AN ATLAS OF NORMAL AND MYC-INDUCED NEOPLASTIC DEVELOPMENT IN THE BURSA OF FABRICIUS.

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Over the past 4 decades I have accumulated a collection of over 100 color histological images displaying various features of normal bursa development and of lymphomagenesis induced by constitutive over-expression of Myc from the HB1 Myelocytoma Virus, and from defective retroviral constructs expressing either HB1 vMyc or normal cMyc oncoproteins The conventional histology was carried out by Sandra Jo Thomas (Bowers). Except where noted otherwise all histological sections were stained with methyl green pyronin (MGP). The immunofluorescence studies were carried out by Christine Heberden with monoclonal antibodies Hy 86b5 (Olson,W.C and Ewart,D.L.1990. Hybridoma., 9: 331-350), and to sialyl Lewis X, Igλ and K76 from commercial sources. Only nine of these images have appeared in publications (indicated by * on the list of slides, most as partials and/or in black and white). Originals exist on 35mm slides, which I have scanned as JPEG files for easy computer accesss.

2. Admiral Bird

LIST OF SLIDES (slide number in red)

A. The normal post-hatch bursa

3. Diagram of a bursal follicle.
4. MGP section 63X bursal follicles
5. K76 monoclonal Ab stain (red) early hatched bursal follicles

B. Early Embryonic Bursa

Day 13 normal embryonic bursa

6. 13 day normal bursa
7. 13 day normal bursa
8. 13 day normal bursa
9. 13 day normal bursa, 100x
10. Day 13 epithelium bud

Day 13 immuno fluorescence studies

11. E13 DAPI
12. E13 Ig λ (green)
13. E13 K76 (red), Hy85 (green)
14. E13 sialyl Lewis X (red), Hy 85 (green) DAPI (blue)

Day 14 normal embryonic bursa

15. 14 day normal bursal follicles 400X
16. 14 day normal bursa, 100X
17. 14 day normal bursa, 400X

Day 15-18 normal embryonic bursa

18. 15 day normal bursa, 100X
19. 15 day normal bursa, 400X
20. 15 day normal bursa, 100X, #2
21. 15 day normal bursal follicle, 400X
22. 15/14/13 day normal bursa composite
23. 18 day normal bursa H&E

Day 15 immunofluorescence studies

24. E15 DAPI
25. E15 K76 (red), Igλ (green).
26. E15 sialyl Lewis X (red), Hy 86b5 (green), DAPI (blue)
27. E15 K76 (red), Hy 86b5 (green)
28. E15 K76 (red). Hy 86b5 (green) composite
29 E15 K6 (red), Igλ (green), composite

Retained H^3 thymidine labeling stem cell study. H^3 Thymidine was injected into E10 embryos and radioautograpy carried out at hatch and 3 days post hatch

30. Day hatch H3 bursa, delayed dev. H&E
31. Day hatch H3 bursa, delayed dev. MGP
32. Day hatch(left) & 3day(right) radioautograph
33 Composite images.

C. Reconstitution of cyclophosphamide depleted bursal follicles. and effects of constitutive over expression of Myc and other transgenes

Chicken bursa transplants

34*. Protocol for primary and secondary bursal transplants.
35. Normal reconstituted bursa, 4 weeks post hatch

Cyclophosphamide (Cy) ablated bursa and follicles

36. Cy ablated follicles, residual cells
37. Cy ablated bursa low power.
38.. Cy ablated follicles, 400X
39. EM of residual cells in Cy ablated bursa
40. Low power EM of bursal cells after Cy treatment

Primary bursal transplants with Alk Phos vector LAPSN (Miller)

41. Primary 4 week LAPSN transplant Alk Phos stain
42. Primary 4 wk LASPN transpl. Alk Phos + stain control

Primary bursal transplants with Myc

43. Reconstituting normal follicle
44. Reconstituting normal follicle
45. Poorly reconstituted follicles
46. Early transformed follicle formation
47. Early reconstituting transformed follicles
48. Primary Myc transplant low power
49*. Primary Myc transplant TFs low power
50. Transformed follicle at 4 weeks
51*. Transformed with normal follicles
52. Transformed and normal follicle
53. Primary Myc Transplant with TFs, 4 weeks
54. Primary Myc transplant with transformed follicle
55*. Primary Myc transplant with 60% TFs
56. Primary Myc transplant with ~ 10% TFs
57. Primary Myc transplant with early bursal nodule
58. Bursal nodule
59*.Composite, primary Myc bursal transplants.

Secondary transplants with Myc

60. Secondary Myc transplant all Transformed follicles
61. Secondary Myc Transplant partial filling

62. Secondary Myc transplant, poor filling
63. Secondary Myc transplant well filled TFs

Secondary Myc transplants immunostaining with anti Myc.
64. Control with no primary anti Myc
65. Anti Myc normal 4 week bursa 100X
66. Anti-Myc secondary transplant 100X
67. Anti-Myc secondary transplant #2, 100X
68. Anti Myc normal bursa 400X
69. Anti Myc secondary ttransplant 400X

Chromosome spreads from secondary Myc transplants.
70. Chromosomes secondary Myc transplants #1
71. Chomosomes #1 enlarged
72. Chromosomes secondary Myc transplants #2
73. Chomosomes #2 enlarged
74. Chromosomes secondary Myc transplant #3
75. Chromosomes #3 enlarged

Bursal lymphomas in secondary transplants
76. Secondary Myc transplant Bursal lymphoma
77. Secondary Myc transplant spreading lymphoma
78. Secondary Myc transplant invasive lymphoma

NR-13 (LNRCG vector) primary transplants produce normal follicles in secondary transplants (Lee et al, 1999.)
79. NR 13 blocks programmed developmental elimination of bursal stem cells

D. Bursal Apoptosis

Tunnel assay in chickens
80*. Tunnel assay embryonic day 18 bursal follicles
81*. Tunnel assay normal 4 week bursal follicles

Radiation of bursal follicles.
82. Secondary transplant 160 Rad
83. Secondary transformed follicles, radiated, 150X
84. Secondary transformed follicles, 80 Rads
85. Secondary transformed follicles. Severe radiation damage
86. High Power view radiated transformed follicle
87. High Power view radiated transformed follicle
88. High Power view radiated transformed follicle

Radiated bursa with lymphoma.
89*. Transformed follicles and resistant lymphoma.
90*. High power (400x) view of resistant lymphoma (400 Rads)

E. Slides from H Grahame Purchase (USDA Regional Poultry Lab E. Lansing Mi) histology all H&E.

Poultry lab histology H&E

91. Gross Bursal Lymphoma 24 week post hatch ALV infected bird.
92. ALV infected bursa with a transformed follicle
93. ALV infected bursa high power view, side by side TF and normal follicle
94. ALV bursa with large nodule.
95. ALV infected bird with liver metastasis.

F. Transformed follicles stained with H&E.

96. H&E stain of enlarged transformed follicles.
97. H& E stain of transformed follicle cluster
98. H&E stain of transformed follicle
99. H&E stain of mixed normal and transformed follicles

G. Miscellaneous tumor slides.

100. Early bursal lymphoma, MGP
101. Fully developed bursal lymphoma, MGP
102. Liver Metastasis, LvMycSN vector secondary transplant, H&E
103. Liver met., H&E
104. Liver tumor, HB1 Myelocytomasis virus infected bird H&E
105. DT40 bursal lymphoma derived cell line.
106. Myelocytoma, skull, in HB1 infected bird, H&E
107. High power skull myelocytoma. H&E
108. Human Burkitt's Lymphoma, H&E
109. Burkitt's Lymphoma, high power, H&E