

**Independent Chemical Consulting:**  
**Why I Can't Blame the Boss Anymore**

**“Consulting Tips, Case Histories and More”  
Seminar at the Chem Show**

**Jacob Javits Center – New York City**

**December 11, 2013**

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## **Mission Statement:**

- **The Application of Fundamental Chemical Principles to Solve Problems.**

## **Vision Statement:**

- **To Solve Problems That Aren't in Any Book.**

## **Business Objective:**

- **Have I Applied My Specialized Knowledge to Help Others Who Under Other Circumstances Wouldn't Be Able to Help Themselves?**

# Independent Chemical Consulting: Why I Can't Blame the Boss Anymore

## Keys to Success:

- **Always Respect Your Client**
- **Always Tell Your Client the Truth**
- **Be Fair in Billing**

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## Getting Started:

- **The Concept (What Do You Want to Do?)**
- **Obtain Legal & Accounting Advice/Guidance**
- **Be Passionate/Believe in What You're Doing**

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- **I can no longer blame the boss.**
- **Pick the 60 hours of work each week.**
- **Importance of “lyrics” and “music.”**

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➤ **Think Outside of the Box.**

➤ **All Knowledge is Relevant.**

➤ **Embrace Serendipity.**



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**Malpractice Case in Northeast Ohio**

- **Plaintiff in this case is a young woman.**
- **She had an abnormal Pap Smear.**
- **A Colposcopy was performed.**

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- **A Colposcopy is used to determine why a Pap Smear was abnormal.**
- **Vinegar (dilute acetic acid) is used on cotton to identify possibly problematic tissue.**

<http://www.webmd.com/cancer/cervical-cancer/colposcopy-and-cervical-biopsy>

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- **The physician reached for a squeeze bottle.**
- **The squeeze bottle contained potassium hydroxide (KOH).**
- **Potassium hydroxide was used in this colposcopy instead of vinegar.**
- **The pH chemistry drives this case.**

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- **I consulted a Clinical Chemistry Professor.**
- **According to Web-MD, vaginal pH is in the 3.80-4.50 range, rendering dilute acetic acid (vinegar) appropriate for use in a Colposcopy.**
- **KOH is very basic and it caused considerable tissue death with terrible pain for the Victim.**

<http://women.webmd.com/vaginal-wet-mount>

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## KOH is used for two vaginal conditions:

### ➤ 1) KOH slide:

A sample of the vaginal fluid is placed on a slide and mixed with KOH. The KOH kills bacteria and cells from the vagina, leaving yeast. This method probes for yeast infection.

<http://women.webmd.com/vaginal-wet-mount>

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## ➤ 2) Whiff test:

Several drops of KOH are added to a sample of vaginal fluid. A strong fishy odor from the mixture indicates bacterial vaginosis.

The Plaintiff, so far as we know, did not have either one of these conditions.

<http://women.webmd.com/vaginal-wet-mount>

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**The Medical Director at the Akron General Emergency Room told the Plaintiff that the pH of the squirt bottle solution was 7.1 units.**

**A sample of the contents of the squirt bottle was submitted to an independent testing laboratory. An acid-base titration was also performed on a reference sample of KOH using sulfuric acid and methyl red indicator.**

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## pH Calculations:

The calculations yielded:

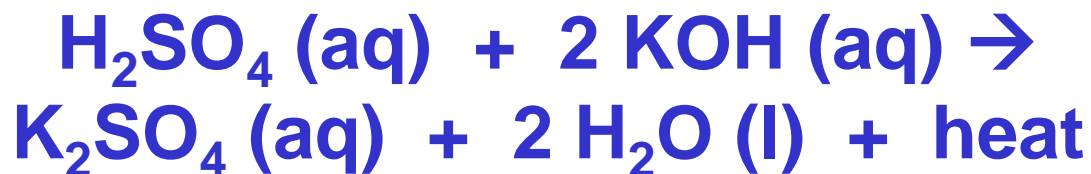
Reference sample pH = 12.3 units, whereas  
the Squirt bottle pH = 12.1 units.

The lab did 100-fold dilutions. Measured pH values were in the 11.8 to 12.0 range. The measured values are close to the calculated values for the Reference and Squirt bottle.



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The chemical reaction between sulfuric acid ( $\text{H}_2\text{SO}_4$ ) and potassium hydroxide (KOH) is known as a neutralization reaction. The products formed from this neutralization reaction are potassium sulfate ( $\text{K}_2\text{SO}_4$ ), water ( $\text{H}_2\text{O}$ ), and heat.



where: (aq) = aqueous solution and (l) = liquid

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In an acid-base titration, the number of equivalents of acid (**eqA**) will be equal to the number of equivalents of base (**eqB**) at the equivalence point. The equivalence point occurs close to the endpoint of the titration (where the methyl red indicator color change from yellow to red occurs).

$$N_A V_A = eq_A, N_B V_B = eq_B, eq_A = eq_B \text{ (at the equivalence point), and } N_A V_A = N_B V_B$$

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**Achieving a Neutral pH (7.0 units):**

**When diluting or neutralizing a chemical, the aim is to achieve a pH = 7.0 units.**

**It is preferable to dilute potassium hydroxide with de-ionized or distilled water rather than neutralize it with an acid. (The neutralization reaction with acid produces heat.)**

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**Discussion of pH Calculations:**

**KOH is a strongly basic chemical.**

**Using the lowest pH value (11.8 units) and the ending pH (7.0 units), the volume of dilution water necessary can be calculated.**

**If the initial volume of the KOH is 5 cc, the volume of de-ionized or distilled water needed to dilute this KOH at pH = 11.8 units to a pH = 7 units is about **74.3 gallons.****

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**Material Safety Data Sheet (MSDS)**  
**for Potassium hydroxide (KOH)**

Moisture absorption by the KOH from the surface it is in contact with produces heat.  
***The impact is both a burning sensation and excessive drying.***

<http://fscimage.fishersci.com/msds/19431.htm>  
<http://www.sciencelab.com/msds.php?msdsId=9927230>

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### The Urinalysis [In-Office (Dipstick)]:

The urinalysis obtained two months after the incident indicated a pH of **8.0 units**. The detection range for the pH measurement is 4.5 to 8.0 units.

The pH for this sample is “at the top of the chart.” This implies that some dilution had occurred, but not enough to neutralize the test fluid to pH = 7.0 units. Since the pH is at the top of the range, the actual pH may be greater than 8.0 units.

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## Concluding Thoughts:

There is a chemical difference between KOH and vinegar. The Victim's reaction to the contents of the squirt bottle was immediate. KOH has a pH of ~12.0 units. Based on the volume of dilution water necessary to achieve a neutral pH = 7.0 units, many tens of gallons of water are required.

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## Concluding Thoughts:

The pH = 8.0 noted in the urinalysis obtained two months later indicates the failure to dilute the KOH. This failure signifies that there still was incompletely diluted KOH in the Victim's vagina. The results of this incident (vaginal burning & drying) continue to impact the Victim. The damage is likely permanent and irreversible.



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**Acknowledgement:**

Deborah Cate of MC<sup>2</sup> does a great job in preparing presentation slides and in ensuring that the layout of our publications always looks sharp.

# On-Going Work

## Our current work is focused in:

- Chemical Consultations/Process Improvement
  - Expert Witnessing in the Physical Sciences
- Chemical Release/Explosion/Fire Investigations
- Automobile and Truck Accident Investigations
  - Insurance Subrogation Cases
- Nuclear Chemistry Issues (including **Energy Employees Occupational Illness Compensational Program Act Claims**)
- HUBZone Distributor of Chemicals and Supplies for ThermoFisher Scientific, L.L.C.

**Making a difference for our clients is our only goal.**