

Lipid Levels in Men Infected with *Treponema pallidum*

^{1,2}Adekunle Odunayo Adejuwon, ²Mary Adejumo Bisi-Johnson,

²Anthony Oluwafemi Ajayi and ³Christopher A. Adejuwon

¹Department of Biochemistry and Microbiology,

Faculty of Information Technology and Applied Sciences, Lead City University, Ibadan, Nigeria

²Department of Microbiology, Obafemi Awolowo University, Ile-Ife, Nigeria

³Department of Chemical Pathology, College of Medicine, University of Ibadan, Ibadan, Nigeria

Abstract: Background: *Treponema pallidum* is a microaerophile or obligate anaerobe which often inhabits body fluids and mucous membranes of infected humans. With a metabolism highly dependent on its host, it lacks enzymes of the TCA cycle and a variety of other pathways. The indiscriminate use of drugs in the United States of America alone in 1990 led to a high incidence of infection. **Materials and Methods:** Inhabitation of the reproductive tract through the mucous membrane will probably not rule out the involvement of lipids of the host during progression of infection. Seminal plasma and sera of twenty male individuals (n = 20) infected with *Treponema pallidum* and those of normal uninfected males (n = 10) were analyzed for total cholesterol, low-density lipoprotein-cholesterol and triglyceride. **Results:** The mean seminal total cholesterol in both groups was about the same though slightly lower in the infected males. The mean seminal plasma concentration of low-density lipo-protein-cholesterol in infected males was lower than observed in normal uninfected males. Mean seminal plasma concentration of triglyceride in infected males was also lower than that observed in normal uninfected males. The mean serum concentration of total cholesterol was slightly lower in infected males than in uninfected males. Serum concentration of low-density lipoprotein-cholesterol was slightly higher in infected males than in uninfected males while serum triglyceride was lower in infected males than in uninfected males. The mean sperm count and volume of ejaculate were lower in the *Treponema pallidum* infected males than in uninfected males.

Key words: *Treponema pallidum*, lipid levels, triglyceride, low-density lipoprotein-cholesterol, total cholesterol

INTRODUCTION

Syphilis, caused by *Treponema pallidum* and some other sexually transmitted diseases of chlamydial and mycoplasma origin can cause epididymitis and blockage of the male reproductive ducts resulting in permanent azospermia (Nester *et al.*, 2004). It has been shown that syphilis is related to salpingitis and infertility in all parts of the world (Topozada and Topozada, 1969). It is one of the major causes of post inflammatory diseases in Africa. It is of tubal occlusion in females but of orchitis and oligospermia/azospermia in males (Pelczar *et al.*, 2005; Nester *et al.*, 2004) which could result in impaired seminal quality in such males. Many factors that are of importance in the formation of sex cells have been found in lesser than normal amount in infertile men. For instance, average blood plasma Epidermal Growth Factor (EGF) concentrations have been reported to be significantly lower in infertile men (Adekunle *et al.*, 2000).

Since lipids play an important role in the development of spermatozoa (Kacsoh, 2000; Olukaibe, 2000), this study was designed to analyze and estimate the concentration of certain lipids in male individuals infected with *Treponema pallidum* in sub-Saharan Nigeria.

MATERIALS AND METHODS

Semen and blood collection: Upon consent, semen samples and fasting blood were collected from twenty adult male individuals (n = 20) at the Special Treatment Clinic, University College Hospital, Ibadan Nigeria. The individuals were diagnosed as having syphilis. Hours of collection of samples were between 10 and 11 am for uniformity of sampling time. The semen samples were collected into sterile containers by masturbation and delivered to the laboratory within thirty minutes of collection. Analyses were carried out within one hour of ejaculation.

Corresponding Author: Adekunle Odunayo Adejuwon, Department of Biochemistry and Microbiology,
Faculty of Information Technology and Applied Sciences, Lead City University, Ibadan, Nigeria
Tel: +2348069781680

About 5 mL of venous blood samples were collected using sterile syringes into heparinized containers from the arms of the subject. The samples were stored at -20°C until analyses. Controls were ten normospermic males (n = 10) with no history of sexually transmitted diseases.

Semen examination and count: The semen samples were measured by aspiration into graduated syringes for the volume of ejaculate. Colour was observed as well. Ten microlitres of samples were put on slides, covered with cover slips and observed under X 400-600 magnification of a binocular microscope. The concentration of spermatozoa was determined using haemocytometer.

Lipid analysis: Seminal plasma and sera stored at -20°C were analyzed for total cholesterol, low-density lipoprotein-cholesterol and triglyceride (Allain *et al.*, 1974; Friedewald *et al.*, 1972; Pomeranz and Meloan, 2004; Lahnsteiner *et al.*, 1996).

RESULTS

Sperm count ($\times 10^6$ mL) and volume of ejaculate (mL) in seminal plasma of normal males (controls) and infected males are given in Table 1. Low-density lipoprotein-cholesterol and seminal plasma triglyceride increased with sperm count. Values of total cholesterol, low-density lipoprotein-cholesterol and triglyceride in seminal plasma (Table 2) and corresponding values in sera (Table 3) are presented.

In comparison, the mean sperm count of control subjects with that of infected present a significant difference ($t = 41.254$, $p < 0.05$). There was no significant difference in the mean volume of ejaculate when controls were compared with infected subjects ($t = 10.469$, $p > 0.05$). In the seminal plasma, there was no significant difference in total cholesterol count in comparison with that of the infected ($t = 2.794$, $p > 0.05$). There was a significant difference when the mean total low-density lipoprotein-cholesterol count in the seminal plasma of control subjects was compared with that of the infected ($t = 12.431$, $p < 0.05$). There was a significant difference in the mean when the triglyceride count in the seminal plasma of controls was compared with that of the infected subjects ($t = 27.479$, $p < 0.05$). There was no significant difference in values of the mean of total cholesterol in sera when the controls were compared with the infected ($t = 3.073$, $p > 0.05$). There was a significant difference in values of mean of low-density lipoprotein-cholesterol in sera when controls were compared with infected ($t = 2.289$, $p < 0.05$). A significant difference was observed when the mean triglyceride count in sera of control subjects were compared with that of infected ($t = 12.747$, $p < 0.05$).

Table 1: Characteristics of seminal plasma of normal uninfected males (controls) and male individuals infected with *Treponema pallidum*

Parameter	Subjects	Mean±SEM
Sperm count $\times 10^6$ (mL ⁻¹)	Controls	75.80±1.32
	Infected	14.02±1.20
Volume of ejaculate (mL ⁻¹)	Controls	3.25±0.32
	Infected	2.62±0.32

Table 2: Lipid levels in seminal plasma of normal uninfected males (controls) and male individuals infected with *Treponema pallidum*

Parameter	Subjects	Mean±SEM
Total cholesterol (mg dL ⁻¹)	Controls	30.32±3.47
	Infected	29.02±3.64
Low-density lipoprotein-cholesterol (mg dL ⁻¹)	Controls	31.32±5.64
	Infected	21.43±2.02
Triglyceride (mg dL ⁻¹)	Controls	176.42±3.82
	Infected	52.84±5.36

Table 3: Lipid levels in sera of normal uninfected males (controls) and male individuals infected with *Treponema pallidum*

Parameter	Subjects	Mean±SEM
Total cholesterol (mg dL ⁻¹)	Controls	179.82±1.82
	Infected	171.65±1.29
Low-density lipoprotein-cholesterol (mg dL ⁻¹)	Controls	22.35±1.62
	Infected	23.42±3.40
Triglyceride (mg dL ⁻¹)	Controls	160.24±1.82
	Infected	131.17±4.62

These results indicate that the total cholesterol was lower in seminal plasma, of both infected and normal (controls) males, than in their sera. Low-density lipoprotein-cholesterol was lower in the seminal plasma of infected males than in their sera. Triglyceride in the seminal plasma and in sera of controls was about the same; though the value was a bit higher in the seminal plasma. Further observation show that the mean seminal plasma concentration (mg dL⁻¹) of triglyceride in infected males was lower than that observed in normal uninfected males. The mean seminal plasma concentration of low-density lipoprotein-cholesterol in infected males was also lower than that observed in normal uninfected controls. The sera did not show much difference in values for these lipids. The mean serum concentration of total cholesterol was slightly lower in infected males than in uninfected males.

DISCUSSION

Infection with *Treponema pallidum*, the microbe causing syphilis is a common cause of male infertility (Nester *et al.*, 2004). HIV-seropositive women have been observed to be co-infected with the human papillomavirus (HPV) and *Treponema pallidum*. (Sagna *et al.*, 2010).

According to Padron *et al.* (1989), there is a relationship between sex steroids and cardiovascular risk factors, lipid levels and semen quality. Seminal plasma triglyceride and low-density lipoprotein-cholesterol may be useful biochemical indicators for assessing male infertility (Olukaife, 2000). Various male factors: testicular volume (Arai *et al.*, 1998), hormonal investigation

(Zabul *et al.*, 1994) for the assessment of infertility have been suggested.

Although, serrological diagnosis of syphilis include non-specific screening tests based on cardiolipin or regain secondary syphilis ensues six to eight weeks after exposure to the bacterium. However, latency may last several years, granulomatous lesion (gummata) at various sites on the body is sign of tertiary stage of infection. Involvement of the cardiovascular and central nervous system in the infective stage cognote quaternary stage of infection (Humphreys and Irving, 1996).

REFERENCES

- Adekunle, A.O., E.A.O. Falase, M. Ausmanus, G.S. Kopf, K.N. Van-Arsdalen and C. Teusher, 2000. Comparative analysis of blood plasma epidermal growth factor concentrations, hormonal profiles and semen parameters of fertile and infertile males. *Afr. J. Med. Med. Sci.*, 29: 123-126.
- Allain, C.C., L.S. Poon, C.S. Chan, W.S. Richmond and P.C. Fu, 1974. Enzymatic determination of total serum cholesterol. *Clin. Chem.*, 20: 470-475.
- Arai, T., S. Kitahara, S. Horiuchi, S. Sumi and K. Yoshida, 1998. Relationship of testicular volume to semen profiles and serum hormone concentrations in infertile Japanese males. *Int. J. Fert. Menopausal Stud.*, 43: 40-47.
- Friedewald, W.T., R.I. Levy and D.S. Fredickson, 1972. Estimation of the concentration low-density lipoprotein cholesterol in plasma with the use of the preparative ultra centrifuge. *Clin. Chem.*, 18: 499-502.
- Humphreys, H. and W.L. Irving, 1996. *Problems Oriented Clinical Microbiology and Infection*. Churchill Livingstone Medical Division of Pearson Professional Ltd., New York, pp: 1698.
- Kacsoh, B., 2000. *Endocrine Physiology*. The McGraw Hill Companies Inc., New York, pp: 741.
- Lahnsteiner, F., B. Berger, T. Weismann and R.A. Patzner, 1996. Physiological and biochemical determination of rainbow trout *Oncorhynchus mykiss*, semen quality cryopreservation. *J. Applied Aquacul.*, 6: 47-73.
- Nester, E.W., D.G. Anderson, C.E. Roberts, N.N. Pearsall, M.T. Nester and D. Hurley, 2004. *Microbiology: A Human Perspective*. McGraw Hill Companies Inc., Boston, pp: 817.
- Olukaibe, I., 2000. Lipid profile of some infertile Nigerian males. M.Sc. Thesis, University of Ibadan, Ibadan, Nigeria.
- Padron, R.S., J. Mas, R. Zamora, F. Riverol, M. Licea, L. Mallea and J. Rodriguez, 1989. Lipid and testicular function. *Int. Urol. Nephrol.*, 21: 515-519.
- Pelczar, M.J., E.C.S. Chan, N.R. Krieg and M.F. Pelczar, 2005. *Microbiology*. Tata McGraw-Hill Publishing Company Ltd., New Delhi, pp: 918.
- Pomeranz, Y. and C.E. Meloan, 2004. *Food Analysis: Theory and Practice*. CBS Publishers and Distributors, New Delhi, pp: 778.
- Sagna, T., F. Djigma, M. Zeba, C. Bisseye and S.D. Karou *et al.*, 2010. Human papillomaviruses prevalence and genital co-infection in HIV-seropositive women in Ouagadougou (Burkina Faso). *Pak. J. Biol. Sci.*, 13: 951-955.
- Topozada, H.K. and M.K. Topozada, 1969. *Gynaecology*. Almaaref Establishment Press, Galal Hazzi Co., Alexandria, pp: 806.
- Zabul J., W. Mierzejewski and A. Rogoza, 1994. Usefulness of examining gonadotropin hormones and testosterone in men with abnormal semen. *Ginekol. Pol.*, 65: 71-74.