# REPORT OF MEDICOLEGAL OPINION

on the

# Death of Oury Jalloh

Date of Birth: 02.06.1983
Date of Death: 07.01.2005
Date of Post Mortem Examination: 07.01.2005
Autopsy Report: 601Js 796/05, Section Number 10/05

**Report prepared by**

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**for**
**Nadine Saeed, Germany**
**Initiative in Remembrance of Oury Jalloh, e.V., Germany**

## QUALIFICATIONS AND EXPERIENCE

I am a registered Forensic Pathologist of the Ontario Forensic Pathology Service (OFPS) who is based at The Ottawa Hospital General Campus, Ottawa, Canada, with an academic appointment of Assistant Professor at the University of Ottawa within its Department of Pathology and Laboratory Medicine at The Ottawa Hospital General Campus. I am also a Visiting Lecturer of the University of the West Indies, Mona, Jamaica campus, on its Masters in Forensic Sciences programme.

Prior to this present appointment I was a Consultant Forensic Pathologist within the Department of Forensic Pathology and Legal Medicine of the UK Forensic Science Service (FSS) and had been on the Home Secretary's Register of Forensic Pathologists in England and Wales as Consultant Home Office Pathologist for 4.5 years.

My undergraduate medical degree (MB.BS) was obtained from the University of the West Indies, St Augustine campus, Trinidad and Tobago in 1996. I successfully completed postgraduate training in Histopathology (Anatomical Pathology) with sub-specialty training Forensic Pathology in the United Kingdom. The sub-specialty training in Forensic Pathology was funded by the Home Office. I obtained Fellowship of the Royal College of Pathologists of the United Kingdom (FRCPath) and the Diploma in Medical Jurisprudence (DMJ Path) by examination. I hold professional Memberships with the Faculty of Forensic and Legal Medicine (MFFLM) and the Chartered Society of Forensic Sciences of the United Kingdom (MCSFS) and a UK Expert Witness Training Certificate. I have excelled as an expert witness in the criminal, coroners' and family courts of the United Kingdom and within the criminal and coroner's courts on Ontario, Canada. Internationally, I have performed forensic post mortem examinations (and given expert witness testimony in relation to these) in the British Overseas Territory of Anguilla and have also provided consultation opinions for parties in Mauritius, and Northern Ireland.

I have been an invited speaker/presenter at various regional and international meetings of the International Academy of Legal Medicine (IALM), the US National Association of Medical Examiners (NAME), the American Academy of Forensic Sciences (AAFS), the Florida Association of Medical Examiners (FAME), the Canadian Association of Pathologists (CAP), the University of the West Indies First International Conference in Forensic Medicine at Mona, Jamaica, the Annual Education Course of the Office of the Chief Coroner of Ontario, the Office of the Director of Public Prosecutions (Trinidad and Tobago) and the Los Angeles County Coroners Department. I was responsible for the development of the educational content of the inaugural conference of the Caribbean Association of Prosecutors which was held in Grand Cayman, Cayman Islands (June 2012). I act as an invited reviewer for the peer-reviewed academic journals *Forensic Science, Medicine and Pathology* and Medicine, *Science and Law.* I *have* co-authored a chapter on Asphyxia (pages 151-157) in the text book *Encyclopedia of Forensic and Legal Medicine, 2005; Payne-James, J, Editor-in-Chief* (ISBN: 978-0-12-369399-0).

## DECLARATION

i. I understand that my overriding duty is to the court, both in preparing reports and in giving oral evidence, and not to the party that have instructed me. I have complied with and will continue to comply with that duty. I have done my best, in preparing this report, to be accurate and complete.

ii. I have mentioned all matters that I regard as relevant to the opinions I have expressed.

iii. The interpretation and conclusions are dependent upon the materials and information disclosed to me. Should any material information provided to me and on which I relied to formulate my opinions be subsequently proven

to be false or inaccurate, I reserve the right to amend those opinions as necessary.

iv. I do not have any connection, professional or otherwise, with any of the parties involved in the materials reviewed to constitute a conflict of interest.

## INSTRUCTIONS

At the request of Ms Nadine Saeed of the *Initiative in Remembrance of Oury Jalloh, e.V., Germany*, I have been asked to review the following materials and provide a medicolegal opinion in relation to the death of Oury Jalloh (Date of Birth 02.06.1983) with regards to the pathological findings.

This instruction was jointly received with Iain Peck (Forensic Scientist – Fire Investigation) and Michael Scott-Ham (Forensic Toxicologist) of Principal Forensic Services, UK.

## MATERIALS REVIEWED

1. **Case Summary.**
2. **Translation of the Autopsy Report of Prof. Dr. med M. Kleiber.**
3. **Scene Images.**
4. **Autopsy Images.**
5. **Translation of the Toxicology Report of Dr M Weise.**
6. **Translation of the Expert Report of Prof. Dr. H. Bratzke and Prof. Dr. G. Kauert.**
7. **Forensic Medical Report of Prof Dr Med Michael Bohnert.**
8. **Fire Investigation Report of Maksim Smirnou.**
9. **Fire Materials Report.**

## CASE SUMMARY

Oury Jalloh was arrested on the morning of January 7, 2005 as a result of being an annoyance to passers-by. He was taken to the Dessau Police Station, Wolfgangstrasse 25, Dessau after allegedly resisting arrest and causing criminal damage. He was extremely aggressive and had allegedly hit his head against a wall and table during police measures as he had refused to provide a blood sample. He was therefore placed in Detention Cell 5 as officers were concerned that he was under the influence of drugs and/or alcohol. He was fixed onto a mattress with handcuffs and gyves (leg shackles). He was checked on several times, the last time being 1145 hrs.

A smoke alarm was activated around 1205 pm on January 7, 2005. Police officers could not get into the cell due to the amount of smoke and only the fire brigade was able to extinguish the fire. The decedent was found in an extremely burnt state in a fixed position. He was affixed at his wrists and ankles on a fire-resistant mattress in the cell. The circumstances of his death and the cause of the fire were unexplained. The body was profoundly changed by heat such that an assessment of the surfaces of the body and the skin was not possible and nothing could be said about possible external injury. There was only limited ability to assess for deep injuries based on the fact that the effects of the heat had destroyed individual bones (e.g. fingers) and had opened joints.

There were two conventional post mortem examination conducted on the body of Oury Jalloh. The first examination was performed on January 7, 2005 at Martin Luther University in Halle-Wittenberg under the auspices of Dr M Kleiber and the Cause of Death was ascribed to "Death by Exposure to Fire." Toxicological analysis of the blood and urine revealed a blood ethanol of 2.68% and a urinary ethanol of 3.42%. Analysis of a blood sample taken from him at 0915 hrs on the morning of his detention revealed that it had contained 2.98% of ethanol. Evidence of cocaine and cannabis use was also detected. The interpretation was

that there was mixed intoxication by cannabis, cocaine and alcohol. The blood alcohol concentration was indicative of a heavy state of intoxication.

The second examination was performed on March 31, 2005 in Frankfurt am Main by Drs H Bratze and G Kauert on behalf of the Initiative in Remembrance of Oury Jalloh. The body was in a frozen state at the second autopsy and additional toxicological investigations were conducted on samples of serosanguinous fluid squeezed out from the lungs and liver and a sample of brain was analysed for solvents but no fire accelerants or fire starting substances were detected in the brain tissue. Cyanide was detected in both the fluids from the lung (0.56 mg/l) and liver (0.12 mg/l) alongside a carboxyhemoglobin concentration of 6% in the fluid from the liver. The cocaine metabolite, benzoylecgonine, was detected at a concentration of 0.17 mg/l in the fluid from the lung, in the absence of cocaine.

Dr Michael Bohnert then provided an expert opinion on the post mortem examination findings in December 2011 which included a repeat microscopic examination of the histological sections prepared from the first post mortem examination in Halle-Wittenberg. He did not perform a repeat gross examination of the body. This report was prepared in relation to a criminal case against Andreas Schubert.

A partially melted cigarette lighter was allegedly recovered three days after the incident on January 10, 2005 from within the fire debris that was collected on January 7, 2005 as "*Exhibit 1.1: Remains of clothing and mattress from beneath the body*". Exhibits 1.1 and 1.2 were analysed for ignitable liquid residues but none was found. Remains of partially burnt clothing were on and under the body at post mortem and appeared to be blue corduroy jeans, a T-shirt and socks.

Exhibits 1.1, 1.2, 1.3 and 1.6 were examined in 2014 for the presence of ignitable liquids but it was noted that the bags had been opened and their contents

analysed at various times in the 9 year period since the incident and therefore no meaningful conclusions could be drawn.

A series of experimental fire tests related to the were performed and reported on in 2013 by Maksim Smirnou who used ten mattresses similar to that which Oury Jalloh was found on.

## SCENE IMAGES

I was provided with four (4) colour images of the scene locus. These depicted burn damage of a tiled room in which a severely burnt body of a man was laid supine on a low level single bed that consisted of a severely burnt single mattress which was on top of a low level metallic frame just a few centimeters off the floor. The right side of the bed (decedent's right side) was close to a wall that exhibited severe burn damage with intense soot staining and cracking of the wall tiles. The right upper limb was nearly fully outstretched on the right side of the body towards the soot-stained wall, with the right wrist affixed to the wall which exhibited a cracked tile. The left wrist was affixed to the left side of the metallic bed frame by a metal shackle. Both ankles are affixed to the foot of the metallic bed frame by metallic shackles. The burn damage was concentrated to the location of the bed and wall adjacent to it.

The discernible thermal injuries in these images consisted of soot staining of the skin and burns with skin splitting. No images of the back of the body or of the mattress after the body had been removed from the mattress were provided for review.

## TRANSLATION OF (FIRST) AUTOPSY REPORT OF PROF. DR. MED M. KLEIBER

The post mortem examination was conducted on January 7, 2005 between 2025 hrs and 2230 hrs by Dr Med Klintschar and Dr Med Stiller at the Institute of Pathology in Halle-Wittenberg with Prof Dr Med M Kleiber as the Principal.

The report stated that Mr Jalloh had been arrested as a result of being an annoyance of passers-by on the morning of January 1, 2005. He had been extremely aggressive during the police procedures and had hit his head against a wall and against a table. He was therefore placed into a "drunk cell" where he was fixed on a mattress with handcuffs and gyves. He was checked on several times that morning, the last occasion being 1145 hrs. The smoke alarm went off at 1205 hrs. Officers could not enter the cell because of the amount of smoke and only the fire brigade was able to extinguish the fire. The decedent was discovered in a fixed position on a mattress in a severely burnt state.

*(i) Summary of External Examination Findings*

The report indicated that the body was unclothed but there was a 13 cm length of carbonised cloth on the throat and the cuff of a T-shirt was queried. An 8 cm diameter of cloth remains was present beneath the head. There were remains of carbonised socks on both feet beneath the ankles. The lower legs exhibited carbonised remains of fibre. The remains were secured by police officers in attendance.

The body weight 55 kg and its height was 1.70 metres. It exhibited severe burn injury with carbonisation (head, throat, both shoulders, flanks, arms, right hip, right leg, inside of the right leg, back of both legs, and buttocks) with burn loss of some parts of the fingers (distal phalanges of the left $2^{nd}$ – $5^{th}$ fingers and the middle phalanges of the left $2^{nd}$, $3^{rd}$ and $5^{th}$ fingers). The teeth were intact and the lips were uninjured. There was a region of unburnt skin (described as intact brown skin) between the shoulders and buttocks of about a hand breadth.

*(ii) Summary of Internal Examination Findings*

***Soot was described as being present on the tongue and in the throat, larynx, gullet and windpipe with smears of soot in the stomach.*** This was interpreted as evidence of inhalation of soot into the upper and lower airways

with swallowing of soot and proof that the decedent was alive and breathing when the fire had started.

It was stated that "*the tongue exhibited enormous incorporations of soot on the mucous membrane that peels especially on the tongue's edges." The mucous membrane of the throat and larynx is heavily reddened, partially carbonised and covered by soot. The epiglottis is denatured by heat on the surface and on the bottom is heavily reddened. The windpipe contains many streaks of soot. The mucous membrane is plainly reddened. The gullet contains white phlegm with streaks of soot in it. The mucous membrane seems thickened and denatured.*"

The organ weights were as follows:
Brain 1380 g
Heart 270 g
Lungs: left 420 g; right 550 g
Liver 1150 g
Kidneys 210 g
Spleen 90 g

There were no bony injuries of the skull, trunk or limbs. The brain was normal. The urinary bladder contained an unspecified volume of clear yellow liquid.

***Pieces of lung (right upper, middle and lower lobes; left upper and lower lobe), air from the windpipe, blood from the aorta, air from the lower part of the windpipe, and aspirated air from the stomach were paced in a head-space pot.***

(iii) *Histology*
Histological examination of the tissues *(complement of Expert Opinion G21/05)* was reported as showing evidence of inhalational injury from hot gases on examination of sections of the epiglottis, mucous membranes of the larynx,

windpipe and lungs. (*Comment: There was no comment on whether or not the alveolar spaces in the lungs contained anthracotic pigment consistent with soot).*

*(iv) Toxicology*

No carbon monoxide (carboxyhemoglobin) was detected.
The blood alcohol was 2,68 % and the urine contained 3,42 %.
The ante mortem blood sample drawn prior to placing him in the cell was 2,98 %.

*(v) Conclusions*

The Cause of Death was ascribed to *"Death by Fire Exposure."*
There was no evidence of outward "violations" (interpreted as injuries) or pre-illness.

*(vi) Expert Opinion*

Subsequent expert opinion provided stated that interpretation of the findings indicate that the decedent had been alive and breathing after the fire had started but it could not be concluded how long after the fire started that the decedent had remained alive. No carbon monoxide was found as death would have been very fast. Histological examination of the larynx and windpipe revealed changes typical of inhalation of hot gases.

The results of toxicological analyses of the blood and urine indicated that there was evidence of a mixed intoxication by cannabis, cocaine and alcohol. The blood alcohol concentration was indicative of a heavy state of intoxication.
No cyanide was detected.

The frequency of sudden death in fires in which carbon monoxide is not detected was quoted as being 3% - 10%. The mechanisms of death in those cases are cyanide toxicity *(not present in this case)*, lack of oxygen, carbon dioxide toxicity and heat shock as occurs in the setting of "flash fires."

## POST MORTEM IMAGES

I was initially provided with 29 colour images of body in PDF format which had been taken at the first post mortem examination. These images mostly depicted the external aspects of the body in various views (inclusive of the back of the body) with the only internal images being of the oropharynx/laryngeal inlet and opened esophagus. ***There were no images of the opened larynx, trachea or tracheobronchial tree. The opened esophagus exhibited a few flecks of black material only.*** It was not possible to zoom in on these images for magnification as they were in PDF format and not jpeg.

Subsequent to the above, I was provided with a set of 16 coloured images of the post mortem examination (jpeg format) in 2015 revealed the following:

1. The images of the external aspects of the body depicted significant charred burn injury in the regions as described, together with heat-induced skin splitting. There were areas of fourth degree burns on the upper limbs (arms) and lower limbs (back of the thighs and medial aspects of the legs). ***There was a large area on unburnt skin on the central and right side of the back of the trunk and on the right buttock.***

2. The images of the internal aspects of the body revealed that the images of the tongue, oropharynx and opened esophagus imparted features of inhalational burn injury in the form of reddening of the surface of the tongue, the oropharynx and laryngeal inlet, with an abrupt line of demarcation in the upper oropharynx as can occur with the inhalation of hot gases in a fire. Additionally, there was soot staining of the surface of the tongue.

3. The mid segment of the esophagus exhibited a few flecks of soot admixed with mucus as described at point 40 of the autopsy report but these were not abundant. Magnification of this image by zooming in confirmed that

the particles of soot were indeed admixed within the mucus and were not existing freely otherwise.

4. The laryngeal inlet (beginning of the voice box) exhibited soot. The voice box is connected to the trachea (windpipe) but there were no images of the opened trachea to confirm soot within its lumen as described at point 41 of in the report on the first post mortem examination.

5. There were no images of the opened trachea and bronchial tree.

## TOXICOLOGY REPORT OF DR M WEISE (CHEMIST)

This details the findings from the toxicological analyses performed on the samples (2 ml of blood, 3 ml of serum, 3 ml of urine and 5 g of liver) which were obtained at the first post mortem examination.

The urine was tested for cannabis, opiates, cocaine, cocaine and amphetamines by enzyme immunoassay. Extracts from the liver and urine was examined by HPLC. The determination of concentrations was achieved by GC-MS.

The toxicological findings (C 54/05) in relation to the samples submitted from the (first) autopsy of Oury Jalloh (S10/05) indicated the following findings:

| | | |
|---|---|---|
| THC | <10 ug/l (serum) | 15,0 ug/l (urine) |
| Cocaine | <10 ug/l | 1,4 mg/l |
| Benzoylecgonine | 171,6 ug/l | About 10,7 mg/l |
| Ecgoninemetylphenidate | 54,8 ug/l | About 6,7 mg/l |

***No cyanide (CN) or carboxyhemoglobin (COHb) was found.***

No medicines were found in the urine and liver.

*The interpretation of these results was that there was mixed intoxication through use of cannabis, cocaine and alcohol.*

## TOXICOLOGY REPORT OF PROF. DR. H. BRATZKE AND PROF. DR. G. KAUERT (SECOND POST MORTEM EXAMINATION)

Toxicological samples taken at a second post mortem examination conducted at Frankfurt am Main (serosanguinous fluid squeezed from the lungs and liver, brain) were analyzed and reported on by the two authors of this report with findings and conclusions as below:

| | | |
|---|---|---|
| Lung | Benzoylecgonine | 0.17 mg/l |
| | Ecgoninethylester | 0.06 mg/l |
| | Caffeine | Low |
| | Cyanide | 0.56 mg/l, calculated as cyanide ion |
| | Fire accelerants and fire starting substances | Not detected |
| Liver | Cyanide | 0.12 mg/l, calculated as cyanide ion |
| | Carbon-dioxide hemoglobin (sic) | Ca 6% |
| | | |
| Brain | Fire accelerants and fire starting substances | Not detected |

It was determined that the decedent was under the influence of a low concentration of cocaine at the time of death as only a low to medium concentration of its inactive metabolite was detected in the blood from the lung.

## FORENSIC MEDICAL REPORT OF PROF DR MED MICHAEL BOHNERT

This is an expert opinion report dated December 1, 2011 in relation to the fatal fire incident in general and the findings at the scene in relation to the corpse of Oury Jalloh.

The author stated that he did not conduct a follow up examination of the body but *merely carried out a repeat examination of the histological preparation from the Institute for Forensic Medicine at Halle University.* It also alluded to some additional toxicological testing which had been done in Frankfurt.

On page 50 of the report, under subsections 2.4.1 Lungs and 2.4.2 Respiratory Tract of section 2.4 Histology, the following findings are summarised:

*2.4.1 Lungs*

- *Acute bloating of the lungs*
- *Acute blood stasis in the lungs with interstitial and intra-alveolar oedema*
- *Individual bleeding area*
- *Numerous smoker cells*
- *No sign of activated clotting in the vessel system*

*2.42 Respiratory Tract*

- *Heat condensation (in the) mucous membrane on the larynx and glottis, heat degradation of the musculature, heat thrombosis in the vessels*
- ***Mucus secretion, mostly in the air pipes, mixed with soot***
- *Large amount of blood in the mucous membrane vessels in the windpipes and larynx*
- *In some segments heat condensation in the mucous membranes of the windpipes*
- *No pseudogoblet cells*
- *Little mucus and **only very isolated soot particles in the peripheral bronchial tubes**; uncharacteristic dissolution of the mucous membranes.*

*Comment: No intra-alveolar soot was described.*

| | **Halle** | **Frankfurt** |
|---|---|---|
| COHb | 0% | 6% |
| Cyanide | 0 µg/ml | 0.56 µg/ml (lungs)<br>0.12 µg/ml (liver) |

| | Serum | Urine | Serum (F) |
|---|---|---|---|
| THC | <10 µg /l | 15.0 µg /l | |
| Cocaine | <10 µg /l | 1400 µg /l | |
| Ecgonine methylester | 54.8 µg /l | 6700 µg /l | 60 µg/l |
| Benzoylecgonine | 171.6 µg /l | 10 700 µg/l | 170 µg/l |

- There was no evidence of catecholamines in the blood (hemolysis).
- Adrenaline in the urine 12 µg/l (<27 µg/l)
- Noradrenaline in urine 116 µg/l (<97 µg/l)
- Quotient A/NA = 0.103
-

Conclusions (Dr Bohnert)

After his review of the findings of the post mortem examination and toxicological analysis, Dr Bohnert arrived at the following conclusions:

- Oury Jalloh was alive when the fire broke out as verified by the macroscopic findings of soot aspiration and swallowing and the microscopic findings of the respiratory tract inclusive of inhalational damage.

- Death occurred very quickly after the fire had broken out, likely within the first few minutes of the fire. This was supported by the negative toxicological findings for carbon monoxide and cyanide with signs of inhalation of soot and hot gases.

- The adrenaline/noradrenaline quotient of the urine (0.103) had remained in the physiological range (0.1-0.3) and therefore indicated that death was rapid. *(Comment: Catecholamine concentrations fall rapidly after death).*

- The burn damage of the body can be explained by fire duration of an estimated half hour.

- The extent of the burns does not necessarily indicate high temperatures as would occur with the use of accelerants. A different extent of burns would not be expected if the fire had been fuelled by accelerants.

## REVIEW OF THE HISTOLOGY SLIDES

The histological sections prepared from the tissues sampled from the first post mortem examination at Halle University were not available for me to review.

## FIRE INVESTIGATION REPORT OF MAKSIM SMIRNOU

This is an expert opinion report prepared by Maksim Smirnou, Fire Investigator in Ireland, based on full scale fire experiments conducted using 10 polyurethane foam mattresses covered by a polyvinyl chloride skin *(similar to the mattress on which Oury Jalloh was found)* within a metallic shed under conditions that simulated that of the cell of Oury Jalloh. A pig was used in some of the experiments and the experiments were conducted with and without the use of various accelerants. Detectors for CO, $CO_2$, NO, $NO_2$, HCl, $O_2$, $NH_3$, HCN, $Cl_2$ and $CCl_20$ were also employed.

The background information of the circumstances of Oury Jalloh's death was that 20 minutes had passed between the activation of the alarm and the fire being extinguished by the fire brigade, a cigarette lighter had been subsequently produced as the source of the ignition and that chemical analysis of the burnt mattress had not revealed any traces of accelerants.

The results of these fire tests were as follows:

1. Tests without accelerants revealed remains of unburned fabrics of the pig's wrapping and very slight damage to the pig's skin. Various dangerous concentrations of toxic gases occurred, but no high level of HCN (cyanic acid) was present in the burning products.

2. High concentration of HCN (cyanic acid) was found in every test, using petrol and BBQ lighter liquid as fire accelerants. The temperature in the area of the head can reach over 120 °C in the first minute with accelerants.

3. ***The test using 2 liters of petrol as fire accelerant on 20.08.2013 is the most corresponding visually to the case of Oury Jalloh.***

4. Concentration of CO (carbon monoxide) significantly reduced after removing the upper layer of polyvinylchloride leather of the mattress and was not dangerous even while using 5 liters of petrol.

5. The heat release rate of a polyurethane foam mattress is not enough for the fire to envelope all area of the mattress to produce uniform damage. Tests with human body cremations are required to reveal if an additional fire load was used in the area of the right hand.

6. All tests results must be reviewed by toxicologists and pathologists to ascertain the cause of death of Mr. Oury Jalloh.

*Overall Comments on the Report of Maksim Smirnou: I defer to the opinion of Iain Peck, Forensic Scientist – Fire Investigation.*

## FIRE MATERIALS REPORT

This is a translated copy of proceedings listed as "Fire Materials in the Case of Oury Jalloh."

## SUMMARY AND OPINIONS

### *Case Summary*

1. The severely burnt body of Oury Jalloh was discovered laid supine on a burnt flame-resistant mattress which was atop the metallic frame of a single bed, to which his left wrist and ankles were shackled with his right wrist shacked to the wall, inside a detention cell of a police station on January 7, 2005. He had arrested that morning as a result of being an annoyance to passers-by, resisting arrest and causing criminal damage. He was described as being extremely aggressive and had allegedly hit his head against a wall and table during police measures as he had refused to provide a blood sample. He was therefore placed in the detention cell out of concern that he was under the influence of drugs and/or alcohol and affixed on the bed. He was checked on several times, the last time being 1145 hrs.

2. The smoke alarm was activated around 1205 pm but smoke had prevented police officers from getting into the cell and the fire was only extinguished on the arrival of the fire brigade.

3. A post mortem examination was performed that day at Martin Luther University in Halle-Wittenberg under the auspices of Dr M Kleiber and the Cause of Death was ascribed to "Death by Exposure to Fire" after features of inhalation and swallowing of soot with inhalational burn injury were

identified at autopsy. No COHb or cyanide was detected in the blood. Toxicological analysis revealed a mixed intoxication by cannabis, cocaine and alcohol. A blood ethanol of 2.68% and a urinary ethanol of 3.42% were detected in the post mortem samples and analysis of the ante mortem blood sample taken from him at 0915 hrs on the morning of his detention revealed that it had contained an even higher concentration (2.98%) of ethanol. The blood ethanol concentrations were indicative of a heavy state of intoxication.

4. A second post mortem examination was performed on March 31, 2005 in Frankfurt am Main by Drs H Bratze and G Kauert on behalf of the Initiative in Remembrance of Oury Jalloh. The body was in a frozen state at the second autopsy and additional toxicological investigations were conducted on samples of serosanguinous fluid which were squeezed out from the lungs and liver. A sample of brain was analysed for volatiles but no volatiles were detected. Cyanide was detected in both of the fluids from the lung (0.56 mg/l) and liver (0.12 mg/l) alongside a carboxyhemoglobin concentration of 6% in the fluid from the liver. The cocaine metabolite, benzoylecgonine, was detected at a concentration of 0.17 mg/l in the fluid from the lung, in the absence of cocaine.

5. An expert opinion on the post mortem and histological findings for a criminal case was the prepared by Dr Michael Bohnert in December 2011 which included his microscopic examination of the histological sections prepared from the first post mortem examination in Halle-Wittenberg without a repeat gross examination of the body.

6. A partially melted cigarette lighter was allegedly recovered three days after the incident on January 10, 2005 from within the fire debris that was collected on January 7, 2005 (*Exhibit 1.1)*. Exhibits 1.1 and 1.2 were analysed for ignitable liquid residues but none was found. Exhibits 1.1,

1.2, 1.3 and 1.6 were examined in 2014 for the presence of ignitable liquids but it was noted that the bags had been opened and their contents analysed at various times in the 9 year period since the incident and therefore no meaningful conclusions could be drawn.

7. In 2013 Maksim Smirnou had conducted a series of experimental fire tests using pigs' carcasses, ten mattresses similar to the one which Oury Jalloh was found on, and a variety of accelerants. The test using 2 liters of petrol as fire accelerant was interpreted as producing the most visually corresponding pattern of burns to that of Oury Jalloh.

***Review of Materials***

7. The autopsy report of Prof Dr Med M Kleiber from the first post mortem examination described the presence of soot on the tongue and in the throat, larynx, gullet and windpipe with smears of soot in the stomach which was indicative of inhalation of soot in the upper and lower airways with the swallowing of soot. Evidence of the inhalation and swallowing of soot in a body recovered from a fire is taken as proof that the decedent was alive and breathing when the fire started.

8. No carbon monoxide (carboxyhemoglobin- COHb) or cyanide (CN) was detected on toxicological analysis of the blood sample taken at the first post mortem examination. The non-detection of carboxyhemoglobin and cyanide does not preclude death from inhalation of fire fumes when there is pathological evidence of inhalation of products of combustion (soot). Flash fires can be associated with the non-detection of COHb or CN.

9. The detection of low concentrations of COHb and cyanide in the serosanguinous fluid squeezed from the liver at the second post mortem examination some months after the initial examination cannot be interpreted as toxicologically valid results due to the nature of the

specimen. Kindly refer to the comment of Michael Scott-Ham in this regard. I do not know if reference tables exist for the analyses conducted on this sample and in the absence of an established reference range of values, it is my opinion that no valid interpretation can be made. In this regard, I agree that the only useful evidential results were obtained from analysis of the post mortem sample taken on the day of the autopsy.

10. Review of the images of the scene locus depicted burn damage of a tiled room in which a severely burnt body of a man was laid supine on a low level single bed that consisted of a severely burnt single mattress which was on top of a low level metallic frame just a few centimeters off the floor. The right side of the bed (decedent's right side) was close to a wall that exhibited severe burn damage with intense soot staining and cracking of the wall tiles. Both ankles are affixed to the foot of the bed frame by metallic shackles. The left wrist was affixed to the left side of the bed frame by a metal shackle. The right wrist was affixed to the soot-stained wall with a cracked tile on the right of the body which was on the right side of the body and bed. The area of burning appeared to be concentrated to the location of the bed and wall adjacent to it. The discernible thermal injuries in these images consisted of soot staining of the skin and burns with skin splitting. No images of the back of the body or of the mattress after the body had been removed from the mattress were provided for review.

11. Review of the digital colour images of the external and internal aspects of the body which were taken during the first post mortem examination indicated that the external aspects of the body depicted significant charred burn injury with heat-induced skin splitting and focal areas of fourth degree burns on the upper limbs (arms) and lower limbs (back of the thighs and medial aspects of the legs). There was a large area on unburnt skin on the central and right side of the back of the trunk and right buttock which indicated that this area had remained protected during the duration of the

fire. Given the position in which the body was found and the manner of restraint which had been employed, it can be inferred that the decedent had remained supine on the mattress for the duration of the fire with the back of his torso in contact with the mattress.

12. The images of the tongue, oropharynx and opened esophagus in continuity imparted features of inhalational burn injury in the form of reddening of the surface of the tongue, oropharynx and laryngeal inlet, with an abrupt line of demarcation in the upper oropharynx as can occur with the inhalation of hot gases in a fire *(see Figure 1)*. Additionally, there was soot staining of the surface of the tongue.

13. A few flecks of soot admixed with mucus were evident within the mid esophagus but were not abundant.

14. Soot was also present at the laryngeal inlet but there were no images of the opened windpipe (larynx and trachea) to confirm the presence of lumenal soot as described at point 41 of the original post mortem examination report. The described reddening of the mucous membrane could not be confirmed. Also, there was no image of the opened main bronchi of the lungs to confirm the description of "*heavy reddening of the mucous membrane and phlegm of soot*". As such, I cannot confirm the gross finding that inhalation of soot into the respiratory system had occurred. The finding of soot throughout the respiratory tree would be conclusive evidence that Oury Jalloh had been alive and breathing at the start of the fire. It is standard forensic pathology practice internationally to photographically document all positive macroscopic findings at autopsy and it would have been expected that this significant macroscopic finding, especially in the context of the death, would have been so documented. I am unaware if no such photograph was taken or it had been taken and just not disclosed for review.

15. The histological sections were also not available for review to determine whether or not soot had been inhaled. I was informed that difficulties were encountered by the Initiative for the Remembrance of Oury Jalloh, e.V., Germany, in obtaining these slides which had been requested for review.

16. Despite the absence of a photograph of the opened windpipe and/or histology of the lungs to review, the observed macroscopic findings of inhalational burn injury of the tongue and oropharynx together with mucus-admixed soot within the esophagus are indicative of Oury Jalloh being alive when the fire started.

17. Inhalational burn injury of the upper airway is an indicator of vitality during a fire (epiglottic swelling and erythema of the buccal and oropharyngeal mucosa with detachment of the mucosa of the pharynx, epiglottis). As air is a poor conductor of heat, internal thermal injury from inspired hot gases is usually limited to the upper airways with a sharp line of demarcation between the injured and uninjured mucosa *(see Figure 2)*.

18. Toxicological analysis of the post mortem blood had revealed a high concentration of ethanol and evidence of use of cocaine within the 12 hour period or so prior to death with previous use of cannabis. No further interpretation of these results will be made here *(see Opinion of Michael Scott-Ham, Toxicologist, for a detailed analysis and interpretation).*

***General Comments – Fire Deaths***

19. The lethality of fires involve many different mechanisms that include (i) reduction in environmental $O_2$, (ii) an increase in CO and other toxic gases and (iii) inhalational injury from smoke and hot gases and (iv) extreme heat, shock and burns. Temperatures greater than 150 °C result in loss of consciousness or death within minutes and higher temperatures cause immediate death. In rapid deaths in fires, the victim inhales little, if any, products of combustion. Smoke/heat-induced laryngospasm, respiratory arrest and/or vagal reflex-mediated cardiac arrest are the proposed mechanisms of rapid death in fires.

20. Smoke is relatively low in $O_2$ and rapid incapacitation will occur if the $O_2$ tension is below 7%. Suffocation is expected when the oxygen concentration falls to 10% but levels in fires are not usually below 15% at which point a fire smolders.

21. The initial production of $CO_2$ in fires stimulates respiration which increases the inhalation of other toxic gases (eg CO, CN etc). The amount of CO produced in a fire is variable and ranges from 0.1 to 10% in the fire atmosphere. Death will be rapid at high concentrations.

22. CN causes more rapid incapacitation than CO. Its rapid absorption and respiratory depressant effect may limit the uptake of CO.

23. In many fire deaths, CO is in the fatal range and CN is not at toxic levels. In certain situation (eg burning of nitrogen-containing plastics), a CN concentration in the range of 100 µmol/l is life threatening and victims can have relatively low COHb concentrations. Fatal CN concentrations are between 1000 – 3000 µmol/l.

24. The observations of soot in the mouth, respiratory and gastrointestinal tract with increased COHb (>10%) and other noxious gases in the blood

indicate that the decedent was alive at the start of and during the fire. A COHb concentration in excess of 50% is considered fatal in healthy individuals who do not have any underlying cardiorespiratory issues or anaemia but an uncritical, rigid adherence that fire death victims have high COHb concentrations can be misleading. The majority of fire victims who are dead at the scene of the fire exhibit some combination of smoke inhalation, elevated COHb (>10%) and swallowing of soot. Gerling et al (2001) reported that only about 1/3 cases in their study had evidence of swallowed soot. Bohnert et al (2003) reported that soot was present in the respiratory tract of ¾ of fire victims and in the upper GI tract in about 50% of the cases. The COHb concentrations were above 10% in about 2/3 of the deaths. The presence of soot in the GI tract was associated with the evidence of aspiration of soot. Rogde and Olving (1996) reported that in their study, fire victims had a fatal level of COHb which was not associated with respiratory soot. In half of those cases, the fires were smoldering in nature and accelerant had been used in one case. Others (Girling et al, Walter et al) have also reported that an absence of smoke inhalation in smoldering fires. In cases of self-immolation, there can be an absence of soot with low levels of COHb, but the latter is usually elevated in value in most cases.

25. Flash fires can be associated with low COHb levels. The presence of copious mucus in the airway is indicative of vitality during the fire, even in the absence of COHb.

26. Shkrum and Johnson (1992) reviewed thirty-two self-immolation deaths which occurred in the province of Ontario, Canada, between1986 through 1988. The victims were mostly male (male/female ratio, 26:6) who were between 21 and 71 years old (mean age, 38 years). Fourteen individuals died in hospitals from severe burn complications. The remainder were found dead at the scene. The post mortem findings of soot in the airway

and elevated carbon monoxide in the blood of most of these victims were helpful in determining that the individuals were not only alive at the time of the fire but also that a significant number died from smoke inhalation and carbon monoxide poisoning. The COHb concentration was less than 10% in one case.

***Second Post Mortem Examination***

27. I note that computed tomography of the body (spiral CT) during the second post mortem examination in Frankfurt am Main on July 23, 2005 identified a fracture of the nasal bone. No CT examination of the body had occurred at the first post mortem examination. I do not have personal experience or working knowledge of the post mortem CT findings in severely burnt bodies or the possible artefacts that can arise so I am unable to provide any additional definitive comment but a post mortem injury cannot be excluded.

***Excited Delirium***

28. I note that Excited Delirium has been raised by Michael Scott-Ham, Forensic Toxicologist, for completeness and is being addressed here in that regard.

29. Excited Delirium (ED) is a syndrome first reported in 1849 by Lewis Bell in psychotic patients (Bell's Mania) which was characterised by mania, fever and death. New reports surfaced in 1980s at beginning of cocaine pandemic. The first modern report of cocaine-associated ED was in 1985 (Wetli and Fishbain).

30. In modern day, individuals die after being subdued/restrained subsequent to being in a state of high agitation as a result of either psychosis or intoxication by stimulant drugs (eg cocaine, methamphetamine, hallucinogen). The decedents exhibit paranoia, agitation to pain,

insensitivity to pain and display superhuman strength which usually requires a significant number of law enforcement officers to restrain and subdue them. It is the cause of significant number of deaths in police custody, usually immediately after forceful restraint that utilises use of TASER, prone positioning, hog-tying. Typically victims become quiet and go into cardiorespiratory arrest after a period of considerable struggle.

31. It is seen in chronic stimulant abuse. In cocaine abusers, low to modest levels of cocaine are encountered in the blood. The mechanism is mediated by alteration of dopamine receptors (D1, 2, 3 and 4) in the brain.

32. There are four (4) progressive component stages of fatal ED (hyperthermia, delirium with agitation, respiratory arrest, Death) although hyperthermia can be absent.

33. Clinicopathological considerations indicate that Excited Delirium is not a candidate possibility to explain Oury Jalloh's death in the police cell.

***Final Comments***

34. The available information indicates that Oury Jalloh was alive when the fire started and succumbed to the effects of fire. The extent of the burns to the body is not outside what would be expected in fire deaths without accelerants but in such a scenario, it would be more commonly encountered in building/residential fires.

35. The pathological features of the burn injuries cannot definitively assist in the determination as to whether or not an accelerant was used but the severity of the burns for the apparent short duration of burning, when coupled with the non-detection of COHb and CN, point towards a flash fire type of scenario and therefore invokes the possibility that an accelerant was used.

36. The results of the experimental fire tests conducted by Maksim Smirnou indicated that the test using 2 liters of petrol as fire accelerant produced the most visually corresponding burns to that of Oury Jalloh. I am not a forensic scientist with expertise in the scientific interpretation of fire scenes or their recreation and further comment as to the validity of the experiments and the results obtained is therefore deferred to Iain Peck.

37. I note Ian Peck's expert opinion that the fire in the cell had started on or around the mattress as a result of flame ignition to the exclusion of cigarettes and electrical causes. He opined that the recovered lighter may have been present in the cell at the time of the fire but the evidence of Officer Schubert was that the decedent had been correctly searched prior to being placed in the cell and the lighter had not been seen at the time of evidence collection when smaller items were identified. It was also stated that there was no DNA from Oury Jalloh associated with the lighter but the lighter was relatively undamaged.

38. Iain Peck also opined that it would appear that the fire tests conducted by Maksim Smirnou indicated that the use of two litres of petrol most closely matched the damage in the cell but despite the fact that no ignitable liquids were found in the cell, it was still entirely possible that an ignitable liquid could have been used to assist in the development of the fire in the cell. Mr Peck's overall opinion was that based on the available information, it was his view that a third party ignited the fire.

***Manner of Death***

39. The pathological findings in isolation cannot provide a definitive answer as to the decedent's manner of death. The determination of the manner of Oury Jalloh's death involves considerations around establishing whether or not an accelerant was used to initiate the fire and effect the severe

degree of burning of the body on a presumably intact flame resistant mattress as well as the physical capability of the decedent to self-initiate a fire in the cell using a cigarette lighter, given his restrained positioning.

## ANSWERS TO SPECIFIC QUESTIONS

1. ***Can the extent of the skin burns allow conclusions to be drawn as to whether or not accelerant was used? If so, then would it be possible to specify the type of accelerant?***

   The extent of the cutaneous burns does not permit valid inference about the use of accelerants or not. The extent of the burns to the body is not outside what would be expected in fire deaths without accelerants but in such a scenario, it would be more commonly encountered in domestic fires. The pathological evidence cannot assist in the determination as to whether or not an accelerant was used but the severity of the burns for the apparent short duration of burning, when coupled with the non-detection of COHb and CN, point towards a flash fire type of scenario and therefore invokes the possibility that an accelerant was used.

2. ***Can conclusions about the intensity of the fire at its start be drawn from this set of data?***

   This is forensic science issue and not a forensic pathology issue. Opinion is therefore deferred to Iain Peck, Fire Investigator.

3. ***What burn conditions must be present in order to reach the above-described profile of contaminants in the blood?***

   Response deferred to Iain Peck and Michael Scott-Ham.

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**DATE: October 23, 2015.**

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## Appendices

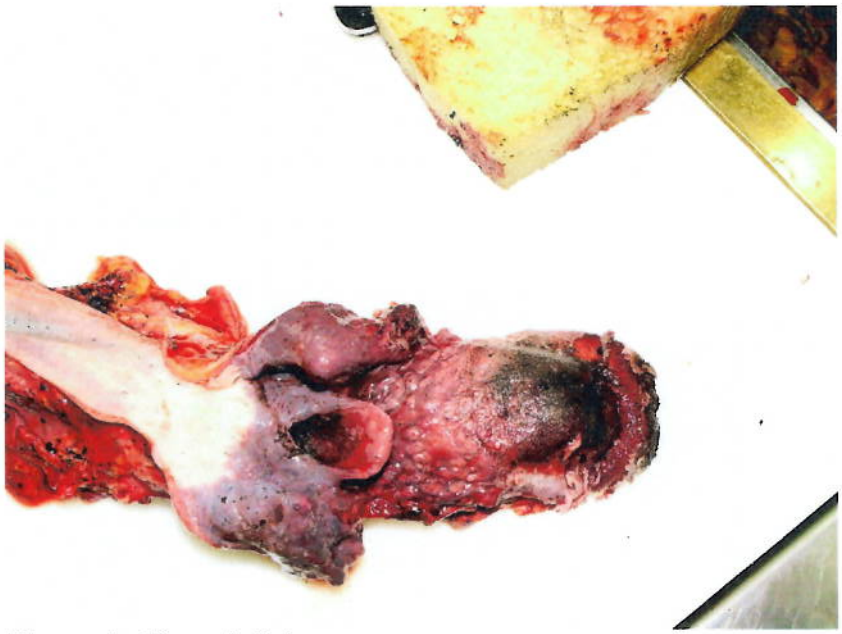

Figure 1: Oury Jalloh


Figure 2: Inhalational injury.
*Reproduced from Shkrum MJ and Ramsay DA. Forensic Pathology of Trauma: Common Problems for the Pathologist. Chapter 4/Thermal Injury. Fig 21. Page 201, Humana Press 2007.*