

Yvette's Brave Battle (Based on a True Story)

by

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Part I – The Mystery

Everyone loved Yvette. Her smile and laugh were infectious, her eyes sparkled, and she could turn the mundane into an adventure. She made the world around her more vivid. In addition to her adventurous spirit, she was extraordinarily bright, kind, and caring. She particularly cared for those who were so often forgotten or treated poorly by society. After earning her degree in sociology, she worked in an inner-city soup kitchen for a time and later worked as an event coordinator for people with disabilities.

It was the holiday season and Yvette was glad that she had some time off from work. She had been feeling tired and a bit nauseous for a couple of weeks. On New Year's Eve, the normally vivacious and fun-loving Yvette decided to skip the evening festivities with her family and went to bed early. When she awoke to the New Year, she was exhausted and one of her hands was numb. When the numbness did not subside, she thought it might be due to a pinched nerve and decided to see her chiropractor later that week.

At the chiropractor's office, things did not go as planned. He took one look into her eyes and observed that her pupils were not properly dilated and recommended that she seek medical attention as soon as possible. At the hospital, it was determined that she had a serious neurological anomaly and she was immediately admitted for testing. A routine pregnancy test indicated that she was pregnant. Pregnancy could not account for the neurological anomalies, but it put a temporary halt on the scheduled body scans to avoid risk to the fetus. Yvette was shocked about the positive pregnancy test. She had been vigilant in taking precautions; she was in her mid-thirties, had two young girls, and the previous summer had difficulties with a molar pregnancy. A molar pregnancy is a rare event that results from the abnormal fertilization of an ovum, resulting in the growth of a placenta, but not a fetus. After an ultrasound was performed to assess fetal development, the doctors were more shocked than Yvette. She was not pregnant.

Questions

1. What physical symptoms suggest that there is something clinically wrong with Yvette?
2. Using the information provided, create a hypothesis as to what might be causing Yvette's symptoms.
3. Imagine that you are a medical student tasked with diagnosing this condition as part of a clinical course. Write down three questions that you would ask Yvette and/or the attending physician to use towards devising a more informed hypothesis.
4. After collecting more information, formulate a hypothesis as to what might be causing Yvette's symptoms. Is it the same as your original hypothesis?

Part II – The Disease

After determining that there was no evidence of pregnancy, Yvette underwent a whole body magnetic resonance imaging (MRI) scan. Multiple tumors were identified in her lungs and liver and one tumor was identified in her brain; the brain tumor was the cause of her abnormal neurological function. The fact that Yvette had multiple tumors in various locations indicated that she had some form of metastatic cancer.

The news was devastating and all of the events seemed surreal to Yvette and her family. She had not left the hospital in weeks, the numbness was progressing, and the doctors did not know what type of cancer they were dealing with. Blood and urine analysis continued to test positive for pregnancy. One physician had observed these rare symptoms before and proposed a viable hypothesis as to the source of the cancer. More blood tests were ordered and the suspicion was confirmed. Levels of human chorionic gonadotropin (hCG) were 1000-fold higher than during a normal pregnancy. hCG is a hormone normally produced by cells of the placenta; it is also the hormone detected in standard pregnancy tests.

Questions

1. What is metastasis?
2. How do cancer cells vary from their normal precursors? Name some potential characteristics of cancer cells.
3. What might have been the original source of the cancer cells?
4. Can cancer cells maintain any of the characteristics of their original cell type of origin? Use evidence from Yvette's case to support your answer.
5. Name some common cancers and their cell source of origin.

Part III – The Treatment

An oncologist explained to Yvette and her family that she had choriocarcinoma—a cancer that is derived from cells of the placenta and often caused by a prior molar pregnancy. The delay in diagnosis could be attributed to the rarity of this type of cancer. In the United States, the rate of choriocarcinoma is 0.22 per 100,000 women aged 15–49 years.¹ It was also explained that choriocarcinoma is a very rapidly proliferating and invasive cancer, yet one of the most responsive cancers to traditional chemotherapy. If caught early, almost all women can be cured. The success rate drops if metastases are located in the brain, if the patient has very high hCG levels, and if the onset was 4 months or more before diagnosis. Yvette had all of the indicators for a poorer prognosis but, even in those cases, up to 70% of patients enter remission.²

It was now late January; nearly a month after being admitted to the hospital. Yvette learned that she would be starting an aggressive chemotherapeutic regimen. She would be administered actinomycin, which inhibits DNA transcription; methotrexate, which inhibits the metabolism of folic acid; and etoposide, which causes DNA strand breaks. These treatments would continue once per week for a minimum of three months or for three treatments after indication of a disease-free state. Yvette had heard the horror stories of chemotherapy side-effects such as hair loss, increased risk of infection and nausea and vomiting. While she was scared, she was optimistic and looking forward to beating this disease.

Questions

1. What is remission? Is it the same as being cured?
2. How might the status of the disease be monitored during treatment and what might be an indication of a disease-free state?
3. How do the chemotherapeutic drugs listed kill cancer cells and why might choriocarcinoma be so responsive to treatment?
4. What other cell types might be affected by these chemotherapeutics? (*Hint*: think about some common side effects.)

1 Altieri, A., Franceschi, S., Ferlay, J., Smith, J., La Vecchia, C. 2003. Epidemiology and aetiology of gestational trophoblastic diseases. *Lancet Oncology* 4(11): 670–678.

2 PubMed Health. Choriocarcinoma. Last reviewed 05/31/2012. U.S. National Library of Medicine. Available at: <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002465/>.

Part IV – The Battle

Chemotherapy was incredibly difficult. Yvette was constantly sick, lost her hair, and experienced some memory loss. The memory loss was particularly frightening, but after 5 long months of treatment, there was no detectable hCG in her blood, the chemotherapy ended, and her body and memory began to return to normal. She was thrilled and optimistically looked forward to regaining her strength, playing with her daughters, and getting back to work. She was scheduled to be monitored on a regular basis.

Two months after the end of chemotherapy treatment, she was notified that the cancer had returned. An MRI showed that the brain tumor was still detectable and lesions remained in her lungs. It was decided that she would need to undergo radiation therapy (causes DNA breaks) on the brain tumor in addition to resuming another chemotherapeutic regimen. She had radiation treatment in August and continued chemotherapy through November. Again, her hCG levels were reduced to zero and the regimen was concluded; just in time for the holidays!

On the day before Christmas, she got a call from her doctor. Her hCG levels had risen—the cancer was back. She began a third round of chemotherapy shortly after the holidays. The regimen was adjusted to include chemotherapeutics not previously administered. Treatment lasted for just over three months; she hoped to be able to enjoy the summer.

Ultimately, the cancer returned and new combinations of chemotherapeutics were administered again and again, but the cancer cells became less responsive to treatment. In over three years of fighting cancer, Yvette underwent several rounds of chemotherapy, multiple rounds of radiation therapy, a hysterectomy, and multiple lung surgeries. Even through the misery of treatments, she maintained her positive attitude, contagious smile, and enjoyed precious time with her friends and family. Ultimately, her body lost the brave battle, but her memory is very much alive in the many people who knew and loved her.

Questions

1. What might have been a reason for a hysterectomy?
2. Radiation and some chemotherapeutics cause cells to die by damaging the DNA. Why might one be used instead of the other in treating different tumors, and why do you think that radiation treatment was used on the brain tumor in this case?
3. Suggest reasons why radiation was not included in the initial round of treatment.
4. Why, ultimately, did the cancer cells no longer respond to chemotherapeutics (describe what might be happening to the cells over time)?



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