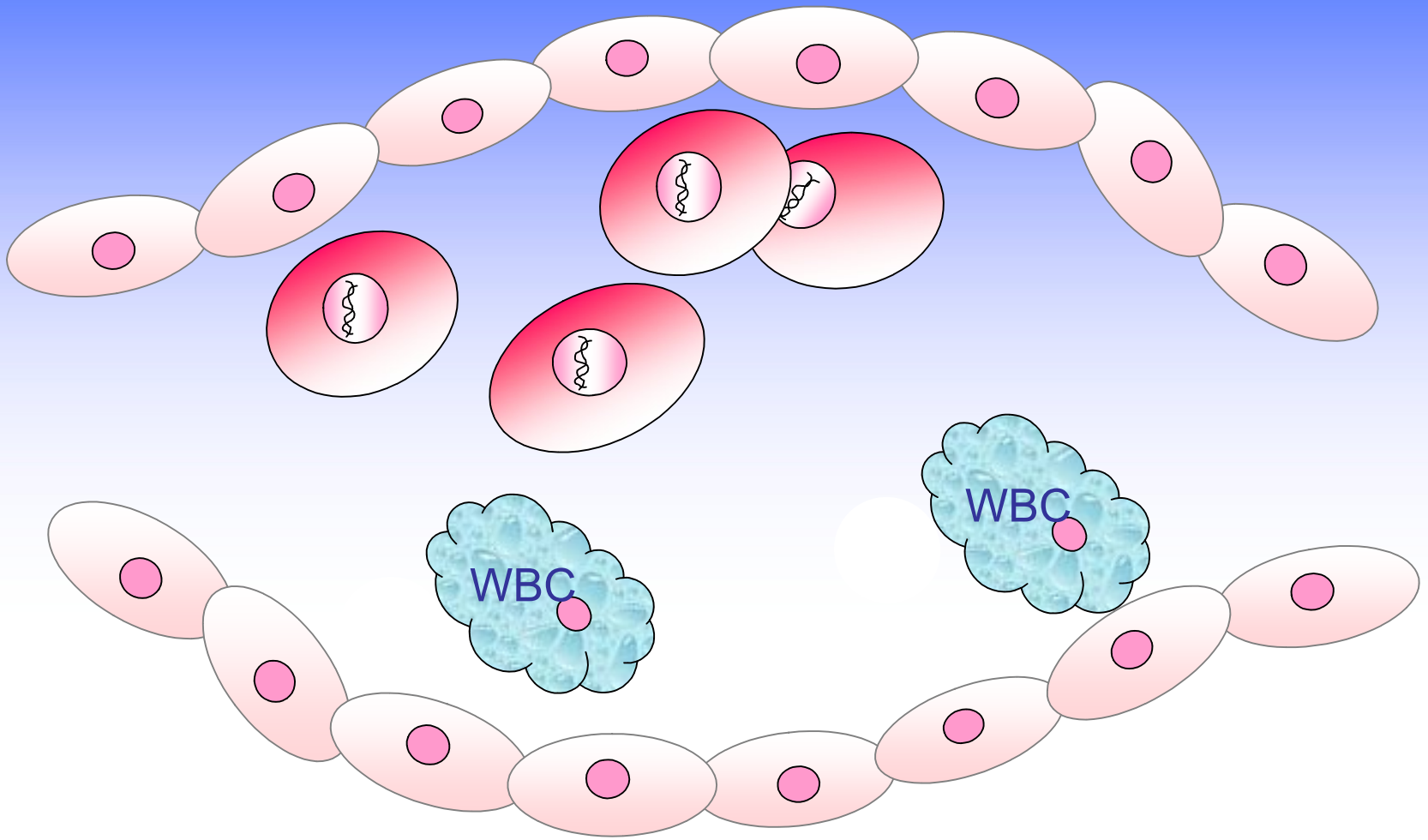
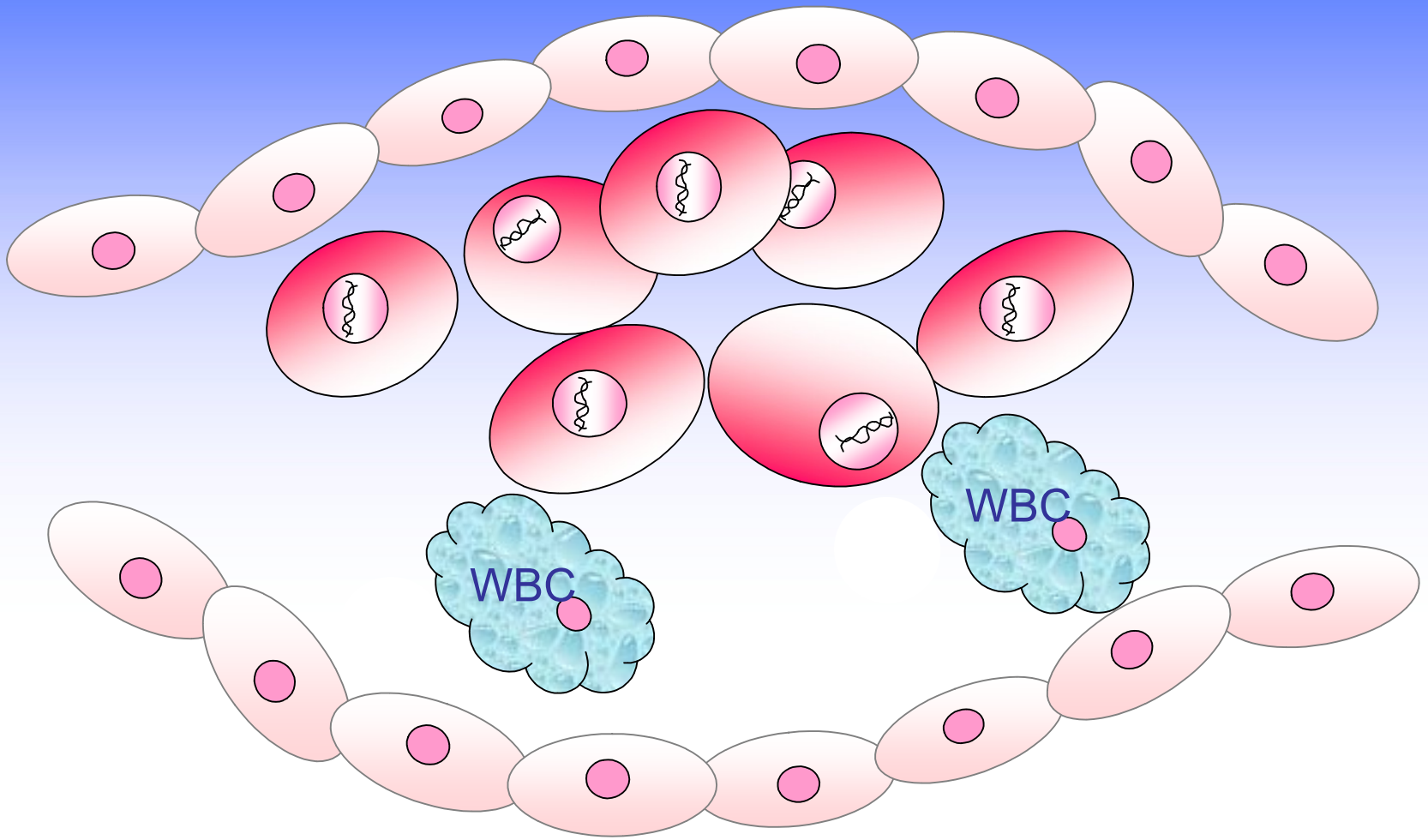


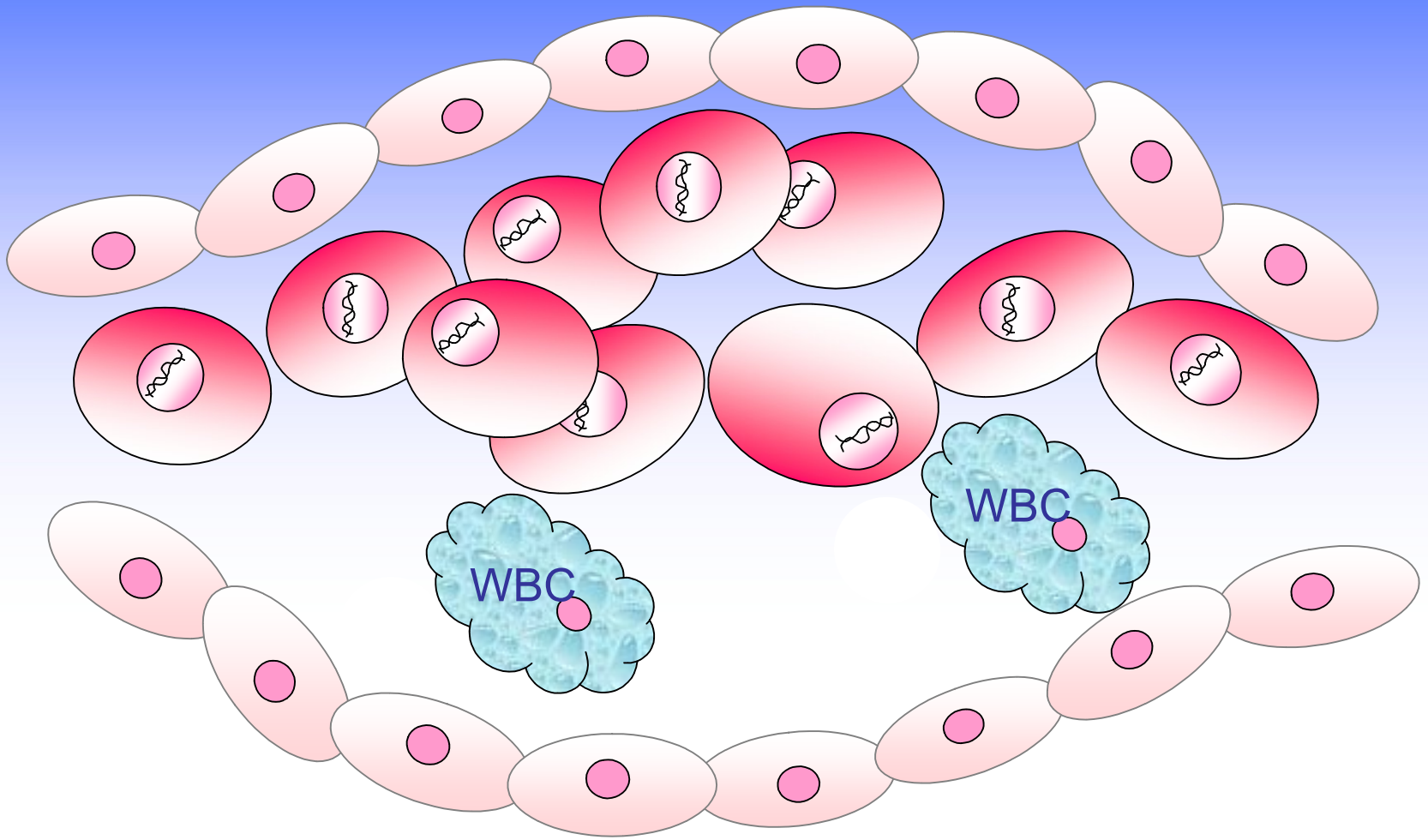
Malignant cell population grows

DINO*M*IT - Metastasis



Expansion of malignant clone in lymph node

DINO*M*IT - Metastasis



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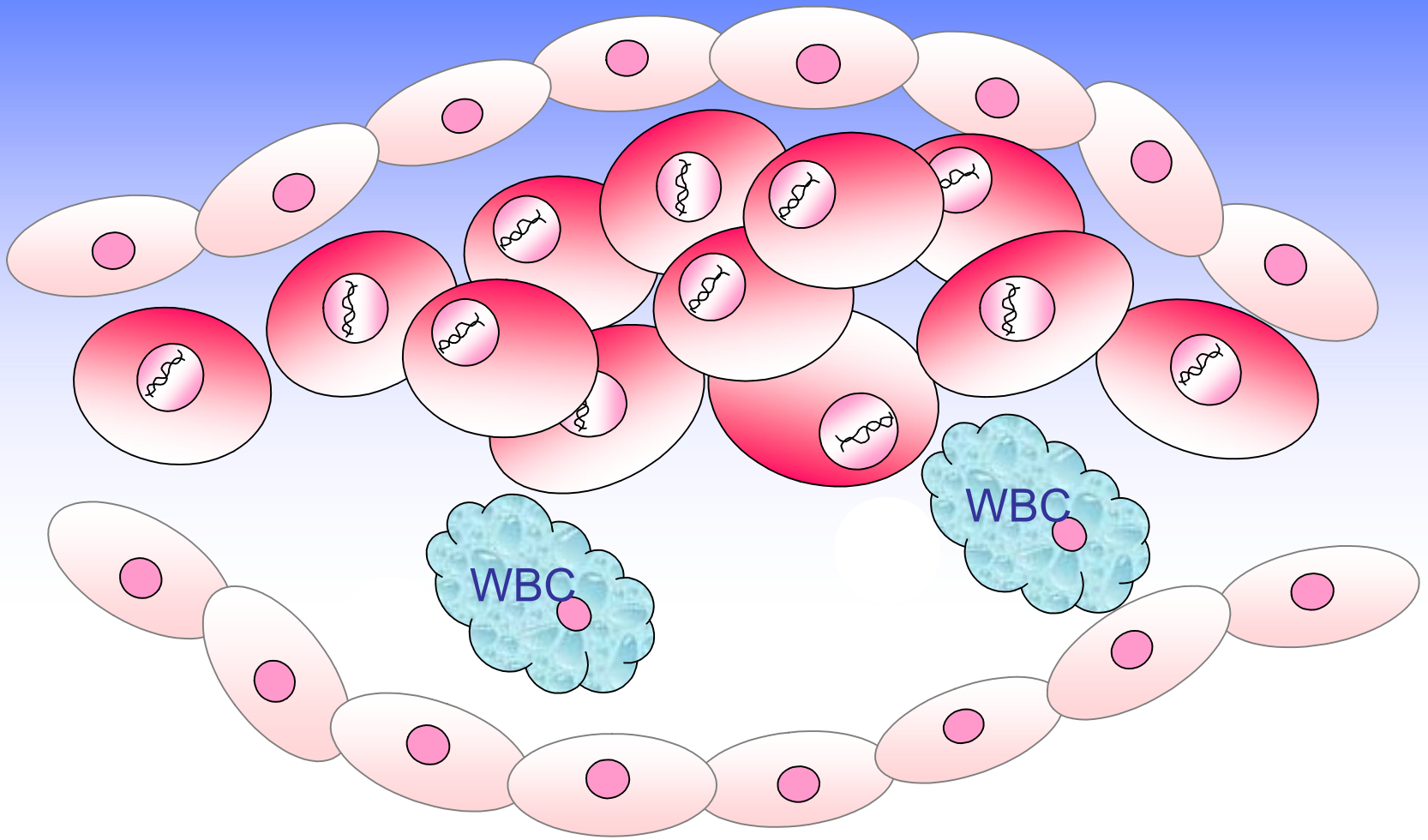

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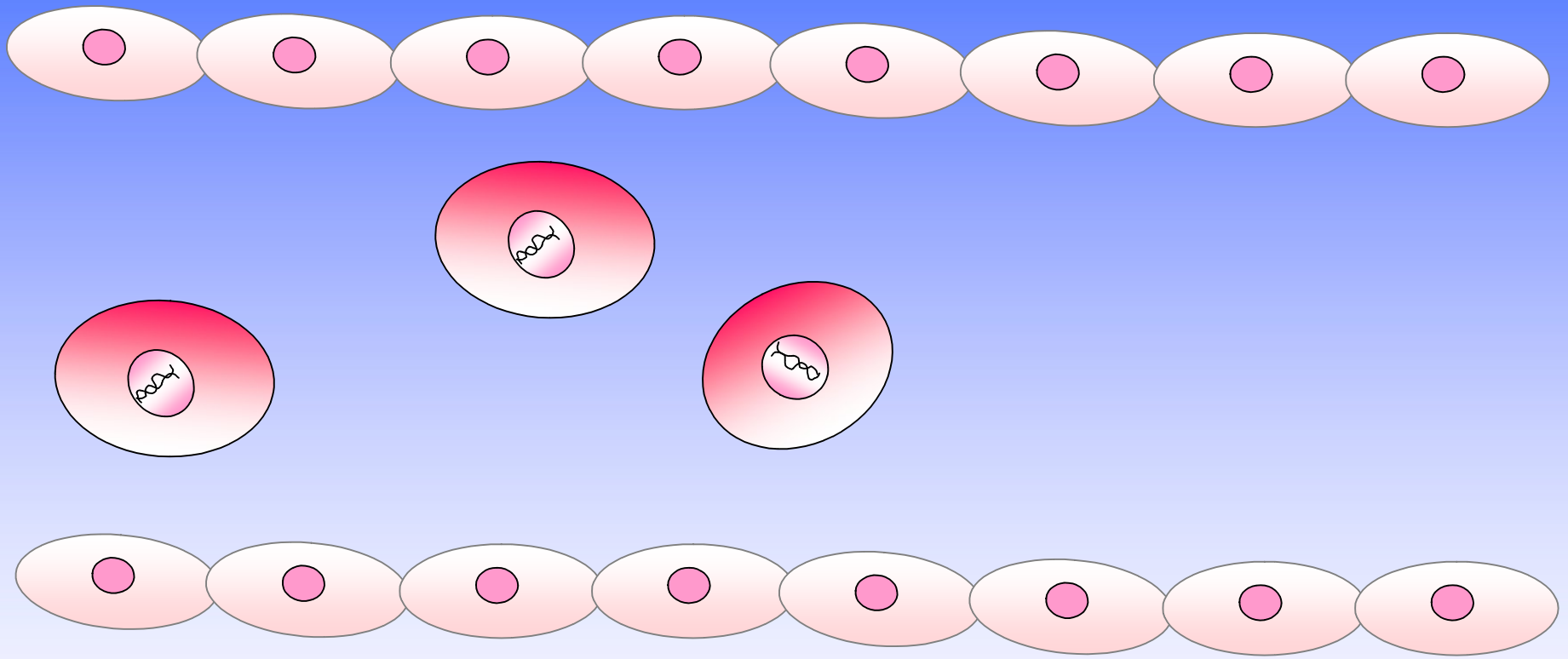
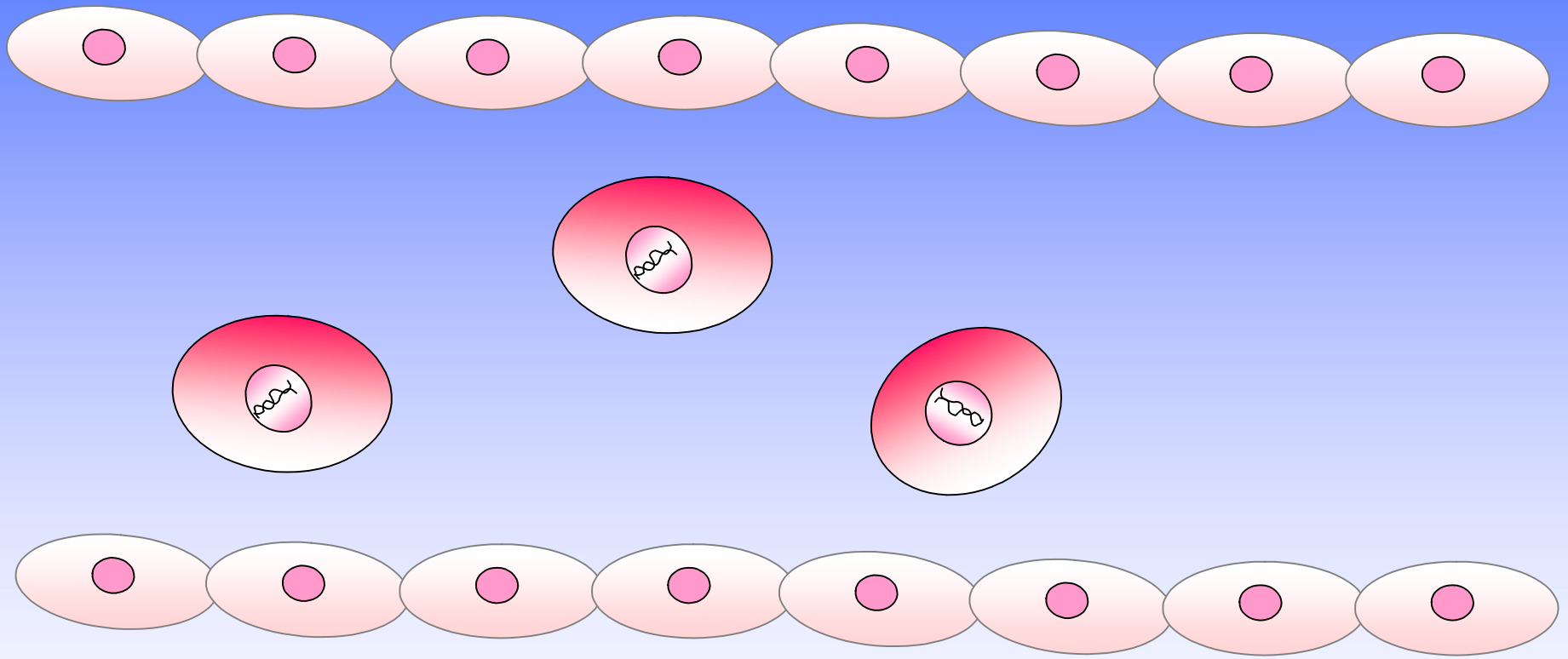


Malignant cells transported from lymph node

DINO*M*IT - Metastasis



Malignant cells transported from lymph node

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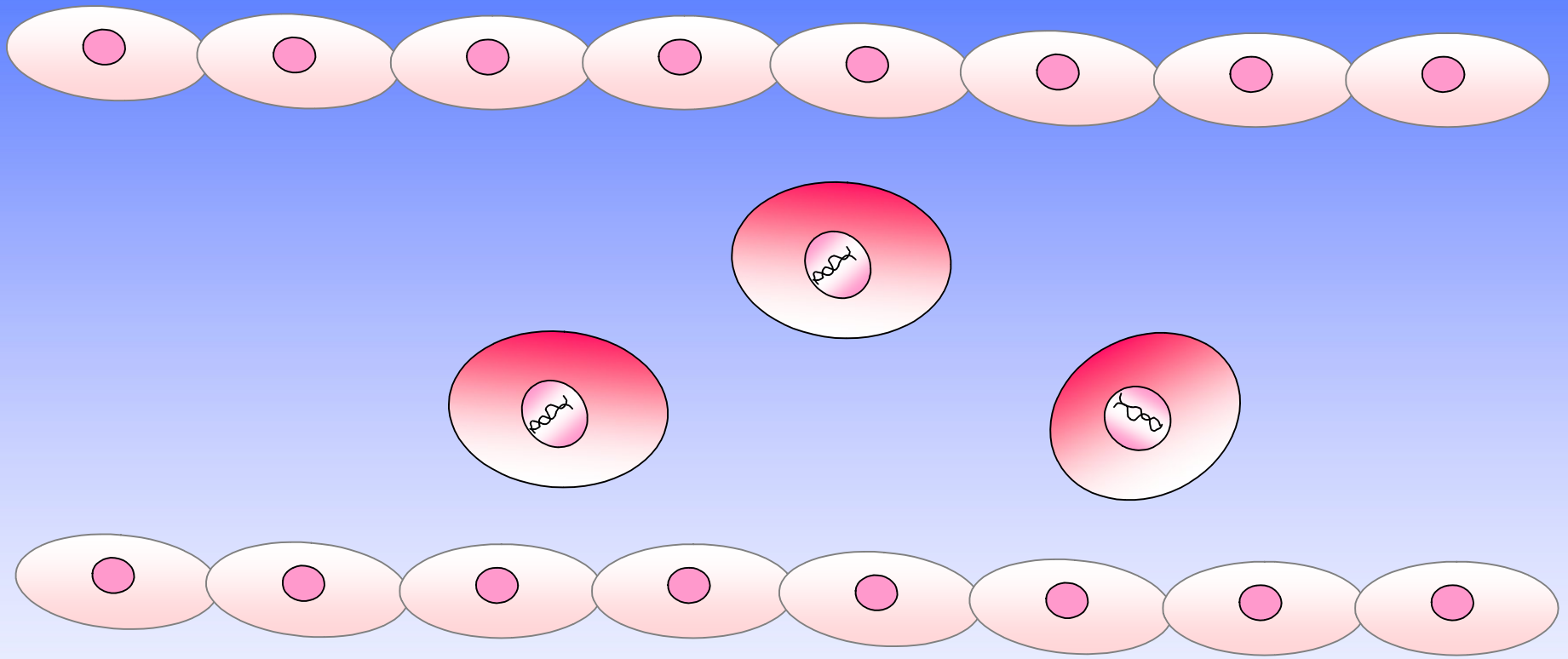

Malignant cells transported from lymph node

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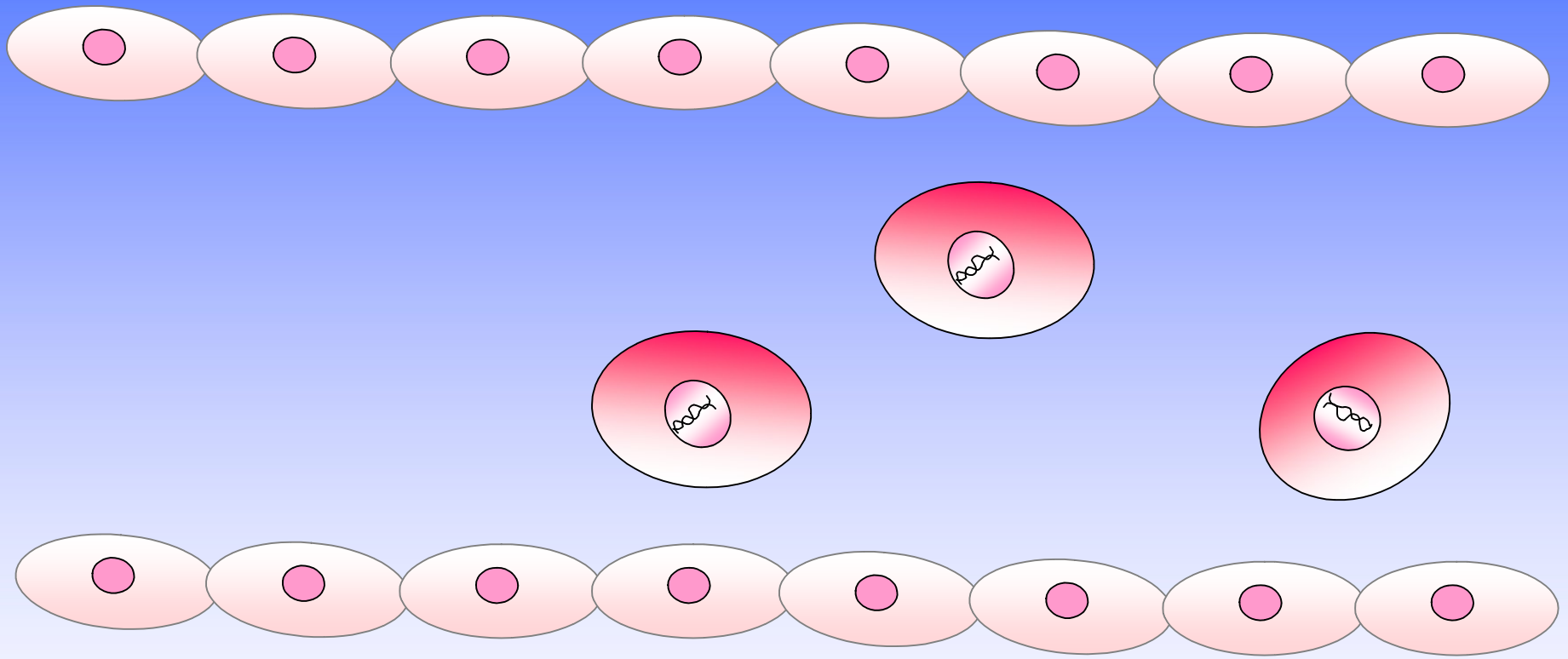

Malignant cells transported from lymph node

What do we do to PREVENT it?

Get serum level to 100-150 nmol/L

1200-1500 mg/day of calcium
(from all sources)

Vitamin D*action

A Consortium of Scientists, Institutions, and Individuals
Committed to Solving the Worldwide Vitamin D Deficiency Epidemic

Beyond Clinical Trials to a Population Level Intervention Project

D*action Project

A population level public health intervention

1. Solve the deficiency epidemic--now!
2. Create Evidence-Based Public Health Policy Recommendations
   - Large scale intervention
   - Education
   - Testing
   - Voluntary/individual intake adjustment
   - Documentation

Vitamin D*action

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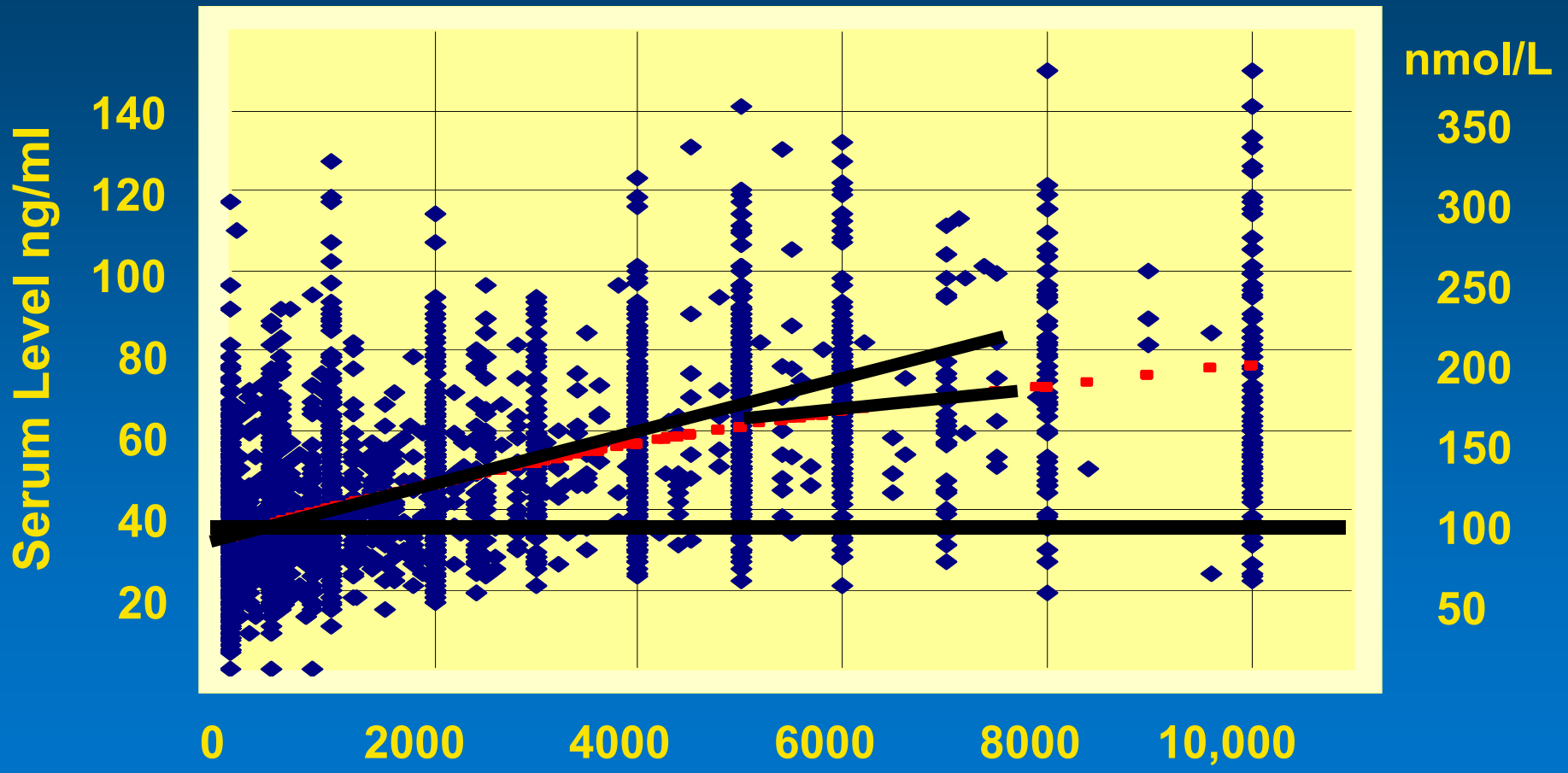
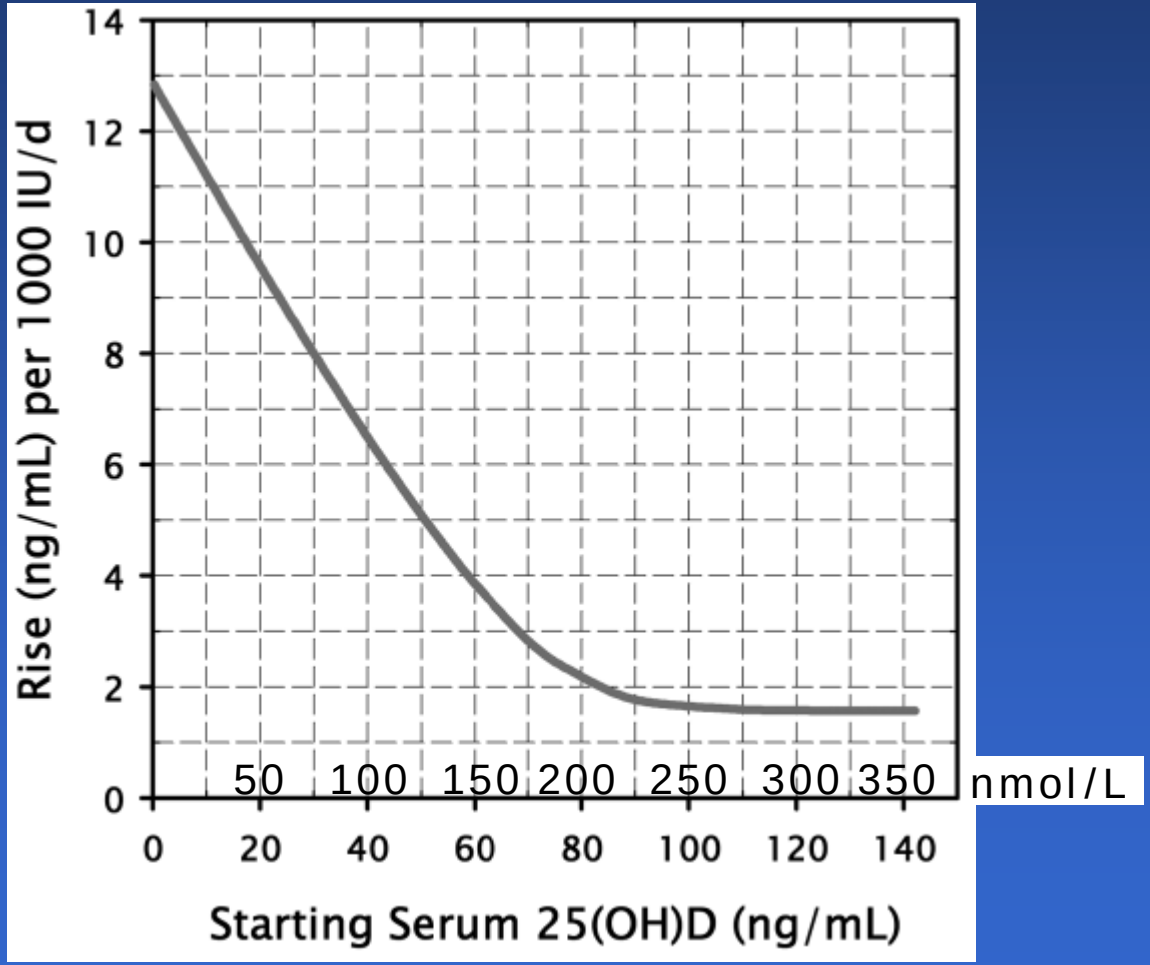
Project Study Results to Date

D*action Project: Serum Level vs Intake



www.grassrootshealth.net

Rise in serum 25(OH)D per 1,000 IU D3 per day



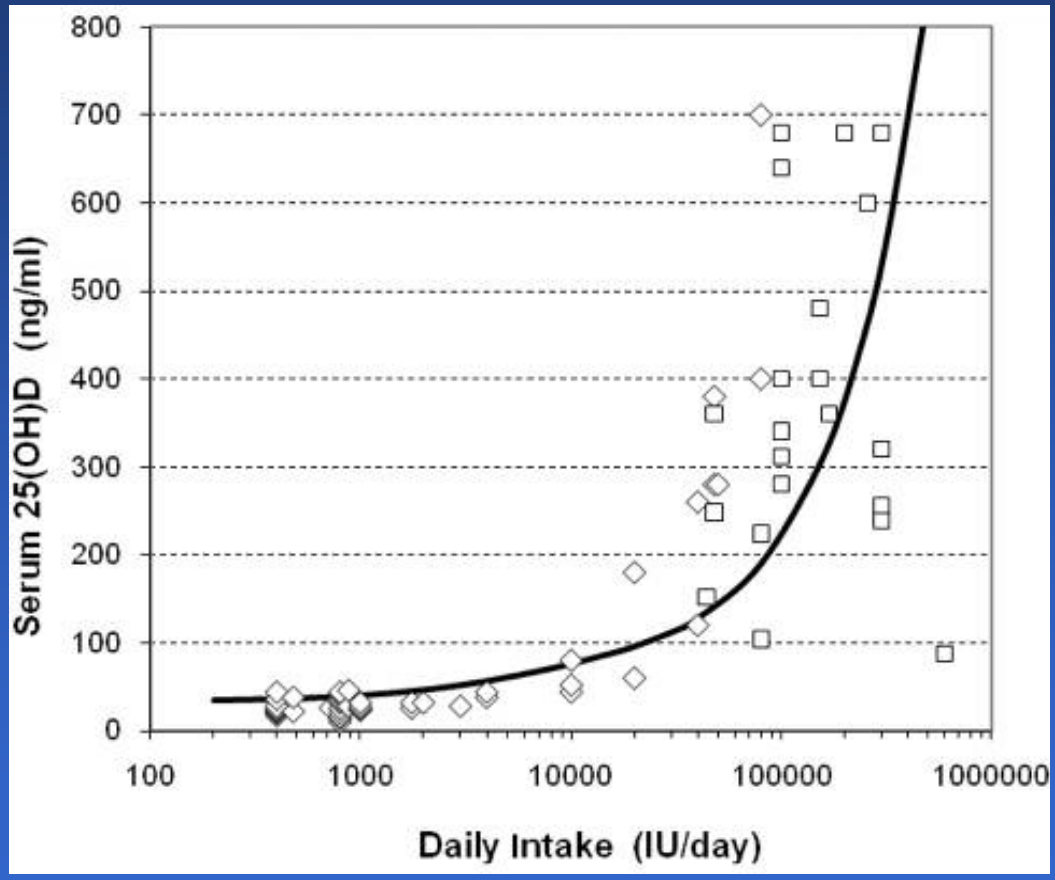
Expected Serum Level (nmol/L)

Current Serum Level (nmol/L)

	50	75	100	125	150	175	200
25	1000	2200	3600	5300	7400	10100	13800
38	500	1700	3200	4900	7000	9700	13400
50		1200	2600	*4300*	6400	9100	12800
63		600	2000	3700	5800	8600	12300
75			1400	3100	5200	7900	11600
88			800	2500	4600	7300	11000
100			--	1700	3800	6500	10200
113			--	900	3000	5700	9400
125			--	--	2100	4800	8500
150			--	--	--	2700	6400
175			--	--	--	--	3700

Example: To go from 50 nmol/L to 125 nmol/L would require an average additional intake of 4300 IU/day

D*action Study Data plotted on previously published data



diamond-shaped are the means of controlled dosing studies (n=48)

square symbols, individual values from reported cases (n=21) of vitamin D intoxication

Next Steps

- Further analyze health outcome data
- Expand endorsements of the Call to Action—get serum levels to 100-150 nmol/L

Key medical group in Canada has fully endorsed with their membership

Next Steps, continued

- Enroll additional groups
  - Disease specific, e.g., MS, breast cancer, falls
  - Other large population groups
    - Communities
    - Research groups
    - Government groups/regions
  - Expand sponsorship

Reality must take precedence ... for nature cannot be fooled.

Richard Feynman

Thank you!

Get your Vitamin D blood serum level to 100-150 nmol/L (40-60 ng/ml)

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