

Alaska Opioid Policy Task Force
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Preventing Opioid Dependency Across Generations

Mark Erickson, MD
Frontline Remote Access Telebehavioral Clinic
Alaska Psychiatric Institute
Anchorage, Alaska
mark.erickson@alaska.gov

A Revolution in Public Health (1882)



March 24, 1882 - Robert Koch to Berlin Society for Physiology:

- 1) A bacteria causes tuberculosis.
- 2) Germ theory of infectious disease - simple, very powerful idea.

Demystified infectious diseases

Impact on public health incalculable.

Leading causes of morbidity and mortality change over ensuing decades.

Robert Koch

A New Revolution in Public Health?

Special Communication to the Journal of the American Medical Association

"A scientific consensus is emerging that the origins of adult disease are often found *among developmental and biological disruptions occurring in the early years of life*...there can be a lag of many years, even decades, before adverse experiences are expressed in the form of disease."

J Shonkoff, W Boyce, B McEwen (2009) JAMA 301:2252-2259.

Drug use attributable to adverse childhood experiences

Drug Addiction – 64%

Intravenous use – 67%

SH DUBE et al. (2003) Pediatrics 111: 564-572

Placing the ACE Study in context:
Developmental origins of health and disease paradigm

1981 - Identifying a problem:

First National Incidence Study - child maltreatment is common

1998 - What are the health risks?

CDC Adverse Childhood Experiences Study - health risks enormous.

Today - Developmental Origins of Health and Disease (DOHAD) paradigm:

- a) What happens from conception to ~ age 3 has disproportionate impact on life long health.
- b) Major reduction in drug dependency - across generations - require getting things right from conception to age 3.
- c) Vast research literature now exists that grows daily.
 - Epidemiology - ACE study, WHO, etc.
 - Epigenetics, neurobiology, behavioral endocrinology, developmental biology
 - Ethology, kin selection theory, anthropology, attachment research, etc.
- d) The 21st century equivalent of Koch's germ theory?

Why are adverse childhood experience so adverse?

The epigenetics of early experience.

Genome

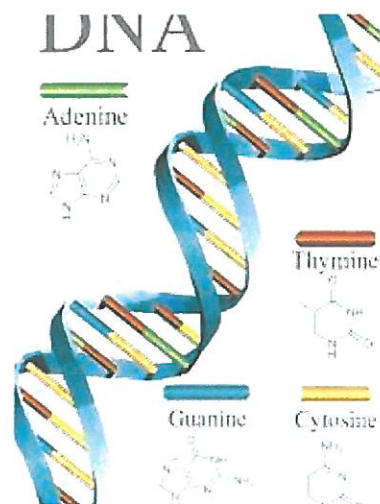
...the genetic material of an organism

1953 - double helix structure of DNA is described:

- James Watson, Francis Crick, Rosalind Franklin.

2003 Human Genome Project completed:

- Human genome =
 - 3.2 billion “letters” of the genetic code sequenced.
 - ~ 23,000 genes.
 - 23 chromosomes (23 pairs).



Epigenome:

definition: “epi” prefix – on, upon... the gene

1942: Conrad Waddington coins term “epigenetic.” A theory of how one genome creates over 200 cell types.

1948: Chemical “marks” discovered on DNA (methyl groups).

- Purpose unknown.
- But marks are not random...always bonded to cytosine adjacent to guanine

1980: Aaron Razin proposes methylation marks regulate gene expression.

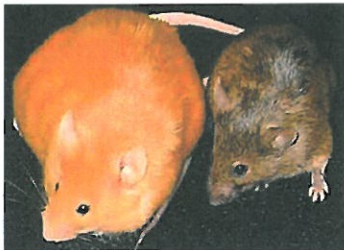
Razin is correct...

Razin A & Riggs AD (1980). Science 210:604-10.



Genome identical
Epigenome is different ...
Environmental epigenetics...mother's diet in pregnancy

R A Waterland & R L Jirtle (2003). Molecular & Cellular Biology 5293-5300.



Maternal care and intergenerational patterns

McGill University, Montreal 1999:

- High care (HC) rat mothers give birth to pups that are more curious and prosocial. Pups later become high care parents...generation after generation.
- Low care (LC) mothers give birth to pups who are less curious & more fearful. Pups later become low care parents...generation after generation.



Francis D et al. (1999). Science 286:1155-58.

Maternal care and intergenerational patterns

Cross-fostering experiment (pups switched at birth)

- Pups born to low care mother *but raised by high care mother* became high care parents.
- Pups born to high care mother *but raised by low care mother* became low care parents.
- What mattered was the experience of being parented - not the biological parent.

Francis D. et al (1999). Science 286:1155-58.



Epigenetic Programming by Maternal Behavior (Weaver et al 2004)

Q. Does quality of maternal care alter the pup epigenome ?

◦Yes...in at least one gene (GCRG)

◦Finding gave birth to new and now rapidly growing branch of biology - environmental or behavioral epigenetics.

(Cited 4036x as of 9-12-16.)

Weaver, I, Meaney, M et al. (2004) Nat. Neurosci. 7:847-54.



Michael Meaney

Does the glucocorticoid receptor gene undergo epigenetic change in humans due to early experience?

Environmental circumstance:

- Maltreatment in childhood (2009)*
-
- Mother depressed - pregnancy'
- Extreme trauma exposure - pregnancy**
- Domestic violence - pregnancy^

Epigenetic change to child's GCRG:

Yes

Yes

Yes

Yes

McGowan PO et al (2009). Nat Neurosci 12:342-48.*
 Tyrka AR (2012) et al. PLoS One 7:e30148.*
 Perroud N et al (2011). Transl Psychiatry 1, e59.*

Perroud N et al. (2014) World J Biol. Psy. doi: 10.3109/15622975.2013.866693.**
 Radke K (2011). Transl. Psychiatry e21.^
 Oberlander TF et al (2008). Epigenetics 3:97-106.'

OK...so social experience in early life epigenetically changes the glucocorticoid receptor gene in humans...What about the other 22,999 genes?

*“Child Abuse and Epigenetic Mechanisms of Disease Risk”
(Yang, Kaufman et al. 2013)*

- Q: Is it possible that epigenetic changes, associated with childhood adversity, explain the myriad health risks found in the ACE study?
- Method:
 - DNA samples (saliva) from 96 children taken from parents due to abuse and neglect and from 96 children with no maltreatment history.
 - 485,000 sites of potential epigenetic change examined (methylation).
- Findings:
 - 2,868 sites of epigenetic difference found comparing maltreated and control children ($p < 5 \times 10^{-7}$).
 - Epigenetic differences across entire genome (all 23 chromosomes).
 - Gene set associated with brain development, risk for depression, substance abuse, diabetes, cancers, asthma, etc.

Yang B & Kaufman J et al. (2013). Am J Prev Med 44: 101-07.

What to do?

Why is child abuse and neglect so common?

What are its causes?

Why is child abuse so common?

Much modern disease is caused by our lifestyle:

- Cardiovascular disease epidemic - modern diet
- Cancer – tobacco, diet, environmental toxins
- Asthma - air pollution
- Child maltreatment – similar?

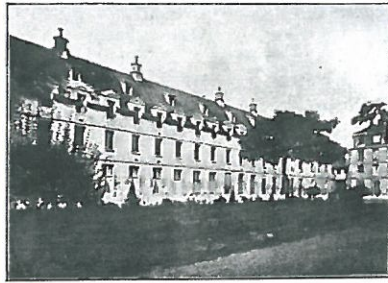
Hypothesis: many factors - rare or non-existent in intact traditional cultures but common in recent human history - inadvertently disrupt the biology of kinship thereby increasing the risk of child abuse and neglect.*

*Hrdy, SB (2001). The Past, Present and Future of the Human Family. The Tanner Lectures on Human Values. See also *Mothers and Others* (2009) and *Mother Nature: Maternal Instincts and How They Shape the Human Species* (1999)

I. The Biology of Maternal – Infant Bonding:

...leveraging biology to prevent child abuse and neglect...and opioid dependence in the next generation.

I. The Biology of Maternal – Infant Bonding: Leveraging the Birth Experience

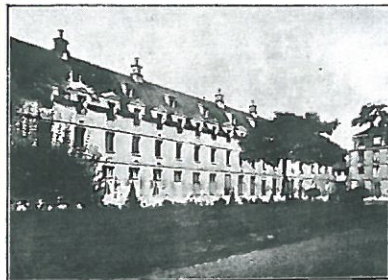


Paris 1800s:

- La Maternité charity hospital.
- 1830 - 64% of infants born at La Maternité were abandoned.

R Fuchs (1987) *Journal of Interdisciplinary History*
v18:55-80.

I. The Biology of Maternal – Infant Bonding: Leveraging the Birth Experience



1837: La Maternité changes policy:

- Mothers asked to stay.
- Abandonment decreased ~40%.
- Policies changed over the decades.
- Key finding: the longer mothers stayed and nursed the less likely they were to abandon infant.

R Fuchs (1987) *Journal of Interdisciplinary History*
v18:55-80.

I. The Biology of Maternal – Infant Bonding: Leveraging the Birth Experience

Landmark Study: (Klaus, Kennell, et al. 1972)

- Study group: At risk mothers.
 - Half of mothers received hospital care as usual (separation).
 - Half of mothers roomed in with infant after birth.

Key findings:

- One month later mothers who roomed in with infant were:
 - more responsive to infants cry
 - more reluctant to leave infant
 - made more direct eye contact
 - more affectionate
- At one year mothers who roomed were still doing better.

M Klaus, J Kennell, et al. (1972) NEJM v286:460-463.
J. Kennel et al. (1974) Dev. Med. Child Neur. v16:172-79.

I. The Biology of Maternal – Infant Bonding: Leveraging the Birth Experience

- Costa Rica (1988): policy change increased mother-infant post-partum contact and reduced abandonment ~ 70% (n~78,000).
- Russia (2000): large maternity hospital increased mother-infant contact and support for ~ first week post partum for at-risk women resulted in ~46% reduction in infant abandonment (n~20,000).
- Thailand (1991): similar change with similar results.

B. Baranasin (1991) Asia-Pacific J Public Health v5:217-220.
N. Lvoff et al. (2000) Arch Pediatr Adolesc Med v154:474-77.
L. Mata et al. (1988) In Programs to Promote Breastfeeding, ed. B. Jelliffe, Oxford Univ. Press.

I. The Biology of Maternal – Infant Bonding: Leveraging the Birth Experience

California Assembly Bill 1368 (effective in 2001)

- Permits mothers to abandon infant to hospital without penalty provided this occurs in first 72 hours post birth.
- Biology of maternal-infant bonding suggests unintended consequences of this bill - it thwarts maternal-infant bonding at its most crucial period.
- A different, biologically informed approach would be to provide maternal support in the early post partum (e.g., La Maternite, Costa Rica, Russia) - establishing maternal-infant bond and thereby preventing abandonment.

Hrdy, SB (2001) The Past, Present and Future of the Human Family. The Tanner Lectures on Human Values.

I. The Biology of Maternal – Infant Bonding: Breastfeeding and a mother's brain

Breastfeeding was ubiquitous among our ancestors...not so now.

Breastfeeding releases into mother's brain:

- Prolactin: hormone promotes maternal care.
- Oxytocin: bonding hormone.
- Dopamine: pleasure neurotransmitter.

Hypothesis: Longer duration of breastfeeding will reduce maternal abuse and neglect of offspring.

C Ferris (2005) J Neurosci. 25:149-56. // DR Grattan (2002) Reproduction 123:497-506. // M Febo et al. (2005) J Neurosci. 25 pp11637-44 // HJ Smith (2002) Parenting for Primates. Harvard U Press, Cambridge, MA.

I. The Biology of Maternal – Infant Bonding: Breastfeeding and a Mother’s Brain

Study: 6,621 mother-infant pairs followed over 15 years (Australia).

Findings:

- Mothers who breastfed more than 4 months were 4.8x less likely to have verified history of maltreating child.
- Controlling for 18 potential confounding variables mothers who nursed 4 months or more were still 2.6x less likely to maltreat their child.

L Strathearn et al. (2009) Pediatrics 123:483-93.

Increasing breastfeeding: What works

Improving the birth experience:

- Baby Friendly Hospital – “gold standard – effective.”
- Skin to skin immediate post partum – effective.
- Doula support during birth – effective.
- Rooming in (maternal haven) for at risk mothers- effective.
- Lactation consultant – probably effective.

Maternity leave policies:

- More generous maternity leave policies – effective.

Education:

- Interactive group education - effective.
- WIC interventions – effective.
- Pamphlets, lectures - not effective.
- Training health professionals – not effective.

Baby Friendly Hospital Initiative

- Baby Friendly Hospital: WHO/UNICEF initiative – 1991
- 10 criteria need to be met for hospital to be given designation
- Norway and Sweden virtually 100% Baby Friendly.
- China: now has over 6,000 BFH. Exclusive breastfeeding increased from 29% to 68% in rural areas and 10% to 48% in urban from 1992-1994.
- Mongolia: rates of exclusive breastfeeding at 4 months increased from 48% to 93% (1992-98). 100% of hospitals are Baby Friendly.
- US – less than 2% of our hospitals are Baby Friendly (in Alaska – Providence and Bartlett)

<http://www.unicef.org/programme/breastfeeding/bab.htm>
<http://www.babyfriendlyusa.org/eng/06.htm>
http://www.infactcanada.ca/bfhi_promotes_optimal_infant_fee.htm

Public policy change to promote breastfeeding (and thereby prevent child abuse and opioid abuse in the next generation)

United Kingdom:

- Had one of the lowest rates of breastfeeding worldwide.
- 2009: UK committee comprehensively reviews evidence on breastfeeding promotion .
- Finding: WHO/UNICEF Baby Friendly Hospital Initiative “single most fundamental intervention.”
- 2011: UK decides that all hospitals will transition to Baby Friendly.

L Dyson et al. (2009) Public Health Nutrition v13:137-44.
L Dyson (2011) personal communication.

I. The Biology of Maternal – Infant Bonding: Breastfeeding and a Mother’s Brain

- Breastfeeding promotes maternal-infant care by its impact on the maternal brain (oxytocin, prolactin, dopamine).
- Increasing the duration of breastfeeding has been associated with a 2.8 fold decrease in verified child maltreatment (Strathearn 2009).
- Policy decisions, such as transitioning to the Baby Friendly Hospital initiative should increase the duration of breastfeeding in a population.
- A reasonable expected outcome would be the prevention of child abuse and neglect and – in later life – opioid dependence.

I. The Biology of Maternal – Infant Bonding: Maternal recognition of offspring



Adelie penguins:

- 1952: Kendeligh hypothesizes that in penguin colonies parents feed whoever is hungry.
- 1968: Thomson and Emlen show that parents feed only their own offspring.
 - Penguin parental ability to recognize young occurs at about 8 days of age – when chicks first become active.
 - Parents will accept foster chick before this age but after reject foster chicks.
 - Potential model of maternal neglect.

Kendeigh SC (1952) Illinois Biol Monograph 22:1-356//
Thompson, DH & Emlen, JT (1968) Antarctic Journal 3:132.

I. The Biology of Maternal – Infant Bonding: Maternal recognition of offspring



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J Child Psychol Psychiatry. 2008 October ; 49(10): 1042–1052. doi:10.1111/j.1469-7610.2008.01963.x.

Maternal brain response to own baby-cry is affected by cesarean section delivery

James E. Swain¹, Esra Tasgin², Linda C. Mayes^{1,3}, Ruth Feldman^{1,4}, R. Todd Constable⁵, and James F. Leckman¹

I. The Biology of Maternal – Infant Bonding: Maternal recognition of offspring

Background:

1. Cesarean section rate across natural history ~ 0
2. Cesarean section rates now - Brazil 47%/ US 32%/ Holland 14%.
3. Vaginal delivery involves a large release of oxytocin (not occurring in cesarean section).
4. Oxytocin is a key mediator of maternal-infant bonding across species.
5. Rejection rate in monkeys of offspring delivered by cesarean section is extremely high.
6. Hypothesis: cesarean section may disrupt maternal-infant bonding in humans.

Swain JE et al (2008). *J Child Psychol Psych* 49:1042-52. / Lundblad EG & Hogden G (1980) *Lab Animal Sci* 5:913. // http://www.oecd-ilibrary.org/sites/health_glance-2011-en/04/09/index.html?itemId=/content/chapter/health_glance-2011-37-en

I. The Biology of Maternal – Infant Bonding:
Maternal recognition of offspring

- Study: 2-4 weeks post delivery mothers have fMRI of brain while listening to recording of own babies cry.
- Finding: as measured by brain activation mothers delivering vaginally were significantly more responsive to babies cry than mothers who delivered by cesarean section in multiple brain regions.

Q: Is cesarean section a risk factor for child abuse and neglect?

Swain JE et al (2008). J Child Psychol Psych 49:1042-52. / Lundblad EG & Hogden G (1980) Lab Animal Sci 5:913. //http://www.oecd-ilibrary.org/sites/health_glance-2011-en/04/09/index.html?itemId=/content/chapter/health_glance-2011-37-en

See also Kim P et al (2011) J Clin Psychol Psychiatry 52:907-15.

I. The Biology of Maternal – Infant Bonding:
Learning how to parent...

- In non-human primates mortality rates for first born can be ~ 60% higher than with more experienced mothers.
- In human mothers early childbearing is a risk for maltreatment.

Hrdy, SB (1999) Mother Nature: Maternal Instincts and How They Shape the Human Species. Ballantine Books, New York

IOM (2014). New Directions in Child Abuse and Neglect Research. National Academies Press, Washington DC.

I. The Biology of Maternal – Infant Bonding: Learning how to parent matters too

Nurse-family partnership (NFP):

- For first time mothers at risk.
- Nurses visit home, teach and support parents from the second trimester until 2 years post birth.
- David Olds – University of Colorado

I. The Biology of Maternal – Infant Bonding: Learning how to parent matters too

- Nurse family partnership (NFP):
 - In one study child abuse and neglect 48% less among NFP mothers (Elmira NY)
 - NFP in Alaska – Southcentral Foundation and Providence.
 - In some states 100% coverage (e.g., Wyoming)
 - Return on investment \$5.70 per dollar spent

I. The Biology of Maternal – Infant Bonding: Leveraging in *Prison Nurseries*

Prison nurseries allow mothers to keep baby.

Prison nurseries are rare in the US but common in most other countries.

Mothers who keep their baby while in prison have much lower rates of recidivism.

- Indiana – 68% decrease in recidivism.
- Ohio – 43% decrease.
- Nebraska – 52% decrease.
- New York – 50% decrease.
- Washington – 72% decrease.


Data from Master's Thesis (2011) of L Dean Marshall, superintendent of Hiland Mountain Correctional Facility in Alaska (dean.marshall@alaska.gov)

I. The Biology of Maternal – Infant Bonding: Leveraging in *Prison Nurseries*

In New York study:

- During pregnancy psychological assessment (Adult Attachment Interview - AAI) indicated 1/3 of mothers were likely to have securely attached infants.
- One year after birth 3/4ths of infants securely attached.
- Secure attachment is associated with many good outcomes later in life.
- Take home message: prison nurseries may dramatically improve the mother-infant bond thereby reducing abuse and neglect.


M. Byrne et al. (2010) Attachment and Human Development, 12:375-93.



I. The Biology of Maternal – Infant Bonding:
Leveraging in *Prison Nurseries*

Prison nurseries: high risk mothers in supportive environment with newborn for an extended period.

- Over a year or more of caring for newborn many mothers seem to undergo a transformation.
- They become good mothers when strong evidence indicated they would not.
- Do prison nurseries rewire the maternal brain?
- Downstream...are both mother and child at substantially reduced risk of drug dependency across their lifespan?



II. The Biology of Fatherhood:
Leveraging to prevent child abuse and neglect

II. The Biology of Fatherhood: Leveraging to prevent child abuse and neglect

“Fatherhood is a creation of society.” Meyer Fortes 1983

1983: Cambridge biologist Alan Dixson reports elevated prolactin levels in marmoset fathers.

Dixon, AF & George L (1982) *Nature* 299: 551-53.
Ziegler T (2000) *Folia Primatol* 71:6-21.
Fortes M (1983) *Am Anthro* 55:17-41.



II. The Biology of Fatherhood: Leveraging to prevent child abuse and neglect

Q. Do human fathers have higher prolactin levels than non-fathers?

Finding: They do ($p=0.006$)

L Gettler et al. (2012) *Am J Phys Anthro* 148:362-70.

II. The Biology of Fatherhood: Leveraging to prevent child abuse and neglect

As men become fathers they experience:

- Increased prolactin
- Increased oxytocin
- Increased cortisol
- Decreased testosterone
- Brain activation in areas associated with emotion processing, empathy in response to child picture.

Mascaro JS (2014) Psychoneuroendocrinology 46:153-63

Hrdy, SB (2001) Tanner Lectures on Human Values.

Gettler, L et al. (2012) Am J Phys Anthro 148:362-70.

II. The Biology of Fatherhood: Leveraging to prevent child abuse and neglect

- How are the biological changes of fatherhood triggered?
- Fathers obvious cannot become pregnant nor can they breastfeed...
- Association with mother and infant is likely key.

II. The Biology of Fatherhood

Do paternal leave policies leverage caregiving ?

Millenium Cohort Study (18,819 births in UK 2000-02)

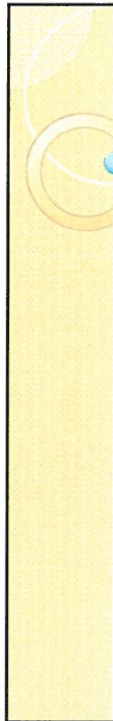
- Study: examined levels of paternal care after taking paternity leave vs. father's who did not take leave.
- Q: Does paternal leave increase engagement of father with their young children?
- Finding: father's that took leave were subsequently more involved in the care of their offspring

Tanaka, S & Waldfogel J (2007). *Community, Work and Family* 10: 409-26.

II. The Biology of Fatherhood


Do paternal leave policies leverage?

- In many species males undergo biological changes as they become fathers.
- This biology appears to be key for paternal care.
- Males are not pregnant nor do they breastfeed – the signal of pending fatherhood more subtle.
- The biology of fatherhood may appear to depend on close association with mother and child.
- Policies, e.g., paternal leave, improve paternal caregiving and may prevent abuse and neglect and opioid dependence...
- They may be effective because they initiate and sustain the biology of fatherhood.



III. Biology of kinship:

Innate boundaries between familial and sexual bonds



III. Biology of kinship:

Boundaries between familial and sexual bonds

1860's - 1960's:

- Social scientists:
 - 1) Assume mating in nature is random and frequently incestuous
 - 2) Assume humans uniquely avoid because of cultural incest taboos.Assumptions are foundation of psychoanalysis and theories of culture.

1960s - present:

- 1961 - first relevant study finds Japanese monkeys do not mate incestuously.
- 1968 - rhesus monkeys rarely mate incestuously.
- 2016 - dozens of studies now show incest is rare nearly across nature.
- 1963-2016 anthropologists show humans possess same adaptive capacity.
- Why then is incest and child sexual abuse common in humans?

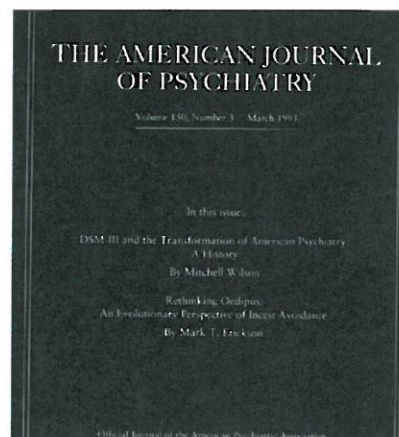
Sade DS (1968). Science and Psychoanalysis 12:18-38. // Pusey A (2004) in Wolf, AP ed., Inbreeding, incest and the incest taboo: State of knowledge. Stanford U Press. // Tokuda K (1961). Primates 3-37-40.

III. Biology of kinship: Boundaries between familial and sexual bonds

- What is the clinical significance of the biology of incest avoidance?
- What does this biology tell us about the causes of incest and child sexual abuse?
- What does it tell us about prevention?

Erickson, MT

1989 J Anth Res 45:267-91.// 1993 Am J Psych 150:411-16 // 1999 chapter in Evolutionary Medicine, Oxford Univ Press// 2004 chapter in Inbreeding, Incest and the Incest Taboo: State of Knowledge at the Turn of the Century, Stanford U Press// 2006 Clinical Neuropsych 3: 110-120.



III. Biology of kinship: Boundaries between familial and sexual bonds

- Hypothesis: capacity for normal familial / sexual boundaries is not hard wired but depends on the quality of early attachment.
- Prediction: severely disrupted early attachment will be a strong risk factor for perpetrating child sexual abuse later in life.
 - Findings:
 - Sexually abusive fathers: childhood filled with rejection, neglect, and often physical, sexual abuse.
 - Mothers in incest families: very high rates of abuse in childhood.
 - Sexually abusive mothers: childhood physical and sexual abuse extremely common (95%).
 - Sexually abusive sibling: sib typically experienced multiple forms of abuse and neglect.
 - Sexually abusive priests: est. 70-80% of priests who abuse were abused in their childhood.

Reviewed in Erickson, MT (2004) in Inbreeding, Incest and the Incest Taboo: The State of Knowledge at the Turn of the Century, Ed AP Wolf, W Durham. Stanford Univ Press. // Sipe, AW (2014) Routledge, NY.

III. Biology of kinship: Boundaries between familial and sexual bonds

Is child sexual abuse a disease of the biology of social perception caused by impaired early life experience?

- Study: 173 mothers videotaped interacting with mother.
 - Most mothers interacted with empathy and affection
 - ~ 9% of mothers seductive, e.g., a mother might ask their child for a kiss and if not given force a "passionate" kiss on the child's lips.
 - The same mothers were less aware/responsive to infants signals.
 - This behavior occurred even though mothers knew they were videotaped – they were apparently unaware of how inappropriate it appeared to others.
 - These mothers, when interviewed, were more likely to give evidence they were abused in childhood.

Sroufe, A & Ward MJ (1980) Child Dev 51:1222-29

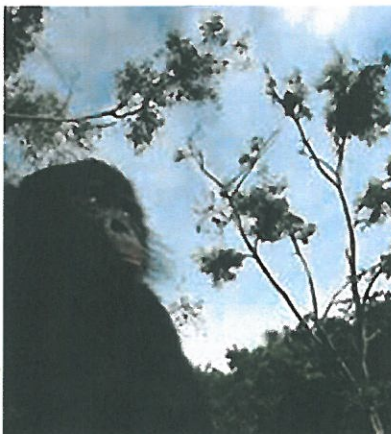
III. Biology of kinship: Boundaries between familial and sexual bonds

Is there a non-human primate equivalent?

- The equivalent of child sexual abuse has never been observed in apes or monkeys in nature.*
- Brian - bonobo chimp
- Sexually abused by his father.
- What was father's attachment experience?
 - "father suffered his own trauma as a research animal"

* See Erickson MT (2006). J Clin Neuropsych 3: 110-20.

Madrigal AC (2014) The Atlantic (June issue)



III. Biology of kinship: Boundaries between familial and sexual bonds

Summary:

- A very large evidence base indicates that humans and many other species possess innate familial – sexual boundaries.
- Although innate a normal manifestation appears to depend on the quality of early attachment experience (good enough parental care).
- ACEs disrupts this capacity – translating in later life to boundary confusion and violation.
- Preventing child sexual abuse in the next generation may – more than anything - depend on ensuring good enough early attachment.
 - Nurse Family Partnership (and other like programs, e.g., Triple P)
 - Baby Friendly Hospitals
 - Prison Nurseries
 - Paternal leave/ maternal leave policies.
 - ? Reduced cesarean section rates
 - Etc.

Summary

Adverse childhood experiences are common:

- Early life adversity is a risk factor for an enormous range of health problems.
- The greatest leverage point we have to improve public health at this point in time is to get things right from conception to age 3.
- To do this well we need to see the whole picture.
 - findings are coming from many directions – epidemiology, epigenetics, neurobiology, behavioral endocrinology, etc., etc.
- Developmental Origins of Health and Disease is a broad conceptual paradigm that may help to keep on target.

Summary

Suggestions:

- Focus healthcare resources on the conception to age 3 range, e.g.,
 - Nurse family partnership
 - Baby Friendly Hospitals – increase duration breastfeeding
 - Maternal leave policies – time to bond
 - Paternal leave policies – get father’s hormones going
 - Prison nurseries
 - Many other evidence based approaches will emerge as we more fully understand the biology of familial bonds.
 - Econometric research indicates a high return on investment (e.g., Doyle, O et al. (2009) *Economics and Human Biology* 7:1-6)

Summary

Suggestions:

- Consider creating something similar to the Washington State Family Policy Council.
 - The Council played a key role in the rapid translation of the ACE study to positive social change in Washington.
 - Now - developmental origins of health and disease research is emerging very rapidly - from diverse fields.
 - This research is likely to be ACE equivalent for years to come - a source of new translational ideas for preventing early adversities and improving family health.

Summary

Finally...

- Keep putting the power of self-knowledge to work.
 - The findings of the ACE study are being presented around Alaska.
 - Understanding these findings, by themselves, amazingly enough, appears to be remarkably beneficial.
 - People with multiple ACEs develop a greater self understanding.
 - A whole range of institutions are becoming trauma or ACE informed including schools, departments of corrections, police departments, hospitals, preschool programs etc.

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Preventing Opioid Dependency Across Generations

Mark Erickson, MD
Frontline Remote Access Telebehavioral Clinic
Alaska Psychiatric Institute
Anchorage, Alaska
mark.erickson@alaska.gov