LENScience Senior Biology Seminar Series

Teacher Update Number 9 – July 21st 2009

In this issue:

- Seminar 4 Information
- Feedback from teacher questions
- Student lists - reminder
- Tell us about what you are doing.....

Seminar 4 – Information

All learning resources for seminar 4 are now posted on the wiki. We have used a slightly different style of writing for this student paper and welcome your feedback.
http://lens.auckland.ac.nz/index.php/Climate_Change_and_Evolution
The challenge questions offer students the opportunity to analyse data that is yet to be published.

Feedback from teacher questions

Professor Peter Gluckman has offered some feedback to a teacher question posed after the last seminar. Read more.....

Student Lists

A reminder that if you would like your students to be sent the student updates directly each Friday via email, please send an excel spreadsheet list of students to ligginsinfo@auckland.ac.nz using the following format: surname | Name |email

Tell us about what you are doing.....

We would love to hear about how the seminars are going in your school. We will be posting photos and stories about the seminar events in schools around the country on the wiki. Please remember all photos must be of students who you have permission to use photos from.

Teacher questions from seminar 3:

Where does epigenic change sit in terms of differentiating between biological and cultural evolution? It is not genetic change as a result of mutation and natural selection and it is not learned behaviour passed on by communication but it is change passed on from one generation to the next.
Ideas? Thoughts?

Peter Gluckman:
Biological and cultural evolution are different phenomena.
Lets define biological evolution here as changes in allelic frequency within a population under selection or drift.

The issue of whether epigenetic processes affect evolution is complex and highly debated and the processes are indirect.

I think the question really confuses evolution with plasticity –plasticity is a within life course phenomenon – it is a form of "adaptive response" within a life course. The organism is more plastic early in its life course and such plasticity appears to operate through epigenetic mechanisms.

Maternal effects (that is the environment of the mother acting on the oocyte, embryo, fetus or infant) is merely a short hand way of saying that the environmental information as transmitted to the new generation through the intermediary of mother informs the epigenetic/plasticity processes. There is no inheritance here in the true sense.

There may be some direct epigenetic inheritance possible over a limited number of generations probably mediated through microRNAs in sperm or oocytes. There is a theoretical phenomenon called genetic assimilation by which epigenetic change might become fixed (methylated CpGs seem more vulnerable to mutation, the silencing of gene expression might also allow silent mutations to accumulate such that function changed even in the absence of methylation) but there is only one or two pieces of experimental evidence to support this – unless occurs biological evolution will not be affected over the long haul by epigenetic processes. Most apparent epigenetic inheritance is likely to be indirect – that is the inducing niche for the plastic change is induced in each generation – for example neonatally stressed rats have induced changes in their glucocortoicid receptors in their brains which means they grow up to be mothers who inadequately groom their infants which means rthe enxtr generation is also stressed in infancy which leads to induction of the same epigenetic change in the next generation and they in turn grow up anxious etc. There is no germ-line mediated epigenetic change here.

In general then it is best to see epigenetics and plasticity as within generation (or perhaps one or two generations) processes to maximize fitness within that generation –hence essentially organiosms living in variable environments must have not only short term homeostatic processes but also longer-term plastic processes

Your question is really about gene-culture co-evolution for which the best example is lactose persistence/lactose intolerance.