Ranitidine Investigation Summary

**PILL**
Ranitidine is unstable and can form millions of ng of NDMA*

1980s – Ranitidine suspected of reacting with nitrite in the stomach to form NDMA.

2000s – Studies show instability of ranitidine and its DMA group is linked to forming NDMA in oxidative conditions.

2019 – Valisure shows ranitidine forms millions of ng of NDMA and can react with itself. Both DMA and nitrite (N) are present in ranitidine.

**BODY**
Ranitidine likely generates millions of ng of NDMA in humans

1980s – Ranitidine shown to form thousands of ng of NDMA in conditions of the human stomach.

2016 – Stanford study suspects millions of ng of NDMA formed by ranitidine separately from the stomach, but mechanism unknown.

2019 – Valisure identifies and models DDAH-1 enzyme revealing potential mechanism for generating millions of ng of NDMA in body.

**WASTE**
>40,000 ng of NDMA found in urine after taking ranitidine pills

2000s – Urination of ranitidine into wastewater suspected as source of NDMA in municipal drinking water.

2016 – Stanford University conducts clinical study with 10 healthy volunteers taking 150mg of ranitidine once per day. >40,000 ng of NDMA detected in urine. Suspected link to bladder cancer.

**CANCER**
Evidence in NCI study linking ranitidine to cancer

2004 – National Cancer Institute study links antacids, ranitidine and cimetidine, to bladder cancer.

2019 – Valisure working with Memorial Sloan Kettering Cancer Center on epidemiological studies specific to ranitidine.

*The FDA maximum permissible daily exposure of the probable human carcinogen, NDMA, in pharmaceuticals is 96 ng