HENNEPIN COUNTY
MEDICAL EXAMINER'S OFFICE
AUTOPSY REPORT

ME NO.: 20-3700

CASE TITLE: CARDIOPULMONARY ARREST COMPLICATING LAW ENFORCEMENT SUBDUAL, RESTRAINT, AND NECK COMPRESSION

DECEASED: George Floyd aka Floyd Perry **SEX:** M **AGE:** 46

DATE AND HOUR OF DEATH: 5-25-20; 9:25 p.m.

DATE AND HOUR OF AUTOPSY: 5-26-20; 9:25 a.m.

PATHOLOGIST: Andrew M. Baker, M.D.

FINAL DIAGNOSES:

46-year-old man who became unresponsive while being restrained by law enforcement officers; he received emergency medical care in the field and subsequently in the Hennepin HealthCare (HHC) Emergency Department, but could not be resuscitated.

I. Blunt force injuries

   A. Cutaneous blunt force injuries of the forehead, face, and upper lip

   B. Mucosal injuries of the lips

   C. Cutaneous blunt force injuries of the shoulders, hands, elbows, and legs

   D. Patterned contusions (in some areas abraded) of the wrists, consistent with restraints (handcuffs)

II. Natural diseases

   A. Arteriosclerotic heart disease, multifocal, severe

   B. Hypertensive heart disease

      1. Cardiomegaly (540 g) with mild biventricular dilatation

      2. Clinical history of hypertension

   C. Left pelvic tumor (incidental, see microscopic description)

III. No life-threatening injuries identified

A. No facial, oral mucosal, or conjunctival petechiae

B. No injuries of anterior muscles of neck or laryngeal structures

C. No scalp soft tissue, skull, or brain injuries

D. No chest wall soft tissue injuries, rib fractures (other than a single rib fracture from CPR), vertebral column injuries, or visceral injuries

E. Incision and subcutaneous dissection of posterior and lateral neck, shoulders, back, flanks, and buttocks negative for occult trauma

IV. Viral testing (Minnesota Department of Health, postmortem nasal swab collected 5/26/2020): positive for 2019-nCoV RNA by PCR (see 'Comments,' below)

V. Hemoglobin S quantitation (postmortem femoral blood, HHC Laboratory): 38% (see 'Comments,' below)

VI. Toxicology (see attached report for full details; testing performed on antemortem blood specimens collected 5/25/20 at 9:00 p.m. at HHC and on postmortem urine)

A. Blood drug and novel psychoactive substances screens:

1. Fentanyl 11 ng/mL

2. Norfentanyl 5.6 ng/mL

3. 4-ANPP 0.65 ng/mL

4. Methamphetamine 19 ng/mL

5. 11-Hydroxy Delta-9 THC 1.2 ng/mL;
Delta-9 Carboxy THC 42 ng/mL; Delta-9 THC 2.9 ng/mL

6. Cotinine positive

7. Caffeine positive

B. Blood volatiles: negative for ethanol, methanol, isopropanol, or acetone

C. Urine drug screen: presumptive positive for cannabinoids, amphetamines, and fentanyl/metabolite

D. Urine drug screen confirmation: morphine (free) 86 ng/mL

Comments: The finding of sickled-appearing cells in many of the autopsy tissue sections prompted the Hemoglobin S quantitation reported above. This quantitative result is indicative of sickle cell trait. Red blood cells in individuals with sickle cell trait are known to sickle as a postmortem artifact. The decedent's antemortem peripheral blood smear (made from a complete blood count collected 5/25/20 at 9:00 p.m.) was reviewed by an expert HHC hematopathologist at the Medical Examiner's request. This review found no evidence of antemortem sickling.

The decedent was known to be positive for 2019-nCoV RNA on 4/3/2020. Since PCR positivity for 2019-nCoV RNA can persist for weeks after the onset and resolution of clinical disease, the autopsy result most likely reflects asymptomatic but persistent PCR positivity from previous infection.

6/1/2020

X

Andrew M. Baker, M.D.
Chief Medical Examiner
Signed by: Andrew M. Baker MD

In accordance with HCME policy, this report was reviewed by another board-certified forensic pathologist prior to release.

IDENTIFICATION:

Positive identification is confirmed by comparison of antemortem and postmortem fingerprints (Federal Bureau of Investigation).

EXTERNAL EXAMINATION:

When initially examined, the body is in a sealed/locked and properly labeled body bag. Evidentiary paper bags are secured over the hands.

The body is that of a normally developed, muscular and adequately nourished appearing, 6 feet 4 inch long, 223 pound male whose appearance is consistent with the reported age of 46 years. Unfixed lividity is present on the posterior dependent surfaces of the body, except in areas exposed to pressure. Rigor mortis is established in all of the major muscle groups, relenting with modest pressure. The temperature is somewhat cool following refrigeration.

The scalp is covered with closely cropped black hair in a normal distribution, with some early vertex thinning. The irides are brown, and the pupils are round and equal in diameter. The conjunctivae are somewhat injected, but there are no bulbar or palpebral conjunctival petechiae. There are no facial, periorbital, or oral mucosal petechiae. The external auditory canals are free of blood. The lobe of the left ear is remotely pierced once; the ears are otherwise unremarkable. The nares are patent. The nasal and facial bones are stable to palpation. A faint, 2 cm maximum dimension V-shaped scar is near the superior end of the left jawline. The teeth appear native and in good repair. Very short black mustache and beard stubble is in the usual distribution on the face, and a small patch of slightly longer black beard hair is just inferior to the lower lip.

The neck is straight, and the trachea is midline. A 0.6 cm diameter circular gray-brown scar is over the middle of the left clavicle. The chest is symmetric. The abdomen is flat. The external genitalia are those of a normal adult male. The testes are descended and free of masses. Pubic hair is present in a normal distribution. The back, buttocks, and anus are unremarkable.

The upper and lower extremities are symmetric and free of clubbing, edema, or absence of digits. Six faint, hypopigmented, haphazardly oriented linear scars ranging up to 1.2 cm long are scattered across the dorsum of the right

forearm. Approximately eight gray-tan foci of healing injuries (scars) ranging up to 0.8 cm maximum dimension are scattered across the dorsum of the right hand. Two similar appearing healing injuries (scars), each 1 cm maximum dimension, are on the anteromedial right wrist. A similar appearing, obliquely oriented 2 cm long linear healing injury (scar) is on the medial right wrist. The skin of the first dorsal webspace on the right hand has a 4.5 cm maximum dimension area of brown hyperpigmentation and gray-tan hyperkeratosis. An 8 cm maximum dimension area of brown hyperpigmentation and gray-tan hyperkeratosis spans the first dorsal webspace on the left hand, and has five superimposed healing linear skin cracks ranging up to 1.2 cm long. Similar gray-tan, scar-like areas are on the dorsum of the left hand (over the left 2nd and 3rd metacarpophalangeal joints and the webspaces between the fingers) and wrist in areas ranging 0.2 to 2 cm maximum dimension. A 4 cm maximum dimension flat tan scar is on the dorsum of the left hand over the 5th metacarpal. The nails of the hands are cut or chewed extremely short.

A 4 cm maximum dimension horizontally oriented linear brown scar is over the anterior right hip. A 0.5 cm maximum dimension macular brown nevus is over the anterior right hip. Two flat, hyperpigmented patches, 1.2 and 2 cm maximum dimension, flank the left side of the waistline. A 1.5 cm maximum dimension hypopigmented oval scar is over the right knee. Approximately nine haphazardly oriented linear hypopigmented scars ranging up to 2 cm maximum dimension are scattered over and just inferior to the right knee. Approximately nine hyper- and hypopigmented linear and oval scars ranging up to 2 cm maximum dimension are over the right shin. A faint, 1.5 cm maximum dimension hyper- and hypopigmented scar is on the posterolateral left thigh. Five hypopigmented linear scars ranging up to 5 cm maximum dimension are over, just superior to, and just inferolateral to the left knee. A 3 cm maximum dimension area of slight skin darkening associated with hair follicle plugging is on the distal left calf. The nails of the toes are somewhat elongated, markedly thickened, and discolored yellow-brown. The soles of the feet and the posterior heels are somewhat hyperkeratotic and desiccated appearing, particularly on the right.

TATTOOS:

- A 42 cm maximum dimension monochromatic blue tattoo of an eagle holding a rifle spans the upper chest, from shoulder to shoulder and from the inferior neck to the distal sternum.
- An 11 cm maximum dimension monochromatic blue tattoo of a pair of praying hands is on the epigastric abdomen.
- A 9 cm maximum dimension monochromatic blue tattoo of the name "LAURA" is on the right upper abdomen.
- A 10 cm maximum dimension monochromatic blue tattoo of the name "CISSY" is on the left upper abdomen.
- A 28 cm maximum dimension monochromatic blue tattoo of the name "FLOYD" spans both sides of the abdomen just superior to the umbilicus.
- A 10 cm maximum dimension monochromatic blue tattoo of what appears to be a gravestone with some letters and numbers and the letters "R.I.P." is on the anterior right forearm.
- A 12 cm maximum dimension monochromatic blue tattoo of two stars and what appears to be the name "Brittney" and the letters "R.I.P." is on the proximal anterior left forearm.
- A 20 cm maximum dimension patterned monochromatic blue tattoo spans the anterior, lateral, and posterior aspects of the left forearm.

CLOTHING AND PERSONAL EFFECTS:

The following clothing items are received with the body in the body bag, in a hospital patient belongings bag, and examined separate from the body at the start of the postmortem examination:

- Size XXL "Nike" brand blue track pants, extensively cut apart (presumably for medical intervention)
- A black ribbed sleeveless t-shirt (no tag), extensively cut apart (presumably for medical intervention)
- Size 3XL "Starting 5" brand black and gray sweatpants, extensively cut apart (presumably for medical intervention)
- A pair of black dress socks, one with a gray heel and gray toe box

MEDICAL INTERVENTION:

- Oral endotracheal tube, correctly positioned in the trachea and held in place on the face with a white and tan plastic and elastic band
- Thoracostomy incision (3.6 cm maximum dimension, somewhat ragged and V-shaped), right lateral chest (approximately six superficial punctures and cuts, ranging from pinpoint to 1.5 cm long, are adjacent to the thoracostomy)
- Thoracostomy incision (3.9 cm long, somewhat ragged and linear), left lateral chest (a pinpoint cut or puncture is just inferior to the thoracostomy)
- Curvilinear orange abrasions centered over the sternum (10 cm maximum dimension aggregate), consistent with cardiopulmonary resuscitation
- Intravascular catheter with attached segment of tubing, taped in place just proximal to the left antecubital fossa (the tape associated with this catheter has created a localized area of skin slippage in the left antecubital fossa)
- Needle puncture, just distal to the left antecubital fossa
- Intraosseous catheter with attached tubing, right tibia
- Intraosseous catheter with attached tubing, left tibia
- Intravascular catheter with attached tubing, taped in place on the right groin
- Hospital tag, right great toe
- Hospital bracelets (2), right wrist
- Needle puncture, left groin
- Minimally hemorrhagic horizontal fracture in the sternum, consistent with cardiopulmonary resuscitation
- Non-hemorrhagic fracture of the anterior left 4th rib, consistent with cardiopulmonary resuscitation

EVIDENCE OF INJURY:

Head and Neck

- 4 cm maximum dimension abraded red-black-purple contusion, lateral corner of left brow
- Pinpoint red abrasion, just left of the midline of the forehead
- 6.5 cm maximum dimension red-black abrasion, left cheek
- 0.6 cm maximum dimension red abrasion, just inferior to left corner of mouth
- 0.8 cm maximum dimension curvilinear red avulsion, just superior to right side of upper lip

- Eight pinpoint to 0.2 cm maximum dimension red abrasions, right side of nose
- Faint blue contusions on the body of the nose (3.5 cm), right naris (1.5 cm), and left naris (1.0 cm)
- 1.5 cm maximum dimension aggregate of pink-purple mucosal abrasions and lacerations, upper lip
- 2 cm maximum dimension aggregate of pink-orange mucosal abrasions and lacerations, lower lip

Shoulders and Extremities

- 8 cm maximum dimension purple contusion with 4.5 cm maximum dimension aggregate of linear red abrasions, anterolateral right shoulder
- 2 cm maximum dimension red L-shaped scratch, superior right shoulder
- 14 cm maximum dimension pink-purple contusion with a discontinuous 8 cm maximum dimension dried red-black abrasion, left shoulder
- 0.2 cm maximum dimension red abrasion, just medial to the right elbow
- 3 cm maximum dimension faint pink contusion, just medial to the left elbow
- Pinpoint red abrasion, just medial and distal to the left elbow
- 1.5 cm maximum dimension purple contusion, proximal right shin
- 2.5 cm maximum dimension aggregate of red abrasions, distal right shin
- 0.3 cm maximum dimension red abrasion over the left calf

Wrists and Hands

- 1.4 cm maximum dimension red and dried black abrasion, dorsum of proximal interphalangeal joint, right index finger
- Two 0.8 cm maximum dimension red and focally dried black abrasions, dorsum of proximal interphalangeal joint, right middle finger
- Circumferential, discontinuous, 3.5 cm maximum width, roughly parallel pink-purple contusions encircling the right wrist, with areas of superimposed abrasions up to 1.2 cm maximum dimension; a 0.9 cm long superficial red scratch is on the lateral right wrist between the patterned contusion and the hand

- Circumferential, discontinuous, 2.5 cm maximum width, roughly parallel pink-purple contusions encircling the left wrist, with areas of superimposed abrasions up to 1.3 cm maximum dimension
  - On the anterolateral left wrist, in a 3.5 cm long area, the injury transitions to a dried yellow-black abraded furrow before blending into the anterior wrist crease
- 2.2 cm maximum dimension purple contusion, dorsum of left hand

INTERNAL EXAMINATION:

HEAD: The soft tissues of the scalp are free of injury. The calvarium is intact, as is the dura mater beneath it. Clear cerebrospinal fluid surrounds the 1380 g brain, which has unremarkable gyri and sulci. Coronal sections demonstrate sharp demarcation between white and gray matter, without hemorrhage or contusive injury. The ventricles are of normal size. The basal ganglia, brainstem, cerebellum, and arterial systems are free of injury or other abnormalities. There are no skull fractures. The atlanto-occipital joint is stable.

NECK: Layer by layer dissection of the anterior strap muscles of the neck discloses no areas of contusion or hemorrhage within the musculature. The thyroid cartilage and hyoid bone are intact. The larynx is lined by intact mucosa. The thyroid is symmetric and red-brown, without cystic or nodular change. The tongue is free of bite marks, hemorrhage, or other injuries. The cervical spinal column is palpably stable and free of hemorrhage.

BODY CAVITIES: Except as previously noted, the ribs, sternum, and vertebral bodies are visibly and palpably intact. Stripping of the parietal pleura reveals no occult rib fractures. No excess fluid is in the pleural, pericardial, or peritoneal cavities. The organs occupy their usual anatomic positions. Adjacent to the left external iliac vessels and left psoas muscle (but not apparently arising from them or attached to them) is a firm, 4 cm maximum dimension thinly encapsulated mass consisting of red-brown and fleshy white-gray areas, admixed with centrally scarred and calcified areas.

RESPIRATORY SYSTEM: The right and left lungs weigh 1085 and 1015 g, respectively. The external surfaces are pink only on the most anterior aspects, and deep red-purple in all other areas. The pulmonary parenchyma is diffusely congested and edematous.

No mass lesions or areas of consolidation are present. The pulmonary vascular tree is free of thromboemboli. The tracheobronchial tree is free of blood, edema fluid, or foreign material.

CARDIOVASCULAR SYSTEM: The 540 g heart (upper limit of normal for body length is 510 g; upper limit of normal for body weight is 521 g)[1] is contained in an intact pericardial sac. The epicardial surface is smooth, with modest fat investment. The coronary arteries are present in a normal distribution, with a right dominant pattern. Cross sections of the vessels show multifocal atherosclerosis, with 75% proximal and 75% mid narrowing of the left anterior descending coronary artery; 75% proximal narrowing of the 1st diagonal branch of the left anterior descending coronary artery; 25% proximal narrowing of the circumflex coronary artery; and 90% proximal narrowing of the right coronary artery. The myocardium is homogeneous, red-brown, and firm. The valve leaflets are thin and mobile. The walls of the left and right ventricles are 1.2 and 0.4 cm thick, respectively. The endocardium is smooth and glistening. Both ventricular cavities are mildly dilated. The minimally atherosclerotic aorta gives rise to three intact and patent arch vessels. The renal and mesenteric vessels are unremarkable.

LIVER AND BILIARY SYSTEM: The 2565 g liver has an intact, smooth capsule and a sharp anterior border. The parenchyma is tan-brown and congested, with the usual lobular architecture. No mass lesions or other abnormalities are seen. The gallbladder contains a moderate amount of green-black bile and no stones. The mucosal surface is green and velvety. The extrahepatic biliary tree is patent.

SPLEEN: The 140 g spleen has a smooth, intact, red-purple capsule. The parenchyma is maroon and congested.

PANCREAS: The pancreas is firm and yellow-tan, with the usual lobular architecture. No mass lesions or other abnormalities are seen.

ADRENALS: The right and left adrenal glands are symmetric, with bright yellow cortices and gray medullae. No masses or areas of hemorrhage are identified.

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[1] Kitzman DW, Scholz DG, Hagen PT, et al. Age-related changes in normal human hearts during the first 10 decades of life. Part II (maturity): a quantitative anatomic study of 765 specimens from subjects 20 to 99 years old. Mayo Clin Proc. 1988; 63: 137-146.

GENITOURINARY SYSTEM: The right and left kidneys weigh 205 and 225 g, respectively. The external surfaces are intact and smooth. The cut surfaces are red-tan and congested, with uniformly thick cortices and sharp corticomedullary junctions. The pelves are unremarkable and the ureters are normal in course and caliber. White bladder mucosa overlies an intact bladder wall. The bladder contains approximately 80 mL of yellow urine. The prostate is normal in size, with lobular, yellow-tan parenchyma. The seminal vesicles are unremarkable. The testes are free of mass lesions, contusions, or other abnormalities.

GASTROINTESTINAL TRACT: The esophagus is intact and lined by smooth, gray-white mucosa. The stomach contains approximately 450 mL of dark brown fluid with innumerable soft fragments of gray-white food particulate matter resembling bread. The gastric wall is intact. The duodenum, loops of small bowel, and colon are unremarkable. The appendix is present.

SPECIAL PROCEDURES:

Incision and subcutaneous dissection of the anterior and lateral aspects of the wrists demonstrates no foci of contusion or hemorrhage deep to the skin on the right. In the left wrist, there is multifocal fascial hemorrhage, with approximately 3 mL liquid blood accumulation, in the tissue surrounding the flexor tendons. The exposed wrist musculature itself appears free of injury.

An incision from the back of the head to the lower back, extending onto both buttocks, is dissected subcutaneously to the lateral aspects of the neck, the shoulders, and flanks. No areas of subcutaneous hemorrhage, soft tissue contusion, or other occult injury are found in the posterior neck, right and left lateral neck, shoulders, back, flanks, or buttocks.

ADDITIONAL PROCEDURES:

- Documentary photographs are taken.
- Postmortem specimens collected and retained: vitreous fluid, femoral blood, urine, liver, and gastric contents.
- Representative tissue biopsies are retained in formalin for microscopic examination.
- The dissected organs are returned to the body.
- Pulled head hairs are placed in a labeled, sealed envelope.

MICROSCOPIC EXAMINATION:

HEART (3-5): Cross sections of left ventricular, right ventricular, and interventricular septal myocardium are examined and show the expected microscopic architecture, with readily visible boxcar nuclear changes in the septal and left ventricular sections. Cross sections of coronary arteries, though not all ideally oriented, confirm the gross impression of atherosclerotic narrowing.

LUNGS (6): Sections of right and left lung show generally normal overall architecture, without malignancy, pneumonia, granulomatous inflammation, or polarizable intravascular foreign material. Many small vessels contain rounded clear vacuoles, consistent with bone marrow embolism from cardiopulmonary resuscitation.

LIVER (7): No significant pathologic abnormality (marked congestion).

SPLEEN (7): No significant pathologic abnormality.

KIDNEY (8): No significant pathologic abnormality (marked congestion).

PANCREAS (8): No significant pathologic abnormality.

ADRENAL (9): No significant pathologic abnormality (marked congestion).

SPLEEN (9): No significant pathologic abnormality (marked congestion).

BRAIN (10-12): Sections of hippocampus, cerebellum, cerebral cortex, and midbrain show the expected microscopic architecture, without hypoxic-ischemic, reactive, neoplastic, or inflammatory changes.

LEFT PELVIC MASS (1,2): Decalcified (1) and routinely fixed (2) sections show a proliferation of generally bland appearing cells with small to moderate amounts of eosinophilic cytoplasm and generally uniform nuclei with neuroendocrine features. Occasional

nuclei show mild pleomorphism, but mitotic activity is not seen. Much of the tumor is composed of cells in sheets, cords, and nests in a carcinoid-like pattern; other areas vary from vascular to sclerosed and fibrotic. Taken together, the gross and microscopic (H&E-stains) features of the lesion are most suggestive of an extraadrenal paraganglioma. AFB and GMS stains are non-contributory.

NOTE: *Many of the above tissue sections, particularly those noted to have congestion, contain sickled-appearing red blood cells.*

AutopsyFiles.org
UNCOVERING THE CAUSE OF DEATH

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Toxicology Report

Report Issued 05/31/2020 18:44

To: **148889**
Hennepin County Medical Examiner
530 Chicago Avenue

Minneapolis, MN 55415

Patient Name	FLOYD, GEORGE
Patient ID	2020-3700
Chain	NMSCP59310
Age 46 Y	**DOB** 10/14/1973
Gender	Male
Workorder	20159963

Positive Findings:

Compound	Result	Units	Matrix Source
Caffeine	**Positive**	**mcg/mL**	**001 - Hospital Blood**
Cotinine	**Positive**	**ng/mL**	**001 - Hospital Blood**
4-ANPP	**0.65**	**ng/mL**	**003 - Hospital Blood**
11-Hydroxy Delta-9 THC	**1.2**	**ng/mL**	**001 - Hospital Blood**
Delta-9 Carboxy THC	**42**	**ng/mL**	**001 - Hospital Blood**
Delta-9 THC	**2.9**	**ng/mL**	**001 - Hospital Blood**
Methamphetamine	**19**	**ng/mL**	**001 - Hospital Blood**
Fentanyl	**11**	**ng/mL**	**001 - Hospital Blood**
Norfentanyl	**5.6**	**ng/mL**	**001 - Hospital Blood**
Cannabinoids	**Presump Pos**	**ng/mL**	**012 - Urine**
Amphetamines	**Presump Pos**	**ng/mL**	**012 - Urine**
Fentanyl / Metabolite	**Presump Pos**	**ng/mL**	**012 - Urine**
Morphine - Free	**86**	**ng/mL**	**012 - Urine**

See Detailed Findings section for additional information

Testing Requested:

Analysis Code	Description
8050U	Postmortem, Urine Screen Add-on (6-MAM Quantification only)
9096B	Alcohol Screen, Blood (Forensic)
8210B	Novel Psychoactive Substances (NPS) Screen 2, Blood
8052B	Postmortem, Expanded, Blood (Forensic)
8756B	Novel Psychoactive Substances (NPS) Screen 1, Blood

Specimens Received:

ID	Tube/Container	Volume/ Mass	Collection Date/Time	Matrix Source	Miscellaneous Information
001	Lavender Vial	2.8 mL	05/25/2020 21:00	Hospital Blood	
002	Gray Vial	0.6 mL	05/25/2020 21:00	Hospital Blood	
003	Lavender Vial	5.75 mL	05/25/2020 21:00	Hospital Blood	
004	Light Blue Vial	2.5 mL	05/25/2020 21:00	Hospital Blood	
005	Green Vial	1.3 mL	05/25/2020 21:00	Hospital Blood	
006	Red Vial	0.75 mL	05/25/2020 21:00	Hospital Serum or Plasma	
007	Gray Top Tube	8.8 mL	05/26/2020 12:20	Femoral Blood	
008	Gray Top Tube	8.8 mL	05/26/2020 12:20	Femoral Blood	
009	Gray Top Tube	8.8 mL	05/26/2020 12:20	Femoral Blood	

ID	Tube/Container	Volume/ Mass	Collection Date/Time	Matrix Source	Miscellaneous Information
010	Gray Top Tube	8.8 mL	05/26/2020 12:20	Femoral Blood	
011	Gray Vial	3.3 mL	05/26/2020 12:20	Femoral Blood	
012	Yellow Vial	7.75 mL	05/26/2020 12:20	Urine	
013	Yellow Vial	7.75 mL	05/26/2020 12:20	Urine	

All sample volumes/weights are approximations.

Specimens received on 05/28/2020.

Detailed Findings:

Analysis and Comments	Result	Units	Rpt. Limit	Specimen Source	Analysis By
Caffeine	Positive	mcg/mL	0.20	001 - Hospital Blood	LC/TOF-MS
Cotinine	Positive	ng/mL	200	001 - Hospital Blood	LC/TOF-MS
4-ANPP	0.65	ng/mL	0.10	003 - Hospital Blood	LC-MS/MS
11-Hydroxy Delta-9 THC	1.2	ng/mL	1.0	001 - Hospital Blood	LC-MS/MS
Delta-9 Carboxy THC	42	ng/mL	5.0	001 - Hospital Blood	LC-MS/MS
Delta-9 THC	2.9	ng/mL	0.50	001 - Hospital Blood	LC-MS/MS
Methamphetamine	19	ng/mL	5.0	001 - Hospital Blood	LC-MS/MS
Fentanyl	11	ng/mL	0.10	001 - Hospital Blood	LC-MS/MS
Norfentanyl	5.6	ng/mL	0.20	001 - Hospital Blood	LC-MS/MS
Cannabinoids	Presump Pos	ng/mL	50	012 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Amphetamines	Presump Pos	ng/mL	500	012 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Fentanyl / Metabolite	Presump Pos	ng/mL	2.0	012 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Morphine - Free	86	ng/mL	25	012 - Urine	LC-MS/MS

Other than the above findings, examination of the specimen(s) submitted did not reveal any positive findings of toxicological significance by procedures outlined in the accompanying Analysis Summary.

Reference Comments:

1. 11-Hydroxy Delta-9 THC (Active Metabolite) - Hospital Blood:

   11-Hydroxy Delta-9 THC is an active intermediate metabolite of tetrahydrocannabinol (THC) the active component of marijuana. Usual peak levels: Less than 10% of THC levels after smoking.

2. 4-ANPP (Despropionyl fentanyl) - Hospital Blood:

   4-ANPP (despropionylfentanyl) is a precursor chemical used in the production of fentanyl and is also a fentanyl metabolite. It may be used in the production of other related compounds such as acetyl fentanyl, butyryl fentanyl and furanyl fentanyl and may be a metabolite of these and other fentanyl-related compounds. It is considered to be pharmacologically weak.

3. Amphetamines - Urine:

   Amphetamines are a class of central nervous system stimulant drugs, with some therapeutic uses, and a high potential for abuse.

   This result derives from a presumptive test, which may be subject to cross-reactivity with non-amphetamine related compounds. A second test is necessary to confirm the presence of amphetamine related compounds.

Reference Comments:

4. Caffeine (No-Doz®) - Hospital Blood:

   Caffeine is a xanthine-derived central nervous system stimulant. It also produces diuresis and cardiac and respiratory stimulation. It can be readily found in such items as coffee, tea, soft drinks and chocolate. As a reference, a typical cup of coffee or tea contains between 40 to 100 mg caffeine.

   The reported qualitative result for this substance was based upon a single analysis only. If confirmation testing is required please contact the laboratory.

5. Cannabinoids - Urine:

   Cannabinoids are chemical compounds derived from the plant Cannabis sativa (marijuana), including active components, chemical congeners and metabolites. Delta-9-Tetrahydrocannabinol (THC) is the principal active component.

   This result derives from a presumptive test, which may be subject to cross-reactivity with non-cannabinoid related compounds. A second test is necessary to confirm the presence of cannabinoid related compounds.

6. Cotinine (Nicotine Metabolite) - Hospital Blood:

   Cotinine is a metabolite of nicotine and may be encountered in the fluids and tissues of an individual as a result of tobacco exposure.

   Anabasine is a natural product occurring in tobacco, but not in pharmaceutical nicotine and a separate test for anabasine in urine can be used to distinguish tobacco from pharmaceutical nicotine use.

   The reported qualitative result for this substance was based upon a single analysis only. If confirmation testing is required please contact the laboratory.

7. Delta-9 Carboxy THC (Inactive Metabolite) - Hospital Blood:

   Delta-9-THC is the principle psychoactive ingredient of marijuana/hashish. Delta-9-carboxy-THC (THCC) is the inactive metabolite of THC. The usual peak concentrations in serum for 1.75% or 3.55% THC marijuana cigarettes are 10 - 101 ng/mL attained 32 to 240 minutes after beginning smoking, with a slow decline thereafter. The ratio of whole blood concentration to plasma concentration is unknown for this analyte. THCC may be detected for up to one day or more in blood. Both delta-9-THC and THCC may be present substantially longer in chronic users. THCC is usually not detectable after passive inhalation.

8. Delta-9 THC (Active Ingredient of Marijuana) - Hospital Blood:

   Marijuana is a DEA Schedule I hallucinogen. Pharmacologically, it has depressant and reality distorting effects. Collectively, the chemical compounds that comprise marijuana are known as Cannabinoids.

   Delta-9-THC is the principle psychoactive ingredient of marijuana/hashish. It rapidly leaves the blood, even during smoking, falling to below detectable levels within several hours. Delta-9-carboxy-THC (THCC) is the inactive metabolite of THC and may be detected for up to one day or more in blood. Both delta-9-THC and THCC may be present substantially longer in chronic users.
   THC concentrations in blood are usually about one-half of serum/plasma concentrations. Usual peak levels in serum for 1.75% or 3.55% THC marijuana cigarettes: 50 - 270 ng/mL at 6 to 9 minutes after beginning smoking, decreasing to less than 5 ng/mL by 2 hrs.

9. Fentanyl (Duragesic®; Sublimaze®) - Hospital Blood:

   Fentanyl is a DEA Schedule II synthetic morphine substitute anesthetic/analgesic. It is reported to be 80 to 200 times as potent as morphine and has a rapid onset of action as well as addictive properties.

   It is reported that patients lost consciousness at mean plasma levels of fentanyl of 34 ng/mL when infused with 75 mcg/Kg over a 15 min period; peak plasma levels averaged 50 ng/mL.

   After application of a fentanyl transdermal preparation (patch), serum fentanyl concentrations are reported to be in the following ranges within 24 hours:
   25 mcg/hour patch: 0.3 - 1.2 ng/mL
   50 mcg/hour patch: 0.6 - 1.8 ng/mL
   75 mcg/hour patch: 1.1 - 2.6 ng/mL
   100 mcg/hour patch: 1.9 - 3.8 ng/mL

Reference Comments:

Following removal of the patch, serum fentanyl concentrations are reported to decrease with a mean elimination half-life of 17 hours (range, 13 to 22 hours).

The mean peak plasma serum fentanyl concentration in adults given an 800 mcg oral transmucosal fentanyl preparation over 15 minutes is reported at 2.1 ng/mL (range, 1.4 - 3.0 ng/mL) at approximately 0.4 hours.

Signs associated with fentanyl toxicity include severe respiratory depression, seizures, hypotension, coma and death. In fatalities from fentanyl, blood concentrations are variable and have been reported as low as 3 ng/mL.

Substance(s) known to interfere with the identity and/or quantity of the reported result: 4-methylphenethyl acetyl fentanyl

10. Fentanyl / Metabolite - Urine:

    Fentanyl is a DEA Schedule II synthetic morphine substitute anesthetic/analgesic. It is reported to be 80 to 200 times as potent as morphine and has a rapid onset of action as well as addictive properties.

    This result derives from a presumptive test, which may be subject to cross-reactivity with non-fentanyl related compounds. A second test is necessary to confirm the presence of fentanyl related compounds.

11. Methamphetamine - Hospital Blood:

    d-Methamphetamine is a DEA schedule II stimulant drug capable of causing hallucinations, aggressive behavior and irrational reactions. Chemically, there are two forms (isomers) of methamphetamine: l- and d-methamphetamine. The l-isomer is used in non-prescription inhalers as a decongestant and has weak CNS-stimulatory activity. The d-isomer has been used therapeutically as an anorexigenic agent in the treatment of obesity and has potent CNS-, cardiac- and circulatory-stimulatory activity. Amphetamine and norephedrine (phenylpropanolamine) are metabolites of methamphetamine. d-Methamphetamine is an abused substance because of its stimulatory effects and is also addictive.

    A peak blood concentration of methamphetamine of 20 ng/mL was reported at 2.5 hr after an oral dosage of 12.5 mg. Blood levels of 200 - 600 ng/mL have been reported in methamphetamine abusers who exhibited violent and irrational behavior. High doses of methamphetamine can also elicit restlessness, confusion, hallucinations, circulatory collapse and convulsions.

    *In this case, the level of methamphetamine determined has not been differentiated according to its isomeric forms. Differentiation of the isomers of methamphetamine is available upon request.

12. Morphine - Free (Codeine Metabolite) - Urine:

    Morphine is a DEA Schedule II narcotic analgesic. In analgesic therapy, it is usually encountered as the parent compound, however, it is also commonly found as the metabolite of codeine and heroin. In illicit preparations from which morphine may arise, codeine may be present as a contaminant. A large portion of the morphine is bound to the blood proteins or is conjugated; that which is not bound or conjugated is termed 'free morphine'. Hydromorphone is a reported metabolite of morphine.

    In general, free morphine is the active biologic agent. Morphine has diverse effects that may include analgesia, drowsiness, nausea and respiratory depression. 6-monoacetylmorphine (6-MAM) is the 6-monoacetylated form of morphine, which is pharmacologically active. It is commonly found as the result of heroin use.

13. Norfentanyl (Fentanyl Metabolite) - Hospital Blood:

    Norfentanyl is the primary inactive metabolite of the synthetic narcotic analgesic fentanyl.
    Substance(s) known to interfere with the identity and/or quantity of the reported result: Benzyl Fentanyl

Sample Comments:

001 Physician/Pathologist Name: Dr. Andrew Baker

Unless alternate arrangements are made by you, the remainder of the submitted specimens will be discarded one (1) year from the date of this report; and generated data will be discarded five (5) years from the date the analyses were performed.

Workorder 20159963 was electronically signed on 05/31/2020 18:27 by:

Daniel S. Isenschmid, Ph.D., F-ABFT
Forensic Toxicologist

Analysis Summary and Reporting Limits:

All of the following tests were performed for this case. For each test, the compounds listed were included in the scope. The Reporting Limit listed for each compound represents the lowest concentration of the compound that will be reported as being positive. If the compound is listed as None Detected, it is not present above the Reporting Limit. Please refer to the Positive Findings section of the report for those compounds that were identified as being present.

Acode 50016U - Opiates - Free (Unconjugated) Confirmation, Urine

-Analysis by High Performance Liquid Chromatography/ Tandem Mass Spectrometry (LC-MS/MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
6-Monoacetylmorphine - Free	5.0 ng/mL	Hydromorphone - Free	5.0 ng/mL
Codeine - Free	25 ng/mL	Morphine - Free	25 ng/mL
Dihydrocodeine / Hydrocodol - Free	25 ng/mL	Oxycodone - Free	25 ng/mL
Hydrocodone - Free	25 ng/mL	Oxymorphone - Free	5.0 ng/mL

Acode 52198B - Cannabinoids Confirmation, Blood - Hospital Blood

-Analysis by High Performance Liquid Chromatography/ Tandem Mass Spectrometry (LC-MS/MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
11-Hydroxy Delta-9 THC	1.0 ng/mL	Delta-9 THC	0.50 ng/mL
Delta-9 Carboxy THC	5.0 ng/mL		

Acode 52483B - Amphetamines Confirmation, Blood - Hospital Blood

-Analysis by High Performance Liquid Chromatography/ Tandem Mass Spectrometry (LC-MS/MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
Amphetamine	5.0 ng/mL	Methamphetamine	5.0 ng/mL
Ephedrine	5.0 ng/mL	Norpseudoephedrine	5.0 ng/mL
MDA	5.0 ng/mL	Phentermine	5.0 ng/mL
MDEA	5.0 ng/mL	Phenylpropanolamine	20 ng/mL
MDMA	5.0 ng/mL	Pseudoephedrine	5.0 ng/mL

Acode 52484B - Fentanyl and Acetyl Fentanyl Confirmation, Blood - Hospital Blood

-Analysis by High Performance Liquid Chromatography/ Tandem Mass Spectrometry (LC-MS/MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
Acetyl Fentanyl	0.10 ng/mL	Norfentanyl	0.20 ng/mL
Fentanyl	0.10 ng/mL		

Acode 52488B - Designer Opioids Confirmation (2019 Scope), Blood - Hospital Blood

-Analysis by High Performance Liquid Chromatography/ Tandem Mass Spectrometry (LC-MS/MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
2-Furanylfentanyl	0.050 ng/mL	Butyrylfentanyl	0.050 ng/mL
4-ANPP	0.10 ng/mL	Carfentanil	0.050 ng/mL
Acryl Fentanyl	0.050 ng/mL	Cyclopropylfentanyl	0.050 ng/mL

Analysis Summary and Reporting Limits:

Compound	Rpt. Limit	Compound	Rpt. Limit
Isobutyrylfentanyl	0.050 ng/mL	meta-Methylmethoxyacetylfentanyl	0.050 ng/mL
Methoxyacetylfentanyl	0.050 ng/mL	ortho-Fluorofentanyl	0.050 ng/mL
THF-F	0.050 ng/mL	para-Fluorobutyrylfentanyl	0.050 ng/mL
U-47700	0.050 ng/mL	para-Fluorofentanyl	0.050 ng/mL
U-49900	0.050 ng/mL	para-Fluoroisobutyrylfentanyl	0.050 ng/mL
U-51754	0.050 ng/mL	para-Methylmethoxyacetylfentanyl	0.050 ng/mL
Valeryl Fentanyl	0.050 ng/mL	trans-3-Methylfentanyl	0.050 ng/mL
cis-3-Methylfentanyl	0.050 ng/mL		

Acode 8050U - Postmortem, Urine Screen Add-on (6-MAM Quantification only)

-Analysis by Enzyme Immunoassay (EIA) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
Amphetamines	500 ng/mL	Fentanyl / Metabolite	2.0 ng/mL
Barbiturates	0.30 mcg/mL	Methadone / Metabolite	300 ng/mL
Benzodiazepines	50 ng/mL	Opiates	300 ng/mL
Cannabinoids	50 ng/mL	Oxycodone / Oxymorphone	100 ng/mL
Cocaine / Metabolites	150 ng/mL	Phencyclidine	25 ng/mL

Acode 8052B - Postmortem, Expanded, Blood (Forensic) - Hospital Blood

-Analysis by Enzyme-Linked Immunosorbent Assay (ELISA) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
Barbiturates	0.040 mcg/mL	Gabapentin	5.0 mcg/mL
Cannabinoids	10 ng/mL	Salicylates	120 mcg/mL

-Analysis by High Performance Liquid Chromatography/Time of Flight-Mass Spectrometry (LC/TOF-MS) for: The following is a general list of compound classes included in this screen. The detection of any specific analyte is concentration-dependent. Note, not all known analytes in each specified compound class are included. Some specific analytes outside these classes are also included. For a detailed list of all analytes and reporting limits, please contact NMS Labs.
Amphetamines, Anticonvulsants, Antidepressants, Antihistamines, Antipsychotic Agents, Benzodiazepines, CNS Stimulants, Cocaine and Metabolites, Hallucinogens, Hypnosedatives, Hypoglycemics, Muscle Relaxants, Non-Steroidal Anti-Inflammatory Agents, Opiates and Opioids.

Acode 8210B - Novel Psychoactive Substances (NPS) Screen 2, Blood - Hospital Blood

-Analysis by Gas Chromatography/Mass Spectrometry (GC/MS) for: The following is a general list of compound classes considered to be Novel Psychoactive Substances included in the Gas Chromatographic screen. The detection of any particular compound is concentration-dependent. Please note that not all known compounds included in each specified class or heading are included. Some specific compounds outside these classes are also included. For a detailed list of all compounds and reporting limits included in this screen, please contact NMS Labs.
Substituted Phenethylamines, Opioid Analgesics, Substituted Cathinones, Pyrrolidinophenones, Piperazines, Tryptamines, Aminoindanes, and Benzofurans.

Acode 8756B - Novel Psychoactive Substances (NPS) Screen 1, Blood - Hospital Blood

-Analysis by High Performance Liquid Chromatography/Time of Flight-Mass Spectrometry (LC/TOF-MS) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
2-Furanylfentanyl	0.10 ng/mL	25B-NBOMe	1.0 ng/mL

Analysis Summary and Reporting Limits:

Compound	Rpt. Limit	Compound	Rpt. Limit
25C-NBOMe	1.0 ng/mL	Meclonazepam	5.0 ng/mL
25H-NBOMe	1.0 ng/mL	Mephedrone	10 ng/mL
25I-NBOMe	1.0 ng/mL	Methoxetamine	2.0 ng/mL
3-Fluorophenmetrazine	5.0 ng/mL	Methoxphenidine	5.0 ng/mL
3-MeO-PCP	5.0 ng/mL	Methoxyacetylfentanyl	0.50 ng/mL
4-ANPP	0.10 ng/mL	Methylone	10 ng/mL
4-MeO-PCP	5.0 ng/mL	Mitragynine	10 ng/mL
Acetyl Fentanyl	0.50 ng/mL	N-Ethyl Pentylone	10 ng/mL
Acryl Fentanyl	0.10 ng/mL	Pentedrone	2.0 ng/mL
BZP	10 ng/mL	Pentylone	10 ng/mL
Bromazepam	10 ng/mL	Phenazepam	10 ng/mL
Butylone	10 ng/mL	Pyrazolam	5.0 ng/mL
Butyrylfentanyl	0.10 ng/mL	TFMPP	10 ng/mL
Carfentanil	0.10 ng/mL	THF-F	0.20 ng/mL
Clephedrone	50 ng/mL	U-47700	1.0 ng/mL
Clonazolam	5.0 ng/mL	U-49900	1.0 ng/mL
Cyclopropylfentanyl	0.50 ng/mL	U-51754	1.0 ng/mL
Delorazepam	5.0 ng/mL	Valeryl Fentanyl	0.50 ng/mL
Deschloroetizolam	2.0 ng/mL	alpha-PVP	2.0 ng/mL
Dibutylone	10 ng/mL	cis-3-Methylfentanyl	0.10 ng/mL
Diclazepam	20 ng/mL	meta-Methylmethoxyacetylfentanyl	0.50 ng/mL
Ethylone	10 ng/mL	ortho-Fluorofentanyl	0.10 ng/mL
Etizolam	10 ng/mL	para-Fluorobutyrylfentanyl	0.10 ng/mL
Flubromazepam	20 ng/mL	para-Fluorofentanyl	0.10 ng/mL
Flubromazolam	5.0 ng/mL	para-Fluoroisobutyrylfentanyl	0.10 ng/mL
Isobutyrylfentanyl	0.10 ng/mL	para-Methylmethoxyacetylfentanyl	0.50 ng/mL
MDPV	10 ng/mL	trans-3-Methylfentanyl	0.10 ng/mL
MPHP	10 ng/mL		

Acode 9096B - Alcohol Screen, Blood (Forensic) - Hospital Blood

-Analysis by Headspace Gas Chromatography (GC) for:

Compound	Rpt. Limit	Compound	Rpt. Limit
Acetone	5.0 mg/dL	Isopropanol	5.0 mg/dL
Ethanol	10 mg/dL	Methanol	5.0 mg/dL