THE CITY OF LONDON
DENTAL SCHOOL

University of Bolton
Teaching Intensive, Research Informed

Dr Robert Banks BDS (Lond) MSc (Implantology) GDC 67315
Dental Implantologist
Respirator Face Fit Tester

1

Respiratory Protective Equipment at Work

AIMS:

- Review the different types of RPE available in the workplace
- Explain latest concepts in RPE protocols in relation to protection against Covid-19
- Review the procedure involved in qualitative face fit testing

OBJECTIVES

- Recall the options on types of RPE suitable for work in the dental surgery
- Appreciate the need for respiratory protection against airborne viruses
- Identify your further learning needs

2

Respiratory Protective Equipment RPE

Dr Robert E Banks
BDS (Lond) MSc (Dental Implantology) GDC 67315

3

Safety?

- Moria refugee camp

4

5

6

Half mask respirator

7

Full face mask respirator

8

Powered air respirator hood

9

Powered air respirator hood

10

3M Valved Cupped FFP3

11

3M non valved

12

Fluid resistant surgical mask Type IIR

13

What the law says

- Health & Safety at Work Act 1974
- COSHH Regulations 2002
- Control of Asbestos Regulations 2012
- Control of Lead at Work Regulations 2002
- Ionising Radiations Regulations 2017
- Confined Spaces Regulations 1997
- Personal Protective Equipment at work Regulations 1992
- These Regulations are supported by Approved Codes of Practice. ACOPs

HSE Health & Safety Executive

14

Health & Safety Executive states:

- RPE must be adequate and suitable

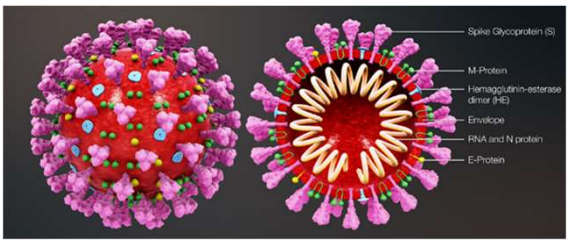
- Adequate:
  - It is right for the hazard and reduces exposure to the level required to protect the wearer's health.
- Suitable
  - It is right for the wearer, task and environment, such that the wearer can work freely and without additional risks due to the RPE.

15

Selecting RPE that is adequate and suitable

16

Covid - 19



17

Which RPE

18

19

20

21

22

Fit testing RPE

- Compatibility test between the wearer and the mask and gives a quantitative measurement known as a fit factor
- Fit Factor: is a measure of how many times cleaner the air inside the mask is compared to air outside the mask
- Minimum Fit Factors:
  - 1) At least 2000 for full face mask
  - 2) At least 100 for a half mask reusable
  - 3) At least 100 for a filtering facepiece FFP1, FFP2, FFP3

23

Fit testing RPE

- Quantitative
- Qualitative

24

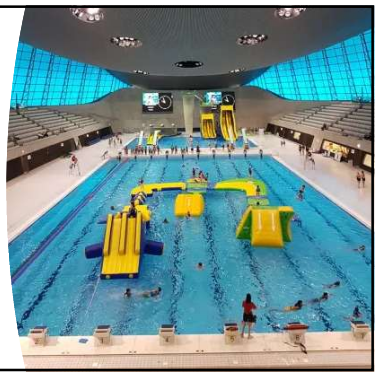
The sensitivity test

- Denatonium Benzoate 'Bitrex' sensitivity
- Saccharin sweet sensitivity

25

Denatonium benzoate (Lidocaine benzyl benzoate)

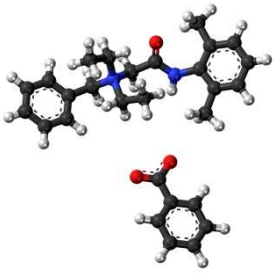
- Drop a thimble-full of Bitrex into an Olympic swimming pool and you can detect the bitterness in those two and a half million litres of water. But despite this bitterness, Bitrex is itself totally harmless. It won't make you sick or ill, it just tastes so bitter that you will want to spit it out – fast.



26

Denatonium

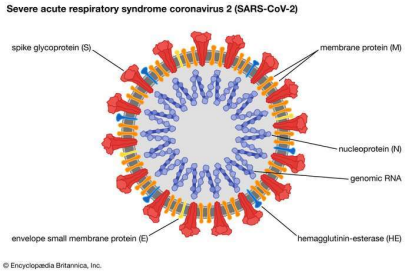
- Denatonium, usually available as denatonium benzoate is the most bitter chemical compound known to man.
- It was discovered in 1958 during research on local anaesthetics .
- Used as aversive agent (bitterant). Denatonium is used in denatured alcohol, antifreeze, preventive nail biting preparations, respirator mask fit-testing, animal repellents, liquid soaps, Nintendo Switch game cards, and shampoos. It is not known to pose any long-term health risks.



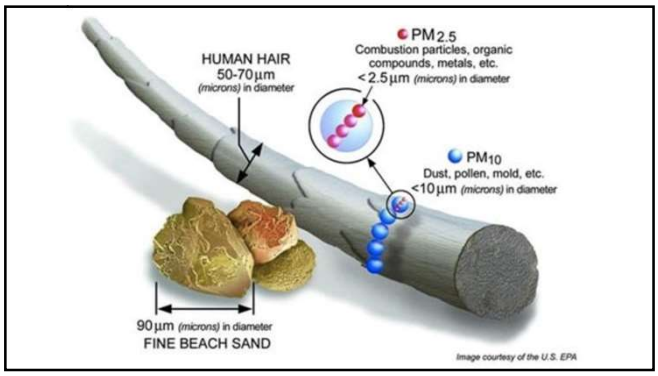
27

Coronavirus

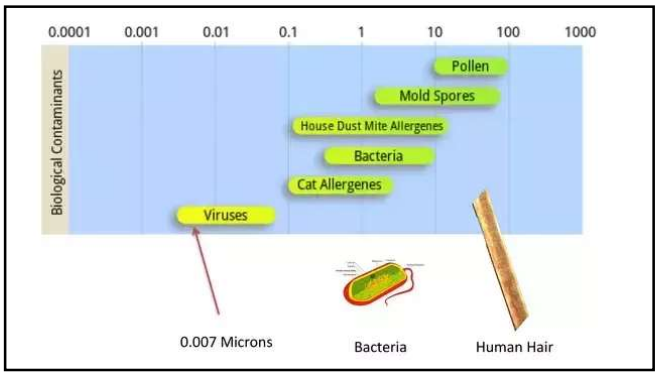
- 125nm diameter



28



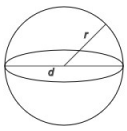
29



30

The Maths

- Coronavirus 62.5nm radius or 125nm average diameter
- Surface area=49,087.385 nm² ≈ **4.9 x 10⁴ nm²**



- Denatonium molecule Surface Area 69.2 Å² =**0.692 nm²**

- Coronavirus: 6,000x larger than Denatonium

$$A_s = 4\pi r^2$$

31

Fit testing RPE

32

Assigned protection factor APF 20 and FFP3

What is it?

Where does it come from?

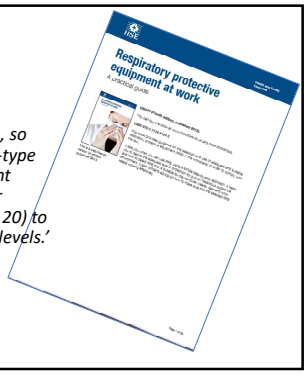
Why is it relevant now?

33

RPE for Biological Agents

- *'When in an airborne state, micro-organisms can be classed as particles, so they can usually be removed by filter-type RPE. You should always use equipment fitted with the highest efficiency filter possible (protection factor of at least 20) to control exposure down to the lowest levels.'*

- HSG53 Fourth edition
- Health & Safety Executive



34

Minimum Infective Dose

- Although coronavirus can survive up to 3 days on certain surfaces, the risk is only high depending on the virus load needed to catch COVID-19.
- The infective dose, or more specifically the ID50, is the estimated number of organisms or virus particles required to produce infection in 50% of normal adult humans exposed by a given route.
- Do we know if it's small or large? NO!

35

Workplace Exposure Limit (WEL)

The upper limit on the acceptable concentration of a hazardous substance in workplace air for a particular material.

It is set by HSE and documented in EH40

36

Substance – Toluene

- ■ Measured airborne toluene concentration:
- 350 ppm (parts per million) within an eight-hour time-weighted average (TWA).
- ■ Toluene WEL: 50 ppm (from EH40).
- ■ Required APF to reduce to WEL = 350/50 = 7.
- Select RPE device with an APF above the required protection factor. In this case an APF of 10 will be required.

37

What level of protection??

You should always use equipment fitted with the highest efficiency filter possible (protection factor of at least 20) to control exposure down to the lowest levels.'

Health & Safety Executive HSG53 2013

'If for any reason FFP3 masks are not available, we recommend using the FFP2 masks as a safe alternative but please note these should also be fit-tested.'

NHS England 28th March 2020

38

Particle Respirators

- Protect against aqueous and oily aerosols, smoke and fine dust in the workplace. They do not protect against gases or vapours
- EN 149 standard
- FFP1, FFP2, FFP3 equate to P1, P2 and P3 particle filters.
- Defined as particle filtering face masks and fine dust respirators.

39

How are particles filtered?

- Multiple filter material layers
- Layers functions:
  - Filtering
  - Stability
  - Tear resistance
  - Look and feel
- Optionally include an exhalation valve.

40

Electrostatic charge

41

Exhalation Valve or not?

42

FFP – Filtering Face Piece Masks

- FFP1 mask
- Aerosol filtration percentage: 80% minimum.
- Internal leak rate: Maximum 22%.
- Assigned protection factor APF = 4

43

FFP – Filtering Face Piece Masks

- FFP2 masks with exhalation valve
- Aerosol filtration percentage: Not less than 94%.
- Internal leak rate: Maximum 8%.
- Assigned protection factor APF = 10

44

FFP – Filtering Face Piece Masks

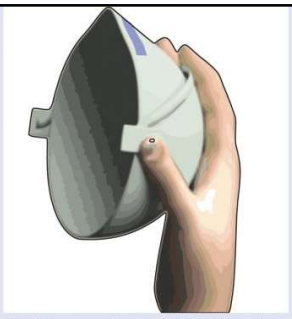
- FFP3 mask with exhalation valve
- Aerosol filtration percentage: Not less than 99%.
- Internal leak rate: Maximum 2%
- Assigned protection factor APF = 20

45

Face fitting your respirator

- Pre-use seal check and preparation
- Facial hair – clean shaven
- Changes to face shape: weight loss or gain, surgery

46



4a. Fully open the respirator. If there is a nose wire present, bend it into a curve

47

4b. Cup the respirator under your chin, then position the upper headband over the crown of your head and above your ears. Position the lower headband at the back of the head and below your ears

48

4c. Check the respirator is flat against the cheeks

49

4d. Press the nose piece around the bridge of the nose to ensure a good fit

50

Pre use seal check

51

The Fit Test

52

Genuine or Fake?

53

Spotting a Fake – Understanding FFP Markings

CE
FFP

European Standard EN149 requires a FFP to have the following markings:

For example:

Manufacturer name or logo
3M

European Standard number
EN149:2001

European certification mark
CE

Manufacturer model number
8810

Filtering facepiece class
'NR' - Single shift use
'R' - Re-usable
FFP2 NR

Notified Body responsible for the product certification
0086

54

Spotting a Fake – Understanding FFP Markings

NIOSH
N95

NIOSH APR-FFR standard requires a FFP to have the following markings:

For example:

Manufacturer name or logo
3M

The word 'NIOSH'
NIOSH

NIOSH Approval number
TC-84A-0006

Manufacturer model number
1860

Manufacturer's lot number
B11159

Filtering facepiece class
N95

55

Spotting a Fake – Understanding FFP Markings

KN95

Chinese Standard GB2626-2006 requires a KN95 to have the following markings:

For example:

Manufacturer name or logo
3M

Chinese Standard
GB2626-2006

Manufacturer model number
9505Z

Filtering facepiece class
KN95

56

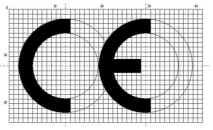
The CE Mark

The CE mark is a specific design and should appear as shown below:

Looks like a circle cut in half

Looks like a circle cut in half

The middle line of the 'E' does not extend to the centre of the circle



57

EU Declaration of Conformity (DoC)

Example created to show content of a Module B EU Type Examination Certificate. This is a Mock Up – BSIF are NOT a Notified Body

BSiF

EU Declaration of Conformity No. 0105123

This declaration of Conformity is issued under the sole responsibility of the manufacturer:

BSIF
Bank House
Market Harborough
Leics. LE16 7AZ

Cov-X-All Chemical Protective Coverall C/w Hood
Code: **CXA100** – Category III PPE
Yellow – Size Ranges Small to XXXL
Various Batch Numbers apply

The product referenced in this Declaration satisfies the essential Health & Safety requirements of Regulation (EU) 2016/425 Personal Protective Equipment

The product referenced in this declaration is issued in compliance with the following harmonised Standards:

EN 13034:2005+A1:2009 — Type 6 – Protection against reduced spray of liquid chemicals
EN ISO 13982-1:2004+A1:2010 — Type 5 – Protection against Fine Dust particles
EN 14605:2005+A1:2009 — Type 4-B & 4—Protection against liquid chemicals
EN 14126:2003 — Type 3B/4B/5B/6B – Protection from biological hazards
EN 1149-5:2008 — Electrostatic Properties – Performance requirements using EN1149-1:2006

EU Module B Type Examination Number: 5231245/A Rehes

EU Notified Bodies involved:
RTTO Testing & Certification Ltd
Unit 3B, Wheal Forge Way
Trafford Park, Manchester, M17 1EH
Notified Body No: 0088

Module D QA Assessment by:
SATRA Technology Europe Ltd
Bracetown Business Park
Clonee, Dublin, D15 YN2P
Notified Body No: 1777

Authorised and approved: 01/04/2020
Issued by:

Company Logo

Name and Address of manufacturer

Description & code of PPE

Declaration of Compliance with PPE Regulation

Details of Module B Certificate(s)

Details of Notified Body who issued Module B Certificate(s)

Title and Number of D of C

Image of Product (Note: not all DoCs will contain an image)

Declaration of Compliance with specific standards

Details of Notified Body who conduct QA Module Assessment

Details of who (person) issued D of C and date of issue

EU DoC must be provided with the product or be available to download or on request to the PPE manufacturer/supplier.

Courtesy of BSIF
www.bsif.co.uk
www.fit2fit.org

58

Genuine or Fake?

- No Standard number
- No manufacturer name, logo or model number
- No markings on packaging
- No EU CE mark and Notified Body number

- Unusual design
- No EU Notified Body Number
- No manufacturer name, logo or model number
- No 'N' or 'NR' marking

- No EU Notified Body Number
- No 'N' or 'NR' marking
- ISO:9001 is not relevant to RPE certification

59

Useful Resources

- British Safety Industry Federation (BSIF): Fake PPE Certificates
https://www.bsif.co.uk/campaigns-projects/fake-certificate/
https://www.bsif.co.uk/are-you-concerned-about-ppe-certificates/

- European Safety Federation: COVID-19 Suspicious certificates for PPE
https://www.eu-esf.org/covid-19/4513-covid-19-suspicious-certificates-for-ppe

- HSE: Report a defective product
https://www.hse.gov.uk/work-equipment-machinery/report-defective-product.htm

- EU Notified Bodies
https://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=directive.notifiedbody&dir_id=155501

60

61

The City of London Dental School © 2020

62