



GOLDSBORO EYE CLINIC



January 18, 2014

State of North Carolina v Raven Abaroa

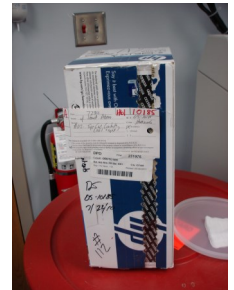
File Number: 10 CRS 1087

Forensic Ophthalmic Consultant: Charles S. Zwerling, MD, FACS, FICS

Examination Procedure and Results: Final Report

On February 28, 2013 material evidence IR: 05-10185 was delivered to Dr. Charles Zwerling from CCSI D. J. Jackson at Goldsboro Eye Clinic, Goldsboro, NC for forensic evaluation. The material evidence was obtained from the exhumation of Janet Abaroa at the Brown's Mill Cemetery in Antrim Township, Pennsylvania on July 19, 2010.

The purpose of this examination is to determine if this material evidence IR: 05-10185 represents contact lens material. All material evidence IR: 05-10185 was returned undamaged and intact to CCSI D.J. Jackson on March 22, 2013 in order to allow the defense to have the ability to retest material evidence IR: 05-10185 if deemed necessary.

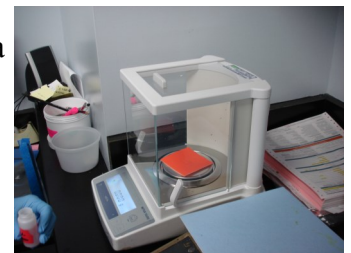


Examination Location:

On March 12, 2013 the material evidence IR: 05-10185 was taken to the Pathology Lab at Wayne Memorial Hospital at 0900 hours for forensic evaluation by Charles S. Zwerling, MD. At all times, the material evidence IR: 05-10185 remained in custody of Dr. Zwerling.

Methodology:

On March 12, 2013, the specimens were examined at the Pathology Lab located at Wayne Memorial Hospital. The material trace evidence was removed from the cardboard container. The numerous trace samples were contained in a plastic bottle with liquid preservative fluid. Using sterile precautions, the numerous specimens were removed from the vial and placed on a sterile surgical gauze to eliminate the preservative fluid from the samples. Next all the samples were gently washed in normal saline to remove the residual liquid preservative. Then, all the samples were weighed using the METTLER TOLEDO analytical scale to determine the overall gross weight.

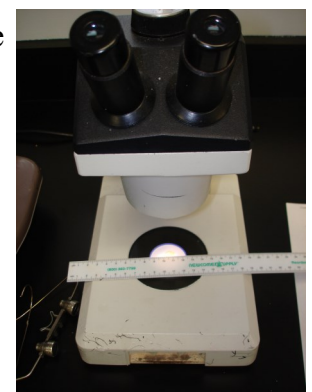


TOTAL WEIGHT: All (8) specimens: 0.024gm

Under sterile conditions, all the samples were placed on the retro-illuminated surface of the Leica Zoom 2000 binocular microscope. The specimens were separated and measured by use of surgical calipers and blunt tip surgical forceps which was documented by the Sony Cybershot digital camera for photography.

Nomenclature:

The specimens were separated into two groups: Group 1: 4 larger specimens and Group 2: 4 smaller specimens. Group 1 was designated as Samples A, B, C, and D. Group 2 was designated as simply 4 small samples of <0.1mm in size





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consisting of irregular fragmented shapes. All specimens of Group 1 and 2 were of the same color and consistency. Both groups were photographed using macro settings and automatic flash of the Sony Cybershot digital camera .

Morphology:

Macroscopic Evaluation-

Samples A, B, C, and D all demonstrated varying degrees of transparency to light. All the samples were hydrophilic and became more pliable and flexible with the slow addition of additional sterile saline solution. All the irregular samples had a smooth curvilinear surface with a concave and convex shape. Samples A, B, and D demonstrated an outer edge that was beveled. Samples A, B, C, and D were then measured using the surgical calipers to determine greatest length and width of each sample. Samples A, B, C, and D were then photographed using the back light of the dissecting microscope to demonstrate the transparency of each of the specimens.

Below is a summary of the physical findings and measurements.

Description of Samples from Group 1:

- (A) measured 1.0cm x 0.6cm with a definitive convex shape of homogenous pliable yellow semi-transparent material with beveled outer edge.
- (B) measured 0.6cm x 0.5cm with a definitive convex shape of homogenous pliable yellow semi-transparent material with beveled outer edge.
- (C) measured 0.5cm x 0.5cm with a definitive convex shape of homogenous pliable yellow semi-transparent material
- (D) measured 0.4cm x 0.3cm with an irregular convex shape of homogenous pliable yellow semi-transparent material with beveled outer edge.

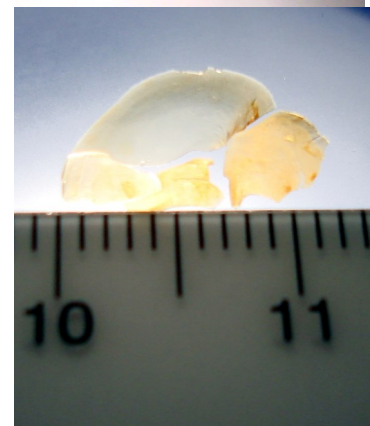
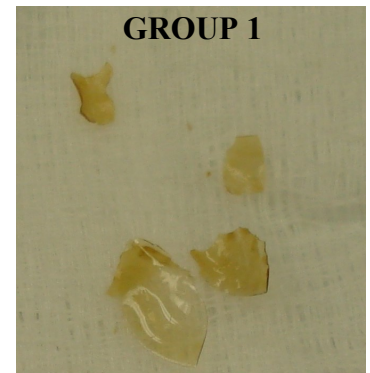
Description of Samples from Group 2:

The 4 remaining smaller minute samples were less than 0.1cm in dimensions with irregular shapes. All samples were of the same homogenous pliable yellow semi-transparent material.

Microscopic Evaluation-

None of the samples demonstrated human histology consistent with epithelial, connective, muscular, and/or nervous human tissue. All samples in Group 1 and 2 had a smooth homogenous and yellow semi-transparent substrate with varying degrees of yellow color and transparency. Inspection of the convex and concave surfaces were identical in appearance and consistency with the exception of **Sample A**.

Sample A demonstrated a pattern of embossed spherical markings that appeared to be manufactured. Using additional saline solution and the use of microsurgical forceps with smooth edges, **Sample A** was unfolded





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to reveal a clearer appearance of the markings. **Sample A** was photographed on the convex and concave side for better evaluation of the embossed markings. Using backlighting techniques and macro enlargement settings of the digital camera, the markings clearly demonstrated the natural numbers 1, 2, and 3.

Discussion:

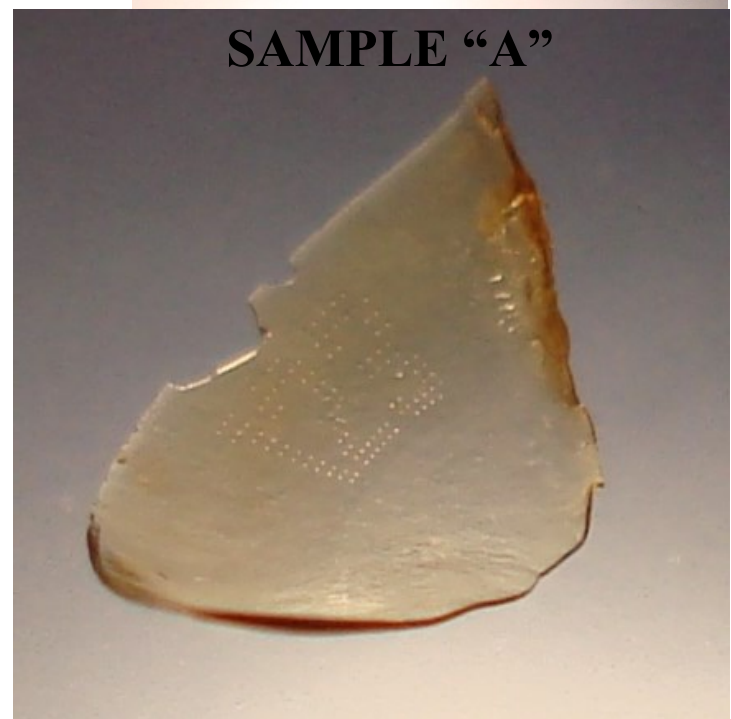
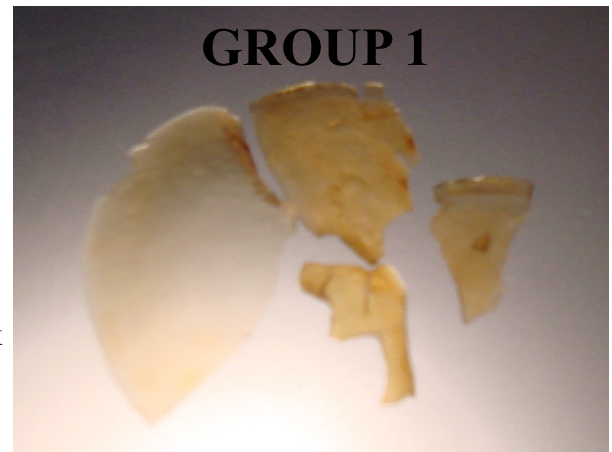
Most contact lenses are composed of monomers and cross-link materials that have charges on the monomers. This electronic charge distribution results in the attraction of proteins and/or lipids. Protein and/or lipid depositions create a biofilm in the lens. This biofilm of deposits can result in the lens losing its ocular properties and transparency; and, thus, will cause the contact lens to assume a yellow color. This yellow color is a result of lens spoilage, the diffusion of proteins and lipid into the contact lens substrate.

The presence of the embossed markings on **Sample A** is consistent with the proprietary inversion or “inside-outside” markings of the Vistakon® A Division of Johnson & Johnson Vision Care, Inc., that manufactures the Acuvue® Brand Contact Lenses. The purpose of this marking is to assist the patient in determining whether the contact lens is in the correct orientation for safe insertion on to the cornea. Vistakon® was contacted and provided the graph below which delineates which brands of Acuvue® contact lens exhibited the inversion mark manufactured in 2005.

As noted in the graph the chemical substrate is **etafilcon A** (based on all sample's water absorption) which is a hydrophilic type of soft contact lens with three dimensional, amorphous material and cross-links substrates. The lenses are soft because the polymer is above its glass transition temperature. These soft contacts are still manufactured by Acuvue® using cast molding with embossing of the 123 Inversion mark.

VISTAKON® A Division of Johnson & Johnson Vision Care, Inc., manufactures ACUVUE® Brand Contact Lenses. . The 123 Inside-Out Mark is used on all of their spherical lenses with the exception of ACUVUE® 2 COLOURS™ Brand. ACUVUE® Brand BIFOCAL lenses also has a 123 Inside-Out Mark.

The contact lenses that were marketed in the U.S. in 2005, that had a 123 Inside-Out Mark, are as follows along with the material and the approved wear schedule (provided by VISTAKON®) :





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Product	Material	Approved Wear Schedule
ACUVUE® 2 Brand	etafilcon A	Daily Wear & Extended Wear
ACUVUE® Brand BIFOCAL	etafilcon A	Daily Wear & Extended Wear
1-DAY ACUVUE® Brand	etafilcon A	Daily Wear
1-DAY ACUVUE® MOIST® Brand	etafilcon A	Daily Wear
ACUVUE® ADVANCE® Brand	galyfilcon A	Daily Wear
ACUVUE® OASYS® Brand	senofilcon A	Daily Wear & Extended Wear

Contact Lens Fracture Simulation Study:

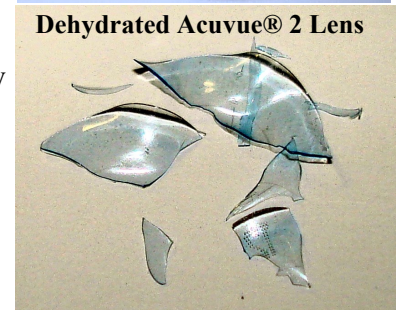
Based on the results of the material evidence samples as being soft contact lens material manufactured by the Vistakon® as an Acuvue® Brand contact lens. At Goldsboro Eye Clinic on April 5, 2013 a new Acuvue® 2 soft contact lens +1.50 power 8.7 Base Curve and 14.0 mm in diameter was removed from its manufacture's container and photographed using the Sony Cybershot digital camera.

The digital photograph clearly demonstrates the same natural numbers 1, 2, and 3 as were previously noted and demonstrated on **Sample A** of the trace material evidence. Moreover, these same inversion marks were located at the outer border of the contact lenses.

The same new Acuvue® 2 contact lens was then dehydrated using a hair blow dryer on the contact lens for 30 minutes. At this point the contact lens exhibited marked brittleness and was easily fractured into smaller fragments in a similar pattern to the Samples in both Group 1 and 2 of the material trace evidence IR: 05-10185.



New Acuvue® 2 Contact Lens



Dehydrated Acuvue® 2 Lens

Contact Lens Burial Study:

A simulation study was performed to demonstrate the effects of the environment and post mortem ocular degeneration on soft contact lenses. Following standard American funeral protocols, enucleated pig eyes with applied soft contact lens were embalmed and buried to determine the effects of burial on the physical properties and bio-degeneration of the soft contact lenses. Two soft contact lenses were used for this simulation study performed to demonstrate this bio degeneration by prolonged exposure under burial conditions.





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A pair of soft contact lenses, Acuvue 2 (-2.25) 8.7 14.0 (right eye) and Air Optix (-2.50) 8.4 13.8 (left eye) were placed on the two fresh enucleated pig eyes. The pig eyes and contact lenses were then exposed to “Dodge Dis Spray” a chemical used to slow the biodegradable process as per the standard funeral protocols in the state of North Carolina. Plastic lens caps were placed over the pig eyes/contact lenses as per usual funeral preparations.

The treated contact lenses and pig eyes were then placed in wooden miniature caskets, covered with funeral quality burial linen and buried six feet below the ground surface inside a brick and cement burial vault on July 1, 2013.



The vault protects the casket from the weight of the earth and heavy maintenance equipment that will pass over the grave.

The wooden casket was exhumed 6 months later on January 11, 2014 and brought to Goldsboro Eye Clinic for forensic evaluation. The casket was opened and the contents were photographed revealing the two decomposed enucleated pig eyes covered with plastic lid caps. The lid caps were carefully removed revealing the partially decomposed pig eyes. The contact lens on each pig eye was carefully removed with microsurgical forceps, inspected and photographed. The plastic lid caps were easily removed and did not have any attachment to the pig eyes.



On the inside surface of the left lens cap that covered the tinted Air Optix contact lens and pig eye demonstrated a blue stain on the inner concave surface of the lid cap.

The contact lens were removed from the cornea of each pig eye with the microsurgical forceps. In each case the contact was partially adherent to the degenerative cornea and required the use of wetting contact lens solution.

After the removal of each contact lens and subsequent careful cleaning with wetting solution, additional microscopic photography using the Sony Cybershot digital camera of the inner and outer contact lens surfaces was performed.



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Results

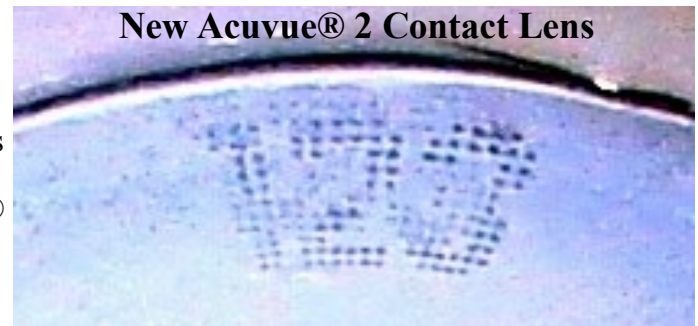
In each case, the soft contact lenses demonstrated thinning and distinctive yellow color changes of the contact lens surface and internal matrix. The soft contact lenses had developed partial and irregular areas of yellowish deposits with loss of the usual contact lens transparency. Moreover there were noticeable areas of thinning tears and fractures of the contact lens surfaces. The yellowish color on the Acuvue® Type 2 contact lens was consistent with lens spoilage that was noted in a similar pattern to the Samples in both Group 1 and 2 of the material trace evidence IR: 05-10185.



**Acuvue® 2 Contact Lens after
six month exhumation**

Conclusion:

The material evidence submitted and examined under strict chain of custody represents fragments of a hydrophilic soft contact lenses. The embossed inscription mark 123 on **Sample "A"** further identifies this material as a specific product of ACUVUE® Brand Contact Lenses manufactured by VISTAKON® A Division of Johnson & Johnson Vision Care, Inc.



Respectfully submitted
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Goldsboro Eye Clinic

