Avian Ovarian Cancer –
A Model for Human Ovarian Cancers

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In Humans
- A leading cause of death among women in US: the eighth most common cancer and the fifth leading cause of cancer deaths
- High mortality due to lack of effective early detection: 80% of women diagnosed at late stages when tumors have metastasized
- Barriers for early detection: non specific symptoms and lack of biomarkers
- High rate of spontaneous cancers in chickens: 35%3
- Incidence increases with age
- Not clinically detected until quite advanced

In Avian Species
- Unilateral (chickens) vs bilateral (humans) ovary: leads to difference in sub-staging
- Chicken lack lymph nodes: leads to difference in nodal involvement in metastasis
- Immunoglobulin system: Classes in chicken: IgA, IgM, IgG/IgY, Classes in humans: IgA, IgM, IgG, IgD, IgE
- Chicken MHC (B complex) genes smaller in size and simpler10 than human MHC genes

Disease Similarities
- 4 types of carcinomas observed:
  - serous, endometrioid, mucinous & clear cell5
- Preceded by putative precursor neoplastic lesions
- Similarities in histology, metastasis, and stages of cancer5
- Gene expression patterns (p53, HER-25)
- Risk factors:
  - incessant ovulation, excessive gonadotropin stimulation
- Overexpression of COX-1 and COX-2 in ovarian cancers7

Disease Differences
- Chickens lack lymph nodes: leads to difference in nodal involvement in metastasis8
- Unilateral (chickens) vs bilateral (humans) ovary: leads to difference in sub-staging
- Chicken luteal phase different from humans
- Immunoglobulin system: Classes in chicken: IgA, IgM, IgG/IgY, Classes in humans: IgA, IgM, IgG, IgD, IgE
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Chickens Can Be Great Models
- Develop spontaneous cancers between 2-7 years of age
- Ovulatory cycle every 24-26 hours
- Rapid disease progression
- Chicken genome sequenced, aligned and well-studied
- Chicken models are widely available
- Prevention and treatment trials on chicken models can save time and reduce expense and failure risk in human clinical trials

Ongoing Research on Chicken Models
- Biomarkers for early detection (eg: analysis of plasma proteome3)
- Agents (eg: oral contraceptives like progestin11) and lifestyle (eg: calorie restriction12, diet with flaxseed13) for tumor prevention
- Study ovulation induced genetic damage to ovarian epithelial cells
- Insight into mechanisms involved in cancer development (eg: cathepsin4, E-cadherin15)
- Understand the antitumor humoral immune response; presence of anti-tumor and anti-ovarian antibodies could be a potential diagnostic marker for ovarian carcinoma16

References