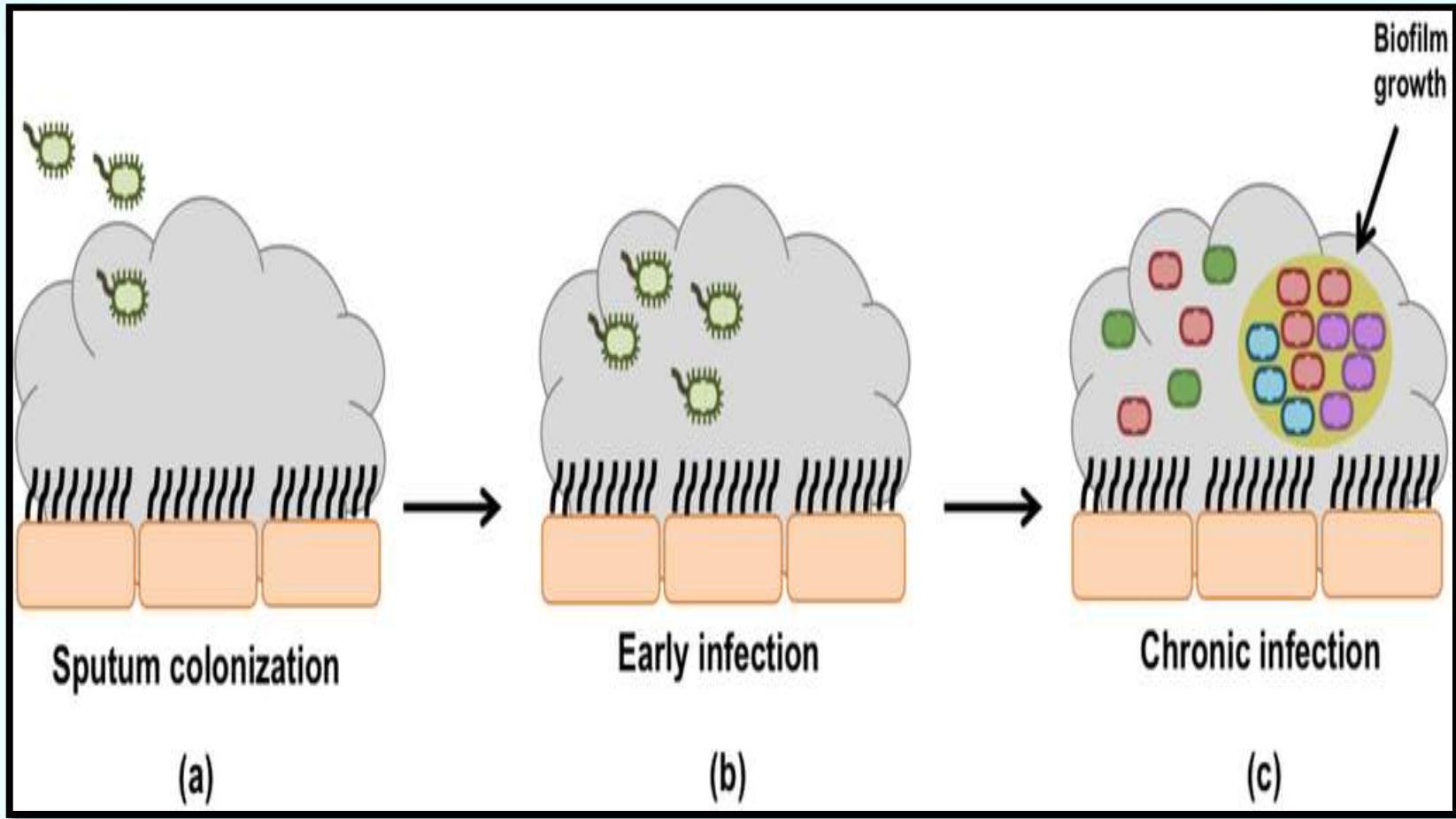




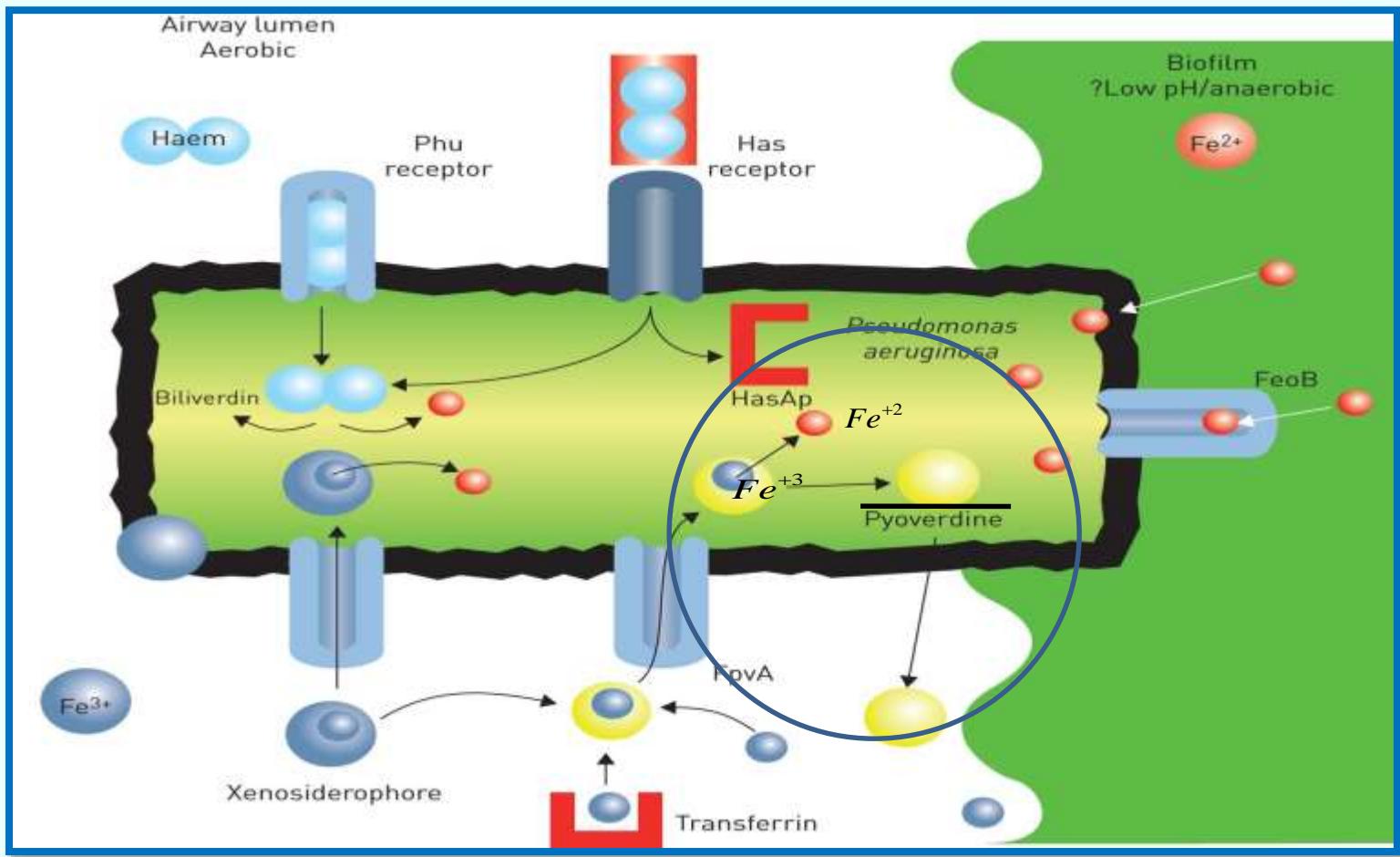
Pseudomonas aeruginosa and iron

Hila Alterovich, RD, MAN
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Pseudomonas aeruginosa Diversification during Infection Development in Cystic Fibrosis Lungs—A Review
Ana Margarida Sousa and Maria Olívia Pereira, *Pathogens* 2014, 3(3), 680-703

Iron acquisition by *P. aeruginosa*



Targeting iron uptake to control *Pseudomonas aeruginosa* infections in cystic fibrosis

Daniel J. Smith, Iain L. Lamont, Greg J. Anderson and David W. Reid, Eur Respir J 2013; 42: 1723–1736

Iron-binding compounds impair *Pseudomonas aeruginosa* biofilm formation, especially under anaerobic conditions

Che Y. O'May,¹ Kevin Sanderson,¹ Louise F. Roddam,¹ Sylvia M. Kirov^{2†} and David W. Reid^{1†}

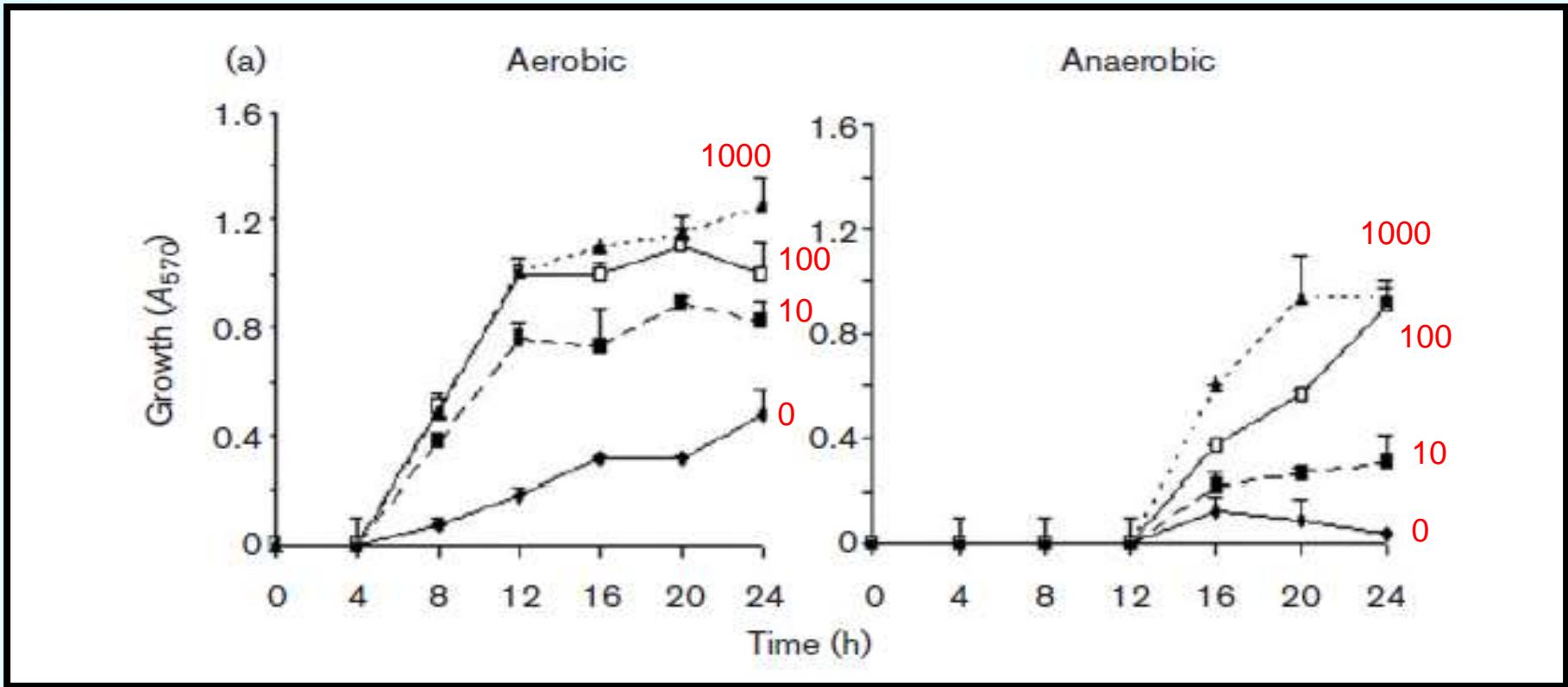
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Effect of iron levels on *Pseudomonas aeruginosa* growth and biofilm formation under aerobic and anaerobic conditions

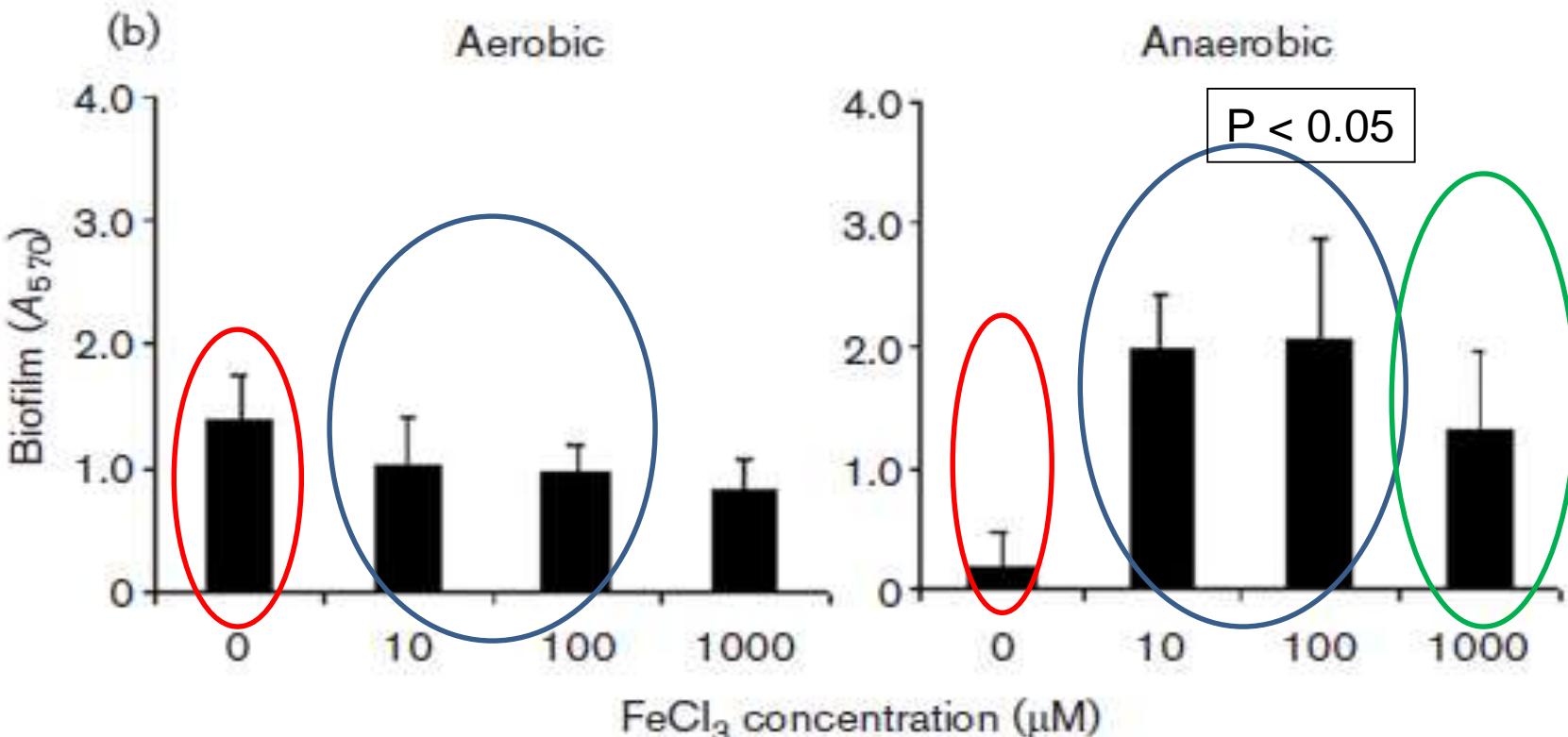
Effect of iron levels on growth and biofilm formation



FeCl₃ concentrations (mM)

◆ 0; ■ 10; □ 100; ▲ 1000.

Effect of iron levels on growth and biofilm formation



FeCl₃ concentrations (mM)

◆, 0; ■, 10; □, 100; ▲, 1000.

Conclusion

- Under both atmospheres, the level of growth increased as the iron concentration increased
- Iron requirements for growth and biofilm formation were higher under anaerobic conditions
- Too much iron is detrimental to biofilm formation



- This study investigated the effects of limiting iron levels as a strategy for preventing/disrupting



Journal of Cystic Fibrosis 11 (2012) 560–562



Letter to the Editor

Intravenous iron among cystic fibrosis patients

- **Use of intravenous (IV) iron in Cystic fibrosis (CF) patients, with *Pseudomonas aeruginosa* and iron deficiency**



- Hemoglobin (g/dL)

pre-IV iron median **10.2** ,
day-5 - post iron - median **11.1** ,(p-value 0.004)

- MCV (fl)

pre-IV iron median **77.6**
day-5 – post iron median **79.7** ,(p-value 0.004)



Limitations

- A small number of participants
- How to assess iron deficiency
- “True” iron deficient anaemia and the anaemia of chronic disease caused by inflammation



Occasion	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 0 IV iron given	Day 1 IV Ferinject®	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
4 ¹								Iron study							
Hb								10.2		10.3					10.6
MCV								87.5		86.7					89.1
WCC								14.2		13.5					15.9
CRP								89.8		57.4					135.1





	Occasion	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 0 IV iron given	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Patient B																
22yo	7 th				11.5	11.6	11.5	11.7	12.2	12.0			12.7			
Female	Hb				80.5	79.9	80.9	79.6	80.5	81.5			81.6			
	MCV				6.2	6.3	4.7	3.6	4.7	5.3			7.2			
	WCC					8.3		8.6		3.7			2.0			
FEV1 61%	CRP															
FEV1 61%	FEV1								61%							

Day 1
IV Ferinject

Day 8
IV Ferinject



Result

- IV iron may be useful among CF patients with iron deficiency
- Clinical deterioration 3–5 days after IV iron administration among CF patients hospitalised with CF respiratory exacerbation



Conclusion

- Caution when using IV iron during exacerbation
- Safer to use IV iron at the end of the antibiotics course
- Extending the antibiotics course for about 7 days after administration of IV iron to cover for potential clinical deterioration



Take home....

Guidelines: Iron

- Supplementation:**

In cases of iron deficiency, we recommend resolving underlying inflammation, and supplementing with iron only if deficiency persists.
(Grade of evidence: **moderate**)

- Monitoring:**

We suggest monitoring children, adolescent, and adult patients annually using serum iron determination, differentiating between iron deficiency anemia and anemia of chronic inflammation; if iron deficiency is suspected, increase frequency of monitoring. (Grade of evidence: **low**)

ESPEN-ESPGHAN-ECFS guidelines on nutrition care for infants, children, and adults with cystic fibrosis.

- Treat the inflammation rather than to supplement iron!**
- Iron deficiency anemia and anemia of chronic inflammation**

Targeting bacterial iron acquisition as a therapeutic strategy

- Iron chelators
 - Synthetic iron chelators
 - Biological iron chelators
- Iron mimetics – Gallium(Ga^{+3})

Targeting iron uptake to control *Pseudomonas aeruginosa* infections in cystic fibrosis

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Questions for discussion

- Should we supplement our patients with iron
- Mode of administration
- Under which (hemoglobin, Ferritin) level should we supplement
- Patients without pseudomonas aeruginosa should we be more liberal in supplement



Thank you